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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Inter Partes Review No.: Unassigned

**DECLARATION OF KEVIN JEFFAY IN SUPPORT OF PETITIONER
DISH NETWORK L.L.C.'S
PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 9,538,122**

TABLE OF CONTENTS

I. Introduction.....	21
II. Summary of Opinions	21
III. Background and Qualifications	22
IV. Legal Standards for Patentability	28
V. Ordinary Skill in the Art	34
VI. Technological Background.....	35
A. Digital Video Recording (DVR) Technologies	35
VII. The Challenged '122 Patent	42
A. Effective Priority Date.....	42
B. Overview of the Challenged Patent's Specification.....	43
VIII. Claim Construction.....	46
IX. Description of the Prior Art.....	47
A. Dow (Ex. 1007)	47
B. Casagrande (Ex. 1006)	50
C. Russ (Ex. 1008)	54
D. Miller (Ex. 1009).....	56
E. Motivations to Combine	58
X. Ground 1: Claims 1–20 are obvious over Casagrande, either alone or in combination with Russ and Miller.....	60
A. Claim 1:	60
1. Claim element 1[pre]: “A digital video recorder (DVR) for time shifting at least one video program, said video program being transmitted over a data distribution system, comprising:”	61
2. Claim element 1[a][i]: “a tuner for receiving a plurality of video programs, wherein (i) said plurality of video programs are transmitted at the same time on a single channel within said data distribution setting,”	62
3. Claim element 1[a][ii]: “said tuner can be tuned to said single channel to receive said plurality of video programs, and”	69
4. Claim element 1[a][iii]: “(iii) at least one of said plurality of said video programs includes at least first, second, and third portions, wherein said	

- second portion as transmitted is configured to follow said first portion and said third portion as transmitted is said to follow said second portion;” 71
5. Claim element 1[b]: “a memory device for storing said plurality of video programs, allowing said one of said plurality of video programs to be played back at a later time;” 74
6. Claim element 1[c]: “a controller configured to receive commands from a user of said DVR, wherein a first command changes said DVR from a first playback state to a second playback state, and a second command initiates playback of said one of said plurality of video programs from said memory device, and a third command instructs said DVR to receive and store said plurality of video programs; and” 75
7. Claim element 1[d][i]: “at least one processor configured to (i) provide said one of said plurality of video programs in its entirety to a display device in response to received said second command regardless of a playback state of said DVR if said second command is received during a first period of time.” 79
8. Claim element 1[d][ii]: “provide said one of said plurality of video programs in its entirety to said display device in response to receiving said second command during a second period of time if said DVR is in said first playback state, and” 82
9. Claim element 1[d][iii]: “provide only a portion of said video program to said display device in response to receiving said second command if said second command is received during said second period of time and said DVR is in said second playback state, said portion of said video program including at least said first and third portions of said video program, wherein said third portion of said video program is provided to said display device immediately following said first portion of said video program if said second command is received during said second period of time and said DVR is in said second playback state;” 87
10. Claim element 1[e]: “wherein said second period of time is a period of time after said first period of time.” 93
- B. Claim 2: “The DVR of claim 1, further comprising a wireless transmitter in communication with said at least one processor and memory device, said wireless transmitter being configured to transmit said one of plurality of video programs in its entirety or said portion of said one of said plurality of programs

at least indirectly to said display device, said display device being remotely located from said DVR.” 95

C. Claim 3: “The DVR of claim 1, further comprising at least one other tuner, wherein said at least one other tuner allows said DVR to receive at least one other video program while said tuner is being used to receive said plurality of video programs, said at least one other video program being selected by said user.” 98

D. Claim 4: “The DVR of claim 1, wherein said one of said plurality of video programs includes at least primary and secondary video content, and said first and third portions of said one of said plurality of video programs consists of said primary video content.” 100

E. Claim 5: “The DVR of claim 4, wherein said second portion of said one of said plurality of video programs consists of said secondary video content and said memory device is further configured to store at least one time when said second portion begins and at least one time when said second portion ends.” . 102

F. Claim 6: “The DVR of claim 1, wherein said first portion of time is a period of time that begins when said one of said plurality of video programs is stored on said memory device and available to be viewed and ends within a predetermined time thereafter, said predetermined time being less than one week.” 106

G. Claim 7: “The DVR of claim 1, wherein said single channel is stored in said memory and said at least one processor is configured to tune said tuner to said single channel in response to said controller receiving said third command.” . 107

H. Claim 8: “The DVR of claim 1, wherein data communicated via said single channel is compressed prior to transmission and said at least one processor is configured to decompress said data after its (sic) have been received so that said one of said plurality of video programs or said portion of said one of said plurality of video programs can be displayed, depending on when said second command is received and said playback state of said DVR.” 109

I. Claim 9: “The DVR of claim 5, wherein said secondary video content comprises at least one advertisement.” 112

J. Claim 10: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said one of said plurality of video programs from said memory if said second command is received during said second period of time and said DVR is in said second playback state, and (ii) retrieve said one of said plurality of video programs in its entirety from said

memory device if another second command is received at a time thereafter and said DVR is switched to said first playback state at or before said time thereafter.” 112

1. Claim element 10[a]: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said plurality of video programs from said memory if said second command is received during said second period of time and said DVR is in said second playback state,” 113

2. Claim element 10[b]: “retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and said DVR is switched back to said first playback state at or before said time thereafter.” 114

K. Claim 11: 117

1. Claim element 11[pre]: “A method for time shifting at least one video program transmitted to a digital video recorder (DVR) over a data distribution system, comprising:” 118

2. Claim element 11[a]: “receiving a plurality of video programs, wherein said plurality of video programs are transmitted as the same time and are received by a single tuner in said DVR, and at least one of said plurality of video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is said to follow said second portion;” 118

3. Claim element 11[b]: “receiving a third command from at least one user of said DVR, said third command indicating a desire to use said single tuner to receive said plurality of video programs and to store said plurality of video programs on at least one memory device in said DVR;” 118

4. Claim element 11[c]: “storing said plurality of video programs on said at least one memory device in said DVR in response to receiving said third command from said at least one user of said DVR;” 119

5. Claim element 11[d]: “receiving a second command from said at least one user of said DVR, said second command indicating a desire to playback at least a portion of said one of said plurality of video programs;” 119

6. Claim element 11[e]: “receiving a first command from said at least one user of said DVR, said first command indicating a playback state of said DVR; and” 120

7. Claim element 11[f]: “providing said at least a portion of said one of said plurality of video programs to a display device in response to receiving said second command from said at least one user of said DVR;” 120
8. Claim element 11[g][i]: “wherein said step of providing at least a portion of said one of said plurality of video programs to said display device further comprises (i) providing said one of said plurality of video programs to said display device in response to receiving said second command during a first period of time,” 121
9. Claim element 11[g][ii]: “(ii) providing said one of said plurality of said video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said first playback state, and” 121
10. Claim element 11[g][iii]: “(iii) providing only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said video program, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and DVR is in said second playback state; 121
11. Claim element 11[h]: “wherein said second period of time is a period of time after said first period of time.” 122
- L. Claim 12: “The method of claim 11, wherein said step of providing said at least a portion of said one of said plurality of video programs to a display device further comprises transmitting said at least a portion of said one of said plurality of video programs to said display device via a transmission path that includes at least one wireless connection, said display device being remotely located from said DVR.” 122
- M. Claim 13: “The method of claim 11, wherein said step of storing said plurality of video programs on said at least one memory device in said DVR further comprises storing at least one time of when said second portion of said video program begins and at least one time of when said second portion of said video program ends. 123
- N. Claim 14: “The method of claim 11, wherein said one of said plurality of video programs includes at least primary and secondary video content, said

portion of said video program that is provided to said display device if said second command is received during said second period of time and said DVR is in second playback state consists of said primary video content, and said secondary video content includes at least one advertisement. 123

O. Claim 15: “The method of claim 11, further comprising the steps of: compressing said plurality of video programs prior to said plurality of video programs being transmitted over said data distribution system, and decompressing said plurality of video programs after said plurality of video programs have been received by said DVRr (sic) and before said one of plurality of video programs or portion thereof is provided to said display device.” 124

P. Claim 16: “The method of claim 11, further comprising the step of tuning said single tuner to a particular channel at a particular time in response to receiving a third command, said particular channel and said particular time being stored in said at least one memory device in said DVR..... 124

Q. Claim 17: “The method of claim 16, further comprising the step of receiving a fourth command from said at least one user of said DVR, said forth command indicating a desire to record a second video program, which is accomplished using another tuner if said second video program is being transmitted to said DVR while said plurality of video programs are being transmitted to said DVR. 124

R. Claim 18: 127

1. Claim element 18[pre]: “A digital video recorder (DVR) for time shifting at least one of a plurality of video programs, said one of said plurality of video programs consisting of first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion, comprising: 127

2. Claim element 18[a]: “a first tuner for receiving data on said plurality of video programs, wherein said data on one of said plurality of video programs is transmitted together with said data on other ones of said plurality of video programs, so that said first tuner receives said data on said one of said plurality of video programs at the same time that it receives data on said other ones of said plurality of programs;” 128

3. Claim element 18[b]: “at least one memory device for storing said data on said plurality of video programs, including at least said one of said plurality of video programs;”	129
4. Claim element 18[c]: “a controller for receiving commands including at least a first command for setting a playback state of said DVR, a second command for initiating a playback state of said one of said plurality of video programs from said memory device, and a third command for initiating said reception and said storage of said data on said plurality of video programs; and”	129
5. Claim element 18[d][i]: “at least one processor for (i) providing said first, second, and third portions of said one of said plurality of video programs respectively to a display device in response to receiving said second command during a first portion of time,”	129
6. Claim element 18[d][ii]: “(ii) providing said first, second, and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during a second period of time if said DVR is in a first playback state, and”	130
7. Claim element 18[d][iii]: “(iii) providing said first and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during said second period of time if said DVR is in a second playback state, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state.”	130
S. Claim 19: “The system of claim 18, wherein said third command further results in said first tuner being tuned to a particular frequency to receive said data on said plurality of video programs, said particular frequency being provided by a content provider and stored on said DVR.”	131
T. Claim 20: “The system of claim 18, wherein said second portion comprises at least one commercial and said data on said plurality of video program is packetized, with individual packets being linked at least indirectly to individual ones of said plurality of video programs and to individual channels associated with content owners thereof.”	131
XI. Ground 2: Claims 1, 3-5, 7-11, 13-16, and 18–19 are invalid as anticipated by Dow.....	135

A. Claim 1:	135
1. Claim element 1[pre]: “A digital video recorder (DVR) for time shifting at least one video program, said video program being transmitted over a data distribution system, comprising:”	136
2. Claim element 1[a][i]: “a tuner for receiving a plurality of video programs, wherein (i) said plurality of video programs are transmitted at the same time on a single channel within said data distribution setting,”	136
3. Claim element 1[a][ii]: “said tuner can be tuned to said single channel to receive said plurality of video programs, and”	137
4. Claim element 1[a][iii]: “(iii) at least one of said plurality of said video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion and said third portion as transmitted is said to follow said second portion,”	138
5. Claim element 1[b]: “a memory device for storing said plurality of video programs, allowing said one of said plurality of video programs to be played back at a later time;”	139
6. Claim element 1[c]: “a controller configured to receive commands from a user of said DVR, wherein a first command changes said DVR from a first payback state to a second playback state, and a second command initiates playback of said one of said plurality of video programs from said memory device, and a third command instructs said DVR to receive and store said plurality of video programs; and”	141
7. Claim element 1[d][i]: “at least one processor configured to (i) provide said one of said plurality of video programs in its entirety to a display device in response to received said second command regardless of a playback state of said DVR if said second command is received during a first period of time.”	144
8. Claim element 1[d][ii]: “provide said one of said plurality of video programs in its entirety to said display device in response to receiving said second command during a second period of time if said DVR is in said first playback state, and”	145
9. Claim element 1[d][iii]: “provide only a portion of said video program to said display device in response to receiving said second command if said second command is received during said second period of time and said DVR	

is in said second playback state, said portion of said video program including at least said first and third portions of said video program, wherein said third portion of said video program is provided to said display device immediately following said first portion of said video program if said second command is received during said second period of time and said DVR is in said second playback state;”	145
10. Claim element 1[e]: “wherein said second period of time is a period of time after said first period of time.”	147
B. Claim 3: “The DVR of claim 1, further comprising at least one other tuner, wherein said at least one other tuner allows said DVR to receive at least one other video program while said tuner is being used to receive said plurality of video programs, said at least one other video program being selected by said user.”	147
C. Claim 4: “The DVR of claim 1, wherein said one of said plurality of video programs includes at least primary and secondary video content, and said first and third portions of said one of said plurality of video programs consists of said primary video content.”	149
D. Claim 5: “The DVR of claim 4, wherein said second portion of said one of said plurality of video programs consists of said secondary video content and said memory device is further configured to store at least one time when said second portion begins and at least one time when said second portion ends.” .	150
E. Claim 7: “The DVR of claim 1, wherein said single channel is stored in said memory and said at least one processor is configured to tune said tuner to said single channel in response to said controller receiving said third command.” .	153
F. Claim 8: “The DVR of claim 1, wherein data communicated via said single channel is compressed prior to transmission and said at least one processor is configured to decompress said data after its (sic) have been received so that said one of said plurality of video programs or said portion of said one of said plurality of video programs can be displayed, depending on when said second command is received and said playback state of said DVR.”	155
G. Claim 9: “The DVR of claim 5, wherein said secondary video content comprises at least one advertisement.”	156
H. Claim 10: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said one of said plurality of video programs from said memory if said second command is received during said	

second period of time and said DVR is in said second playback state, and (ii) retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and said DVR is switched to said first playback state at or before said time thereafter.” 158

1. Claim element 10[a]: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said plurality of video programs from said memory if said second command is received during said second period of time and said DVR is in said second playback state,” 158

2. Claim element 10[b]: “retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and said DVR is switched back to said first playback state at or before said time thereafter.” 159

I. Claim 11: 162

1. Claim element 11[pre]: “A method for time shifting at least one video program transmitted to a digital video recorder (DVR) over a data distribution system, comprising:” 163

2. Claim element 11[a]: “receiving a plurality of video programs, wherein said plurality of video programs are transmitted as the same time and are received by a single tuner in said DVR, and at least one of said plurality of video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is said to follow said second portion;” 163

3. Claim element 11[b]: “receiving a third command from at least one user of said DVR, said third command indicating a desire to use said single tuner to receive said plurality of video programs and to store said plurality of video programs on at least one memory device in said DVR;” 163

4. Claim element 11[c]: “storing said plurality of video programs on said at least one memory device in said DVR in response to receiving said third command from said at least one user of said DVR;” 164

5. Claim element 11[d]: “receiving a second command from said at least one user of said DVR, said second command indicating a desire to playback at least a portion of said one of said plurality of video programs;” 164

6. Claim element 11[e]: “receiving a first command from said at least one user of said DVR, said first command indicating a playback state of said DVR; and” 165
7. Claim element 11[f]: “providing said at least a portion of said one of said plurality of video programs to a display device in response to receiving said second command from said at least one user of said DVR;” 165
8. Claim element 11[g][i]: “wherein said step of providing at least a portion of said one of said plurality of video programs to said display device further comprises (i) providing said one of said plurality of video programs to said display device in response to receiving said second command during a first period of time,” 165
9. Claim element 11[g][ii]: “(ii) providing said one of said plurality of said video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said first playback state, and” 166
10. Claim element 11[g][iii]: “(iii) providing only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said video program, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and DVR is in said second playback state; 166
11. Claim element 11[h]: “wherein said second period of time is a period of time after said first period of time.” 167
- J. Claim 13: “The method of claim 11, wherein said step of storing said plurality of video programs on said at least one memory device in said DVR further comprises storing at least one time of when said second portion of said video program begins and at least one time of when said second portion of said video program ends.” 167
- K. Claim 14: “The method of claim 11, wherein said one of said plurality of video programs includes at least primary and secondary video content, said portion of said video program that is provided to said display device if said second command is received during said second period of time and said DVR is

in second playback state consists of said primary video content, and said secondary video content includes at least one advertisement.”..... 167

L. Claim 15: “The method of claim 11, further comprising the steps of: compressing said plurality of video programs prior to said plurality of video programs being transmitted over said data distribution system, and decompressing said plurality of video programs after said plurality of video programs have been received by said DVRr (sic) and before said one of plurality of video programs or portion thereof is provided to said display device.” 168

M. Claim 16: “The method of claim 11, further comprising the step of tuning said single tuner to a particular channel at a particular time in response to receiving a third command, said particular channel and said particular time being stored in said at least one memory device in said DVR..... 168

N. Claim 18: 169

1. Claim element 18[pre]: “A digital video recorder (DVR) for time shifting at least one of a plurality of video programs, said one of said plurality of video programs consisting of first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion, comprising: 169

2. Claim element 18[a]: “a first tuner for receiving data on said plurality of video programs, wherein said data on one of said plurality of video programs is transmitted together with said data on other ones of said plurality of video programs, so that said first tuner receives said data on said one of said plurality of video programs at the same time that it receives data on said other ones of said plurality of programs;” 170

3. Claim element 18[b]: “at least one memory device for storing said data on said plurality of video programs, including at least said one of said plurality of video programs;” 171

4. Claim element 18[c]: “a controller for receiving commands including at least a first command for setting a playback state of said DVR, a second command for initiating a playback state of said one of said plurality of video programs from said memory device, and a third command for initiating said reception and said storage of said data on said plurality of video programs; and” 171

5. Claim element 18[d][i]: “at least one processor for (i) providing said first, second, and third portions of said one of said plurality of video programs respectively to a display device in response to receiving said second command during a first portion of time,”	171
6. Claim element 18[d][ii]: “(ii) providing said first, second, and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during a second period of time if said DVR is in a first playback state, and”	172
7. Claim element 18[d][iii]: “(iii) providing said first and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during said second period of time if said DVR is in a second playback state, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state.”	172
O. Claim 19: “The system of claim 18, wherein said third command further results in said first tuner being tuned to a particular frequency to receive said data on said plurality of video programs, said particular frequency being provided by a content provider and stored on said DVR.”	173
XII. Ground 3: Claims 1-20 are invalid as obvious over Dow, either alone or in combination with Russ and Miller.....	173
A. Claim 1:	174
1. Claim element 1[pre]: “A digital video recorder (DVR) for time shifting at least one video program, said video program being transmitted over a data distribution system, comprising:”	174
2. Claim element 1[a][i]: “a tuner for receiving a plurality of video programs, wherein (i) said plurality of video programs are transmitted at the same time on a single channel within said data distribution setting,”	175
3. Claim element 1[a][ii]: “said tuner can be tuned to said single channel to receive said plurality of video programs, and”	176
4. Claim element 1[a][iii]: “(iii) at least one of said plurality of said video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion and said third portion as transmitted is said to follow said second portion;”	180

5. Claim element 1[b]: “a memory device for storing said plurality of video programs, allowing said one of said plurality of video programs to be played back at a later time;” 181
6. Claim element 1[c]: “a controller configured to receive commands from a user of said DVR, wherein a first command changes said DVR from a first playback state to a second playback state, and a second command initiates playback of said one of said plurality of video programs from said memory device, and a third command instructs said DVR to receive and store said plurality of video programs; and” 183
7. Claim element 1[d][i]: “at least one processor configured to (i) provide said one of said plurality of video programs in its entirety to a display device in response to received said second command regardless of a playback state of said DVR if said second command is received during a first period of time.”
185
8. Claim element 1[d][ii]: “provide said one of said plurality of video programs in its entirety to said display device in response to receiving said second command during a second period of time if said DVR is in said first playback state, and” 186
9. Claim element 1[d][iii]: “provide only a portion of said video program to said display device in response to receiving said second command if said second command is received during said second period of time and said DVR is in said second playback state, said portion of said video program including at least said first and third portions of said video program, wherein said third portion of said video program is provided to said display device immediately following said first portion of said video program if said second command is received during said second period of time and said DVR is in said second playback state;” 189
10. Claim element 1[e]: “wherein said second period of time is a period of time after said first period of time.” 191
- B. Claim 2: “The DVR of claim 1, further comprising a wireless transmitter in communication with said at least one processor and memory device, said wireless transmitter being configured to transmit said one of plurality of video programs in its entirety or said portion of said one of said plurality of programs at least indirectly to said display device, said display device being remotely located from said DVR.” 192

- C. Claim 3: “The DVR of claim 1, further comprising at least one other tuner, wherein said at least one other tuner allows said DVR to receive at least one other video program while said tuner is being used to receive said plurality of video programs, said at least one other video program being selected by said user.” 194
- D. Claim 4: “The DVR of claim 1, wherein said one of said plurality of video programs includes at least primary and secondary video content, and said first and third portions of said one of said plurality of video programs consists of said primary video content.” 196
- E. Claim 5: “The DVR of claim 4, wherein said second portion of said one of said plurality of video programs consists of said secondary video content and said memory device is further configured to store at least one time when said second portion begins and at least one time when said second portion ends.” . 198
- F. Claim 6: “The DVR of claim 1, wherein said first portion of time is a period of time that begins when said one of said plurality of video programs is stored on said memory device and available to be viewed and ends within a predetermined time thereafter, said predetermined time being less than one week.” 200
- G. Claim 7: “The DVR of claim 1, wherein said single channel is stored in said memory and said at least one processor is configured to tune said tuner to said single channel in response to said controller receiving said third command.” . 202
- H. Claim 8: “The DVR of claim 1, wherein data communicated via said single channel is compressed prior to transmission and said at least one processor is configured to decompress said data after its (sic) have been received so that said one of said plurality of video programs or said portion of said one of said plurality of video programs can be displayed, depending on when said second command is received and said playback state of said DVR.” 204
- I. Claim 9: “The DVR of claim 5, wherein said secondary video content comprises at least one advertisement.” 206
- J. Claim 10: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said one of said plurality of video programs from said memory if said second command is received during said second period of time and said DVR is in said second playback state, and (ii) retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and

said DVR is switched to said first playback state at or before said time thereafter.” 208

1. Claim element 10[a]: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said plurality of video programs from said memory if said second command is received during said second period of time and said DVR is in said second playback state,” 208

2. Claim element 10[b]: “retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and said DVR is switched back to said first playback state at or before said time thereafter.” 209

K. Claim 11: 212

1. Claim element 11[pre]: “A method for time shifting at least one video program transmitted to a digital video recorder (DVR) over a data distribution system, comprising:” 213

2. Claim element 11[a]: “receiving a plurality of video programs, wherein said plurality of video programs are transmitted as the same time and are received by a single tuner in said DVR, and at least one of said plurality of video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is said to follow said second portion;” 213

3. Claim element 11[b]: “receiving a third command from at least one user of said DVR, said third command indicating a desire to use said single tuner to receive said plurality of video programs and to store said plurality of video programs on at least one memory device in said DVR;” 213

4. Claim element 11[c]: “storing said plurality of video programs on said at least one memory device in said DVR in response to receiving said third command from said at least one user of said DVR;” 214

5. Claim element 11[d]: “receiving a second command from said at least one user of said DVR, said second command indicating a desire to playback at least a portion of said one of said plurality of video programs;” 214

6. Claim element 11[e]: “receiving a first command from said at least one user of said DVR, said first command indicating a playback state of said DVR; and” 215

7. Claim element 11[f]: “providing said at least a portion of said one of said plurality of video programs to a display device in response to receiving said second command from said at least one user of said DVR;” 215
8. Claim element 11[g][i]: “wherein said step of providing at least a portion of said one of said plurality of video programs to said display device further comprises (i) providing said one of said plurality of video programs to said display device in response to receiving said second command during a first period of time,” 215
9. Claim element 11[g][ii]: “(ii) providing said one of said plurality of said video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said first playback state, and” 216
10. Claim element 11[g][iii]: “(iii) providing only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said video program, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and DVR is in said second playback state; 216
11. Claim element 11[h]: “wherein said second period of time is a period of time after said first period of time.” 217
- L. Claim 12: “The method of claim 11, wherein said step of providing said at least a portion of said one of said plurality of video programs to a display device further comprises transmitting said at least a portion of said one of said plurality of video programs to said display device via a transmission path that includes at least one wireless connection, said display device being remotely located from said DVR.” 217
- M. Claim 13: “The method of claim 11, wherein said step of storing said plurality of video programs on said at least one memory device in said DVR further comprises storing at least one time of when said second portion of said video program begins and at least one time of when said second portion of said video program ends. 218
- N. Claim 14: “The method of claim 11, wherein said one of said plurality of video programs includes at least primary and secondary video content, said

portion of said video program that is provided to said display device if said second command is received during said second period of time and said DVR is in second playback state consists of said primary video content, and said secondary video content includes at least one advertisement. 218

O. Claim 15: “The method of claim 11, further comprising the steps of: compressing said plurality of video programs prior to said plurality of video programs being transmitted over said data distribution system, and decompressing said plurality of video programs after said plurality of video programs have been received by said DVRr (sic) and before said one of plurality of video programs or portion thereof is provided to said display device.” 219

P. Claim 16: “The method of claim 11, further comprising the step of tuning said single tuner to a particular channel at a particular time in response to receiving a third command, said particular channel and said particular time being stored in said at least one memory device in said DVR. 219

Q. Claim 17: “The method of claim 16, further comprising the step of receiving a fourth command from said at least one user of said DVR, said forth command indicating a desire to record a second video program, which is accomplished using another tuner if said second video program is being transmitted to said DVR while said plurality of video programs are being transmitted to said DVR. 220

R. Claim 18: 224

1. Claim element 18[pre]: “A digital video recorder (DVR) for time shifting at least one of a plurality of video programs, said one of said plurality of video programs consisting of first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion, comprising: 224

2. Claim element 18[a]: “a first tuner for receiving data on said plurality of video programs, wherein said data on one of said plurality of video programs is transmitted together with said data on other ones of said plurality of video programs, so that said first tuner receives said data on said one of said plurality of video programs at the same time that it receives data on said other ones of said plurality of programs; 225

3. Claim element 18[b]: “at least one memory device for storing said data on said plurality of video programs, including at least said one of said plurality of video programs;”	226
4. Claim element 18[c]: “a controller for receiving commands including at least a first command for setting a playback state of said DVR, a second command for initiating a playback state of said one of said plurality of video programs from said memory device, and a third command for initiating said reception and said storage of said data on said plurality of video programs; and”	226
5. Claim element 18[d][i]: “at least one processor for (i) providing said first, second, and third portions of said one of said plurality of video programs respectively to a display device in response to receiving said second command during a first portion of time,”	227
6. Claim element 18[d][ii]: “(ii) providing said first, second, and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during a second period of time if said DVR is in a first playback state, and”	227
7. Claim element 18[d][iii]: “(iii) providing said first and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during said second period of time if said DVR is in a second playback state, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state.”	227
S. Claim 19: “The system of claim 18, wherein said third command further results in said first tuner being tuned to a particular frequency to receive said data on said plurality of video programs, said particular frequency being provided by a content provider and stored on said DVR.”	228
T. Claim 20: “The system of claim 18, wherein said second portion comprises at least one commercial and said data on said plurality of video program is packetized, with individual packets being linked at least indirectly to individual ones of said plurality of video programs and to individual channels associated with content owners thereof.”	228
XIII. Materials Considered.....	231

I. Introduction

I, Kevin Jeffay, declare as follows:

1. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters stated herein.

2. I have been asked by DISH Network L.L.C. to provide technical assistance in connection with the *inter partes* review of U.S. Patents No. 8,929,710 and 9,538,122 (which I refer to as the “’710 Patent” and “’122 Patent,” respectively). This declaration is a statement of my opinions on issues related to the patentability of claims 1–20 of the ’122 Patent (collectively, the “challenged claims”).

3. My compensation is not based on the content of my opinions or the resolution of this matter.

II. Summary of Opinions

4. With respect to the ’122 Patent, it is my opinion that:

5. Claims 1–20 are invalid as obvious over Casagrande, either alone or in combination with Russ and Miller.

6. Claims 1–5, 7–16, and 18–19 are invalid as anticipated by Dow.

7. Claims 1–20 are invalid as obvious over Dow, either alone or in combination with Russ.

III. Background and Qualifications

8. In formulating my opinions, I have relied on my knowledge, training, and experience in the relevant field, which I will summarize briefly. Further detail can be found in my Curriculum Vitae, which is attached as **Attachment A** to this declaration.

9. I am a tenured professor in the Department of Computer Science at the University of North Carolina at Chapel Hill where I currently hold the position of Gillian T. Cell Distinguished Professor of Computer Science. I have been a faculty member at UNC since 1989. From 2014–2022 I also served as the Chairman of the Department.

10. I received a Ph.D. in computer science from the University of Washington in 1989. Before that, I received a M.Sc. degree in computer science from the University of Toronto in 1984, and a B.S. degree with Highest Distinction in mathematics from the University of Illinois at Urbana-Champaign in 1982.

11. I have been involved in the research and development of computing systems for nearly 40 years. I have been a faculty member at the University of North Carolina since 1989 where I perform research and I teach in the areas of multimedia networking, computer networks, distributed systems, real-time systems, and operating systems, among others. A major theme of my research has been the development of technology to improve the performance of data transfers on the

Internet. My research has examined problems ranging from network and operating system support for real-time multimedia applications such as audio and video streaming, voice-over-Internet protocol (VoIP) and Internet videoconferencing, to the design of congestion control mechanisms in network routers, to measurements and analysis of network traffic to passively assess the performance of servers on the Internet.

12. For example, starting in the late 1980s, the focus of my research was the development of network and operating system technology to enable the real-time transfer of streams of audio and video data across the Internet. This involved, among other things, the development of media encoders, media players, and network communication protocols for adaptive transmission of live audio and video data on the Internet. This work culminated in my research group developing some of the first videoconferencing systems for the Internet. Several of the papers authored by myself and members of my research group on this project won awards for their technical contributions.

13. The videoconferencing and adaptive streaming research attracted the attention of industry groups such as IBM, Intel, Digital Equipment Corporation, Cabletron, and AT&T Bell Laboratories. For example, starting in 1991 IBM supported aspects of my research at UNC and these efforts resulted in U.S. Patent No. 5,892,754 on adaptive media streaming being issued to IBM and UNC.

14. During this time, I was also collaborating with researchers at the Intel Architecture Labs in Hillsboro, OR, to modify an Intel product, the ProShare videoconferencing system, to use technology developed in my research lab at UNC for adaptive media transmission. By the late 1990s, the ProShare product included the ability to also transfer desktop information of a PC to a remote PC.

15. My research group also developed other “data conferencing” systems, also known as “shared window systems,” that were capable of transferring the desktop information on a PC to a remote PC in real-time. One system that we built, called “XTV,” was operational by 1991. The source code for XTV was made freely available and, by 1993, had been downloaded by over 600 users and institutions. The system was functionally and visually equivalent to today’s Cisco’s WebEx and Zoom’s screen sharing products and services. It provided a sophisticated means of transferring the desktop information of a PC to a remote site. In the XTV system, individual windows displayed on the desktop, or the entire desktop itself, could be selected for sharing with remote users. The XTV system also allowed remote users to remotely control and manipulate the desktop whose information was being distributed, as well as remotely control the applications that were generating the desktop information that was being shared.

16. In much of my research, I regularly build and use clusters of computers interconnected by network switches, bridges, and routers to form and evaluate

experimental and production networks. For example, in the late 1990s and early 2000s, my research evolved to consider router-based mechanisms for controlling the performance of network traffic. In much of this research, my students and I built and instrumented network routers and performed large scale experiments with this equipment. The instrumentation included, for example, the development of network monitors that would receive copies of packets flowing on a network link and analyze and store packets or the results of analyses on these packets, all in real-time. Based on these experiments, in 2003, my group at UNC won the most prestigious research award for original research in computer networking. UNC applied for, and received, U.S. Patent No. 7,447,209 for aspects of this research.

17. This project, and others, took place in a networking lab my students and I constructed at UNC over a number of years. The lab consists of several hundred computers and networking devices. Managing this lab required establishing and configuring VLANs, firewalls, and other security appliances to isolate the lab from the campus network (and vice versa).

18. More recently, my research group has considered the design and operation of next generation aerial networks. UNC applied for, and received, U.S. Patent No. 9,832,705 for aspects of this research.

19. I have authored or co-authored over 100 articles in peer-reviewed journals, conference proceedings, texts, and monographs in the aforementioned

areas of computer science and others. In addition, I have edited and co-edited numerous published proceedings of technical conferences and have edited a book of readings in multimedia computing and networking (with Hong-Jiang Zhang) published by Morgan Kaufman. I am a co-author (with Long Le and F. Donelson Smith) of a monograph related to computer network protocols, and a co-author (with Jay Aikat and F. Donelson Smith) of a second monograph related to experimental computer networking.

20. My research extends to leadership positions in several journals, conferences, and committees. I have previously served as Editor-in-Chief for the journal Multimedia Systems and Associate Editor for the journal Real-Time Systems. In addition, I have been an active participant in the Association for Computing Machinery (“ACM”) and the Institute of Electrical and Electronics Engineers (“IEEE”). Specifically, I have been a member of the steering committees for the ACM Special Interest Group on Multimedia, and the ACM Special Interest Group on Data Communications (“SIGCOMM”) and its subgroup on Internet Measurement. I have also served as a member of the IEEE Technical Committee on Real-Time Systems. As a result of this involvement, I have served as a program chair or member of the technical program committee for over 100 professional, international, and technical conferences, workshops, and symposia. I was previously on the steering committee for the ACM technical committee on Internet

measurement, where we worked on community standards for measurement-based research. I have also served on numerous proposal review panels for the National Science Foundation and other international funding agencies in the aforementioned areas of computer science.

21. In addition to the U.S. patents referenced above, I am a named inventor on a fourth patent. Each of these patents is generally related to computer networking and the delivery of services over networks including audio and video transmission.

22. I have developed and taught undergraduate and graduate level courses on operating systems, computer networking, computer security, and multimedia computing. These courses have been developed for, and delivered to, students at UNC as well as for industry professionals.

23. I have served as an expert witness and technical consultant in litigation and *inter partes* review matters concerning videoconferencing, data conferencing and screen sharing, cellular and wireline telephony, voice over IP (VoIP) telephony, multimedia networking, distributed systems, operating systems, computer networks, datacenter networking, embedded systems and embedded software, and real-time systems, among others. I have testified in several trials, arbitrations, and claim construction hearings as an expert witness.

IV. Legal Standards for Patentability

24. My opinions are also formed by my understanding of the relevant law. I am not an attorney. For purposes of this declaration, I have been informed about certain aspects of the law as it relates to my opinions.

25. I understand that for an invention claimed in a patent to be found patentable, it must be (among other things) new and not obvious based on what was known before the invention was made.

26. I understand that the information that is used to evaluate whether an invention was new and not obvious when made is generally referred to as “prior art.” I understand that the prior art includes all patents and printed publications that existed before the earliest filing date of the patent (*i.e.*, the “effective filing date”). This includes foreign language material. I also understand that a patent is prior art if it was filed before the effective filing date of the claimed invention and that a printed publication is prior art if it was publicly available before the effective filing date.

27. I understand that in this *inter partes* review proceeding, DISH has the burden of proving that the claims of the '122 Patent are unpatentable in light of the prior art by a preponderance of the evidence. I understand that a preponderance of the evidence is evidence sufficient to show that a fact is more likely true than not true.

28. I understand that unexpired patent claims in an *inter partes* review are generally construed under the *Phillips* claim construction standard. After the claims are construed, they are then compared to the prior art.

29. I understand that in this *inter partes* review proceeding, the information that may be evaluated is limited to patents and printed publications. My analysis, which is set out in detail below, compares the claims of the '122 Patent to patents and printed publications that are prior art to the claims.

30. I understand that prior art can render the claim “obvious” to a person of ordinary skill in the art (“POSA”). My understanding of this legal standard is set out below.

31. I understand that prior art can render a patent claim unpatentable where subject matter that falls within the claim would have been obvious to a person of ordinary skill in the art. I understand that the following standards govern the determination of whether a patent claim is rendered “obvious” in light of the prior art. I have applied these standards in my evaluation of whether the challenged claims of the '122 Patent are obvious in light of the prior art.

32. I understand that a claimed invention is not patentable if it would have been obvious to a person of ordinary skill in the field of the invention at the time the invention was made. The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. Even

if all the requirements of a claim were not found in a single prior art reference, the claim is not patentable if the differences between the subject matter in the prior art and the subject matter in the claim would have been obvious to a person of ordinary skill in the art at the time the application was filed. Prior art disclosing a method or device that falls within the scope of a claim can render that claim obvious even if other, different methods or devices might also fall within the scope of the claim.

33. I understand that a determination as to whether a claim would have been obvious should be based on four factors (though not necessarily in the following order): (i) the level of ordinary skill in the art at the time the application was filed; (ii) the scope and content of the prior art; (iii) the differences between the claimed invention and the prior art; and (iv) any “objective factors” indicating obviousness or non-obviousness that may exist in a particular case.

34. I understand that an obviousness analysis should not be based on hindsight, but must be done using the perspective of a person of ordinary skill in the relevant art as of the effective filing date of the patent claim.

35. I understand the objective factors indicating obviousness or non-obviousness may include: commercial success of products covered by the patent claims; a long-felt but unaddressed need for the invention; failed attempts by others to make the invention; copying of the invention by others in the field; expressions of surprise by experts and those skilled in the art at the making of the invention; and

the patentee having proceeded contrary to the accepted wisdom of the prior art. I also understand that any of this evidence must be specifically connected to the invention rather than associated with the prior art or with marketing or other efforts to promote an invention. I am not presently aware of any evidence of such objective factors suggesting the claims of the '122 Patent is non-obvious. Should the Patent Owner submit evidence purportedly showing such objective factors, I reserve the right to consider the evidence and respond to it.

36. I understand that the teachings of two or more prior art references may be combined in the manner disclosed in the claim if such a combination would have been obvious to one having ordinary skill in the art. In determining whether a combination would have been obvious, the following exemplary rationales may support a conclusion of obviousness:

- combining prior art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- use of a known technique to improve similar devices (methods, or products) in the same way;
- applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

- “obvious to try” – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
- some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention; or
- common sense.

37. I understand that the obviousness analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, but instead can take account of the ordinary innovation and experimentation in the relevant field that does no more than yield predictable results.

38. I understand that, in assessing whether there was an apparent reason to modify or combine known elements as claimed, it may be necessary to look to interrelated teachings of multiple patents and printed publications, the effects of commercial demands, and the background knowledge of a person of ordinary skill in the art. I further understand that any motivation that would have applied to a person of ordinary skill in the art, including motivation from common sense or

derived from the problem to be solved, is sufficient to explain why references would have been combined.

39. I understand that modifications and combinations suggested by common sense are important and should be considered. Common sense suggests that familiar items can have obvious uses beyond the particular application being described in a prior art reference, that if something can be done once it would be obvious to do it multiple times, and that in many cases a person of ordinary skill in the art can fit the teachings of multiple patents together in an obvious manner to address a particular problem. Further, the prior art does not need to be directed to solving the same problem that is addressed in the patent.

40. I understand that a person of ordinary skill in the art is also a person of ordinary creativity. In many fields, it may be that there is little discussion of obvious techniques, modifications, and combinations, and it may be the case that market demand, rather than scientific research or literature, will drive a new design. When there is market pressure or design need to solve a particular problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has a good reason to employ the known options. If this leads to the expected success, then it is likely the product of ordinary skill and common sense as opposed to patentable innovation. I understand that if a combination was obvious to try, that may show that it was obvious and therefore unpatentable. That a particular combination of

prior art elements was obvious to try suggests that the combination was obvious even if no one made the combination.

V. Ordinary Skill in the Art

41. I understand that the factors considered in determining the ordinary level of skill in the art include the level of education and experience of persons working in the field, the types of problems encountered in the field, and the sophistication of the technology. Based on my analysis of the challenged patents and the prior art references, a person of ordinary skill in the art (which I will refer to as a “POSA”) as of November 2010, which I understand is the earliest possible priority date, would have a bachelor’s degree in computer science, computer engineering, or a similar technology degree and approximately two years of relevant industry experience, including work related to computer network architecture, digital program delivery in broadcast, cable or satellite television networks, and associated set top boxes. A higher degree of education could compensate for less work experience and *vice versa*.

42. I note that I was a person of at least ordinary skill in the art at the time of the alleged invention and have re-familiarized myself with the level of skill that persons of ordinary skill in the art possessed at that time and applied that level of skill to the analysis herein.

VI. Technological Background

43. The '122 Patent states that it concerns “[a] system and method for time shifting a video program.” ’122 Patent at Abstract. “The [’122 Patent’s] invention provides a system and method for adding auxiliary data (e.g., advertisements, news tickers, ‘crawlers,’ etc.) to data that has been time-shifted.” *Id.* at 2:17–19. The following provides a background discussion regarding this field in the period leading up to the ’122 Patent’s October 2011 priority date.

A. Digital Video Recording (DVR) Technologies

44. In traditional broadcast television, content (television programs) was consumed by viewers as it was transmitted. In particular, nothing in the broadcast system allowed a consumer to record content either for archival purposes or for later playback. By the 1950s, magnetic tape video recorders that were similar to reel-to-reel audio recorders were available for television studios and video professionals but were cost prohibitive for consumer use. Nonetheless, these early video recorders enabled television station affiliates to time shift broadcasts (*e.g.*, delay a broadcast of a television program broadcast live on the east coast to a later time for west coast audiences).

45. The 1970s saw the development of the first video cassette recorders such as the Sony U-Matic system followed by the Sony Betamax system. (The 1970s also famously saw the “format wars” as the Sony Betamax system vied for market

dominance against the JVC VHS video cassette format.) Video cassette recorders, or VCRs as they were commonly known, enabled consumers to record and later playback television broadcasts. And like audio cassette recorders of the day, VCRs were analog recorders and typically supported functions such as pause, fast forward and rewind. These functions allowed consumers to perform time shifting functions on recorded television programming that studios were previously able to perform. As VCRs became popular, content such as movies were available for purchase (and eventually rental) on pre-recorded video cassettes.

46. By the mid-1990s, personal computers became powerful enough that that with appropriate acquisition and digitization hardware, they could encode and compress color video at NTSC (broadcast television) resolution and frame rates in real-time using formats such as MPEG. This enabled PCs to function as digital VCRs for playback of television (and other video sources) content on computer monitors. Given the large storage capacity of computer servers of the day, researchers experimented with the design of servers for hosting large amounts of compressed digital video for delivery “on-demand” over local and wide-area networks to clients. By 1999 “digital VCRs” had been demonstrated. *See, e.g.*, “On Managing Continuous Media Data,” E.Y. Chang, Ph.D. dissertation, Department of Electrical Engineering, Stanford University, August 1999.

47. Contemporaneously, commercial companies such as Microsoft, ReplayTV, and Tivo were developing digital video recorders (“DVRs,” also called personal video recorders or “PVRs”) for broadcast and cable television systems. *See, e.g.,* <https://spectrum.ieee.org/the-consumer-electronics-hall-of-fame-tivo>, <https://www.engadget.com/2018-01-05-new-tech-at-ces-history.html>, <https://www.bloomberg.com/press-releases/1999-03-29/replay-networks-and-showtime-networks-inc-announce-personal-tv>.

48. These devices were embedded computer systems comprising tuners, processors, disk drives, and in cases custom silicon for video processing and/or disk management. These devices could acquire an analog television signal, digitize, compress, and store the broadcast content for later playback in real-time. Given the large storage capacity of computer disk drives, many hours of programming could be stored on a single DVR.

49. DVRs supported VCR-like playback functions (*i.e.*, pause, fast-forward, and rewind) but went beyond VCRs in that they provided the ability to simultaneously record and playback different programs. This enabled complete time-shifting of programming including the ability to pause and later resume a live program and playback of a recorded program after the program had started but before the recording had completed. In both cases this required the DVRs to be capable of

playback of one portion of a recorded program while the live broadcast of the same program was simultaneously being recorded.

50. By the early 2000s, DVRs were viewed as a superior alternative to VCRs and were being integrated into cable and satellite television set-top boxes. This made video recording more convenient to use as video recording and playback controls were integrated into television remotes and on-screen electronic program guides (EPGs). *See, generally*, Russ. Multiple set-top boxes within a home could access and use a common DVR so that programming recorded on one set-top box/television could be viewed on other set-top box/televisions in the home. *Id.*

51. In addition, companies began introducing multi-tuner DVRs. With two or more independent tuners within the same DVR system, the system had the ability to record multiple programs that aired simultaneously or during overlapping periods of time. Alternatively, multiple-tuners could allow a user to watch a video program live while simultaneously recording at one or more other programs airing at the same time.

52. The late 1990s and early 2000s also saw a movement in the broadcast, cable, and satellite television industries away from analog broadcasting to towards digital broadcasting, most notable using MPEG standards. By 2009, the initial cutover from analog broadcasting to all digital broadcasts had begun. Digital broadcasting was a boon for DVRs as these devices no longer needed to digitize and

encode the input signal and could instead record the video data it received in its native format.

53. Digital broadcasting also enabled new modes of playback for DVRs. When digitized and encoded, digital television transmissions included metadata (non-video data) that described the structure and layout of a video program. Generally, a video program is comprised of multiple contiguous segments of video content. Each segment is generally classified as either primary program content or supplementary content. Primary program content comprises the audio and video data of a video program being broadcast by the content provider while supplementary content, also called “interstitials” refers to content that is not part of the primary program content such as commercials, news flashes, and “crawlers” or “Chyrons” (*e.g.*, content, typically text, that horizontally scrolls across the bottom third of the screen).

54. The metadata encoded with the transmitted digital video data typically includes “location” information that identifies boundaries between primary program content segments and supplementary content segments. This location information enabled local cable affiliates to, for example, insert local or regional supplemental program segments (*e.g.*, advertising (commercials)) into broadcasts in the place of national or network supplemental program segments. However, location information could also be leveraged by DVRs to provide value-added playback

functions. For example, a DVR could parse a received digital video program into its constituent components and selectively display program segments or record and display segments in an order that differed from their broadcast. Obvious applications included the ability to identify locations in a broadcast where interstitials appeared and not display the supplemental content (*e.g.*, commercials) during the playback of a recorded program. Additional applications included the ability to use location information to parse a program such as a broadcast news program into (primary) segments corresponding to sports and weather and enable the user to view these segments out of the order in which they were broadcast (*e.g.*, watch the weather segment as the first segment of the program) or just individually (*e.g.*, watch only the weather segment). *See, generally*, Casagrande.

55. Beginning in the late-2000s decade, companies such as DISH marketed and sold DVR systems that used location information in digital broadcasts to provide enhanced playback of recorded programming. For example, DISH introduced a new form of time-shifting termed “auto-hopping.” This technology took advantage of the received location information and could filter interstitial content from a recorded video program. With auto-hopping, a user could view a video program and elect to skip entire segments of commercial breaks with improved precision (over prior systems that simply skipped *x* seconds of recorded content) and even automatically skip all the interstitial content, resulting in the primary video program segments

being consecutively played without interruption. DISH DVRs still performed traditional time-shifting playback functions for primary video content in response to user command received via a remote. Thus, a user could elect to fast forward within a segment of a show, play a desired portion of the segment, and skip over the commercial break so that the next segment of primary content would be displayed.

56. Auto-hopping technology gave rise to a reduction in commercial viewership. Because viewers of recorded content could skip over commercial breaks, the value of commercials to content providers decreased and lead to concerns of potential violations of broadcaster's copyright. Thus, a need for ensuring commercial viewership arose.

57. One solution to the decline in commercial viewership was restricting time-shifting functions during interstitial portions of a video program. Because DVR systems already received location information about where an interstitial boundary existed within an A/V stream, DVR systems could restrict hopping functions and not allow users to skip, fast-forward, rewind, or pause the broadcast program during an interstitial/supplemental segment. Thus, for example, a user could perform time-shifting functions through the primary video content they were watching while being required to watch the commercial breaks.

58. Another solution to the decline in commercial viewership called for the insertion of substitute content of supplemental segments in recorded programs.

Substitute content here referred to interstitial content that is later inserted where an interstitial would have originally been shown. Substitute content can also refer to “bonus” primary content segments or a new scene of a show not previously included in the original broadcast or recording. Content providers would provide substitute content and location information to the DVR so that the substitute content, such as a more timely or relevant commercial, could be shown instead of an outdated or inappropriate primary video segment, such as an expired commercial or a scene for more mature audiences.

59. As the Casagrande Patent, the Russ application, the Miller application, and the papers cited above confirm, and as I know from my own experience, there is nothing novel about the challenged claims that was not already found in standard DVR systems and STBs that supported time shifting functionality leading up to 2010.

VII. The Challenged '122 Patent

A. Effective Priority Date

60. The challenged '122 Patent is a continuation of application number 13/279,943, filed on October 24, 2011, now U.S. Patent No. 8,929,710 (the “’710 Patent”). The ’710 Patent claims priority to U.S. Provisional Patent Application No. 61/408,759, which was filed on November 1, 2010. Accordingly, I have assumed

November 1, 2010 as the priority date for the '122 Patent. I reserve the right to assert that the '122 Patent is not entitled to this priority date in the future.

B. Overview of the Challenged Patent's Specification

61. The '122 Patent “relates to the storage and play back of time-shifted data, and more particularly to a system and method for adding auxiliary data to data that has been time-shifted.” '122 Patent at 1:18–21. At best, the '122 Patent's claims relate to the patent's purported embodiment where “the auxiliary data is removed only after its value is diminished. '122 Patent at Abstract.

62. With regards to Fig. 1, the '122 Patent explains that “preferred embodiments of the present invention operate in accordance with a data transmission system, wherein data (e.g., movies and television programs, including sitcoms, sporting events, news programs, etc.) is being transmitted from at least one data source 110 a, 110 b (e.g., content owner, content provider, etc.) to at least one receiving device 120 a, 120 b and 120 c (e.g., set-top box, television, etc.) via at least one data distribution means 100 (e.g., satellite, cable, fiber-optics, telephone line, etc.).” '122 Patent at 3:66–4:7.

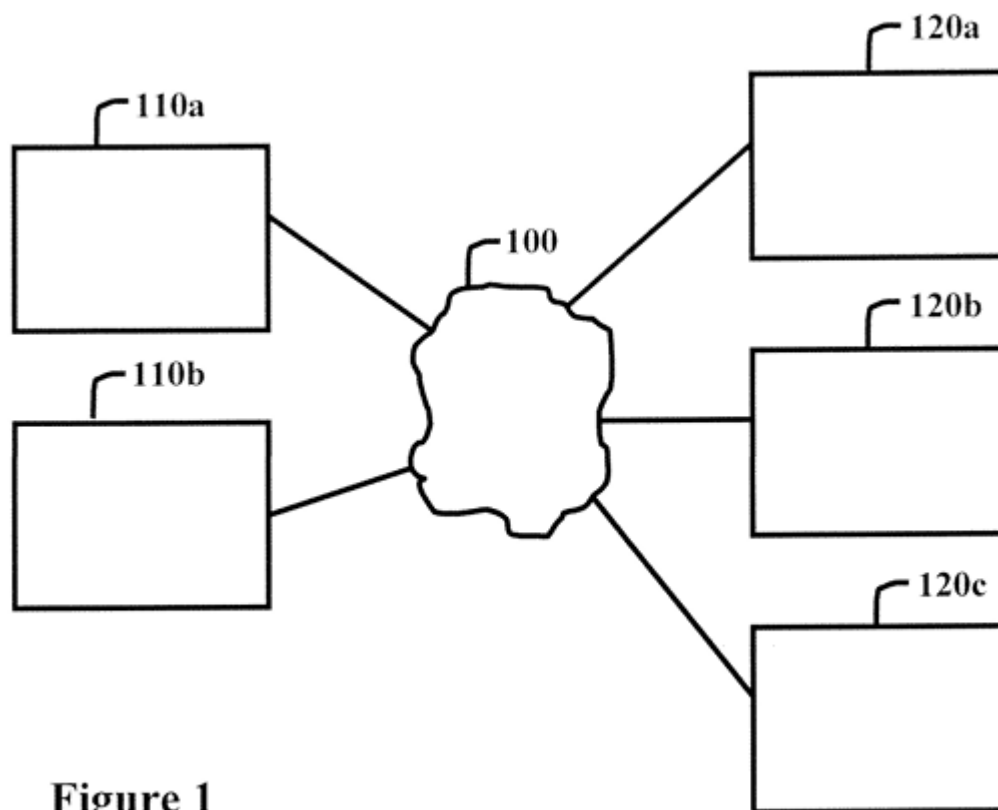


Figure 1

Id. at Fig. 1.

63. The '122 Patent admits that it was already known in the art that “[d]igital video recorders (“DVRs”), like TiVO™, [were] commonly used to record data (e.g., video, audio, etc.), allowing it to be played back at a later time.” ’122 Patent at 1:23-25. The patent refers to this concept as “time-shifting,” which “allows the recorded data (in its original form) to be played back at a later time.” ’122 Patent at 1:25-27. Thus, the user can watch or “re-watch the program (or a portion thereof), or skip a portion of the program” at a more convenient time. ’122 Patent at 1:32-33; 1:45-47.

64. Because of the then-existing ability to skip over portions of programs, the '122 Patent recognizes that time-shifting functions present a dilemma to content owners and/or content providers. Importantly, time shifting “allows the user to skip commercials, or paid advertisements, which can decrease the value of the program to the content owner, the content provider and advertisers.” '122 Patent at 1:48-51. The '122 Patent attempts to address this issue by configuring a receiving device “to function as a DVR.” '122 Patent at 4:41.

65. The '122 Patent explains that “the receiving device 120 is configured to function as a DVR” and “perform both standard receiver functions (e.g., receiving data on a plurality of channels, processing data on a channel selected by a user (e.g., via a remote control), and providing the processed data to a display) and standard DVR functions (e.g., allowing a user to record, pause, rewind, fast forward and play processed data).” *Id.* at 4:40-48. Further, “[t]he receiving device 120 may also be configured to add auxiliary data (e.g., advertisements, new tickers, ‘crawlers,’ etc.) to data that is being time-shifted, or data that has been recorded and is being played back (hereafter referred to as ‘time-shifted data’).” *Id.* at 4:54-58. For example, “at the time the time-shifted data is being played (e.g., in response to a request to play the time-shifted data, in response to the time-shifted data being played, in response to the time-shifted data being accessed from memory, etc.), the receiver is configured to acquire auxiliary data, and (at that time or a time thereafter) insert the

auxiliary data into the time-shifted data, so that both the time-shifted data (or a portion thereof) and the auxiliary data (or a portion thereof) are displayed to the user on the display 220.” *Id.* at 4:58-67. The ’122 Patent explains that “[b]y acquiring auxiliary data at (or around) the time the time-shifted data is being played, it is more likely that the auxiliary data has value to the user, thereby increasing the value of the time-shifted data to the content owner, the content provider and advertisers.” *Id.* at 4:67-5:4.

VIII. Claim Construction

66. At this time, I do not believe any terms need to be construed. Below I apply the prior art to the plain language of the claims as understood by a POSA at the time of the alleged invention of the ’122 Patent. To the extent there are any ambiguities in how a term should be interpreted, I have, for purposes of this declaration only, applied my understanding of Patent Owner’s interpretation of the term as evidenced by the Complaint (Ex. 1004) and Initial Infringement Contentions (Ex. 1005) in the related district court matter. My application of any claim interpretation put forth by Patent Owner is not a concession that this is the proper interpretation or construction. I reserve the right to put forth constructions for any term as the matter progresses and additional discovery requires.

IX. Description of the Prior Art

A. Dow (Ex. 1007)

67. U.S. Patent Number 7,241,413 by Dow *et al.* (“Dow”) (Ex. 1007) is titled “System and Method for Improved Blackfield Detection.” Dow was filed on April 26, 2002, published on October 30, 2003, and issued on July 31, 2007. Because Dow issued more than one year before the priority date of the ’122 Patent, I understand it is available as prior art under at least 35 U.S.C. §§ 102(a), (b), and (e).

68. Dow is directed towards “systems and methods for providing enhanced navigation of stored digital video content based upon an event index.” Dow at Abstract. Specifically, Dow teaches the “detection of events in a video signal or data stream.” *Id.* at 3:53-54.

69. Dow illustrates a digital video recorder (“DVR”) system in which a “DVR 100 [is] configured to include commercial detection.” *Id.* at 5:3-4. According to Dow, the DVR “includes an AV input module 102, a processor 104, a memory 106, an AV Output module 108, a data storage medium 110, a modem 112 and a network interface 114,” wherein the “processor 104 executes instructions” stored in memory or provided to the system. *Id.* at 5:10-11. The DVR receives operational instructions from, among other sources, users “through control signals originating from a remote control, which are received through the remote signals interface 134,

in conventional fashion.” *Id.* at 5:23-25. Importantly, Dow teaches that “[t]he DVR 100 may also receive input from other devices, such as a set top box or a media player.” *Id.* at 5: 41-43.

70. Dow teaches AV input modules that include MPEG encoding modules for “convert[ing] signals from a first format (e.g., analog NTSC format) into an MPEG format (e.g., MPEG 2, etc.)[, such that the signals] may be stored in the memory 106 or the data storage medium 110” of the DVR. *Id.* at 5:51-54. “The AV input module 102 receives input through various conventional interfaces, including . . . S-Video . . . and others.” *Id.* at 5:34-36. In one example, Dow illustrates “receiv[ing] an external signal, such as a broadcast signal . . . or packetized communication signal” at the AV input module, which includes “a conventional tuner for selecting a signal or channel from a spectrum of available signals or channels.” *Id.* at 12:31-32.

71. While Dow teaches a processor of the DVR system that “generally executes instructions such as those stored in memory 106 to provide functionality,” *id.* at 5:10-12, Dow also describes a control interface module that “correlates initiation, execution, and/or termination of the navigation function with operation of the DVR. The control interface module 818 [also] define[s] compatibility between other DVR functions and the navigation function.” *Id.* at 24:16-20. For example, the control interface module includes “cues, graphics, and logic structure for

prompting control signals through a graphical user interface” corresponding to playback options of a video program. *Id.* at 55-56. Similarly, the commercial interface module “defines one or more control signals for toggling the commercial skip function between active and inactive modes.” *Id.* at 24:30-31.

72. Additionally, Dow teaches a memory device and data storage unit, wherein the memory device “includes [a] commercial indexer 140 and a program navigator 150” while the data storage unit “includes at least one content file 160 and at least one index file 170.” *Id.* at 6:45-48.

73. Dow also discloses an AV output module that “includes a graphics module 122, video decoder 124 and [an] audio decoder 126.” *Id.* at 4:61-62. “The video decoder 1244 and audio decoder 126 are preferably MPEG decoders that can obtain the data stored . . . and convert it to [a] format compatible with the display device, typically the NTSC format that can be readily received by a conventional television set. *Id.* at 5:62-67.

74. According to Dow, a video program “contains content of varying natures, for example, program segments and commercials.” *Id.* at 9:48-49. “These portions of content are viewed sequentially in a normal presentation, such as during a television broadcast or standard replay from a recorded source.” *Id.* at 9:49-52. “The program 300 also includes a number of commercials embedded within the video presentation.” *Id.* at 10:18-19. According to Dow, “[t]he commercials are

embedded as commercial groups,” each of which “is composed of 3-4 commercials separated by a corresponding number of transitions.” *Id.* at 10:19-20; 23-34. As the video program transitions between the various portions of content, Dow teaches that the transition may be attended by a “abrupt change” or a “brief transition screen, such as a black screen and attendant silence,” or “changes in volume and other detectable events.” *Id.* at 9:53, 59-60, 63-64. [a] user of the DVR 100 may use its enhanced navigation features to view recorded content with substantially reduced commercials.” *Id.* at 9:37-38. Dow teaches that various DVR features, including the “commercial indexer 140, may detect events, analyze patterns, and store data regarding identified transitions in the content.” *Id.* at 6:61-64. “The data stored regarding the identified transitions in content may then be used by the program navigator 150 to provide enhanced playback options, such as commercial skipping.” *Id.* at 64-67. In this way, “[a] user of the DVR 100 may use its enhanced navigation features to view recorded content with substantially reduced commercials.” *Id.* at 9:37-39.

B. Casagrande (Ex. 1006)

75. U.S. Patent Number 8,510,771 by Casagrande *et al.* (“Casagrande”) (Ex. 1006) is titled “Methods and Apparatus for Filtering Content from a Presentation Stream Using Signature Data.” Casagrande was filed on May 4, 2009, published on June 24, 2010, and issued on August 13, 2013. Because Casagrande

was published before the earliest possible priority date of the '122 Patent, I understand it is available as prior art under at least 35 U.S.C. §§ 102(a) and (e).

76. Casagrande is directed towards “methods and apparatus[es] for the identification of locations within a presentation stream based on metadata associated with the presentation stream.” Casagrande, at Abstract. Specifically, Casagrande describes using metadata associated with the presentation stream to “identify boundaries of contiguous video segments within a presentation stream, such as segments of a show and interstitials (e.g., commercials) of the show.” *Id.* After identifying said segments, Casagrande teaches skipping segments from the presentation stream such that only certain portions of the presentation stream are shown to a user. *Id.* at 3:3–5, 20–29. Casagrande discloses that the program may be associated with “playback restrictions” that can restrict certain user operations or otherwise “prevent the user from maintaining” certain types of playback control, including outputting the stream “without skipping over” any segments, “regardless of whether a user provides input requesting....skipping.” Casagrande at 4:20–32, 6:1–3, 19:63–20:2.

77. Casagrande explains that “digital video recorders (DVRs) and personal video recorders (PVRs) allow viewers to record video programs in a digital format to a storage disk or other type of storage medium for later playback.” *Id.* at 1:17–20. Often, according to Casagrande, “DVRs are incorporated into set-top boxes”

configured to receive a plurality of video programs through common television or movie distribution systems, such as “satellite and cable television services.” *Id.* at 1:20–21. When the set-top box’s DVR plays back a recorded video program, a user has the ability to perform traditional time-shifting functions, such as fast forwarding and rewinding, as well as *to skip over commercial breaks and other portions of the program that the user does not desire to view.* *See id.* at 1:22–26.

78. Casagrande discloses the automation of certain time-shifting functions present in DVRs. More particularly, Casagrande eliminates the need for manual time shifting functions such as fast forward. *See, e.g., id.* at 23:40–44.

79. In Casagrande, a receiving device that receives an audio/video presentation stream and metadata (*e.g.*, location information and/or signature data) at a particular time during which a television program is shown on a particular channel. *See id.* at 2:53–55. Casagrande’s device receives the stream and metadata as compressed data, processes that data, and then expands the data. *See id.* at 8:55–62. The metadata’s location information refers to locations within the presentation stream at which certain events occur, while signature data “refers to characteristics of a waveform or data that help identify an event or condition” within the stream corresponding to the locations. *Id.* at 2:54–55, 58–60. Casagrande describes receiving the presentation stream and metadata together or separately, and both may be stored on a storage unit within the receiving device. *See id.* at 2:60–65, 19:6–

9. The receiving device also processes the presentation stream and metadata to locate the signature data and the location at which certain events occur. Casagrande at 2:66–3:7.

80. Casagrande teaches that “a user may be restricted from temporally moving, or time shifting, during particular identified segments.” *Id.* at 4:20–22. In other words, during a first period of time, “a receiving device may automatically output particular segments of a presentation stream without skipping over or otherwise fast forwarding through the segments, regardless of whether a user provides input” requesting skipping or fast forwarding. *Id.* at 4:23–27.

81. According to Casagrande, once the DVR has processed the received stream, the DVR may transmit a second presentation stream that corresponds to the user-selected or DVR-detected filtering previously discussed. *See id.* at 8:43–52. For example, a user may transmit a command (via a remote control) indicating the user’s desire to skip all commercials within a presentation stream. If there are no corresponding restrictions to time shifting the presentation stream, then the DVR, by way of control logic, may: detect all interstitial content boundaries using the location information and signature data, remove all interstitial content segments from the presentation stream, and output a second presentation stream containing only primary video content. *See, e.g., id.* at 13:5–31. Alternatively, according to Casagrande, if there are restrictions to time shifting the presentations stream, then

the DVR, by way of control logic, may: simply output the presentation stream in its entirety; or detect some or all of the interstitial segments using location information and signature data, replace some or all of the detected interstitial segments, and output a second presentation stream containing primary video content along with partial or entirely new interstitial segments. *See, e.g., id.* at 24:31–56.

82. Additionally, Casagrande discloses a broadcast environment of networked systems, wherein numerous receiving devices may query a communicatively coupled communication network for further detailed location information and signature data. *See id.* at 20:18–47. According to Casagrande, this reduces the need to broadcast metadata to each individual receiving device within the network, reducing the amount of consumed bandwidth over the network. *Id.* at 20:49–52.

C. Russ (Ex. 1008)

83. U.S. Patent Application Publication Number 2006/0225105 by Russ (“Russ”) (Ex. 1008) is titled “Networked Multi-Room System.” Russ was filed on April 5, 2005, and published on October 5, 2006. Because Russ was published more than one year before the earliest possible priority date of the ’122 Patent, I understand it is available as prior art under at least 35 U.S.C. §§ 102(a), (b), and (e).

84. Russ is directed towards the insertion of replacement material “into a presentation stream from a tuned source in a networked multi-room system (‘NMS’)

with a primary device and at least one remote device.” Russ at Abstract. Specifically, Russ teaches the utilization of presentation metadata to display secondary content with a previously recorded presentation stream. *See id.* ¶¶[0022], [0023], [0026–0031].

85. Russ describes DVR functionality in a set-top box. Russ ¶¶[0003–0005]. In Russ, “[a] primary device . . . includes a processor, a tuner system, a storage device, a modulator, and a remote devices communications receiver,” configured to receive commands from devices such as a remote control. *Id.* ¶[0020].

86. Russ describes presentation streams that are typically in compressed MPEG format. *See id.* According to Russ, “MPEG stream[s] [are] made of a series of I, P, and B frame types.” *Id.* ¶[0027]. “The I frames are preferably tagged to indicate a splicing point when a commercial break is coming.” *Id.* This allows the primary device to process the frames and identify the locations of commercials within a presentation stream. “By knowing the location of commercials in a presentation, the primary device could replace the originally provided commercials with other new material” separately stored on the primary device’s storage device. *Id.*

87. Russ also discloses “the use of trick mode functionality (e.g., pause, fast forward, rewind, skip ahead, or skip back functionality) while watching a presentation.” *Id.* ¶[0032]. In one example, Russ teaches that “a user’s trick play

functionality could be restricted while viewing a portion of the presentation, such as commercials.” *Id.* ¶[0033]. Russ describes implementing such restrictions through the inclusion of multipurpose tags “included in the presentation stream.” *Id.* ¶[0034]. The multipurpose tags may signify where to insert an ad, whether or not to preclude trick play, and the duration of a commercial. *Id.* ¶¶[0034], [0035]. For example, a multipurpose tag may command a primary device to “preclude trick play for only a specified length of time, such as two weeks.” *Id.* Thus, Russ teaches an example where a user must view a presentation stream in its entirety during a first period of time and a later second period of time, during which the DVR could skip portions of the same presentation stream, such as commercials.

D. Miller (Ex. 1009)

88. U.S. Patent Application Publication 2009/0165057 to Miller (“Miller”) (Ex.1009) is titled “Concurrent Program Content Processing Apparatus, Systems, and Methods.” Miller was filed on December 20, 2007, and published on June 25, 2009. Because Miller was published before the earliest possible priority date of the ’122 Patent, I understand it is available as prior art under at least 35 U.S.C. §§ 102(a), (b), and (e).

89. Miller is directed towards the concurrent processing of multiple distinct program content communicated via a multiplexed signal containing a plurality of programs. *See* Miller ¶[0002]. According to Miller, its “system includes a receiving

device comprising a tuner operable to receive a multiplexed signal via a satellite network that communicates digital video programming.” *Id.* And Miller teaches its receiving device is a “set-top box” and is communicatively coupled to a presentation device such as a digital video recorder (“DVR”). *Id.* ¶[0002].

90. Miller explains that the signal received by the receiving device via the satellite network “may include a plurality of multiplexed programs.” *Id.* ¶[0029]. “In particular, a plurality of programs may be communicated as a plurality of content streams that are multiplexed upon a single carrier signal.” *Id.* “Each content stream may comprise a plurality of program content portions each containing video, audio, and/or other data corresponding to the program. Program content portions may comprise MPEG packets that contain compressed audio, video, and/or other data.” *Id.*

91. Miller discloses that “a plurality of program content streams may be multiplexed in various ways.” *Id.* ¶[0030]. For example, two video programs communicated over the single carrier channel may contain program content related to both a first video program and a second video program. *Id.* According to Miller, “[i]n some instances, it may be desirable to access multiple program content streams concurrently”, for example, if a user desires to view a first program and record a concurrently communicated second program. *Id.* ¶[0031]. “In one approach, the receiving device may include at least two tuners” each configured to receive each of

the content streams corresponding to each program. *Id.* In other embodiments, however, “a program content transporter facilitates the concurrent processing of the two or more programs.” *Id.* ¶[0035].

92. When using the program content transporter, Miller explains that a user directs the receiving device to concurrently present a first program and record a second program, the program content transporter, by way of software implementation, directs a content stream selector to deliver the corresponding video programs to the user device and memory device, respectively. *Id.* ¶¶[0035–0037], [0051]. In another embodiment, the program content transporter may automatically record a second program based on the user’s selection to view only a first program and other relevant user information, such as demographic data, recording history, and program metadata stored on the storage unit. *Id.* ¶[0054].

E. Motivations to Combine

93. Although specific motivations to combine to reach individual claim limitations are described in detail below, a POSA would generally have been motivated to combine the teachings of Casagrande, Miller, and Russ for several reasons with a reasonable expectation of success. First, both Casagrande and Russ are related to the use of digital video recorders (DVRs) by a user to view content. Casagrande at 1:18-34; Russ ¶[0003]. Both references disclose the use of trick-play functionality when viewing content on said DVR. Casagrande at 9:64-67; Russ

¶[0032]. Likewise, both references acknowledge the use of restrictions to prevent users from performing trick-play or skipping over content such as commercials. Casagrande at 9:64-67; Russ ¶[0033]. Miller similarly discloses details regarding the processing of multiple concurrent signals delivered over a satellite network. Thus, a POSA viewing the teachings of Casagrande would naturally have looked to Russ and Miller for additional details regarding the implementation of such functionality on DVRs, considered Russ's disclosure of time-limited restriction on trick-play/commercial skipping as applicable to Casagrande's system, and would have understood the benefits of adding this feature to Casagrande.

X. Ground 1: Claims 1–20 are obvious over Casagrande, either alone or in combination with Russ and Miller.

A. Claim 1:

1. A digital video recorder (DVR) for time shifting at least one video program, said video program being transmitted over a data distribution system, comprising:

a tuner for receiving a plurality of video programs, wherein (i) said plurality of video programs are transmitted at the same time on a single channel within said data distribution system, (ii) said tuner can be tuned to said single channel to receive said plurality of video programs, and (iii) at least one of said plurality of video programs includes at least first, second and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion;

a memory device for storing said plurality of video programs, allowing said one of said plurality of video programs to be played back at a later time;

a controller configured to receive commands from a user of said DVR, wherein a first command changes said DVR from a first playback state to a second playback state, a second command initiates playback of said one of said plurality of video programs from said memory device, and a third command instructs said DVR to receive and store said plurality of video programs; and

at least one processor configured to (i) provide said one of said plurality of video programs in its entirety to a display device in response to receiving said second command during a first period of time, (ii) provide said one of said plurality of video programs in its entirety to said display device in response to receiving said second command during a second period of time if said DVR is in said first playback state, and (iii) provide only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said one of said plurality of video programs, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state;

wherein said second period of time is a period of time after said first period of time.

1. Claim element 1[pre]: “A digital video recorder (DVR) for time shifting at least one video program, said video program being transmitted over a data distribution system, comprising:”

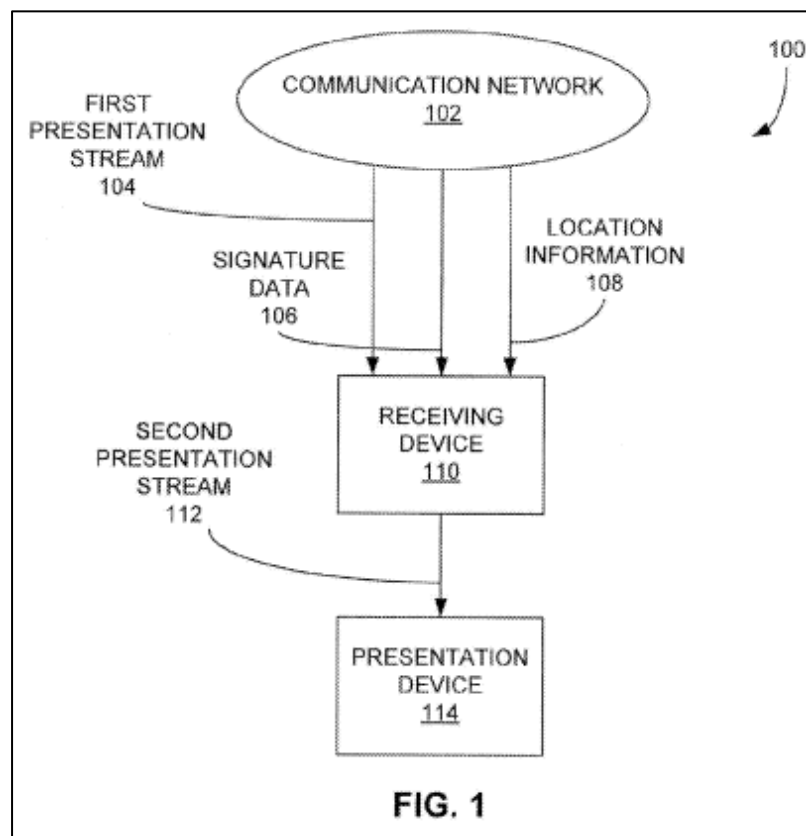
94. To the extent it is limiting, Casagrande discloses the preamble. DVRs with time-shifting capabilities were well-known in the art as of the priority date of the '122 Patent, and included functions such as pausing, fast forwarding, rewinding, skipping ahead, skipping back, and buffering. For example, Casagrande references “time shifting” in the context of navigating an A/V stream stored on a DVR. Specifically, Casagrande discloses “[a] digital video recorder (“DVR”) [to] allow viewers to record video in a digital format to a disk drive or other type of storage medium for later playback.” Casagrande at 1:17–22. According to Casagrande, DVRs “are often incorporated to set-top boxes for satellite and cable television services. A television program stored on a set-top box allows a viewer to perform time shifting functions, and may additionally allow a view to skip over commercial breaks and other portions of the recording that the viewer does not desire to watch.” *Id.* at 1:21–26.

95. Additionally, Casagrande explains “it is to be appreciated that the A/V stream may be supplied by any source, such as an over-the-air broadcast, a satellite or cable television distribution system, a digital video disk (DVD) or other optical disk, the internet or other communication networks and the like.” Casagrande at 4:36–40. Casagrande further discloses an embodiment in which a presentation

stream is transmitted over a communication network, comprising a “cable or satellite television network for distribution of an A/V stream and [a] receiving device.” *Id.* at 6:29–31.

2. Claim element 1[a][i]: “a tuner for receiving a plurality of video programs, wherein (i) said plurality of video programs are transmitted at the same time on a single channel within said data distribution setting,”

96. As I detail in this section, a POSA would have understood that the “receiving device 110” disclosed in Casagrande corresponds to the claimed “tuner” of the ’122 Patent. Casagrande explains that “[t]he receiving device 110 of Fig. 1 may be any device capable of receiving a presentation stream from the communication network 102. *See* Casagrande at 6:26–34; Fig. 1 (below).



Casagrande explains that “the communication network 102 comprises a cable or satellite television network for distribution of an A/V stream and the receiving device 110 comprises a set-top box configured to communicate with the communication network 102.” Casagrande at 6:28–32.

97. Casagrande’s receiving device is configured to receive a presentation stream, including an A/V stream or “a contiguous block of associated audio and video data that may be transmitted to, and received by, an electronic device, such as a terrestrial (“over-the-air”) television receiver, an internet connected television or television receiver, a computer, a portable electronic device, or the like.” Casagrande at 4:41–46. In one embodiment, “the receiving device identifies

portions of the presentation stream based on the identified location, such as the boundaries of segments or content or insertion locations of supplemental content.” *Id.* at 3:2–5. The receiving device may also “then perform further processing using the identified portions of the presentation stream, such as filtering of segments of the presentation stream.” *Id.* at 3:5–7.

98. Casagrande discloses that its receiving device includes a “communication interface 1502” that “include[s] circuitry to receive a first A/V stream 1504 and location information 1508.” Casagrande at 17:62–64. Casagrande explains that “[i]f the receiving device 1510 is a satellite set-top box, then the communication interface 1502 may be configured to receive satellite programming, such as the first A/V stream 1504, via an antenna from a satellite transponder.” *Id.* at 17:65–18:2.

99. Although Casagrande does not expressly use the word “tuner,” a POSA would have understood Casagrande’s satellite set-top box used one or more tuners. Specifically, a POSA would have understood that it was well-known that set-top boxes used a tuner to receive the data for a video program from a satellite transponder via the antenna. Moreover, it would be obvious to implement Casagrande’s set-top box with at least one tuner to isolate and extract the desired programming from the signal received via the satellite antenna or coaxial cable.

100. To be sure, Russ explains that “the set-top terminal (STT), otherwise known as the set-top box, has become an important computing device for accessing various video services.” Russ ¶[0003]. Russ describes such STTs such as “primary device 140” that “includes a processor, *a tuner system*, a storage device, a modulator, and a remote device communications receiver.” *Id.* ¶[0020] (emphasis added). Specifically, Russ explains that “[a] processor and a tuner system, which may be a simplified processor and only one tuner, may be included to extract channels from the received downstream broadband signals.” *Id.*

101. Thus, a POSA viewing the teachings of Casagrande, Miller, and Russ would have understood that the DVR of Casagrande included one or more tuners for receiving a plurality of video segments or would have found it an obvious implementation choice. A POSA could use a tuner and related software, such as disclosed in Russ, to effectuate the embodiment disclosed in Casagrande to achieve the desired channel extraction. Casagrande at 18:49-53.

102. To the extent Casagrande does not expressly disclose the claimed “said plurality of video programs are transmitted at the same time on a single channel within said data distribution system,” or render it obvious based on Russ, Miller’s teachings render it obvious. For example, Miller discloses “a system that concurrently processes multiple distinct programs communicated via a single carrier signal.” Miller ¶[0002]. Miller explains that the “system includes a receiving device

comprising a tuner operable to receive a multiplexed signal via a satellite network that communicates digital video programming, the multiplexed signal comprising a plurality of program content portions, each program content portion corresponding to one of a plurality of programs, and a program content transporter that is communicatively coupled to the tuner.” Miller ¶[0002].

103. Further, a POSA would have been motivated to combine the teachings of Casagrande with Russ and Miller so that Casagrande’s system properly processes the received user input and A/V stream communicated over a single channel within a distribution system. For example, a POSA viewing Casagrande would have understood that the DVR needs one or more tuners to extract the A/V streams and process the execution of software for performing the various control functions. Casagrande states that its “control logic 1520 may include hardware and logic circuitry in lieu of, or in addition to, a processor and related software to allow the control logic 1520 to control the other components of the receiving device 1510.” Casagrande at 18:49–53. A POSA would have found it obvious to try an implementation of Casagrande’s A/V stream as a plurality of video programs communicated at the same time on a single channel, which Miller explains saves resources and efficiently operates the satellite network.

104. For example, Miller notes that having multiple tuners, each of which is capable of accessing a single program on a single channel, is “subject to several

disadvantages, such as higher manufacturing costs for receiving devices 118, increased power consumption by receiving devices 118, and the like.” Miller ¶[0031]. Thus, Miller seeks to avoid these disadvantages by providing “various techniques to facilitate the concurrent utilization of program content communicated via a single carrier signal” such as “receiving via a single content stream selector a multiplexed signal containing multiple distinct programs.” *Id.* ¶[0032]. Thus, a POSA would have understood that adding the multiplexing feature of Miller to the combined system of Casagrande and Russ would have avoided these disadvantages. Further, a satellite set-top box, such as a DVR, has a finite number of tuners. Thus, it would have been advantageous to deliver multiple video programs at the same time using a single tuner. A POSA would have found it obvious to try an implementation of Casagrande’s A/V stream as multiple video programs communicated at the same time on a single channel, which Miller explains provides the benefits of saving resources and improving operational efficiency of the satellite network.

105. Additionally, each of these references discloses the use of satellite systems to deliver video content. Casagrande explains that “*an A/V stream is a contiguous block of associated audio and video data that may be transmitted to, and received by, an electronic device, such as a terrestrial (‘over-the-air’) television receiver, a cable television receiver, a satellite television receiver, an internet*

connected television or television receiver, a computer, a portable electronic device, or the like.” Casagrande at 4:41-46 (emphasis added). Russ explains that “[b]roadband communications systems, such as *satellite and cable television systems*, are now capable of providing many services in addition to analog broadcast video.” Russ ¶[0003] (emphasis added). Russ teaches that “[t]he primary device 140, in accordance with one embodiment of the present invention, includes a processor, *a tuner system*, a storage device, a modulator, and a remote device communications receiver.” *Id.* ¶[0020] (emphasis added). Miller describes that “[t]he system includes a receiving device comprising *a tuner operable to receive a multiplexed signal via a satellite network* that communicates digital video programming, the multiplexed signal comprising a plurality of program content portions, each program content portion corresponding to one or a plurality of programs.” Miller ¶[0002] (emphasis added). A POSA would have expected predictable results from combining the teachings of these results. Specifically, each of these references describes a system for receiving content from a satellite system via tuner. Thus, a person of ordinary skill in the art would have been motivated to look to the teachings of Miller which describe the known process of using multiplexed signals alongside one or more tuners to deliver video content.

106. Thus, a POSA would have had a reasonable expectation of success in combining the teachings of Casagrande, Russ, and Miller for this limitation.

Specifically, each reference describes a system for receiving content from a satellite system via a tuner. And as described above, POSA would have found it obvious to transmit Casagrande's plurality of video programs at the same time on a single channel. In fact, it would have been advantageous to implement the multiplexing functionality of Miller in the combined system of Casagrande and Russ to avoid the "higher manufacturing costs" and "increased power consumption" associated with multiple tuners to access single program streams. Miller ¶[0031].

107. Therefore, I conclude that Casagrande in view of Russ and Miller would have taught a POSA the elements of claim sub-element 1[a][i].

3. Claim element 1[a][ii]: "said tuner can be tuned to said single channel to receive said plurality of video programs, and"

108. Casagrande's and Russ's teachings disclose or render obvious claim element 1[a][ii]. For instance, Russ expressly or inherently discloses this claim element.

109. According to Russ ¶[0020], "The primary device 140, in accordance with one embodiment of the present invention, includes a processor, a tuner system, a storage device, a modulator, and a remote device communications receiver. Each of the remote devices, such as the remote device 150-1, may be identical to the primary device 140 and just share the storage device contents of the primary device 140. Alternatively, the remote device 150-1 may be a simplified or conventional version of the primary device 140. A processor and a tuner system, which may be a

simplified processor and only one tuner, may be included to extract channels from the received downstream broadband signals. Additionally, decryptors and decoders may be included to decode encoded signals for proper processing and display. Preferably, the remote device 150-1 includes a user input receiver, such as an IR receiver or an RF receiver that receives signals from a remote control, such as an IR remote control or an RF remote control. The remote control is not required and any user input device could be incorporated in the remote device 150-1.”

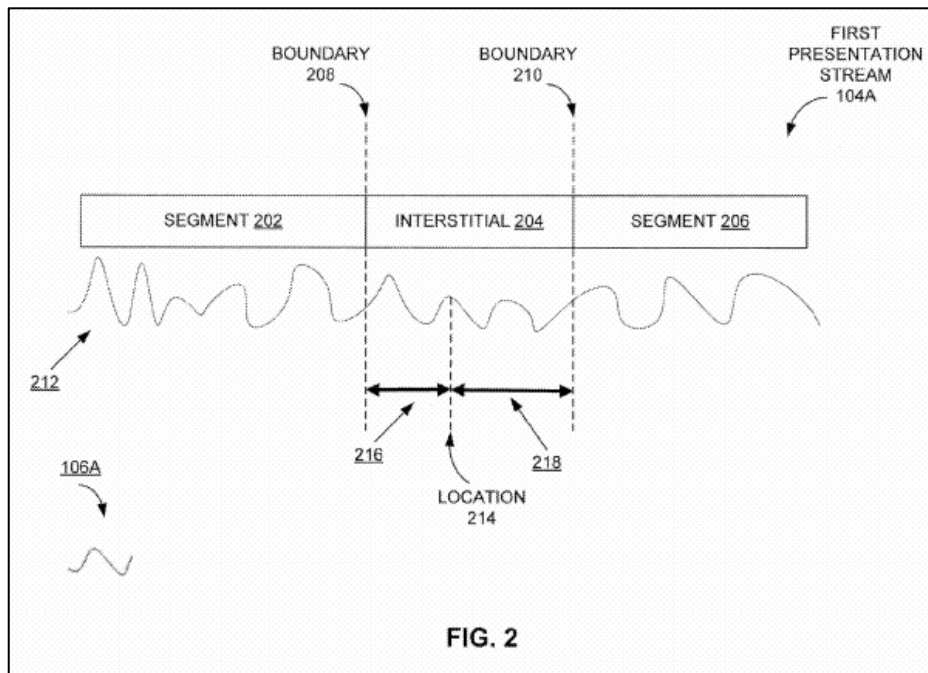
110. To the extent it is otherwise asserted that Casagrande does not disclose this limitation or render it obvious, alone or in view of Russ, tuning a tuner to a single channel to receive video programs was already well-known in the art. For example, Miller ¶[0002] discloses “a system that concurrently processes multiple distinct programs communicated via a single carrier signal” wherein the “system includes a receiving device comprising a tuner operable to receive a multiplexed signal via a satellite network that communicates digital video programming, the multiplexed signal comprising a plurality of program content portions, each program content portion corresponding to one of a plurality of programs, and a program content transporter that is communicatively coupled to the tuner.” A POSA would have been motivated to have Casagrande’s tuner be capable of tuning to a single channel to receive a plurality of video programs because, as Miller teaches, this

provides the benefit of saving resources and improving operation efficiencies of satellite-based networks.

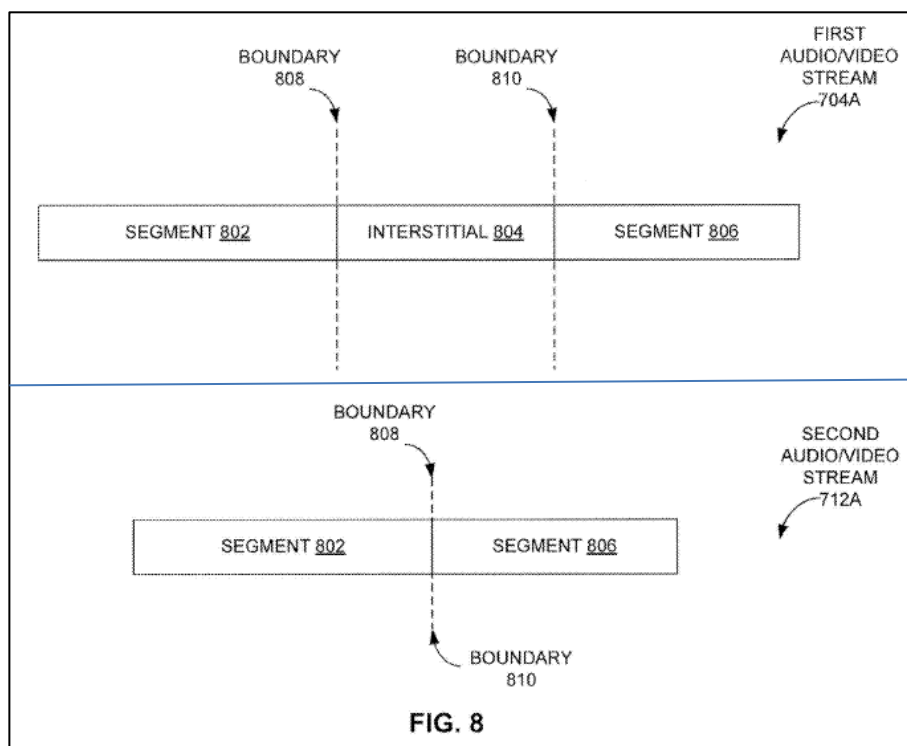
111. Thus, I conclude that claim sub-element 1[a][ii] is obvious in view of Russ.

4. Claim element 1[a][iii]: “(iii) at least one of said plurality of said video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion and said third portion as transmitted is said to follow said second portion;”

112. Casagrande also discloses the presence of “segments” and “interstitials” within A/V streams. *See* Casagrande at Abstract. Specifically, Casagrande discloses: a “television program may be comprised of multiple segments of video frames, which are interspersed with interstitials (e.g., commercials). As used herein, interstitials are the video frames of a recording that do not belong to a selected show (e.g., commercials, promotions, alerts, and other shows). A segment of video includes contiguous video frames of the program that are between one or more interstitials.” *Id.* at 4:57–63; *see also id.* Fig. 2 (below) (illustrating contiguity of presentation stream segments with an interstitial segment).



113. Likewise, Fig. 8 of Casagrande depicts an example of “an embodiment of a graphical representation of the first A/V stream received by the receiving device and a second A/V stream outputted by the receiving device.” Casagrande at 13:5–8. Importantly, the first A/V stream 704A is depicted as separate contiguous segments (segments 802 and 806, respectively) that maintain their order as the interstitial 804 is removed to form the second A/V stream 712A.



114. The presentation streams of Casagrande are comprised of “segments” and “interstitials.” One of ordinary skill in the art at the time the ’122 Patent was filed would understand that Fig. 2 and Fig. 8 of Casagrande demonstrate that the contiguous segments correspond to the first, second, and third portions, “wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion.”

115. Therefore, I find that the Casagrande, together with Russ, renders obvious all limitations of claim sub-element 1[a][iii].

5. Claim element 1[b]: “a memory device for storing said plurality of video programs, allowing said one of said plurality of video programs to be played back at a later time;”

116. Casagrande discloses “a storage unit 1516, which is configured to store both the first A/V stream 1504 and the supplemental content 1506. The storage unit may include any storage component configured to store one or more such A/V streams.” Casagrande at 18:18–25; *see also* Fig. 15 (below; highlight added).

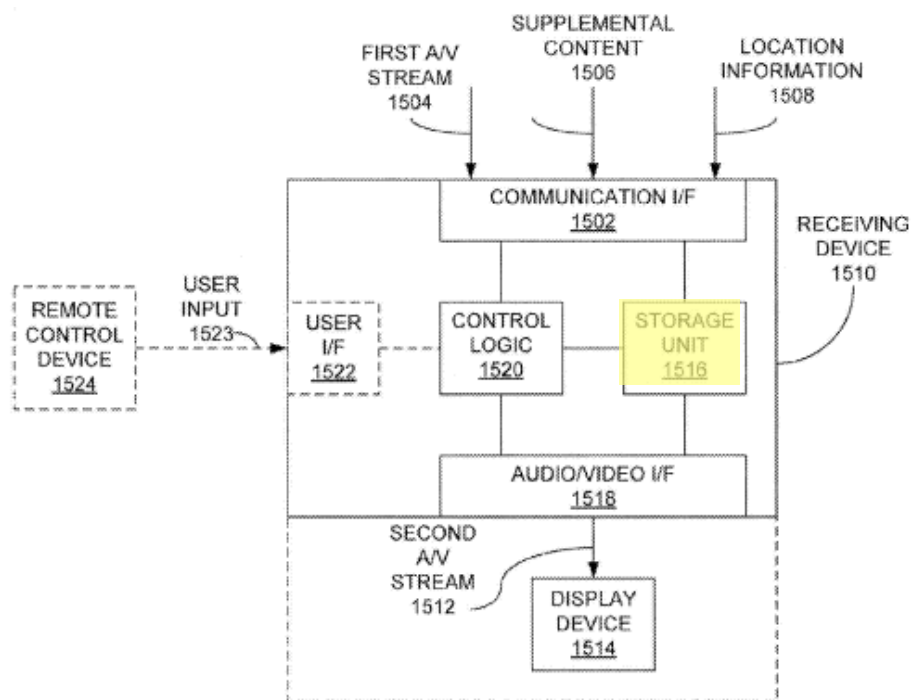


FIG. 15

117. Further, Casagrande explains that “the receiving device 1510, by way of the control logic 1520, is configured to receive the first A/V stream 1504 by way of the communication interface 1502, and store the A/V stream 1504 in the storage unit 1516.” Casagrande at 18:64–67. Moreover, Casagrande discloses “[a] second A/V stream 1512 may or may not be stored as a separate data structure in the storage

unit 1516.” *Id.* at 19:37–39. Casagrande also lists several non-limiting examples of storage units in the context of the invention, which include a hard disk drive, an optical disk drive, and flash semiconductor memory. A POSA would have understood that a storage unit in the context of the Casagrande patent includes a memory device for storing a plurality of video programs.

118. With respect to the second portion of claim element 1[b], Casagrande also describes a storage unit as allowing for at least a portion of the referenced saved video program to be played back at a later time. *See* Casagrande at 18:26–29 (“Communicatively coupled with the storage unit 1516 is an A/V interface 1518, which is configured to output A/V streams from the receiving device 1510 to the display device for presentation to a user.”). A POSA would have understood that the storage unit disclosed in Casagrande, including the implementation of logic circuitry to route, store, and subsequently retrieve A/V segments from a receiving device correspond to the functionality required of the memory device depicted in the ’122 Patent. Therefore, Casagrande discloses the memory device allowing for the plurality of said video programs to be played back at a later time.

6. Claim element 1[c]: “a controller configured to receive commands from a user of said DVR, wherein a first command changes said DVR from a first payback state to a second playback state, and a second command initiates playback of said one of said plurality of video programs from said memory

device, and a third command instructs said DVR to receive and store said plurality of video programs; and”

119. The first portion of claim element 1[c] is disclosed in Casagrande.

120. The controller, as described in the '122 Patent, is “in communication with a remote control 770 (e.g., operated by a user of the DVR system)” and receives a command from the user via the remote control, subsequently transmitting the command to the processor of the DVR system. '122 Patent at 7:40–42. This technology is disclosed in Casagrande.

121. Casagrande explains that “the control logic 1520 may communicate with a user interface 1522 configured to receive user input 1523 directing the operation of the device 1510. The user input 1523 may be generated by way of a remote control device 1524, which may transmit the user input 1523 to the user interface 1522” via modes such as radio frequency or infrared. Casagrande at 18:54–60. Casagrande teaches the use of “control logic 1520, [which] includes a processor, such as a microprocessor, microcontroller, digital signal processor (DSP), or the like for execution of software configured to perform the various control functions [t]herein.” Casagrande at 18:45–49.

122. While the '122 Patent does not specifically identify the use of control logic in the initiation of the playback of video programs from the memory device, a POSA would have understood that controllers utilize control logic to effectuate desired outcomes. In view of Casagrande, it is clear that the use of control logic

technology was integrated into the controllers of DVRs by the time the effective filing date of the '122 Patent. Therefore, Casagrande describes a controller configured to receive commands from a user of said DVR.

123. Casagrande discloses “wherein a first command changes said DVR from a first playback state to a second playback state.” Specifically, Casagrande teaches that “[t]he receiving device 710A is operable to receive a first A/V stream 704, signature data 1006 and location information 706A.” Casagrande at 15:21-24. Casagrande explains that the “*first A/V stream* include[es] at least one segment of a show, at least one interstitial of the show and text data, e.g., closed captioning data (operation 1802).” *Id.* at 21:28-32 (emphasis added). Casagrande also explains that “at some point after the location information 1508 is processed, the control logic 1520 generates and transmits a second A/V stream 1512 over the A/V interface 1518 to the display device 1514.” *Id.* at 19:10–14. For example, Casagrande teaches that “[r]esponsive to identifying portions of the first A/V stream 704, the receiving device 710 filters particular portions from the first A/V stream 704 to output a second A/V stream 712 for presentation by the display device 714.” *Id.* at 15:30-34.

124. Casagrande explains that “a user may select by way of the user input 1523 whether the first A/V stream 1504 or the second A/V stream 1512 is outputted to the display device 1514 by way of the A/V interface 1518.” Casagrande at 19:63–66. User commands, such as “select[ing] a particular channel to watch or record,”

are “provided to the processor 740 via the controller 710.” *Id.* at 8:15-16; ’122 Patent at 7:46-48. Thus, a POSA would have understood Casagrande’s “user interface” comprises the claimed “controller” because it communicates with the “remote control” to receive “user input” and deliver instructions to “control logic” including a “processor.” Thus, Casagrande teaches a user selecting between a first playback state (*i.e.*, selecting to play the first A/V stream) and a second playback state (*i.e.*, selecting to play the second A/V stream).

125. Casagrande also discloses wherein “a second command initiates playback of said video program from said memory device.” Casagrande discloses “a menu of available segments of [a] television program, and [a user] may select one or more of the available segments for the presentation Based upon user selection of particular segments from the selection menu, the receiving device responsively outputs the selected segments.” Casagrande at 4:1–8. Thus, this limitation of claim element 1[c] is disclosed by Casagrande.

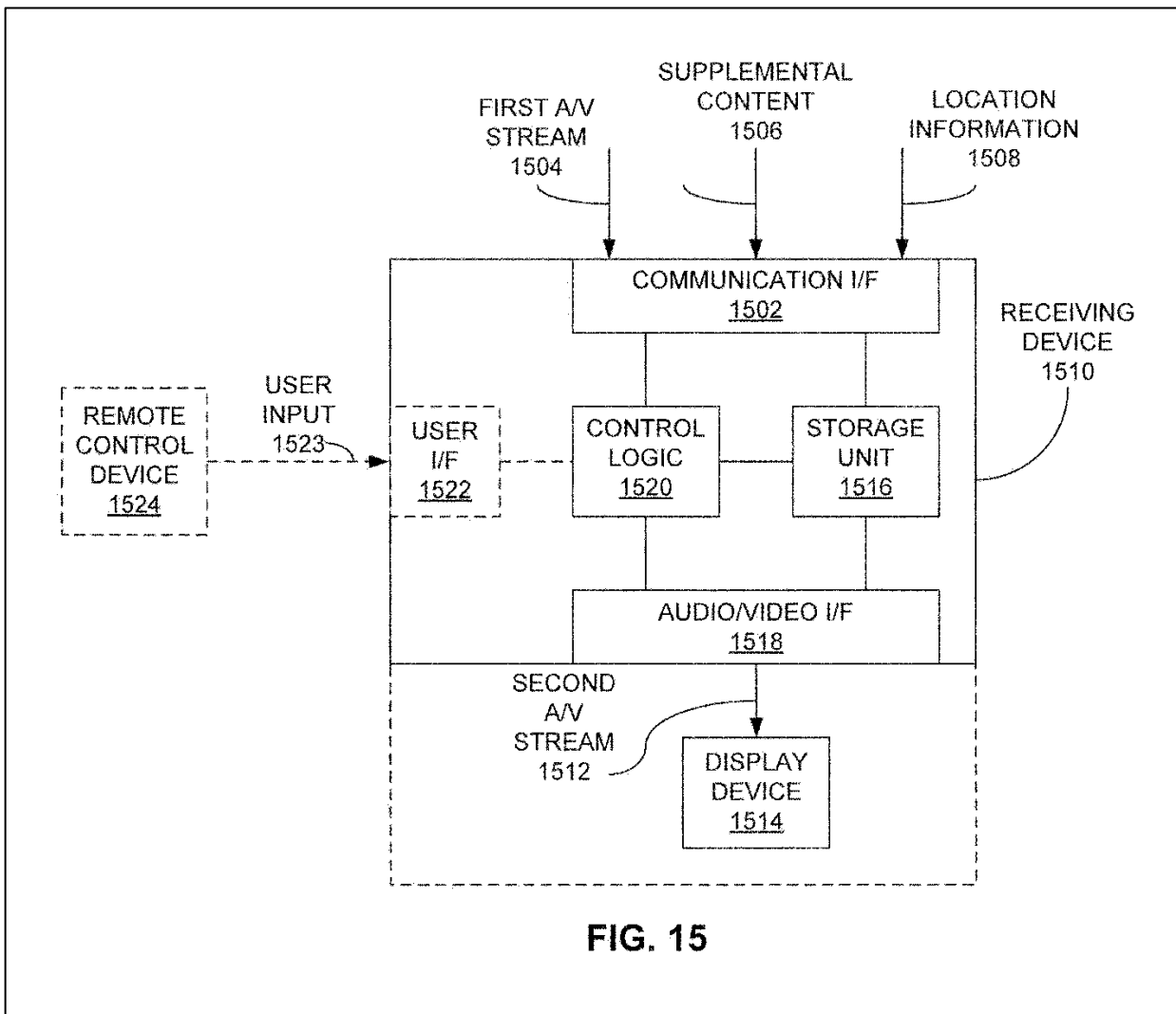
126. Casagrande also discloses wherein “a third command instructs said DVR to receive and store said plurality of video programs.” Casagrande discloses “the control logic 1520 may communicate with a user interface 1522 configured to receive user input 1523 directing the operation of the receiving device 1510.” Casagrande at 18:54–60. Casagrande explains that “[t]he receiving device 1510, by way of the control logic 1520, is configured to receive the first A/V stream 1504 by

way of the communication interface 1502, and store the A/V stream 1504 in the storage unit 1516.” *Id.* at 18:64-67. Thus, this limitation of claim element 1[c] is disclosed by Casagrande.

127. Therefore, claim element 1[c] is disclosed in Casagrande. This functionality would remain when combined with Russ and Miller.

7. Claim element 1[d][i]: “at least one processor configured to (i) provide said one of said plurality of video programs in its entirety to a display device in response to received said second command regardless of a playback state of said DVR if said second command is received during a first period of time.”

128. As an initial matter, Casagrande discloses “at least one processor.” For example, Casagrande teaches the use of “control logic 1520, [which] includes a processor, such as a microprocessor, microcontroller, digital signal processor (DSP), or the like for execution of software configured to perform the various control functions [t]herein.” Casagrande at 18:45–49. Additionally, Fig. 15 of Casagrande depicts the control logic and storage unit as housed within the receiving device 1510. *See* Fig. 15 (below).



129. Casagrande also discloses that said processor is “configured to (i) provide said video program in its entirety to a display device in response to received said second command regardless of a playback state of said DVR if said second command is received during a first period of time.” Casagrande explains that control logic 1520 is “configured to control the operation of each of” the “communication interface 1502, the storage unit 1516, and the A/V interface 1518.” Casagrande at 18:42-45. Casagrande further explains that “A/V interface 1518...is configured to

output A/V streams from the receiving device 1510 to the display device for presentation to a user.” *Id.* at 18:26–29. Thus, Casagrande teaches that “control logic 1520” was “configured” to control “A/V interface 1518” to “output A/V streams from the receiving device 1510 to the display device.”

130. Casagrande also explains that the entirety of the A/V presentation (*e.g.*, the first A/V stream) may be presented even if the user selects a shortened version (*e.g.*, the second A/V stream). As described above, Casagrande explains that “a user may select by way of the user input 1523 whether the first A/V stream 1504 or the second A/V stream 1512 is outputted to the display device 1514 by way of the A/V interface 1518.” Casagrande at 19:63-66. However, Casagrande also explains that “a content provider of the first A/V stream 1504 ***may prevent the user from maintaining such control*** by way of additional information delivered to the receiving device 1510.” *Id.* at 19:66-20:2 (emphasis added). Casagrande specifically explains that “commercials within a television program may be associated with restrictions against fast forwarding or skipping, and a ***receiving device may automatically present the commercial segments regardless of the receipt of user input requesting non-presentation of the segments.***” *Id.* at 4:27-32 (emphasis added). Thus, Casagrande teaches limiting the DVR’s ability to initiate playback of the second playback state (*i.e.*, the second A/V stream with the interstitial content for commercials removed).

131. Casagrande further explains that the additional information would be processed using the same control logic device explained above, within the same receiving device explained above. And, a POSA would have understood that processing a user request for changing between the first playback state (the first A/V stream) and the second playback state (the second A/V stream) will still lead to the depiction of the first A/V stream (*i.e.*, the stream in its entirety) on the display device during a first period of time where the content provider has placed restrictions on removing interstitial content. Moreover, when combined with Russ, these restrictions on skipping may be lifted after a period of time. Therefore, claim sub-element 1[d][i] is disclosed in Casagrande, either alone or in combination with Russ.

8. Claim element 1[d][ii]: “provide said one of said plurality of video programs in its entirety to said display device in response to receiving said second command during a second period of time if said DVR is in said first playback state, and”

132. Casagrande also discloses this limitation.

133. As discussed above, Casagrande and Russ disclose a first period of time where only the first A/V stream may be played such as when the content provider has placed restrictions on removing interstitials, as well as a second period of time where the interstitials may be removed after the restrictions have been lifted. Even in the second period of time, “a user may select by way of the user input 1523 whether the first A/V stream 1504 or the second A/V stream 1512 is outputted to the display device 1514 by way of the A/V interface 1518.” Casagrande at 19:63-20:2.

Indeed, a POSA would have understood numerous reasons for a user to select the playback of the first A/V stream (*i.e.*, the entire video program), such as:

- to watch the advertisements;
- to view the programming in the manner in which it was originally broadcast.

134. To the extent it is suggested that Casagrande does not disclose lifting the restrictions on skipping interstitials, thereby creating a first period of time wherein skipping is restricted and a second period of time wherein skipping is allowed, Russ teaches such options. As discussed above, Casagrande explains that “a user may be restricted from temporally moving through particular identified segments of a presentation stream at a non-real time presentation rate of the A/V stream.... In other words, a receiving device may automatically present the commercial segments regardless of the receipt of user input requesting non-presentation of the segments” Casagrande at 4:20-32. Casagrande explains that “specific segments may be identified and associated with particular playback restrictions.” Casagrande at 5:67-6:1.

135. Russ teaches that “trick play functionality” to skip commercials “could be restricted” such that “[t]he commercial slot could also preclude trick play for only a specified length of time, such as two weeks.” Russ ¶[0035].

136. Russ further explains that “[f]or example, a tag corresponding with a commercial could expire after a period of time....” Russ ¶[0035]. Thus, Russ

discloses the desirability of having a first period of time wherein the user must watch the entire A/V stream, including commercials, such as when the operator or programmer has placed a two-week restriction on skipping commercials. Similarly, Russ discloses the desirability of having a second period of time (*i.e.*, once the restriction expires) in which the user may elect to skip the commercials or not. *Id.* A POSA would have been motivated to combine Casagrande and Russ in order to effectuate the desired result of restricting “temporally moving through particular identified segments” that Casagrande discusses. Casagrande at 4:20-21. Specifically, a POSA would have found it obvious to apply the time-based nature of the restrictions on trick-play taught in Russ to the various “playback restrictions” found in Casagrande, including the restriction on skipping commercials entirely. For example, Casagrande and Russ both disclose restrictions on removing interstitials that are directly linked to a first and second period of time. A POSA would look to the teachings and methods of Russ for guidance to understand how to further achieve the desired result.

137. A POSA would have also recognized that Russ’s time-based limit (*e.g.*, for period of time) on the preclusion of trick play was applicable to the various types of trick play described in Casagrande, such as automatically skipping interstitials (*e.g.*, commercials). A POSA would have been motivated to implement the known time-based limits on restrictions found in Russ in Casagrande’s DVR to obtain the

predictable result of restricting the automatic skipping of interstitials for a finite period of time, thereby increasing the financial value of the interstitial content to the broadcaster. A POSA would have had a reasonable expectation of success incorporating Russ's techniques into Casagrande's DVR, as they would have entailed simple software/user interface modifications well within the skill of a POSA, and because a similar technique had been shown to work in Russ's similar system.

138. Further, a POSA would have understood, as confirmed by Russ's disclosure, that some users would be more willing to accept restrictions on commercial skipping soon after distribution of the content (*i.e.*, a first period beginning upon completion of transmission of the program) while other users may be willing to wait for several weeks to watch the program in order to allow commercial skipping. Accordingly, a POSA would understand that applying Russ's technique would allow the content provider to obtain additional revenue from advertisements shown to viewers who value watching the program during the initial release period, while still appealing to viewers who are willing to delay watching the program to avoid commercials.

139. Moreover, Casagrande confirms that some commercials become less relevant over time, further confirming the obviousness of having an initial period where commercials are shown, and a later period where commercials can be skipped.

For example, Casagrande teaches that “a department store may have originally advertised a sale during the original broadcast of the show, but that particular sale may have since ended.” Casagrande at 10:5-13. Thus, a POSA would have been motivated to implement Russ’s time-based restrictions in the system of Casagrande for this additional reason.

140. A POSA would also have recognized that the time-based limits on restrictions of Russ were one of a number of finite number of identified solutions to providing restrictions to skipping or fast-forwarding through content. A POSA would have found it obvious to try the time-based limits on restrictions of Russ in the system of Casagrande.

141. As noted, Casagrande describes that “a user may select by way of the user input 1523 whether the first A/V stream 1504 or the second A/V stream 1512 is outputted to the display device 1514 by way of the A/V interface 1518.” Casagrande at 19:63-20:2. Thus, during the second period of time, when the skipping restrictions are lifted, the selection of the second A/V stream would still result in display of the first A/V stream, without skipping the commercial. Thus, Casagrande teaches a user selecting between a first playback state (*i.e.*, selecting to play the first A/V stream) and a second playback state (*i.e.*, selecting to play the second A/V stream).

142. As discussed above, Casagrande and Russ both disclose a first time period when only the first A/V stream may be played such as when the content provider has placed restrictions on removing interstitials. A POSA would have appreciated that multiple reasons existed for a user of Casagrande's DVR to select the playback of the first A/V stream (*i.e.*, the entire video program) even after a period of restriction on commercial skipping had ended, such as, for example, when watching the Super Bowl, where commercials may be of particular interest.

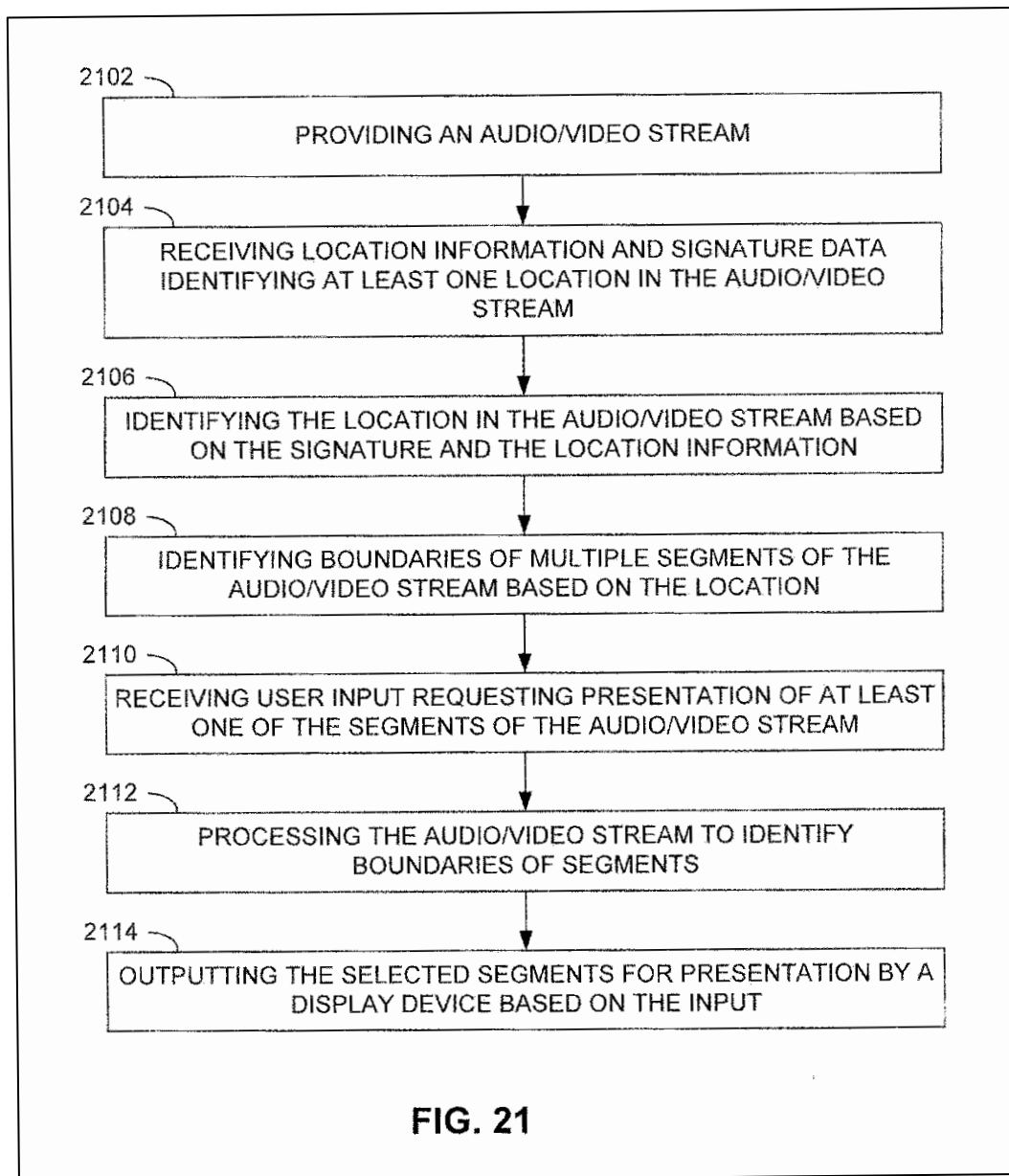
143. Thus, Casagrande in view of Russ discloses all limitations of claim element 1[d][ii].

9. Claim element 1[d][iii]: “provide only a portion of said video program to said display device in response to receiving said second command if said second command is received during said second period of time and said DVR is in said second playback state, said portion of said video program including at least said first and third portions of said video program, wherein said third portion of said video program is provided to said display device immediately following said first portion of said video program if said second command is received during said second period of time and said DVR is in said second playback state;”

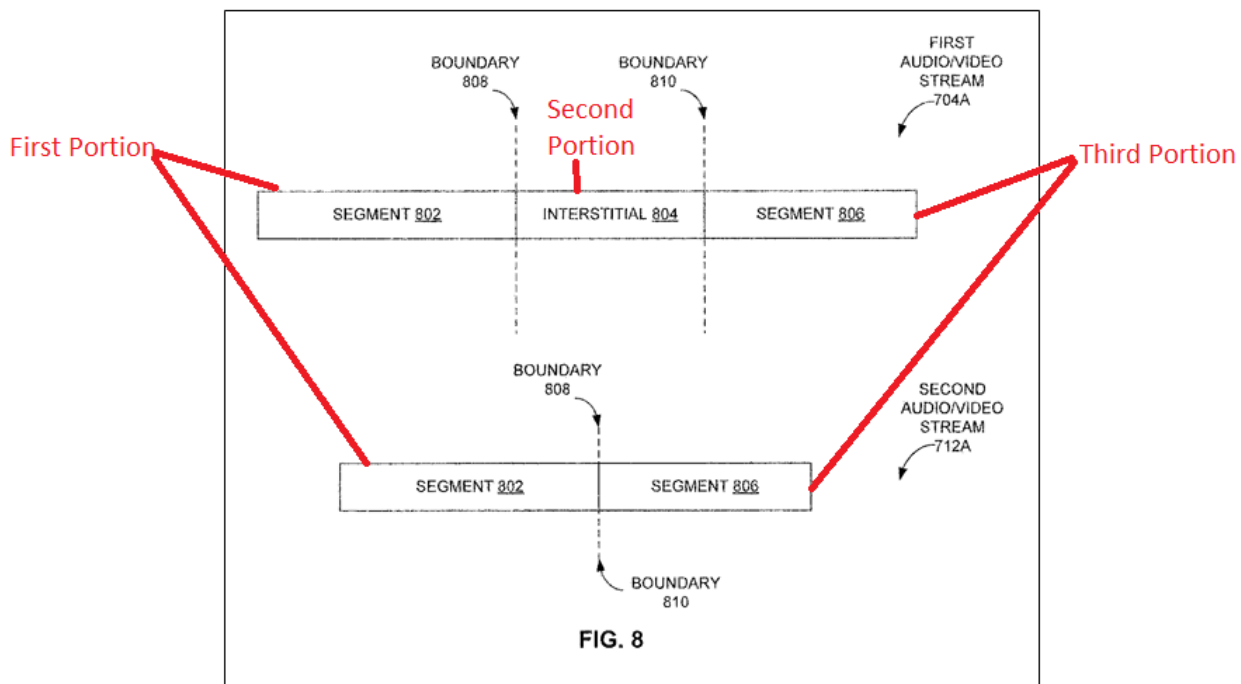
144. Casagrande also discloses “provid[ing] only a portion of said video program to said display device in response to receiving said second command if said second command is received during said second period of time and said DVR is in said second playback state, said portion of said video program including at least said first and third portions of said video program, wherein said third portion of said

video program is provided to said display device immediately following said first portion of said video program if said second command is received during said second period of time and said DVR is in said second playback state.”

145. A POSA would understand that a user may effectively view a subset of segments of an A/V stream in the original temporal order of the segments of the first A/V stream without viewing the identified interstitials when requesting to view the second A/V stream. Fig. 21, reproduced below, illustrates the “process for processing an audio/video stream.” Casagrande at 23:45-46, Fig. 21. Using Figure 21’s steps, Casagrande teaches that using this process, a user “may effectively view a subset of the segments of an A/V stream in the original temporal order of the segments, skipping output of undesigned segments of the A/V stream.” *Id.* at 24:23-26.



146. Casagrande's Figure 8, reproduced below, illustrates the effect of the process embodied by Fig. 21 having "first A/V stream 704A received by the receiving device 710, and a second A/V stream 712A outputted by the receiving device 710." Casagrande at 13:5-8.



Casagrande explains that “a first A/V stream 704 includes a first A/V segment 802 of a show, an interstitial 804 and a second A/V segment 806 of the show.” Casagrande at 13:13–15. Casagrande teaches that “the boundary 808 (e.g., the ending boundary of segment 802) is the starting point at which the interstitial 804 is to be filtered from the first A/V stream 704A” and that “the boundary 810 (e.g., the beginning boundary of segment 806) is the ending point at which the interstitial 804 is to be filtered from the first A/V Stream 704A.” *Id.* at 13:23-28. Casagrande explains that “[a]s a result of the filtering, a second A/V stream 712A is produced, in which the second segment 806 is outputted immediately following the first segment 802.” *Id.* at 13:29-31. Thus, Casagrande discloses generating the “second A/V stream” that has the interstitials (*i.e.*, commercials) removed from the first A/V

stream.

147. In view of Figs. 21 and 8, claim sub-element 1[d][iii] is disclosed in Casagrande.

148. A POSA would have been motivated to combine Casagrande and Russ in order to effectuate the result of restricting “temporally moving through particular identified segments” discussed in Casagrande. Casagrande at 4:20–21. For example, Casagrande and Russ both disclose restrictions on removing interstitials that are directly linked to a first and second period of time. Casagrande explains that “specific segments may be identified and associated with particular playback restrictions.” *Id.* at 5:67-6:1. Specifically, Casagrande explains that “in some embodiments, a user may be restricted from temporally moving through particular identified segments of a presentation stream at a non-real time presentation rate of the A/V stream. In other words, a receiving device may automatically output particular segments of a presentation stream without skipping over or otherwise fast forwarding through the segments, regardless of whether a user provides input requesting fast forwarding or skipping through the segments.” *Id.* at 4:20–27. Similarly, Russ teaches “trick play functionality” such as “fast forward” may be used to skip commercials. Russ ¶[0033]. However, Russ also teaches that trick play “could be restricted while viewing a portion of a presentation, such as commercials” and “would not work for certain commercials as specified, for example, by the local

cable operator or the presentation programmer.” *Id.* Russ explains that “[t]he commercial slot could also preclude trick play for only a specified length of time, such as two weeks.” *Id.* ¶[0035]. Russ further explains that “[f]or example, a tag corresponding with a commercial could expire after a period of time after which the tag would become inactive or replaceable.” *Id.* Thus, a person of ordinary skill in the art would have been motivated to combine Casagrande and Russ in order to effectuate the desired result of restricting “temporally moving through particular identified segments” discussed in Casagrande. Casagrande at 4:20–21. A person of ordinary skill in the art would look to the teachings and methods of Russ for guidance to understand how to further achieve the desired result.

149. For example, a POSA would recognize that Russ’s preclusion of trick play for a specified length of time is one such type of playback restriction that expands upon Casagrande’s “playback restrictions.” A POSA would have motivated to implement the known restrictions of Russ in the known system of Casagrande to obtain the predictable result of restricting skipping of interstitials, thereby increasing the financial value of the interstitial content to the broadcaster.

150. Casagrande acknowledges that one concern expressed by content providers is the decreasing value of interstitial content over time, particularly because commercials may become less relevant to the user or may expire. Casagrande teaches that “the supplemental content 602 may also be selected to

replace a commercial with a timelier commercial from the same advertiser. For example, a department store may have originally advertised a sale during the original broadcast of the show, but that particular sale may have since ended. Thus, the supplemental content 602 [] replace[s] that particular commercial with another commercial advertising a current sale at the store.” Casagrande at 10:5–13. This disclosure from Casagrande suggests to a POSA that it would be advantageous not to skip interstitial commercials initially when they are most relevant and therefore financially beneficial to a content provider. However, at some point in time in the future, the content provider would be less financially invested in the commercial being viewed. Thus, a POSA would have been motivated to implement Russ’s time-period based restrictions in the system of Casagrande.

151. A POSA would also have recognized that the restrictions of Russ were one of a finite number of identified solutions to providing restrictions to skipping or fast-forwarding through content. Thus, a POSA would have found it obvious to try the restrictions of Russ in the system of Casagrande.

152. Therefore, Casagrande discloses all the limitations of claim element 1[d][iii] or renders the element obvious in view of Russ.

10.Claim element 1[e]: “wherein said second period of time is a period of time after said first period of time.”

153. As explained above, Casagrande discloses a first period of time where the first A/V stream is shown on the display device and a second period of time

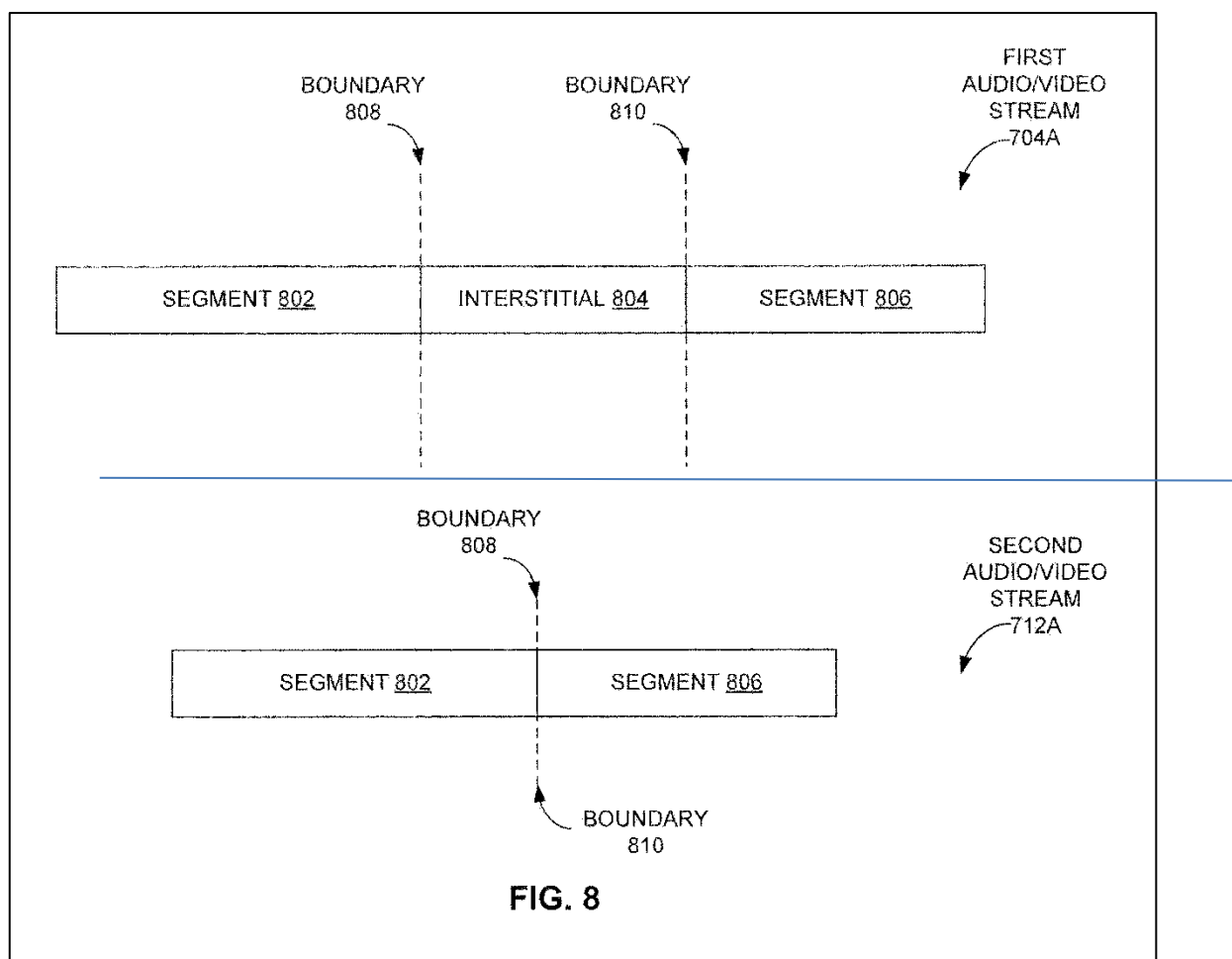
where only a second A/V stream is shown on the display device. A POSA, therefore, would understand that Casagrande teaches that the received user inputs to the DVR vary in time rather than being simultaneous with one another.

154. Further detailed above, Russ explains that “[t]he commercial slot could also preclude trick play for only a specified length of time, such as two weeks.” Russ ¶[0035]. Russ further explains that “a tag corresponding with a commercial could expire after a period of time after which the tag would become inactive or replaceable.” *Id.* Thus, a POSA would have understood that the combination of Casagrande and Russ as described above in relation to claim element 1[d] also renders obvious the claimed “wherein said second period of time is a period of time after said first period of time.”

155. Russ clearly defines a first period of time where trick play is “preclude[d].” In other words, during the first period of time, the combination of Casagrande and Russ would have resulted in the ability to play only the first A/V stream.

156. Moreover, described with reference, to Fig. 8 of Casagrande below, the second period of time wherein skipping of commercials is allowed begins once the restriction expires. During the second period of time, the user attempting to play the stream when selection of the “second A/V stream” is active would result in playback

of the first portion (e.g., segment 802) followed by the third portion (e.g., segment 806) while removing the second portion (e.g., interstitial 804). *Id.*



157. Therefore, Casagrande in view of Russ renders obvious claim element 1[e]. In sum, Casagrande, in view of Russ and Miller, renders obvious claim 1.

B. Claim 2: “The DVR of claim 1, further comprising a wireless transmitter in communication with said at least one processor and memory device, said wireless transmitter being configured to transmit said one of plurality of video programs in its entirety or said portion of said one of said plurality of programs at least indirectly to

said display device, said display device being remotely located from said DVR.”

158. I understand that because claim 2 depends from claim 1, claim 2 requires all the elements from claim 1 in addition to those disclosed in claim 2. As mentioned above, all the elements of claim 1 are disclosed in Casagrande, Russ, Miller, or were well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 2.

159. Casagrande discloses that its “receiving device 1510 includes a communication interface 1502, a storage unit 1516, an A/V interface 1518, and control logic 1520.” Casagrande at 17:53–55. Further, “[i]n one implementation, the control logic 1520 includes a processor, such as a microprocessor, microcontroller, digital signal processor (DSP), or the like for execution of software configured to perform the various control functions described [t]herein.” *Id.* at 18:45–49. Moreover, Casagrande explains that “[t]he A/V interface 1518 may incorporate circuitry to output the A/V streams in any format recognizable by the display device 1514 . . . including WiFi.” *Id.* at 18:29–35.

160. As explained above, Casagrande discloses a controller housed within a receiving device that receives transmitted user commands from a user input device, such as a remote control. *See also* Casagrande at Fig. 15 (depicting remote control device 1524 transmitting user input 1523 to the receiving device 1510 and into the control logic 1520). In one exemplary embodiment, “a user may select by way of

user input 1523 whether the first A/V stream 1504 or the second A/V stream 1512 is outputted to the display device 514 by way of the A/V interface. *Id.* at 19:63–66. “The control logic 1520 may communicate with a user interface 1522 configured to receive user input 1523 directing the operation of the receiving device 1510. The user input 1523 may be generated by way of a remote control device 1524, which may transmit the user input 1523 to the user interface 1522 by use of, for example, infrared (IR) or radio frequency (RF) signals.” *Id.* at 18:54–60.

161. Further according to Casagrande, “[t]he presentation device 114 may be any device configured to receive a presentation stream from the receiving device 110 and present the presentation stream to a user. Examples of the presentation device 114 include a television, a video monitor or similar device capable of presenting audio and/or video information to a user, a stereo or audio receiver, a projector and the like. The receiving device 110 may be communicatively coupled to the presentation device 114 through any type of wired or wireless connection. . . . Exemplary wireless connections include WiFi, ultra-wide band (UWB) and Bluetooth.” Casagrande at 6:48–59.

162. Casagrande, explains that “user[s] perform [time shifting functions, allowing a viewer to skip over commercial breaks and other portions of the recording that the viewer does not desire to watch] manually, for example, using a fast forward button of a remote control associated with a DVR.” Casagrande at 1:26–30.

163. Therefore, I conclude that Casagrande renders obvious the limitation recited in claim 2.

C. Claim 3: “The DVR of claim 1, further comprising at least one other tuner, wherein said at least one other tuner allows said DVR to receive at least one other video program while said tuner is being used to receive said plurality of video programs, said at least one other video program being selected by said user.”

164. I understand that because claim 3 depends from claim 1, claim 3 requires all the elements from claim 1 in addition to those disclosed in claim 3. As mentioned above, all the elements of claim 1 are disclosed in Casagrande, Russ, Miller, or were well-known practices in the art by the priority date of the ’122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 3.

165. As mentioned above, Casagrande teaches the use of a tuner by way of a receiving device comprising, in one embodiment, a DVR. *See* Casagrande at 6:26–30 (“The receiving device 110 of Fig. 1 may be any device capable of receiving a presentation stream from the communication network 102.”).

166. Casagrande teaches that the receiving device 110 of Casagrande is configured to receive a presentation stream, including an A/V stream or “a contiguous block of associated audio and video data that may be transmitted to, and received by, an electronic device, such as a terrestrial (“over-the-air”) television receiver, an internet connected television or television receiver, a computer, a portable electronic device, or the like.” Casagrande at 4:41–46. In one embodiment,

“the receiving device identifies portions of the presentation stream based on the identified location, such as the boundaries of segments or content or insertion locations of supplemental content.” *Id.* at 3:2–5. The receiving device may also “then perform further processing using the identified portions of the presentation stream, such as filtering of segments of the presentation stream.” *Id.* at 3:5–7.

167. Russ similarly teaches the use of tuners in DVR systems, explaining that “[a] processor and a tuner system, which may be a simplified processor and only one tuner, may be included to extract channels from the received downstream broadband signals.” Russ ¶[0020].

168. To the extent it is asserted that Casagrande and Russ do not disclose the use of “at least one other tuner”, Miller discloses this limitation.

169. For example, Miller ¶[0031] discloses that “it may be desirable to access multiple program content streams concurrently. For example, a user may desire to view a first program and record a second program that are being communicated concurrently.” Specifically, Miller explains that “a user may desire to view a first program and record a second program that are being communicated concurrently by a program distributor 106 to a receiving device 118.” *Id.* ¶[0031]. “In one approach, the receiving device 118 may include at least two tuners, such that the first tuner can be configured to receive a first carrier signal that carries a program content stream corresponding to the first program and the second tuner can be

configured to receive a second carrier signal that carries a program content stream corresponding to the second program.” *Id.* ¶[0031]. Then, “the receiving device 118 may concurrently process the two program content streams by, for example, displaying the first program content stream on a presentation device 120 and recording the second program content stream on a user device 122, which may be, for example, a digital video recorder. However, such a multiple tuner approach may be subject to several disadvantages, such as higher manufacturing costs for receiving devices 118, increased power consumption by receiving devices 118, and the like.” *Id.* ¶[0031].

170. Thus, for all the motivations to combine discussed above, I conclude that Casagrande in view of Russ and Miller renders obvious the limitation recited in claim 3.

D. Claim 4: “The DVR of claim 1, wherein said one of said plurality of video programs includes at least primary and secondary video content, and said first and third portions of said one of said plurality of video programs consists of said primary video content.”

171. I understand that because claim 4 depends from claim 1, claim 4 requires all the elements from claim 1 in addition to those disclosed in claim 4. As mentioned above, all the elements of claim 1 are disclosed in Casagrande, Russ, Miller, or were well-known practices in the art by the priority date of the ’122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 4.

172. According to the '122 Patent's Detailed Description of the Preferred Embodiment, "time-shifted" data relates to "data that has been recorded and is being played back" at a later time. *See* '122 Patent at 4:560-57. Auxiliary data, on the other hand, refers to data such as advertisements, new tickers, "crawlers", and the like. *Id.* at 4:54–56.

173. Casagrande discloses a television program comprised of multiple segments of video frames, which are interspersed with interstitials (*e.g.*, commercials, promotions, alerts, and other shows). Casagrande at 4:57–59. A POSA would have understood that the multiple segments of video frames in Casagrande correspond to the "primary content" or "time-shifted" data in the '710 Patent. Similarly, the interstitials of Casagrande correspond to the "secondary content" or "auxiliary data" of the '122 Patent.

174. A POSA would have also understood that the interstitials disclosed in Casagrande are the video frames of a recording that do not belong to a selected show. To remove them, Casagrande discloses an embodiment where the "receiving device 710A may then operate to output the content within the boundaries 1106 and 1108 [of a video segment] . . . and utilize the identified boundaries to determine content to skip during output of a second A/V stream." Casagrande at 16:4–12. Thus, Casagrande discloses the playback of a second stream that includes the primary

video content while removing or skipping portions of the secondary video content (*e.g.*, interstitials or “auxiliary data”).

175. As discussed above, Casagrande discloses removing or skipping certain content, such as commercials, during playback of a video stream. Thus, the reference discloses playback of a stream that includes the primary video content (*e.g.*, the video stream) while removing or skipping portions of the secondary video content (*e.g.*, commercials.). *See* Casagrande at 14:40-44.

176. Therefore, I conclude that Casagrande render obvious the limitation recited in claim 4.

E. Claim 5: “The DVR of claim 4, wherein said second portion of said one of said plurality of video programs consists of said secondary video content and said memory device is further configured to store at least one time when said second portion begins and at least one time when said second portion ends.”

177. I understand that because claim 5 depends from claim 4 and claim 1, claim 5 requires all the elements from claims 4 and 1 in addition to those disclosed in claim 5. As mentioned above, all the elements of claims 4 and 1 are disclosed in Casagrande, Russ, Miller, or were well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 5.

178. Casagrande discloses a television program comprised of multiple segments of video frames, which are interspersed with interstitials (*e.g.*,

commercials, promotions, alerts, and other shows). Casagrande at 4:57–59. The multiple segments of video frames in Casagrande correspond to the “primary content” or “time-shifted” data in the ’710 Patent. Similarly, the interstitials of Casagrande correspond to the “secondary content” or “auxiliary data” of the ’122 Patent.

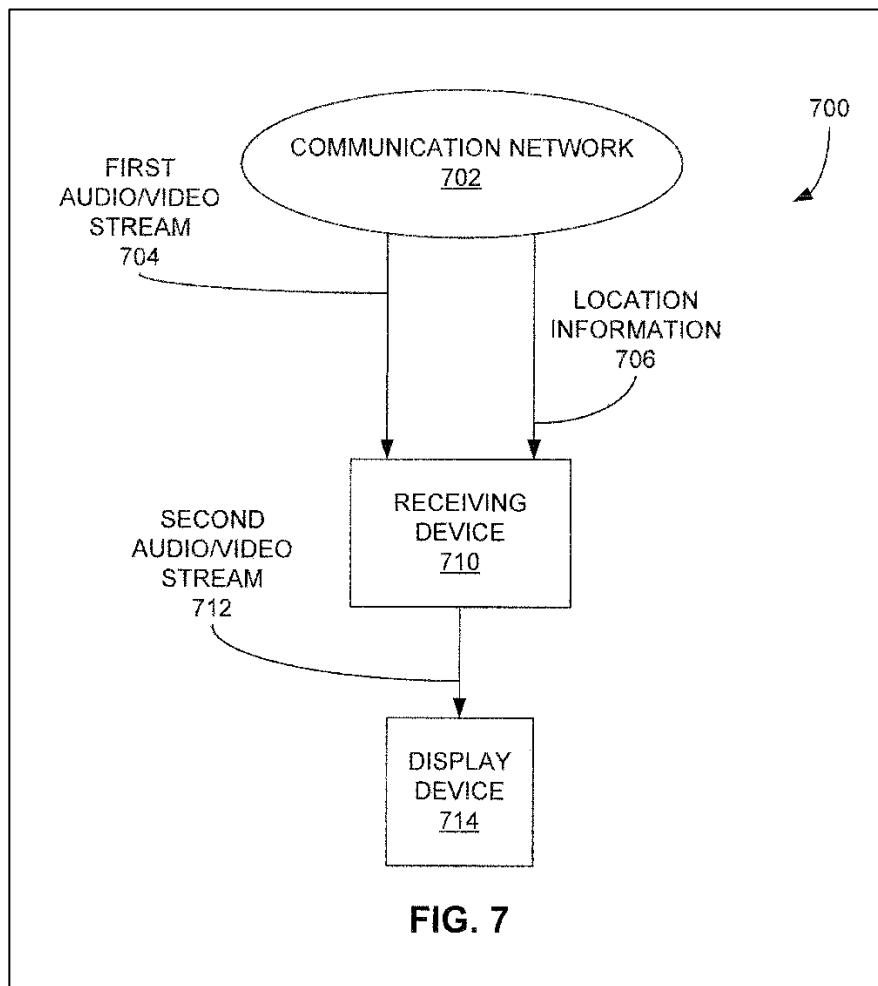
179. Discussed above, Casagrande discloses the filtering of interstitials, or secondary content. Specifically, Casagrande teaches “interstitials are the video frames of a recording that do not belong to a selected show (e.g., commercials, promotions, alerts, and other shows). A segment of video includes contiguous video frames of the program that are between one or more interstitials.” Casagrande at 4:59–63.

180. As explained above, Casagrande discloses a storage unit within the receiving device. Casagrande also discloses the use of metadata that “specifies portions of the first presentation stream 104 that are to be skipped and/or presented during presentation of the A/V data of the first presentation stream 104 by the receiving device 110.” Casagrande at 7:35-39. In other words, “the location information 108 may identify which portions of the content of the first presentation stream 104 are to be presented and/or skipped during presentation to a user.” *Id.* at 7:67-8:3.

181. Casagrande explains how location information which may consist of boundaries within the A/V stream, and offsets from those boundaries, correspond to “presentation times” of the content. Casagrande at 14:34-35.

182. It would also be obvious to a POSA that the location information corresponding to “presentation times” could be implemented as a time stamp of the stored video. This could simplify implementation as MPEG files, which Casagrande explains was a common format for video presentation that was also widely known to include time stamp information. Casagrande at 7:12-16.

183. Casagrande also discloses a “first A/V stream 704 includ[ing] a first A/V segment 802 of a show, an interstitial 804, and a second A/V segment 806 of the show. Also indicated are beginning and ending boundaries 808 and 810 of the interstitial 804, which are indicated to the receiving device 710 (see FIG. 7) by way of the location information 706. It is to be recognized that the boundaries 80 and 810 of the interstitial 804 are also boundaries of the segments 802 and 806.” Casagrande at 13:13–20. With reference to Fig. 7, reproduced below, Casagrande explains that “[t]he communication network 702 also transmits location information 706 to the receiving device 710.” *Id.* at 12:51-52.



184. Further, “[t]he location information 706 may be transmitted to the receiving device 710 together or separately from the first A/V stream 704.” Casagrande at 12:52-54. Finally, Casagrande explains that “the location information 1508 may be stored in the storage unit 1516 for subsequent retrieval and processing by the control logic 1520.” *Id.* at 19:6–9.

185. Because Casagrande discloses a memory device within its receiving unit that is configured in part to store the location information containing interstitial

boundaries, Casagrande discloses or renders obvious all the elements listed in claim 5 of the '122 Patent. Thus, I conclude that Casagrande renders obvious the limitation recited in claim 5.

F. Claim 6: “The DVR of claim 1, wherein said first portion of time is a period of time that begins when said one of said plurality of video programs is stored on said memory device and available to be viewed and ends within a predetermined time thereafter, said predetermined time being less than one week.”

186. I understand that because claim 6 depends from claim 1, claim 6 requires all the elements from claim 1 in addition to those disclosed in claim 6. As mentioned above, all the elements of claim 1 are disclosed in Casagrande, Russ, Miller, or were well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 6.

187. As discussed above, Russ teaches “trick play functionality” such as “fast forward” may be used to skip commercials. Russ ¶[0033]. However, Russ also teaches that trick play “could be restricted while viewing a portion of a presentation, such as commercials” and “would not work for certain commercials as specified, for example, by the local cable operator or the presentation programmer.” *Id.* Russ explains that “[t]he commercial slot could also preclude trick play for only a specified length of time, such as two weeks.” *Id.* ¶[0035].

188. As evidenced by Russ’s inclusion of phrases like “such as” to show a particular example, a POSA would have understood that Russ’s disclosure of a

“specified length of time” could include any period of time, such as a day or less than a week, as those were well known specified lengths of time. Moreover, a POSA would have understood that Russ’s disclosure of a two week period is exemplary in nature. A POSA would have understood that any period of time could have been used. A “local cable operator” or “presentation programmer” would have found it obvious to specify a shorter period of time, such as a day or less than a week, if a particular commercial were only relevant for said time period. For example, a “presentation programmer” may include a commercial for an event that takes place the next day or the coming weekend. Thus, the receiving unit of Casagrande may be able to skip the commercial after the event has occurred.

189. Therefore, I conclude that Casagrande, either alone or in view of Russ, renders obvious the limitation recited in claim 6.

G. Claim 7: “The DVR of claim 1, wherein said single channel is stored in said memory and said at least one processor is configured to tune said tuner to said single channel in response to said controller receiving said third command.”

190. I understand that because claim 7 depends from claim 1, claim 7 requires all the elements from claim 1 in addition to those disclosed in claim 7. As mentioned above, all the elements of claim 1 are disclosed in Casagrande, Russ, Miller, or were well-known practices in the art by the priority date of the ’122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 7.

191. As discussed above, Casagrande discloses “a third command instruct[ing] said DVR to receive and store said plurality of video programs.” Casagrande’s DVR uses “control logic 1520 [to] communicate with a user interface 1522 [that is] configured to receive user input 1523 directing the operation of the receiving device 1510.” Casagrande at 18:54–60. As a result, Casagrande explains that “[t]he receiving device 1510 . . . receive[s] the first A/V stream 1504 by way of the communication interface 1502, and store[s] the A/V stream 1504 in the storage unit 1516.” *Id.* at 18:64-67.

192. Casagrande teaches the storage of supplemental content within the storage unit of the DVR. *See, e.g.*, Casagrande at 18:18–20 (“Coupled to the communications interface 1502 is a storage unit 1516, which is configured to store both the first A/V stream 1504 and the supplemental content 1506.”).

193. To the extent it is suggested that Casagrande does not recite the storage of a channel within the non-limiting list of data provided therein, the storage of non-A/V data, such as channels, Miller’s teachings render this limitation obvious. For example, Miller ¶[0002] teaches “a system that concurrently processes multiple distinct programs communicated via a single carrier signal.” the system includes “receiving device comprising a tuner operable to receive a multiplexed signal via a satellite network that communicates digital video programming, the multiplexed signal comprising a plurality of program content portions, each program content

portion corresponding to one of a plurality of programs, and a program content transporter that is communicatively coupled to the tuner.” “The program content transporter is operable to determine a first and second program of the plurality of programs, and to concurrently present the program content portion corresponding to the first program on a display device communicatively coupled to the receiving device and record the received program content portion corresponding to the second program.” *Id.*

194. Miller also discloses a “content stream selector” that “may comprise a single tuner” that may “tune to a frequency of a carrier signal that carries multiple program content streams multiplexed in a manner as described above. The content stream selector may then begin and continue to receive and forward, such as by storing in a buffer 412, program content portions from each of the multiple program content streams, as they arrive over the carrier signal.” Miller ¶[0003].

195. Therefore, for all the motivations to combine listed above, I conclude that Casagrande in view of Russ and Miller renders obvious the limitation recited in claim 7.

H. Claim 8: “The DVR of claim 1, wherein data communicated via said single channel is compressed prior to transmission and said at least one processor is configured to decompress said data after its (sic) have been received so that said one of said plurality of video programs or said portion of said one of said plurality of video

programs can be displayed, depending on when said second command is received and said playback state of said DVR.”

196. I understand that because claim 8 depends from claim 1, claim 8 requires all the elements from claim 1 in addition to those disclosed in claim 8. As mentioned above, all the elements of claim 1 are disclosed in Casagrande, Russ, Miller, or were well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 8.

197. Casagrande teaches that “the A/V data may be formatted according to one of the MPEG encoding standards, such as MPEG-2 or MPEG-4.” Casagrande at 7:12-14. A POSA would have understood that MPEG encoding standards, including MPEG-2 and MPEG-4 both involved compressing video data.

198. Further, Casagrande explains that “[i]n at least one embodiment, the signature data 106 comprises compressed data, e.g., compressed audio or video data. The compressed data may then be expanded and compared with the audio or *video data of the first presentation stream 104 which has also been uncompressed*. In some embodiments, the signature data 106 may be compared with the data of the first presentation stream 104 in compressed format, e.g., before either data has been expanded.” Casagrande, at 8:55–62 (emphasis added).

199. Thus, Casagrande discloses at least one processor configured to decompress received compress data via a single channel for display.

200. Indeed, the decompression of previously compressed data for display in a DVR system was already well known in the art. For example, Miller teaches that “the signal received by the receiving device 118 may include a plurality of multiplexed programs. In particular, a plurality of programs may be communicated as a plurality of program content streams that are multiplexed upon a single carrier signal. Each content stream may comprise a plurality of program content portions each containing video, audio, and/or data corresponding to the program. Program content portions may comprise MPEG (“Motion Picture Experts Group”) packets that contain compressed and/or encrypted video, audio, and/or other data.” Miller ¶[0029]. In addition, “program content portions may be encapsulated and/or formatted in other ways, such as by use of other or additional transport, compression, and/or encryption techniques.” *Id.* Miller further explains that “[t]he video processing system 404 and/or the presenter 408 may perform additional processing on program content portions, such as decompressions, decryption, encryption, scaling, and the like, prior to communicating the program content to the presentation device 120.” *Id.* ¶[0052].

201. Therefore, for all the motivations to combine listed above, I conclude that Casagrande in view of Miller renders obvious the limitation recited in claim 8.

I. Claim 9: “The DVR of claim 5, wherein said secondary video content comprises at least one advertisement.”

202. I understand that because claim 9 depends from claim 5, which depends from claim 1, claim 9 requires all the elements from claim 5 in addition to those disclosed in claim 9. As mentioned above, all the elements of claim 5 are disclosed in Casagrande, Russ, Miller, or were well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 9.

203. The term “secondary video content” as it is used throughout the '122 Patent to refer to “auxiliary data” which includes advertisements, news tickers, or crawlers. *See* '122 Patent at 5:48–49. Casagrande discloses interstitials, which include but are not limited to commercials. *See, e.g.*, Casagrande at 4:57–63 (“The television program may be comprised of multiple segments of video frames, which are interspersed with interstitials (e.g., commercials). As used herein, interstitials are the video frames of a recording that do not belong to a selected show (e.g., commercials, promotions, alerts, and other shows)”).

204. I find that Casagrande discloses all the elements claimed in claim 9 and that there are no differences between what is claimed and what exists in the prior art. Therefore, I conclude that claim 9 is obvious.

J. Claim 10: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said one of said plurality of video programs from said memory if said second command is

received during said second period of time and said DVR is in said second playback state, and (ii) retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and said DVR is switched to said first playback state at or before said time thereafter.”

205. I understand that because claim 10 depends from claim 1, claim 10 requires all the elements from claim 1 in addition to those disclosed in claim 10. As mentioned above, all the elements of claim 1 are disclosed in Casagrande, Russ, Miller, or were well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 10.

1. Claim element 10[a]: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said plurality of video programs from said memory if said second command is received during said second period of time and said DVR is in said second playback state,”

206. Casagrande explains that “the control logic 1520 includes a processor . . . or the like for execution of software configured to perform the various control functions.” Casagrande at 18:45–49.

207. Casagrande also teaches that “[r]esponsive to identifying portions of the first A/V stream 704, the receiving device 710 filters particular portions from the first A/V stream 704 to output a second A/V stream 712 for presentation by the display device 714.” Casagrande at 15:30-34. Casagrande explains: “Depending on the implementation, the second A/V stream may or may not be stored as a separate

data structure in the storage unit 1516 Both the first A/V stream 1504 and the second A/V stream 1512 may reside within the storage unit 1516.” *Id.* at 19:37–39, 43–44. Additionally, “[i]n one implementation, a user may select by way of the user input 1523 whether the first A/V stream 1504 or the second A/V stream 1512 is outputted to the display device 1514 by way of the A/V interface. *Id.* at 19:63–66.

208. Once the user selects whether a first or second A/V stream is outputted to the display device, Casagrande explains that “at some point after the location information 1508 is processed, the control logic 1520 generates and transmits a second A/V stream 1512 over the A/V interface 1518 to the display device 1514.” Casagrande at 19:10–13.

209. Casagrande discloses a processor, by way of a control logic, configured to retrieve a said second portion of a video program from a memory device if a said second command is received during a said second period of time and said DVR is in a said second playback state.

210. Thus, I conclude that claim element 10[a] was obvious in view of Casagrande and well-known practices in the art.

2. Claim element 10[b]: “retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and

said DVR is switched back to said first playback state at or before said time thereafter.”

211. As explained above, the '710 patent's description of “first” and “second” playback states refers to the original, unedited video stream communicated to the display device and an edited or altered video stream removing “auxiliary data”, respectively. Casagrande discloses both. With respect to the first playback state Casagrande discloses the user setting the DVR to play the first A/V stream with the original interstitials. *See also* Casagrande at 4:20–28 (explaining some embodiments in which a user may be restricted from temporally moving through particular identified segments of a presentation stream at a non-real-time presentation rate of the A/V stream). Similarly, Casagrande also discloses the second playback state, where the user views a second A/V stream that has interstitials removed.

212. Also mentioned throughout, Casagrande discloses the use of a storage unit, which is “configured to store both the first A/V stream 1504 and the supplemental content.” Casagrande at 18:19–20. The storage unit may include any storage component configured to store one or more such A/V streams, including hard disk drives, optical disk drives, and flash semiconductor memory. *Id.* at 18:20–24.

213. A POSA would have understood that changing the “playback state” of Casagrande is not temporally limited to before the first request to view an A/V stream is received and processed. Thus, a subsequent request to view the “first A/V

stream” comprising the entire content stream may be received after a request to view the “second A/V stream” has been processed, such as when commercials are of interest to the user. Casagrande simply explains that “a user may select by way of the user input 1523 whether the first A/V stream 1504 or the second A/V stream 1512 is outputted to the display device 1514 by way of the A/V interface 1518.” Casagrande at 19:63–66.

214. Casagrande also explains “[d]epending on the implementation, the second A/V stream 1512 may or may not be stored as a separate data structure in the storage unit 1516.” Casagrande at 19: 37–39. “[B]oth the first A/V stream 1504 and the second A/V stream 1512 may reside within the storage unit 1516.” *Id.* at 19:44–45.

215. Thus, I conclude that claim element 10[b] is obvious in view of Casagrande and well-known practices in the art.

216. Thus, I conclude that Casagrande renders obvious claim 10.

K. Claim 11:

11. A method for time shifting at least one video program transmitted to a digital video recorder (DVR) over a data distribution system, comprising:

receiving a plurality of video programs, wherein said plurality of video programs are transmitted as the same time and are received by a single tuner in said DVR, and at least one of said plurality of video programs includes at least first, second and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion;

receiving a third command from at least one user of said DVR, said third command indicating a desire to use said single tuner to receive said plurality of video programs and to store said plurality of video programs on at least one memory device in said DVR;

storing said plurality of video programs on said at least one memory device in said DVR in response to receiving said third command from said at least one user of said DVR;

receiving a second command from said at least one user of said DVR, said second command indicating a desire to playback at least a portion of said one of said plurality of video programs;

receiving a first command from said at least one user of said DVR, said first command indicating a playback state of said DVR; and

providing said at least a portion of said one of said plurality of video programs to a display device in response to receiving said second command from said at least one user of said DVR;

wherein said step of providing said at least a portion of said one of said plurality of video programs to said display device further comprises (i) providing said one of said plurality of video programs to said display device in response to receiving said second command during a first period of time, (ii) providing said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said first playback state, and (iii) providing only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said video program, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state;

wherein said second period of time is a period of time after said first period of time.

1. Claim element 11[pre]: “A method for time shifting at least one video program transmitted to a digital video recorder (DVR) over a data distribution system, comprising:”

217. To the extent it is limiting, Casagrande discloses the preamble. The preamble of claim 11 recites a method step that is substantially the same limitations as the preamble of claim 1.

218. Therefore, in my opinion, the preamble of claim 11 is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim 1. *See supra* Claim Element 1[pre].

2. Claim element 11[a]: “receiving a plurality of video programs, wherein said plurality of video programs are transmitted as the same time and are received by a single tuner in said DVR, and at least one of said plurality of video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is said to follow said second portion;”

219. Claim element 11[a] recites a method step that is substantially the same limitations as claim elements 1[a][i], 1[a][ii], and 1[a][iii].

220. Therefore, in my opinion, claim element 11[a] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim elements 1[a][i], 1[a][ii], and 1[a][iii]. *See supra* Claim Elements 1[a][i], 1[a][ii], and 1[a][iii].

3. Claim element 11[b]: “receiving a third command from at least one user of said DVR, said third command indicating a desire

to use said single tuner to receive said plurality of video programs and to store said plurality of video programs on at least one memory device in said DVR;”

221. Claim element 11[b] recites a method step that is substantially the same limitations as claim elements 1[b] and 1[c].

222. Therefore, in my opinion, claim element 11[b] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim elements 1[b] and 1[c]. *See supra* Claim Elements 1[b] and 1[c].

4. Claim element 11[c]: “storing said plurality of video programs on said at least one memory device in said DVR in response to receiving said third command from said at least one user of said DVR;”

223. Claim element 11[c] recites a method step that is substantially the same limitations as claim elements 1[b] and 1[c].

224. Therefore, in my opinion, claim element 11[c] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim elements 1[b] and 1[c]. *See supra* Claim Elements 1[b] and 1[c].

5. Claim element 11[d]: “receiving a second command from said at least one user of said DVR, said second command indicating

a desire to playback at least a portion of said one of said plurality of video programs;”

225. Claim element 11[d] recites a method step that is substantially the same limitations as claim element 1[c].

226. Therefore, in my opinion, claim element 11[d] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[c]. *See supra* Claim Element 1[c].

6. Claim element 11[e]: “receiving a first command from said at least one user of said DVR, said first command indicating a playback state of said DVR; and”

227. Claim element 11[e] recites a method step that is substantially the same limitations as claim element 1[c].

228. Therefore, in my opinion, claim element 11[e] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[c]. *See supra* Claim Element 1[c].

7. Claim element 11[f]: “providing said at least a portion of said one of said plurality of video programs to a display device in response to receiving said second command from said at least one user of said DVR;”

229. Claim element 11[f] recites a method step that is substantially the same limitations as claim elements 1[d][i], 1[d][ii], and 1[d][iii].

230. Therefore, in my opinion, claim element 11[f] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the

same reasons discussed for claim elements 1[d][i], 1[d][ii], and 1[d][iii]. *See supra* Claim Elements 1[d][i], 1[d][ii], and 1[d][iii].

8. Claim element 11[g][i]: “wherein said step of providing at least a portion of said one of said plurality of video programs to said display device further comprises (i) providing said one of said plurality of video programs to said display device in response to receiving said second command during a first period of time,”

231. Claim element 11[g][i] recites a method step that is substantially the same limitations as claim element 1[d][i].

232. Therefore, in my opinion, claim element 11[g][i] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[d][i]. *See supra* Claim Element 1[d][i].

9. Claim element 11[g][ii]: “(ii) providing said one of said plurality of said video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said first playback state, and”

233. Claim element 11[g][ii] recites a method step that is substantially the same limitations as claim element 1[d][ii].

234. Therefore, in my opinion, claim element 11[g][ii] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[d][ii]. *See supra* Claim Element 1[d][ii].

10. Claim element 11[g][iii]: “(iii) providing only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second

period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said video program, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and DVR is in said second playback state;

235. Claim element 11[g][iii] recites a method step that is substantially the same limitations as claim element 1[d][iii].

236. Therefore, in my opinion, claim element 11[g][iii] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[d][iii]. *See supra* Claim Element 1[d][iii].

11.Claim element 11[h]: “wherein said second period of time is a period of time after said first period of time.”

237. Claim element 11[h] recites a method step that is substantially the same limitations as claim element 1[e].

238. Therefore, in my opinion, claim element 11[h] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[e]. *See supra* Claim Element 1[e].

L. Claim 12: “The method of claim 11, wherein said step of providing said at least a portion of said one of said plurality of video programs to a display device further comprises transmitting said at least a portion of said one of said plurality of video programs to said display device via a transmission path that includes at least one wireless

connection, said display device being remotely located from said DVR.”

239. Claim 12 recites substantially the same limitations as claim 2.

240. Therefore, in my opinion, claim 12 is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ for the same reasons discussed for claim 2. *See supra* Claim 2.

M. Claim 13: “The method of claim 11, wherein said step of storing said plurality of video programs on said at least one memory device in said DVR further comprises storing at least one time of when said second portion of said video program begins and at least one time of when said second portion of said video program ends.

241. Claim 13 recites substantially the same limitations as claim 5.

242. Therefore, in my opinion, claim 13 is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ for the same reasons discussed for claim 5. *See supra* Claim 5.

N. Claim 14: “The method of claim 11, wherein said one of said plurality of video programs includes at least primary and secondary video content, said portion of said video program that is provided to said display device if said second command is received during said second period of time and said DVR is in second playback state consists of said primary video content, and said secondary video content includes at least one advertisement.

243. Claim 14 recites substantially the same limitations as claims 4, 5, and

9.

244. Therefore, in my opinion, claim 14 is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claims 4, 5, and 9. *See supra* Claims 4, 5, 9.

O. Claim 15: “The method of claim 11, further comprising the steps of: compressing said plurality of video programs prior to said plurality of video programs being transmitted over said data distribution system, and decompressing said plurality of video programs after said plurality of video programs have been received by said DVRr (sic) and before said one of plurality of video programs or portion thereof is provided to said display device.”

245. Claim 15 recites substantially the same limitations as claim 8.

246. Therefore, in my opinion, claim 15 is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim 8. *See supra* Claim 8.

P. Claim 16: “The method of claim 11, further comprising the step of tuning said single tuner to a particular channel at a particular time in response to receiving a third command, said particular channel and said particular time being stored in said at least one memory device in said DVR.

247. Claim 16 recites substantially the same limitations as claim 7.

248. Therefore, in my opinion, claim 16 is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim 7. *See supra* Claim 7.

Q. Claim 17: “The method of claim 16, further comprising the step of receiving a fourth command from said at least one user of said DVR, said forth command indicating a desire to record a second video

program, which is accomplished using another tuner if said second video program is being transmitted to said DVR while said plurality of video programs are being transmitted to said DVR.

249. I understand that because claim 17 depends from claim 16, which depends from claim 11, claim 17 requires all the elements from claim 16 in addition to those disclosed in claim 17. As mentioned above, all the elements of claim 16 are disclosed in Casagrande, Russ, Miller, or were well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 17.

250. As discussed above, Casagrande teaches the receiving device may also “perform further processing using the identified portions of the presentation stream, such as filtering of segments of the presentation stream.” Casagrande at 3:5–7. The “communication interface 1501” within the receiving device of Casagrande may further include “circuitry to receive a first A/V stream 1504 and location information 1508.” *Id.* at 17:62–64.

251. Casagrande discloses “a storage unit 1516, which is configured to store both the first A/V stream 1504 and the supplemental content 1506. The storage unit may include any storage component configured to store one or more such A/V streams.” Casagrande at 18:18–25.

252. Russ similarly teaches the use of tuners in DVR systems, explaining that “[a] processor and a tuner system, which may be a simplified processor and only

one tuner, may be included to extract channels from the received downstream broadband signals.” Russ ¶[0020].

253. Recording multiple video programs airing on various channels was a well-known practice in the art by the priority date of the '122 Patent, and this limitation is inherently present in Casagrande and Russ.

254. Further, Miller explains that “[i]n some instances, it may be desirable to access multiple program content streams concurrently.” Miller ¶[0031]. Miller further explains that “a user may desire to view a first program and record a second program that are being communicated concurrently by a program distributor 106 to a receiving device 118.” *Id.* Miller teaches that “the receiving device 118 may include at least two tuners, such that the first tuner can be configured to receive a first carrier signal that carries a program content stream corresponding to the first program and the second tuner can be configured to receive a second carrier signal that carries a program content stream corresponding to the second program.” *Id.*

255. Therefore, for all the motivations to combine discussed throughout, I conclude that Casagrande, either alone or in combination with Russ and Miller, renders obvious the limitation recited in claim 17.

R. Claim 18:

18. A digital video recorder (DVR) for time shifting at least one of a plurality of video programs, said one of said plurality of video programs consisting of first, second and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion, comprising:

a first tuner for receiving data on said plurality of video programs, wherein said data on one of said plurality of video programs is transmitted together with said data on other ones of said plurality of video programs, so that said first tuner receives said data on said one of said plurality of video programs at the same time that it receives data on said other ones of said plurality of video programs;

at least one memory device for storing said data on said plurality of video programs, including at least said one of said plurality of video programs;

a controller for receiving commands including at least a first command for setting a playback state of said DVR, a second command for initiating a playback of said one of said plurality of video programs from said memory device, and a third command for initiating said reception and said storage of said data on said plurality of video programs; and

at least one processor for (i) providing said first, second and third portions of said one of said plurality of video programs respectively to a display device in response to receiving said second command during a first portion of time, (ii) providing said first, second and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during a second period of time if said DVR is in a first playback state, and (iii) providing said first and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during said second period of time if said DVR is in a second playback state, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state.

1. Claim element 18[pre]: “A digital video recorder (DVR) for time shifting at least one of a plurality of video programs, said one of said plurality of video programs consisting of first,

second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion, comprising:

256. To the extent it is limiting, Casagrande discloses the preamble. The preamble of claim 18 recites substantially the same limitations as the preamble of claim 1 and claim element 1[a][iii].

257. Therefore, in my opinion, the preamble of claim 18 is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim 1. *See supra* Claim Elements 1[pre] and 1[a][iii].

2. Claim element 18[a]: “a first tuner for receiving data on said plurality of video programs, wherein said data on one of said plurality of video programs is transmitted together with said data on other ones of said plurality of video programs, so that said first tuner receives said data on said one of said plurality of video programs at the same time that it receives data on said other ones of said plurality of programs;”

258. Claim element 18[a] recites substantially the same limitations as claim elements 1[a][i] and 1[a][ii].

259. Therefore, in my opinion, claim element 18[a] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ for the same reasons discussed for claim elements 1[a][i] and 1[a][ii]. *See supra* Claim Elements 1[a][i] and 1[a][ii].

3. Claim element 18[b]: “at least one memory device for storing said data on said plurality of video programs, including at least said one of said plurality of video programs;”

260. Claim element 18[b] recites substantially the same limitations as claim element 1[b].

261. Therefore, in my opinion, claim element 18[b] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[b]. *See supra* Claim Element 1[b].

4. Claim element 18[c]: “a controller for receiving commands including at least a first command for setting a playback state of said DVR, a second command for initiating a playback state of said one of said plurality of video programs from said memory device, and a third command for initiating said reception and said storage of said data on said plurality of video programs; and”

262. Claim element 18[c] recites substantially the same limitations as claim element 1[c].

263. Therefore, in my opinion, claim element 18[c] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[c]. *See supra* Claim Element 1[c].

5. Claim element 18[d][i]: “at least one processor for (i) providing said first, second, and third portions of said one of said plurality of video programs respectively to a display device in

response to receiving said second command during a first portion of time,”

264. Claim element 18[d][i] recites substantially the same limitations as claim element 1[d][i].

265. Therefore, in my opinion, claim element 18[d][i] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[d][i]. *See supra* Claim Element 1[d][i].

6. Claim element 18[d][ii]: “(ii) providing said first, second, and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during a second period of time if said DVR is in a first playback state, and”

266. Claim element 18[d][ii] recites substantially the same limitations as claim element 1[d][ii].

267. Therefore, in my opinion, claim element 18[d][ii] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[d][ii]. *See supra* Claim Element 1[d][ii].

7. Claim element 18[d][iii]: “(iii) providing said first and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during said second period of time if said DVR is in a second playback state, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said

second period of time and said DVR is in said second playback state.”

268. Claim element 18[d][iii] recites substantially the same limitations as claim element 1[d][iii].

269. Therefore, in my opinion, claim element 18[d][iii] is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[d][iii]. *See supra* Claim Element 1[d][iii].

S. Claim 19: “The system of claim 18, wherein said third command further results in said first tuner being tuned to a particular frequency to receive said data on said plurality of video programs, said particular frequency being provided by a content provider and stored on said DVR.”

270. Claim 19 recites substantially the same limitations as claim element 1[c] and claim 7.

271. Therefore, in my opinion, claim 19 is disclosed by Casagrande or rendered obvious by Casagrande in view of Russ and Miller for the same reasons discussed for claim element 1[c] and claim 7. *See supra* Claim Element 1[c] and 7.

T. Claim 20: “The system of claim 18, wherein said second portion comprises at least one commercial and said data on said plurality of video program is packetized, with individual packets being linked at least indirectly to individual ones of said plurality of video programs and to individual channels associated with content owners thereof.”

272. I understand that because claim 20 depends from claim 18, claim 20 requires all the elements from claim 18 in addition to those disclosed in claim 20.

As mentioned above, all the elements of claim 18 are disclosed in Casagrande, Russ, or were well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 20.

273. Casagrande teaches that a television program “may be comprised of multiple segments of video frames, which are interspersed with interstitials (e.g., commercials). As used herein, interstitials are the video frames of a recording that do not belong to a selected show (e.g., commercials, promotions, alerts, and other shows). A segment of video includes contiguous video frames of the program that are between one or more interstitials.” Casagrande at 4:57–63.

274. Casagrande also teaches a system where “the communication network 102 transmits each of a first presentation stream 104, signature data 106 and location information 108 to the receiving device 110.” Casagrande at 7:1–3.

275. Casagrande further discloses an embodiment, wherein “the location information 1508 may be stored in the storage unit 1516 for subsequent retrieval and processing by the control logic 1520.” Casagrande at 19:6–9. The location information 706 indicates to the receiving device 710 “beginning and ending boundaries 808 and 810 of interstitial 804.” *Id.* at 13:13–20.

276. “[T]he identification process is utilized to identify interstitials within a first presentation stream 104 that are to be skipped. The location information 108 may identify the boundaries of either the segments or the interstitials depending on

desired design criteria. Generally, the beginning boundary of a segment corresponds with the ending boundary of an interstitial. Similarly, the ending boundary of a segment corresponds with the beginning boundary of an interstitial.” Casagrande at 7:53–61.

277. Further, “[T]he receiving device 110 may filter the interstitial 204 during output of the content. FIG. 3 illustrates an embodiment of a second presentation stream outputted by the receiving device 110 of FIG. 1. As illustrated in FIG. 3, the receiving device 110 filters the interstitial 204 from the second presentation stream 112A. Thus, the segment 206 follows the segment 202 during output of the second presentation stream 104A.” Casagrande at 8:43–50.

278. To the extent it is suggested that Casagrande does not explain how data associated with the said plurality of video programs is linked to individual channels associated with the content owners thereof, Miller’s teachings render this obvious. For example, Miller provides: “[T]he signal received by the receiving device 118 may include a plurality of multiplexed programs. In particular, a plurality of programs may be communicated as a plurality of program content streams that are multiplexed upon a single carrier signal. Each content stream may comprise a plurality of program content portions each containing video, audio, and/or data corresponding to the program. Program content portions may comprise MPEG (“Motion Picture Experts Group”) packets that contain compressed and/or encrypted

video, audio, and/or other data. In addition, program content portions may be encapsulated and/or formatted in other ways, such as by use of other or additional transport, compression, and/or encryption techniques.” Miller ¶[0029].

279. Therefore, I conclude that Casagrande in view of Miller renders obvious the limitation recited in claim 20.

280. Therefore, I conclude that all the claims in the '122 Patent are obvious in view of Casagrande, either alone or in combination with Russ and Miller.

XI. Ground 2: Claims 1, 3-5, 7-11, 13-16, and 18-19 are invalid as anticipated by Dow.

A. Claim 1:

1. A digital video recorder (DVR) for time shifting at least one video program, said video program being transmitted over a data distribution system, comprising:

a tuner for receiving a plurality of video programs, wherein (i) said plurality of video programs are transmitted at the same time on a single channel within said data distribution system, (ii) said tuner can be tuned to said single channel to receive said plurality of video programs, and (iii) at least one of said plurality of video programs includes at least first, second and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion;

a memory device for storing said plurality of video programs, allowing said one of said plurality of video programs to be played back at a later time;

a controller configured to receive commands from a user of said DVR, wherein a first command changes said DVR from a first playback state to a second playback state, a second command initiates playback of said one of said plurality of video programs from said memory device, and a third command instructs said DVR to receive and store said plurality of video programs; and

at least one processor configured to (i) provide said one of said plurality of video programs in its entirety to a display device in response to receiving said second command during a first period of time, (ii) provide said one of said plurality of video programs in its entirety to said display device in response to receiving said second command during a second period of time if said DVR is in said first playback state, and (iii) provide only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said one of said plurality of video programs, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state;

wherein said second period of time is a period of time after said first period of time.

1. Claim element 1[pre]: “A digital video recorder (DVR) for time shifting at least one video program, said video program being transmitted over a data distribution system, comprising:”

281. To the extent it is limiting, Dow discloses the preamble. As mentioned above, DVRs with time-shifting capabilities were well-known in the art as of the priority date of the '710 Patent, and included functions such as pausing, fast forwarding, rewinding, skipping ahead, skipping back, and buffering. For example, Dow discloses digital video recorders that have allowed consumers “to record broadcast video (e.g., television, cable, and satellite broadcasts) for later viewing.” Dow at 1:14-16. According to Dow, “DVRs include systems for receiving, digitally storing, and playing back video content, such as video programs and commercials.” *Id.* at 2:62-64. Moreover, Dow describes index files within the DVR system that “enable time-based manipulation of the video data stream during playback.” *Id.* at 3:21-22. As a result of the enhanced navigation options, Dow teaches the enablement of features “such as slow motion, fast forwarding, and rewinding—all at variable speeds and with better fidelity than prior analog systems.” *Id.* at 3:24-26.

2. Claim element 1[a][i]: “a tuner for receiving a plurality of video programs, wherein (i) said plurality of video programs

are transmitted at the same time on a single channel within said data distribution setting,”

282. Dow discloses a tuner for receiving a plurality of video programs. According to Dow, “the AV input module 510 receives an external signal, such as a broadcast signal, signal from another playback device, or packetized communication signal.” Dow at 12:35-37. Dow recites an “AV input module [that] includes a tuner 512, an A/D converter 513, indexing logic 516, an event detector 518, and a compression encoder 520.” *Id.* at 12:28-30. “The tuner 512 is a conventional tuner for selecting a signal or channel from a spectrum of available signals or channels.” *Id.* at 12:31-32. And Dow states that “a tuner may be unnecessary where the data carrier consists of a single signal or channel.” *Id.* at 12:33-34. Thus, I conclude that Dow discloses this limitation of claim 1.

3. Claim element 1[a][ii]: “said tuner can be tuned to said single channel to receive said plurality of video programs, and”

283. As discussed above, the DVR of Dow includes at least one tuner within the DVR’s AV input module that “is a conventional tuner for selecting a signal or channel from a spectrum of available channels or signals.” Dow at 12:31-33. “The AV input module 510 receives an external signal, such as broadcast signal, signal from another playback device, or packetized communication signal.” *Id.* at 12:21-

284. Figure 1 of Dow (below) illustrates its DVR system, depicting an AV signal being fed into the AV input model including the at least one tuner.

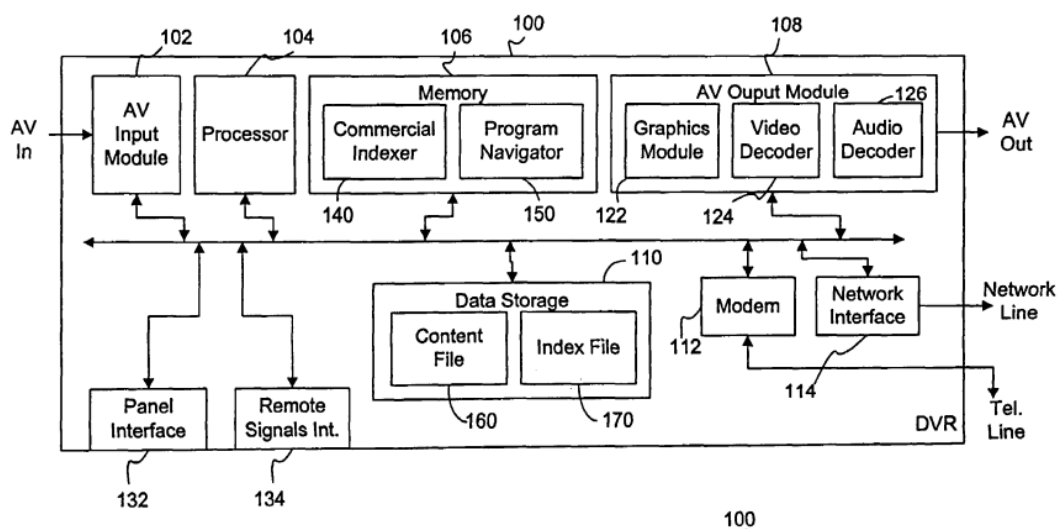
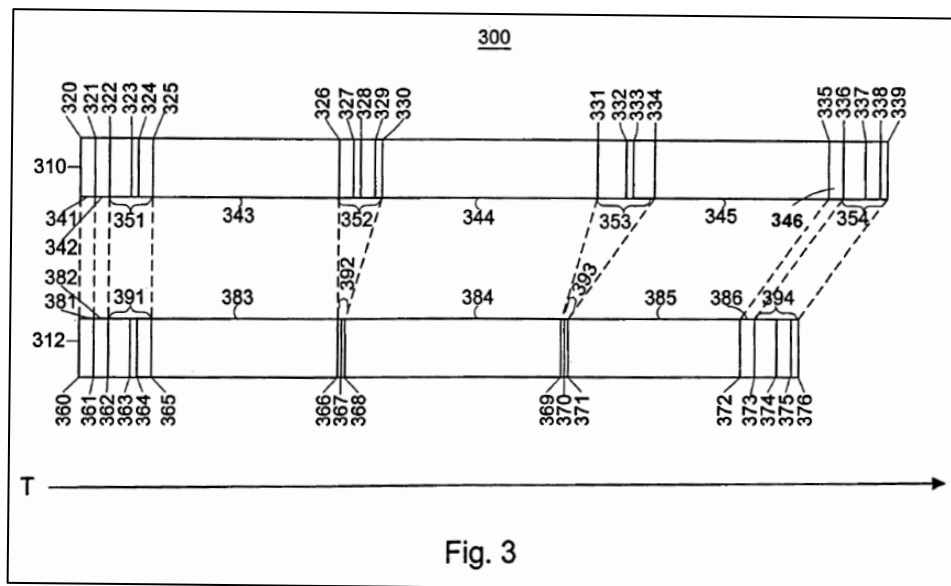


Fig. 1

285. Thus, I conclude that this limitation is disclosed in Dow.

4. Claim element 1[a][iii]: “(iii) at least one of said plurality of said video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion and said third portion as transmitted is said to follow said second portion;”

286. Dow also describes a video program containing “portions of content” that are “viewed sequentially in a normal presentation, such as during a television broadcast or standard replay from a recorded source.” Dow at 9:49-52. *See also id.* at Fig. 3 (below):



Dow explains that “[t]he program 300 contains content of varying features, for example, program segments and commercials.” *Id.* at 9:48-49. Figure 3 of Dow depicts a video program 300, a first portion comprising content 343, a second portion comprising a commercial group 352, and a third portion comprising content 344.

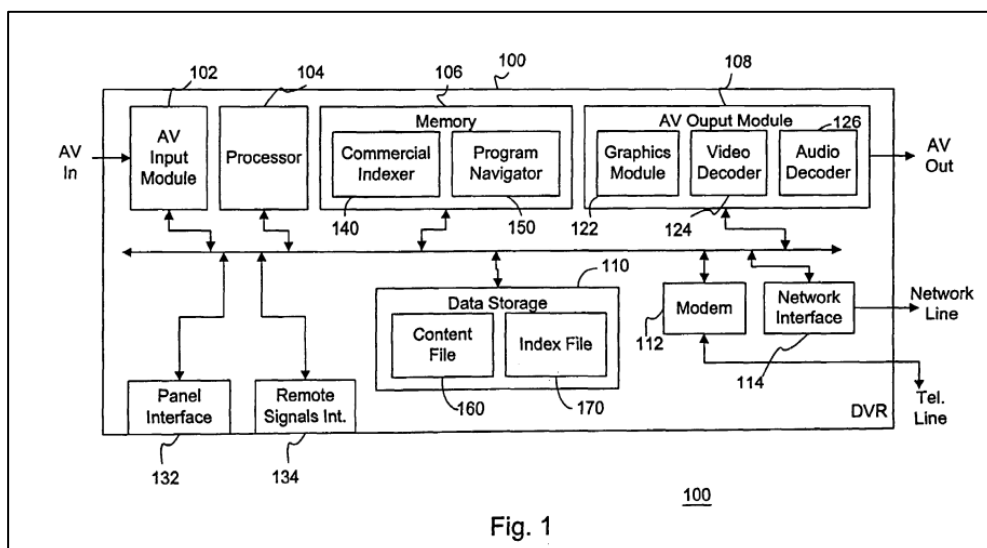
287. Therefore, Dow describes a tuner for receiving a video program as transmitted, wherein at least one of the plurality of video programs includes at least first, second, and third portions played in sequential order.

288. Therefore, I conclude that Dow discloses this limitation of claim 1.

5. Claim element 1[b]: “a memory device for storing said plurality of video programs, allowing said one of said plurality of video programs to be played back at a later time;”

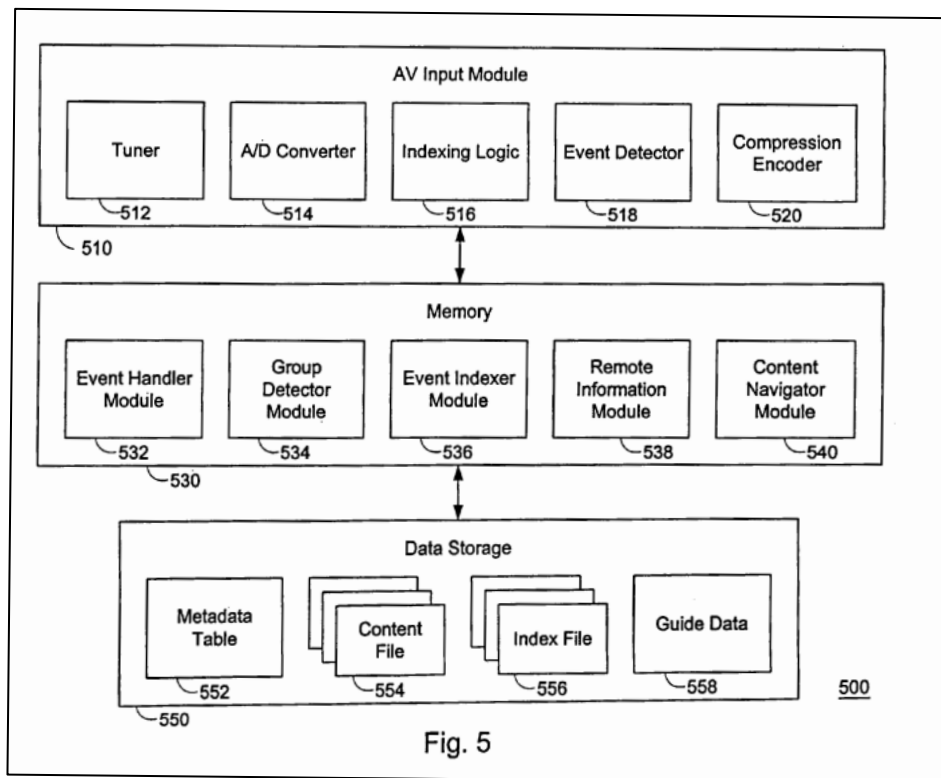
289. Figure 1 of Dow “illustrates a DVR 100” that “includes an AV input module, 102, a processor, 104, a memory 106, an AV Output module 108, a data

storage medium 110, a modem 112 and a network interface 114 interconnected by a conventional bus architecture.” Dow at 5:3-9; Fig. 1 (below):



As depicted in Fig. 1 of Dow, “the DVR memory 106 includes an [sic] commercial indexer 140 and a program navigator 150 and the data storage 110 includes at least one content file 160 and at least one index file 170.” *Id.* at 6:45-48.

290. Figure 5 of Dow “shows a modular configuration 400 for implementing an improved commercial skip feature.” Dow at 12:5-7. “The structures include an AV input module 510, a memory 530, and a data storage 550.” *Id.* at 12:9-11. “The memory 530 includes software modules for processing received data, selectively storing secondary data, and providing navigation of stored content. The data storage 550 includes files for storing content and other data used in the operation of the DVR.” *Id.* at 12:11-17. *See also id.* at Fig. 5 (below).



291. Dow also discloses that the content file “includes the stored video data of one or more recorded video transmissions.” Dow at 7:40-41.

292. Thus, Dow discloses claim element 1[b]’s memory device for storing said plurality of video programs, allowing one of said plurality of programs to be played back at a later time.

6. **Claim element 1[c]: “a controller configured to receive commands from a user of said DVR, wherein a first command changes said DVR from a first payback state to a second playback state, and a second command initiates playback of said one of said plurality of video programs from said memory**

device, and a third command instructs said DVR to receive and store said plurality of video programs; and”

293. The first portion of claim element 1[c], a controller configured to receive commands from a user of said DVR, generally encompasses devices related to remotely controlling the DVR system. The controller, as described in the '122 Patent, is “in communication with a remote control 770 (e.g., operated by a user of the DVR system)” and receives a command from the user via the remote control, subsequently transmitting the command to the processor of the DVR system. '122 Patent at 7:32–34. This technology is disclosed in Dow.

294. Dow necessarily includes, thus inherently teaches, a controller in view of the ability to control the device. Specifically, Dow teaches that “[t]he user may control the operation of the DVR 100 through control signals provided on the exterior of the DVR 100 housing through the panel interface 132, or through control signals originating from a remote control, which are received through the remote signals interface 134, in conventional fashion.” Dow at 5:21-26.

295. Similarly, Dow discloses a processor that generally “executes instructions such as those stored in the memory 106 to provide functionality” to the DVR. Dow at 5:9-13.

296. Moreover, Dow provides that the “control interface module 818 provides an interface between operation of the navigation module 814 and general operation of the DVR For example, a commercial skip function may be active

or inactive during playback. The control interface module 818 may define one or more control signals for toggling the commercial skip function between active and inactive modes, such as a button on (and corresponding control signal from a remote control.” Dow at 24:29-32. Thus, Dow’s command for toggling the commercial skip function corresponds to the claimed “first command,” wherein the toggling changes the DVR between the “first playback state” and the “second playback state.”

297. Regarding the remainder of claim element 1[c], Dow teaches a second command initiating the playback of stored video programs through “a global default”, wherein the global default includes “a menu system for defining whether the commercial skip function is active or inactive at the start of playback (e.g., when the play button is pressed.).” Dow at 24:37-40. Additionally, Dow describes a menu overlay that displays “ways of viewing the previously recorded programs, including using the commercial skipping feature. Display of menu overlay 420 may be initiated based on a control signal received from the user, e.g., when the user presses select on the remote control.” *Id.* at 11:42-47.

298. Lastly, Dow teaches a third command instructing the DVR to receive and store the plurality of video programs. Specifically, Dow teaches “[a] channel guide [that] displays available content from which individual pieces of content may be selected for current or future recording and viewing.” Dow at 6:10-13. For example, “[i]n a specific case, the channel guide may list numerous broadcast

television programs, and the user may select one or more of the programs for recording. The playback guide displays content that is stored or immediately storable by the DVR 100.” *Id.* at 6:31-17.

7. Claim element 1[d][i]: “at least one processor configured to (i) provide said one of said plurality of video programs in its entirety to a display device in response to received said second command regardless of a playback state of said DVR if said second command is received during a first period of time.”

299. As an initial matter, Dow discloses at least one processor. For example, Dow discloses that “[g]enerally, the processor 104 executes instructions such as those stored in the memory 106 to provide functionality.” Dow at 5:9-11.

300. Dow also discloses a control interface module that “defines triggering events, both mode and control signals, for the navigation function” present in Dow’s DVR system. Dow at 24:21-22. For example, Dow discloses an embodiment in which the control interface module 818 defines “variables governing activation of the navigation function when the DVR is in a particular state, such as playback mode, playback menu mode, live view mode, program guide menu mode, etc.” *Id.* at 24:24-27. In that same embodiment, the control interface module defines “control signals for toggling the commercial skip function between active,” when the user may skip commercials, “and inactive modes,” when the user may not skip commercials. *Id.* at 24:30-31. Further, Dow’s control interface module defines “that the commercial skip is always inactive in live view mode or delayed mode (a form

of playback) where there is insufficient time to buffer and process events for identifying commercial groups (e.g., a time delay of less than two minutes).” *Id.* at 24:44-48. Thus, this limitation is disclosed in Dow.

8. Claim element 1[d][ii]: “provide said one of said plurality of video programs in its entirety to said display device in response to receiving said second command during a second period of time if said DVR is in said first playback state, and”

301. Dow teaches that the DVR’s control interface module defines “one or more control signals for toggling the commercial skip function between active and inactive modes, such as a button on (and corresponding control signal from) a remote control.” Dow at 24:29-32. When the commercial skip is inactive, for example, when the DVR is in live view mode or delayed view mode, Dow teaches that the video program is played back in its entirety due to “insufficient time to buffer and process events for identifying commercial groups (e.g., a time delay of less than two minutes).” *Id.* at 24:46-48. As a result, a user of Dow’s DVR would view a video program in its entirety if the commercial skip function is inactive. Therefore, Dow discloses this claim limitation.

9. Claim element 1[d][iii]: “provide only a portion of said video program to said display device in response to receiving said second command if said second command is received during said second period of time and said DVR is in said second playback state, said portion of said video program including at least said first and third portions of said video program, wherein said third portion of said video program is provided to said display device immediately following said first portion of

said video program if said second command is received during said second period of time and said DVR is in said second playback state;”

302. Dow describes the playback of only a portion of a video program when the commercial skip function is active, a second playback state. For example, Dow discloses the use of the DVR’s “enhanced navigation features to view recorded content with substantially reduced commercials.” Dow at 9:37-39. Figure 3 of Dow (below) “shows a timeline of a program that has been recorded on a DVR, such as the DVR 100. The first timeline 310 is the program 300 as it may be viewed in correspondence with how it was originally presented and stored on DVR 100. The second timeline 312 is the program 300 viewed with one embodiment of an automated commercial skipping feature enabled.” *Id.* at 9:39-45.

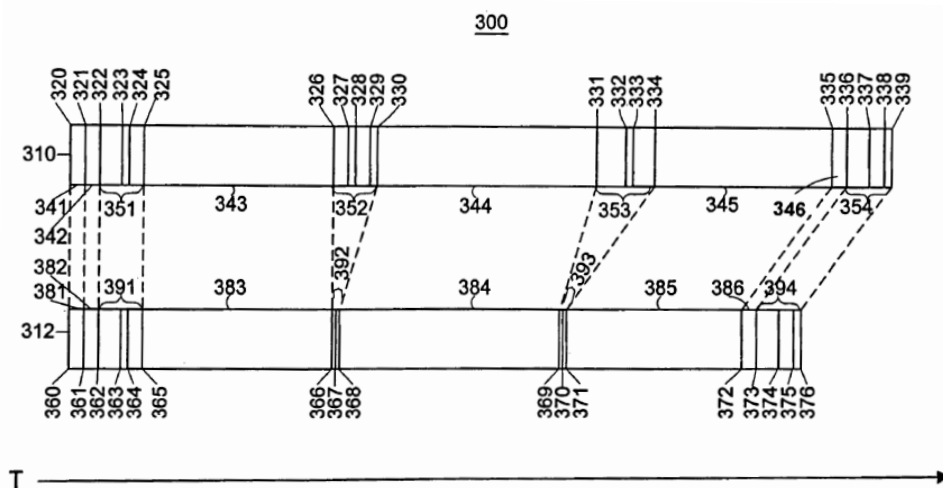


Fig. 3

As shown in Figure 3, Dow teaches that “[p]rogram segments 383, 384, and 385 would be presented sequentially without any interruption or other indication that

commercials had been skipped.” *Id.* at 10:47-50. Ultimately, the program segments (e.g., 343 and 344) correspond to the first and third portion, while the commercial 352 corresponds to the second portion. Essentially, “the second timeline 312 provides a substantially different viewing experience, including a shortened total running time for the presentation.” *Id.* at 9:45-47.

303. Thus, this claim limitation is disclosed in Dow.

10.Claim element 1[e]: “wherein said second period of time is a period of time after said first period of time.”

304. Dow explicitly states that the second period of time follows the first period of time. For example, as mentioned above, Dow teaches that its control interface module defines that “the commercial skip is always inactive in live view mode or delayed view mode (a form of playback) where there is insufficient time to buffer and process events for identifying commercial groups (e.g., a time delay of less than two minutes).” Dow at 24:43-48. Because the user cannot enable commercial skip during that time period, the second time period during which commercial skip is available must occur after the first time period. Thus, this limitation is disclosed in Dow.

305. Therefore, I conclude that Dow anticipates claim 1.

B. Claim 3: “The DVR of claim 1, further comprising at least one other tuner, wherein said at least one other tuner allows said DVR to receive at least one other video program while said tuner is being

used to receive said plurality of video programs, said at least one other video program being selected by said user.”

306. I understand that because claim 3 depends from claim 1, claim 3 requires all the elements from claim 1 in addition to those disclosed in claim 3. As discussed above, all elements of claim 1 are disclosed in Dow, and I incorporate my analysis of those elements into my further analysis of claim 3.

307. As discussed above, Dow discloses a DVR containing an AV input module comprising at least one “conventional tuner for selecting a signal or channel from a spectrum of available signals or channels.” Dow at 12:31-33. Also disclosed in the AV input module of Dow’s DVR is “any number of conversion modules for converting between conventional broadcast or communication signals and a digital format used within the DVR.” *Id.* at 12:46-48. In this way, “event detection or other video processing may be carried out simultaneously with compression and storage of the video data.” *Id.* at 12:39-42.

308. Dow contemplates that “where the data carrier consists of a single signal or channel,” then “a tuner may be unnecessary.” Dow at 12:33-34. Dow similarly discloses that a tuner allows the selection of a single signal or channel from a spectrum of available signals or channels. *See id.* at 12:31-33. Dow’s AV input module, which contains the DVR’s tuner, may be scaled to enable the simultaneous processing of video programs. To that end, Dow recognizes that as the DVR system incorporates multiple tuners for receiving video programs transmitted across

multiple channels at the same time. In this way, the DVR system may record or display more than one video program airing at the same time.

309. Thus, I find that Dow discloses all the limitations of claim 3. As such, I conclude that Dow anticipates claim 3.

C. Claim 4: “The DVR of claim 1, wherein said one of said plurality of video programs includes at least primary and secondary video content, and said first and third portions of said one of said plurality of video programs consists of said primary video content.”

310. I understand that because claim 4 depends from claim 1, claim 4 requires all the elements from claim 1 in addition to those disclosed in claim 4. As discussed above, all elements of claim 1 are disclosed in Dow, and I incorporate my analysis of those elements into my further analysis of claim 4.

311. As discussed above, Dow discloses a video program containing content of varying natures, “for example, program segments and commercials.” Dow at 9:48-49. Those portions of “commercials are embedded as commercial groups, depicted as commercial groups 351-354 in the first timeline [of Figure 3 (below)] and commercial groups 391 and 394.” *Id.* at 10:19-22. Moreover, Dow explains that the “program content in program 300 is depicted as program content 341-346 in the first timeline 310 and program content 381-386 in the second timeline 312.” *Id.* at 10:6-8. *See id.* at Fig. 3 (below):

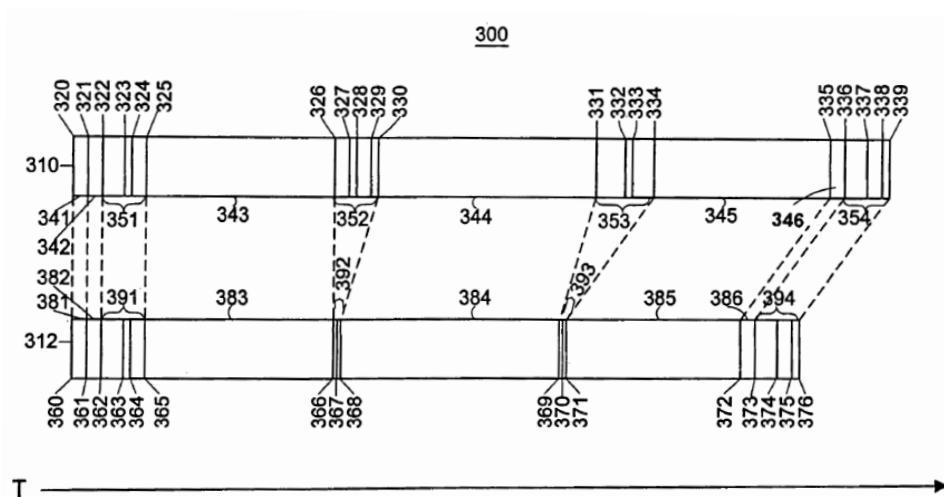


Fig. 3

312. The program segments, labeled as 343, 344, and 345 in Figure 3 (above) “are viewed sequentially in a normal presentation, such as during a television broadcast or standard replay from a recorded source” but are viewed without commercials in presentations using the disclosed commercial skip function of Dow, shown in the second timeline of Figure 3. Dow at 9:49-52.

313. Therefore, the limitations of this claim are disclosed in Dow. As such, I conclude that Dow anticipates claim 4.

D. Claim 5: “The DVR of claim 4, wherein said second portion of said one of said plurality of video programs consists of said secondary video content and said memory device is further configured to store at least one time when said second portion begins and at least one time when said second portion ends.”

314. I understand that because claim 5 depends from claim 4, which depends from claim 1, claim 5 requires all the elements from claims 4 and 1 in addition to those disclosed in claim 5. As discussed above, all elements of claims 4 and 1 are

disclosed in Dow, and I incorporate my analysis of those elements into my further analysis of claim 5.

315. As explained above, Dow discloses a video program containing content of varying natures, “for example, program segments and commercials.” Dow at 9:48-49. Those portions of “commercials are embedded as commercial groups, depicted as commercial groups 351-354 in the first timeline [of Figure 3 (below)] and commercial groups 391 and 394.” *Id.* at 10:19-22. Moreover, Dow explains that the “program content in program 300 is depicted as program content 341-346 in the first timeline 310 and program content 381-386 in the second timeline 312.” *Id.* at 10:6-8. *See id.* at Fig. 3 (below):

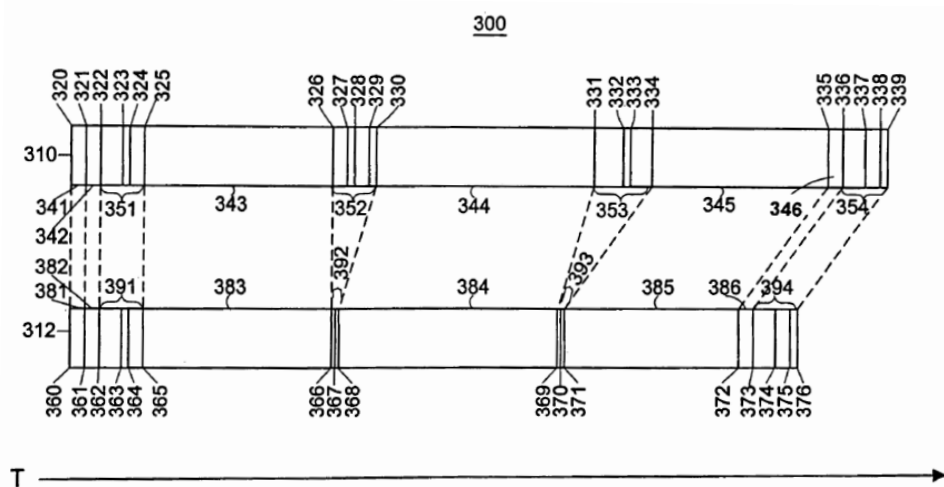


Fig. 3

316. The program segments, labeled as 343, 344, and 345 in Figure 3 (above) “are viewed sequentially in a normal presentation, such as during a television broadcast or standard replay from a recorded source” but are viewed without

commercials in presentations using the disclosed commercial skip function of Dow, shown in the second timeline of Figure 3. Dow at 9:49-52.

317. Moreover, Dow discloses having, among other features, a memory and a storage data medium. Because the commercials are embedded within the presentation in Dow, they may also be transmitted along with the video program and stored in memory. Dow's DVR likewise contains an event indexer module, which "provides the logic for writing an event index into the data storage 550." Dow at 14:48-49. "The event indexer receives one or more identifiers and corresponding file locations for those identifiers. For example, the event indexer module 536 may receive a first tag indicating a starting location for a commercial group and a second tag indicating an ending location for a commercial group. Other identifiers may include those corresponding to particular types of events (e.g., black field, silent frame, both, etc.)," which Dow explains are indicative of a scene change or upcoming commercial group. *Id.* at 14:49-57.

318. Dow also discloses that "event data or other metadata may be provided with received video data." Dow at 14:17-19. The metadata is then indexed into a metadata table—which contains (among other data) "the location of a corresponding content file, corresponding index file (time-based index file and/or commercial index file)," and more—and stored in the storage unit of the DVR. *Id.* at 17L47-17; 16:59-60.

319. Therefore, Dow discloses secondary content, such as commercials, embedded between primary program content segments and a memory storage device on its DVR that is configured to store a time at which said commercials begin and end. Thus, I conclude that Dow anticipates claim 5.

E. Claim 7: “The DVR of claim 1, wherein said single channel is stored in said memory and said at least one processor is configured to tune said tuner to said single channel in response to said controller receiving said third command.”

320. I understand that because claim 7 depends from claim 1, claim 7 requires all the elements from claim 1 in addition to those disclosed in claim 7. As discussed above, all elements of claim 1 are disclosed in Dow, and I incorporate my analysis of those elements into my further analysis of claim 7.

321. Dow discloses that its “DVR 100 processes guide information that describes and allows navigation among content from a system (e.g., a broadcast system) at present or future times, as well as content that has already been captured by the DVR 100.” Dow at 6:4-7. This information is displayed, according to Dow, in content guides, which include channel and playback guides. *Id.* at 6:7-10.

322. Dow’s processor “executes instructions such as those stored in memory 106 to provide functionality” of the DVR. Dow at 5:10-12. Also, Dow’s DVR contains a “conventional tuner for selecting a signal or channel from a spectrum of signals or channels.” *Id.* at 12:31-32. Conventional tuners such as those available before the ’122 Patent operated by tuning the DVR to a particular channel or signal

to record a program transmitted over the particular channel or signal. Dow confirms its DVR's ability to store a channel in memory and processor to tune the DVR to the stored channel by specifically explaining that its DVR channel guide "displays available content from which individual pieces of content may be selected for current or future recording and viewing." *Id.* at 6:11-13.

323. Thus, when the user provides a command indicating their desire to record a program airing in the future via the remote control, the DVR's processor executes instructions to save the particular signal or channel and tune the DVR to the particular signal or channel for recording. In this way, the user need not leave the television or display device turned on to record the program.

324. The channel guides of Dow "display[] available content from which individual pieces of content may be selected for current or future recording and viewing." Dow at 6:10-13. For example, "the channel guide may list numerous broadcast television programs, and the user may select one or more of the programs for recording. The playback guide displays content that is stored or immediately storable by DVR 100." *Id.* at 6:13-17.

325. A POSA viewing Dow's disclosure would have understood that the DVR's ability to record a future program would necessarily engage the data storage to store the time and channels at which the program is set to air, the processor to

execute instructions stored on the DVR, and a tuner to receive the program when it is aired, as these were widely known practices in the art by the relevant priority date.

326. I find that all the limitations of claim 7 are disclosed in Dow. Therefore, I conclude that Dow anticipates claim 7.

F. Claim 8: “The DVR of claim 1, wherein data communicated via said single channel is compressed prior to transmission and said at least one processor is configured to decompress said data after its (sic) have been received so that said one of said plurality of video programs or said portion of said one of said plurality of video programs can be displayed, depending on when said second command is received and said playback state of said DVR.”

327. I understand that because claim 8 depends from claim 1, claim 8 requires all the elements from claim 1 in addition to those disclosed in claim 8. As discussed above, all elements of claim 1 are disclosed in Dow, and I incorporate my analysis of those elements into my further analysis of claim 8.

328. The AV input module 510 of Dow’s DVR is configured to receive external signals that include broadcast signals such as “packetized communication signals.” Dow at 12:23. As is widely known in the art, the packetization of a media stream entails the manipulation of a media file, typically with respect to the file size, such that the file may be compressed prior to transmission for easy transmission. Of course, this idea is contemplated in Dow, which provides for the ability to compress analog signals that have already been transmitted to the DVR or the ability to simply receive prior-compressed media files. Specifically, Dow teaches that its

compression encoder “may be unnecessary,” for example, when a system “share[s] data already formatted with the appropriate video compression.” *Id.* at 13:36-39. Thus, Dow discloses the compression of media files prior to transmission.

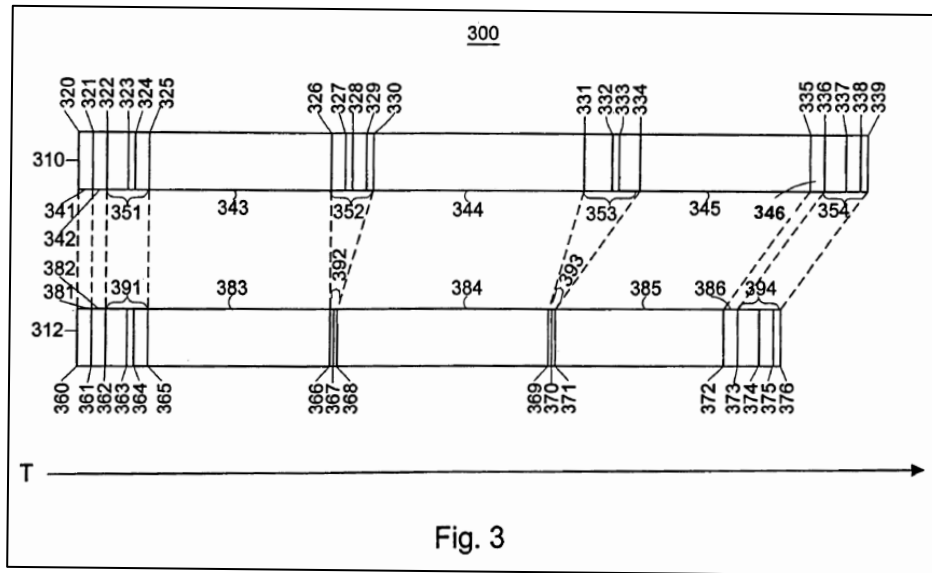
329. Regarding decompression, the ’122 Patent defines the DVR’s processor by the functions it carries out, including the decompression of video program data transmitted to the DVR. Dow discloses a decoder configured to decompress any received data after it has been received such that the data may be subsequently displayed on a television or other display device. According to Dow, the DVR’s “video decoder 124 and audio decoder 126 are preferably MPEG decoders that can obtain the MPEG data stored in the data storage medium 110 and convert it to format compatible with the display device.” Dow at 5:62-66. Thus, because Dow discloses all the limitations of claim 8, I conclude that Dow anticipates claim 8.

G. Claim 9: “The DVR of claim 5, wherein said secondary video content comprises at least one advertisement.”

330. I understand that because claim 9 depends from claim 5, which depends from claims 4 and 1, claim 9 requires all the elements from claims 5, 4, and 1 in addition to those disclosed in claim 9. As discussed above, all elements of claims 5, 4, and 1 are disclosed in Dow, and I incorporate my analysis of those elements into my further analysis of claim 9.

331. The term “secondary video content” as it is used throughout the ’122 Patent to refer to “auxiliary data,” which includes advertisements, news tickers, or

crawlers. *See* '122 Patent at 5:48–49. Dow discloses a video program that “includes a number of commercials embedded within the video presentation.” Dow at 10:17-18; Fig. 3 (below):



According to Dow, “[t]he commercials are embedded as commercial groups, depicted as commercial groups 351-354 in the first timeline 310 and commercial groups 301 and 304 in the second timeline 312. Each commercial group is composed of 3-4 commercials separated by a corresponding number of transitions. There are four commercial groups 351-354 contained in first timeline 310, representing the commercial groups as broadcast and recorded. There are only two complete commercial groups 391 and 294 in second timeline 312, representing operation of a commercial skip feature to substantially decrease the commercials presented during playback.” *Id.* at 10:19-29,

332. I find that all the limitations of claim 9 are disclosed in Dow. As such, I conclude that Dow anticipates claim 9.

H. Claim 10: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said one of said plurality of video programs from said memory if said second command is received during said second period of time and said DVR is in said second playback state, and (ii) retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and said DVR is switched to said first playback state at or before said time thereafter.”

333. I understand that because claim 10 depends from claim 1, claim 10 requires all the elements from claim 1 in addition to those disclosed in claim 10. As discussed above, all elements of claim 1 are disclosed in Dow, and I incorporate my analysis of those elements into my further analysis of claim 10.

1. Claim element 10[a]: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said plurality of video programs from said memory if said second command is received during said second period of time and said DVR is in said second playback state,”

334. As discussed above, Dow discloses a processor that “executes instructions such as those stored in the memory 106 to provide functionality” to the DVR system. Dow at 5:9-12. Dow also teaches that “[t]he user may control the operation of the DVR 100 through control signals provided on the exterior of the DVR 100 housing through the panel interface 132, or through control signals

originating from a remote control, which are received through the remote signals interface 134, in conventional fashion.” *Id.* at 5:21-26.

335. Moreover, Dow provides that the “control interface module 818 provides an interface between operation of the navigation module 814 and general operation of the DVR For example, a commercial skip function may be active or inactive during playback. The control interface module 818 may define one or more control signals for toggling the commercial skip function between active and inactive modes, such as a button on (and corresponding control signal from a remote control.” Dow at 24:29-32.

336. When the commercial skip feature of Dow’s DVR is activated, a user may use the DVR’s enhanced navigation features to view recorded content” that has been retrieved from memory “with substantially reduced commercials.” Dow at 9:37-39.

337. Thus, the control interface module and processor for executing instructions stored in the memory 106 to provide functionality teach the retrieval of said video program from the DVR’s memory device during the second period of time when the DVR is in a second playback state.

2. Claim element 10[b]: “retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and

said DVR is switched back to said first playback state at or before said time thereafter.”

338. As explained above, the '122 Patent's description of “first” and “second” playback states refers to the original, unedited video stream communicated to the display device and an edited or altered video stream removing “auxiliary data”, respectively. Dow discloses both.

339. Dow discloses the retrieval of a video program in its entirety via a menu overlay that may be opened to toggle the commercial skip feature during playback. Specifically, Dow states: “The menu overlay 420 displays one or more ways of viewing previously recorded programs, including using the commercial skipping features. Display of menu overlay 420 may be initiated based on a control signal received from the user, e.g., when the user presses select on the remote control. Menu overlay 420 is shown in conjunction with content guide 400 *a*, but could also be used with a recorded program presently being viewed . . . such as a scene or chapter selection interface.” Dow at 11:42-51.

340. Dow discloses offering other play modes and menu options through the menu overlay as well. Dow at 11:55-56. For example, “if the commercial skip toggle 426 is marked (as shown), the commercials will be skipped when the program is played, regardless of the play mode selected.” *Id.* at 11:58-61. “The toggle 426 and identifier 428 allow the user to toggle the commercial skip feature on and off.” *Id.* at 11:64-65.

341. Thus, Dow discloses the retrieval of a stored video program in its entirety from the DVR's memory device when a second command is received at a later time and the DVR is switched to a first playback state before said time.

342. Because Dow discloses all the limitations of claim 10, I conclude that Dow anticipates claim 10.

I. Claim 11:

11. A method for time shifting at least one video program transmitted to a digital video recorder (DVR) over a data distribution system, comprising:

receiving a plurality of video programs, wherein said plurality of video programs are transmitted as the same time and are received by a single tuner in said DVR, and at least one of said plurality of video programs includes at least first, second and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion;

receiving a third command from at least one user of said DVR, said third command indicating a desire to use said single tuner to receive said plurality of video programs and to store said plurality of video programs on at least one memory device in said DVR;

storing said plurality of video programs on said at least one memory device in said DVR in response to receiving said third command from said at least one user of said DVR;

receiving a second command from said at least one user of said DVR, said second command indicating a desire to playback at least a portion of said one of said plurality of video programs;

receiving a first command from said at least one user of said DVR, said first command indicating a playback state of said DVR; and

providing said at least a portion of said one of said plurality of video programs to a display device in response to receiving said second command from said at least one user of said DVR;

wherein said step of providing said at least a portion of said one of said plurality of video programs to said display device further comprises (i) providing said one of said plurality of video programs to said display device in response to receiving said second command during a first period of time, (ii) providing said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said first playback state, and (iii) providing only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said video program, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state;

wherein said second period of time is a period of time after said first period of time.

1. Claim element 11[pre]: “A method for time shifting at least one video program transmitted to a digital video recorder (DVR) over a data distribution system, comprising:”

343. To the extent it is limiting, Dow discloses the preamble. The preamble of claim 11 recites substantially the same limitations as the preamble of claim 1.

344. Therefore, in my opinion, the preamble of claim 11 is anticipated by Dow for the same reasons discussed for claim 1. *See supra* Claim Element 1[pre].

2. Claim element 11[a]: “receiving a plurality of video programs, wherein said plurality of video programs are transmitted as the same time and are received by a single tuner in said DVR, and at least one of said plurality of video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is said to follow said second portion;”

345. Claim element 11[a] recites a method step that is substantially the same limitations as claim elements 1[a][i], 1[a][ii], and 1[a][iii].

346. Therefore, in my opinion, claim element 11[a] is disclosed in Dow for the same reasons discussed for claim elements 1[a][i], 1[a][ii], and 1[a][iii]. *See supra* Claim Elements 1[a][i], 1[a][ii], and 1[a][iii].

3. Claim element 11[b]: “receiving a third command from at least one user of said DVR, said third command indicating a desire to use said single tuner to receive said plurality of video

programs and to store said plurality of video programs on at least one memory device in said DVR;”

347. Claim element 11[b] recites a method step that is substantially the same limitations as claim elements 1[b] and 1[c].

348. Therefore, in my opinion, claim element 11[b] is disclosed in Dow for the same reasons discussed for claim elements 1[b] and 1[c]. *See supra* Claim Elements 1[b] and 1[c].

4. Claim element 11[c]: “storing said plurality of video programs on said at least one memory device in said DVR in response to receiving said third command from said at least one user of said DVR;”

349. Claim element 11[c] recites a method step that is substantially the same limitations as claim elements 1[b] and 1[c].

350. Therefore, in my opinion, claim element 11[c] is disclosed in Dow for the same reasons discussed for claim elements 1[b] and 1[c]. *See supra* Claim Elements 1[b] and 1[c].

5. Claim element 11[d]: “receiving a second command from said at least one user of said DVR, said second command indicating a desire to playback at least a portion of said one of said plurality of video programs;”

351. Claim element 11[d] recites a method step that is substantially the same limitations as claim element 1[c].

352. Therefore, in my opinion, claim element 11[d] is disclosed in Dow for the same reasons discussed for claim element 1[c]. *See supra* Claim Element 1[c].

6. Claim element 11[e]: “receiving a first command from said at least one user of said DVR, said first command indicating a playback state of said DVR; and”

353. Claim element 11[e] recites a method step that is substantially the same limitations as claim element 1[c].

354. Therefore, in my opinion, claim element 11[e] is disclosed in Dow for the same reasons discussed for claim element 1[c]. *See supra* Claim Element 1[c].

7. Claim element 11[f]: “providing said at least a portion of said one of said plurality of video programs to a display device in response to receiving said second command from said at least one user of said DVR;”

355. Claim element 11[f] recites a method step that is substantially the same limitations as claim elements 1[d][i], 1[d][ii], and 1[d][iii].

356. Therefore, in my opinion, claim element 11[f] is disclosed in Dow for the same reasons discussed for claim elements 1[d][i], 1[d][ii], and 1[d][iii]. *See supra* Claim Elements 1[d][i], 1[d][ii], and 1[d][iii].

8. Claim element 11[g][i]: “wherein said step of providing at least a portion of said one of said plurality of video programs to said display device further comprises (i) providing said one of said plurality of video programs to said display device in response to receiving said second command during a first period of time,”

357. Claim element 11[g][i] recites a method step that is substantially the same limitations as claim element 1[d][i].

358. Therefore, in my opinion, claim element 11[g][i] is disclosed in Dow for the same reasons discussed for claim element 1[d][i]. *See supra* Claim Element 1[d][iii].

9. Claim element 11[g][ii]: “(ii) providing said one of said plurality of said video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said first playback state, and”

359. Claim element 11[g][ii] recites a method step that is substantially the same limitations as claim element 1[d][ii].

360. Therefore, in my opinion, claim element 11[g][ii] is disclosed in Dow for the same reasons discussed for claim element 1[d][ii]. *See supra* Claim Element 1[d][ii].

10. Claim element 11[g][iii]: “(iii) providing only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said video program, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and DVR is in said second playback state;

361. Claim element 11[g][iii] recites a method step that is substantially the same limitations as claim element 1[d][iii].

362. Therefore, in my opinion, claim element 11[g][iii] is disclosed in Dow for the same reasons discussed for claim element 1[d][iii]. *See supra* Claim Element 1[d][iii].

11.Claim element 11[h]: “wherein said second period of time is a period of time after said first period of time.”

363. Claim element 11[h] recites a method step that is substantially the same limitations as claim element 1[e].

364. Therefore, in my opinion, claim element 11[h] is disclosed in Dow for the same reasons discussed for claim element 1[e]. *See supra* Claim Element 1[e].

J. Claim 13: “The method of claim 11, wherein said step of storing said plurality of video programs on said at least one memory device in said DVR further comprises storing at least one time of when said second portion of said video program begins and at least one time of when said second portion of said video program ends.”

365. Claim 13 recites substantially the same limitations as claim 5.

366. Therefore, in my opinion, claim 13 is disclosed Dow for the same reasons discussed for claim 5. *See supra* Claim 5.

K. Claim 14: “The method of claim 11, wherein said one of said plurality of video programs includes at least primary and secondary video content, said portion of said video program that is provided to said display device if said second command is received during said second period of time and said DVR is in second playback state

consists of said primary video content, and said secondary video content includes at least one advertisement.”

367. Claim 14 recites substantially the same limitations as claims 4, 5, and 9.

368. Therefore, in my opinion, claim 14 is disclosed in Dow for the same reasons discussed for claims 4, 5, and 9. *See supra* Claims 4, 5, 9.

L. Claim 15: “The method of claim 11, further comprising the steps of: compressing said plurality of video programs prior to said plurality of video programs being transmitted over said data distribution system, and decompressing said plurality of video programs after said plurality of video programs have been received by said DVRr (sic) and before said one of plurality of video programs or portion thereof is provided to said display device.”

369. Claim 15 recites substantially the same limitations as claim 8.

370. Therefore, in my opinion, claim 15 is disclosed in Dow for the same reasons discussed for claim 8. *See supra* Claim 8.

M. Claim 16: “The method of claim 11, further comprising the step of tuning said single tuner to a particular channel at a particular time in response to receiving a third command, said particular channel and said particular time being stored in said at least one memory device in said DVR.

371. Claim 16 recites substantially the same limitations as claim 7.

372. Therefore, in my opinion, claim 16 is disclosed in Dow for the same reasons discussed for claim 7. *See supra* Claim 7.

N. Claim 18:

18. A digital video recorder (DVR) for time shifting at least one of a plurality of video programs, said one of said plurality of video programs consisting of first, second and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion, comprising:

a first tuner for receiving data on said plurality of video programs, wherein said data on one of said plurality of video programs is transmitted together with said data on other ones of said plurality of video programs, so that said first tuner receives said data on said one of said plurality of video programs at the same time that it receives data on said other ones of said plurality of video programs;

at least one memory device for storing said data on said plurality of video programs, including at least said one of said plurality of video programs;

a controller for receiving commands including at least a first command for setting a playback state of said DVR, a second command for initiating a playback of said one of said plurality of video programs from said memory device, and a third command for initiating said reception and said storage of said data on said plurality of video programs; and

at least one processor for (i) providing said first, second and third portions of said one of said plurality of video programs respectively to a display device in response to receiving said second command during a first portion of time, (ii) providing said first, second and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during a second period of time if said DVR is in a first playback state, and (iii) providing said first and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during said second period of time if said DVR is in a second playback state, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state.

1. Claim element 18[pre]: “A digital video recorder (DVR) for time shifting at least one of a plurality of video programs, said one of said plurality of video programs consisting of first,

second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion, comprising:

373. To the extent it is limiting, Dow discloses the preamble. The preamble of claim 18 recites substantially the same limitations as the preamble of claim 1 and claim element 1[a][iii].

374. Therefore, in my opinion, the preamble of claim 18 is disclosed in Dow for the same reasons discussed for claim 1. *See supra* Claim Elements 1[pre] and 1[a][iii].

2. Claim element 18[a]: “a first tuner for receiving data on said plurality of video programs, wherein said data on one of said plurality of video programs is transmitted together with said data on other ones of said plurality of video programs, so that said first tuner receives said data on said one of said plurality of video programs at the same time that it receives data on said other ones of said plurality of programs;”

375. Claim element 18[a] recites substantially the same limitations as claim elements 1[a][i] and 1[a][ii].

376. Therefore, in my opinion, claim element 18[a] is disclosed in Dow for the same reasons discussed for claim elements 1[a][i] and 1[a][ii]. *See supra* Claim Elements 1[a][i] and 1[a][ii].

3. Claim element 18[b]: “at least one memory device for storing said data on said plurality of video programs, including at least said one of said plurality of video programs;”

377. Claim element 18[b] recites substantially the same limitations as claim element 1[b].

378. Therefore, in my opinion, claim element 18[b] is disclosed in Dow for the same reasons discussed for claim element 1[b]. *See supra* Claim Element 1[b].

4. Claim element 18[c]: “a controller for receiving commands including at least a first command for setting a playback state of said DVR, a second command for initiating a playback state of said one of said plurality of video programs from said memory device, and a third command for initiating said reception and said storage of said data on said plurality of video programs; and”

379. Claim element 18[c] recites substantially the same limitations as claim element 1[c].

380. Therefore, in my opinion, claim element 18[c] is disclosed in Dow for the same reasons discussed for claim element 1[c]. *See supra* Claim Element 1[c].

5. Claim element 18[d][i]: “at least one processor for (i) providing said first, second, and third portions of said one of said plurality of video programs respectively to a display device in response to receiving said second command during a first portion of time,”

381. Claim element 18[d][i] recites substantially the same limitations as claim element 1[d][i].

382. Therefore, in my opinion, claim element 18[d][i] is disclosed in Dow for the same reasons discussed for claim element 1[d][i]. *See supra* Claim Element 1[d][i].

- 6. Claim element 18[d][ii]: “(ii) providing said first, second, and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during a second period of time if said DVR is in a first playback state, and”**

383. Claim element 18[d][ii] recites substantially the same limitations as claim element 1[d][ii].

384. Therefore, in my opinion, claim element 18[d][ii] is disclosed in Dow for the same reasons discussed for claim element 1[d][ii]. *See supra* Claim Element 1[d][ii].

- 7. Claim element 18[d][iii]: “(iii) providing said first and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during said second period of time if said DVR is in a second playback state, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state.”**

385. Claim element 18[d][iii] recites substantially the same limitations as claim element 1[d][iii].

386. Therefore, in my opinion, claim element 18[d][iii] is disclosed in Dow for the same reasons discussed for claim element 1[d][iii]. *See supra* Claim Element 1[d][iii].

387. As discussed above, all the limitations of claim 18 are disclosed in Dow. Thus, I conclude that Dow anticipates claim 18.

O. Claim 19: “The system of claim 18, wherein said third command further results in said first tuner being tuned to a particular frequency to receive said data on said plurality of video programs, said particular frequency being provided by a content provider and stored on said DVR.”

388. Claim 19 recites substantially the same limitations as claim element 1[c] and claim 7.

389. Therefore, in my opinion, claim 19 is disclosed in Dow for the same reasons discussed for claim element 1[c] and claim 7. *See supra* Claim Element 1[c] and 7.

390. Because Dow discloses all the limitations of claims 1, 3-5, 7-11, 13-16, and 18-19 of the '122 Patent, I conclude that Dow anticipates claims 1, 3-5, 7-11, 13-16, and 18-19.

XII. Ground 3: Claims 1-20 are invalid as obvious over Dow, either alone or in combination with Russ and Miller.

391. To the extent that any previous explanations concerning the '122 Patent's invalidity are not mentioned below, I fully incorporate those explanations as further justification of the obviousness of claims 1-20.

A. Claim 1:

1. A digital video recorder (DVR) for time shifting at least one video program, said video program being transmitted over a data distribution system, comprising:

a tuner for receiving a plurality of video programs, wherein (i) said plurality of video programs are transmitted at the same time on a single channel within said data distribution system, (ii) said tuner can be tuned to said single channel to receive said plurality of video programs, and (iii) at least one of said plurality of video programs includes at least first, second and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion;

a memory device for storing said plurality of video programs, allowing said one of said plurality of video programs to be played back at a later time;

a controller configured to receive commands from a user of said DVR, wherein a first command changes said DVR from a first playback state to a second playback state, a second command initiates playback of said one of said plurality of video programs from said memory device, and a third command instructs said DVR to receive and store said plurality of video programs; and

at least one processor configured to (i) provide said one of said plurality of video programs in its entirety to a display device in response to receiving said second command during a first period of time, (ii) provide said one of said plurality of video programs in its entirety to said display device in response to receiving said second command during a second period of time if said DVR is in said first playback state, and (iii) provide only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said one of said plurality of video programs, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state;

wherein said second period of time is a period of time after said first period of time.

1. Claim element 1[pre]: “A digital video recorder (DVR) for time shifting at least one video program, said video program

**being transmitted over a data distribution system,
comprising:”**

392. To the extent it is limiting, Dow discloses the preamble. As I discuss above in Ground 2, DVRs with time-shifting capabilities were well-known in the art as of the priority date of the '122 Patent, and included functions such as pausing, fast forwarding, rewinding, skipping ahead, skipping back, and buffering. For example, Dow discloses digital video recorders that have allowed consumers “to record broadcast video (e.g., television, cable, and satellite broadcasts) for later viewing.” Dow at 1:14-16. According to Dow, “DVRs include systems for receiving, digitally storing, and playing back video content, such as video programs and commercials.” *Id.* at 2:62-64. Moreover, Dow describes index files within the DVR system that “enable time-based manipulation of the video data stream during playback.” *Id.* at 3:21-22. As a result of the enhanced navigation options, Dow teaches the enablement of features “such as slow motion, fast forwarding, and rewinding—all at variable speeds and with better fidelity than prior analog systems.” *Id.* at 3:24-26.

2. Claim element 1[a][i]: “a tuner for receiving a plurality of video programs, wherein (i) said plurality of video programs are transmitted at the same time on a single channel within said data distribution setting,”

393. Dow discloses a tuner for receiving a plurality of video programs. According to Dow, “the AV input module 510 receives an external signal, such as a

broadcast signal, signal from another playback device, or packetized communication signal.” Dow at 12:35-37. Dow recites an “AV input module [that] includes a tuner 512, an A/D converter 513, indexing logic 516, an event detector 518, and a compression encoder 520.” *Id.* at 12:28-30. “The tuner 512 is a conventional tuner for selecting a signal or channel from a spectrum of available signals or channels.” *Id.* at 12:31-32. And, Dow states that “a tuner may be unnecessary where the data carrier consists of a single signal or channel.” *Id.* at 12:33-34. A POSA would have understood these disclosures of Dow to mean that the DVR system of Dow contained at least one tuner that selects a channel or signal from a plurality of channels or signals.

3. Claim element 1[a][ii]: “said tuner can be tuned to said single channel to receive said plurality of video programs, and”

394. As I discuss above in Ground 2, the DVR of Dow includes at least one tuner within the DVR’s AV input module that “is a conventional tuner for selecting a signal or channel from a spectrum of available channels or signals.” Dow at 12:31-33. “The AV input module 510 receives an external signal, such as broadcast signal, signal from another playback device, or packetized communication signal.” *Id.* at 12:21-24

395. Figure 1 of Dow (below) illustrates its DVR system, depicting an AV signal being fed into the AV input model including the at least one tuner.

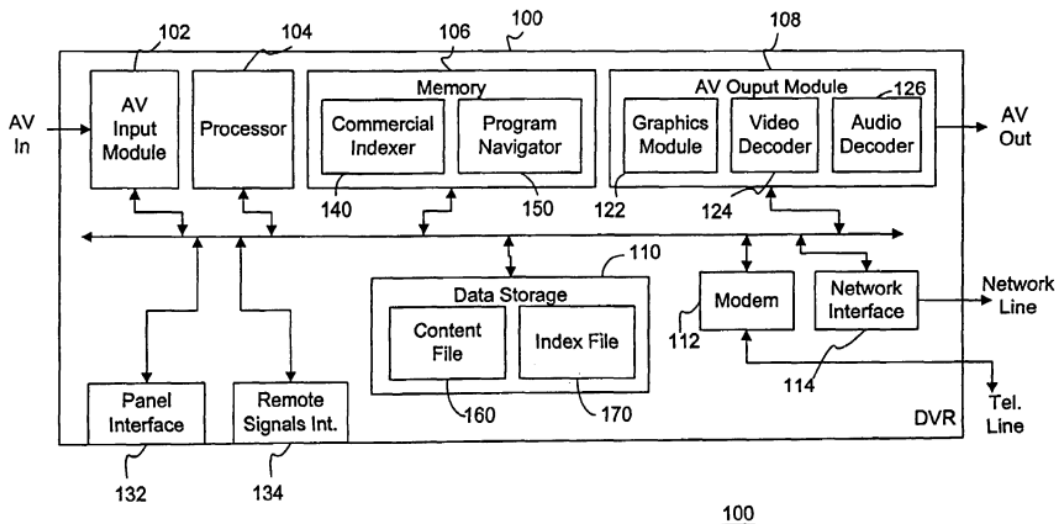


Fig. 1

396. To the extent it is asserted that Dow does not disclose tuning its DVR's tuner to a single channel upon which the DVR receives a plurality of videos, Miller discloses this limitation. For instance, Miller discloses "a system that concurrently processes multiple distinct programs communicated via a single carrier signal." Miller ¶[0002]. Miller "includes a receiving device comprising a tuner operable to receive a multiplexed signal via a satellite network that communicates digital video programming, the multiplexed signal comprising a plurality of program content portions, each program content portion corresponding to one of a plurality of programs, and a program content transporter that is communicatively coupled to the tuner." *Id.*

397. A POSA would have been motivated to combine Dow with Miller so that Dow's system properly processes the received user input and A/V stream

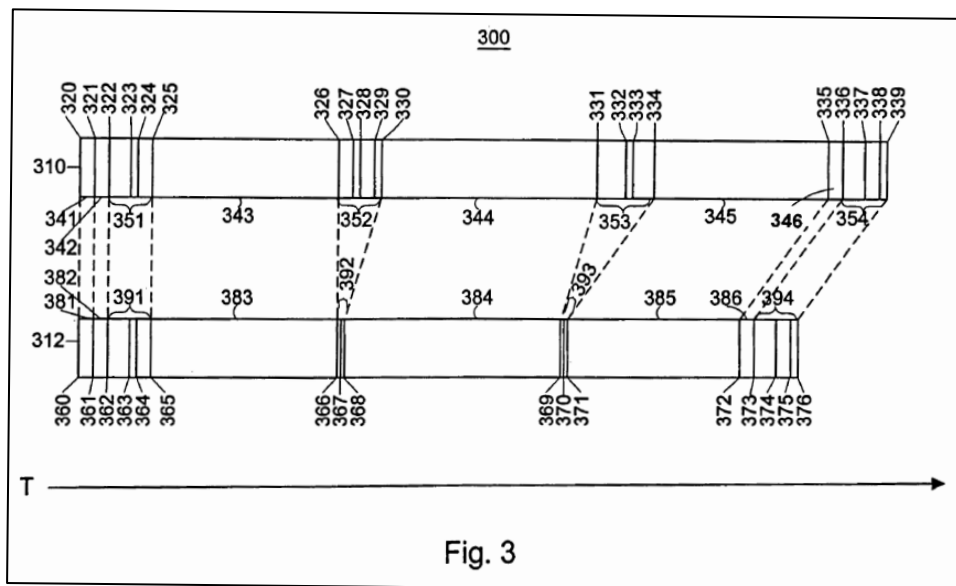
communicated over a single channel. For example, a POSA viewing Dow would have understood that the DVR needs one or more tuners to extract the A/V streams in order to perform the various control functions on them. Dow teaches “a conventional tuner for selecting a signal or channel from a spectrum of available signals or channels.” Dow at 12:31-32. And, the “tuner may be unnecessary where the data carrier consists of a single signal or channel.” *Id.* at 12:33-34. Thus, a POSA would have found it obvious to try an implementation of Dow’s system using a plurality of video programs communicated at the same time on a single channel, which Miller explains provides the benefits of saving resources and improving operation efficiency of the satellite network. Miller notes that having multiple tuners capable of accessing a single program is disadvantageous because of “higher manufacturing costs for receiving devices 118, increased power consumption by receiving devices 118, and the like.” Miller ¶[0031]. Thus, Miller seeks to avoid these disadvantages by providing “various techniques to facilitate the concurrent utilization of program content communicated via a single carrier signal” such as “receiving via a single content stream selector a multiplexed signal containing multiple distinct programs.” *Id.* ¶[0032]. Thus, a POSA would have understood that adding the multiplexing feature of Miller to the system of Dow would have avoided these disadvantages. Further, a satellite set-top box, such as a DVR, has a finite number of tuners.

398. Additionally, each of these references discloses the use of satellite systems to deliver video content. Dow explains that “[t]he received signals can originate from standard NTSC broadcast, high definition (HDTV) broadcast, standard cable, digital cable, *satellite*, Internet, or other sources, with the AV input module 102 being configured to *include appropriate conventional tuning* and/or decoding functionality.” Dow at 5:36-41 (emphasis added). Russ explains that “[b]roadband communications systems, such as *satellite and cable television systems*, are now capable of providing many services in addition to analog broadcast video.” Russ ¶[0003] (emphasis added). Russ teaches that “[t]he primary device 140, in accordance with one embodiment of the present invention, includes a processor, *a tuner system*, a storage device, a modulator, and a remote device communications receiver.” *Id.* ¶[0020] (emphasis added). And Miller describes that “[t]he system includes a receiving device comprising *a tuner operable to receive a multiplexed signal via a satellite network* that communicates digital video programming, the multiplexed signal comprising a plurality of program content portions, each program content portion corresponding to one or a plurality of programs.” Miller ¶[0002] (emphasis added). A POSA would have been motivated to combine the teachings of Miller, which describe the known process of using multiplexed signals alongside one or more tuners to deliver video content, with Dow and Russ with a reasonable expectation of success.

399. Thus, a POSA would have found it advantageous to implement the multiplexing functionality of Miller in the combined system of Dow and Russ to avoid the “higher manufacturing costs” and “increased power consumption” associated with using multiple tuners to access single program streams. Miller ¶[0031].

4. Claim element 1[a][iii]: “(iii) at least one of said plurality of said video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion and said third portion as transmitted is said to follow said second portion;”

400. Dow also describes a video program containing “portions of content” that are “viewed sequentially in a normal presentation, such as during a television broadcast or standard replay from a recorded source.” Dow at 9:49-52. *See also id.* at Fig. 3 (below):

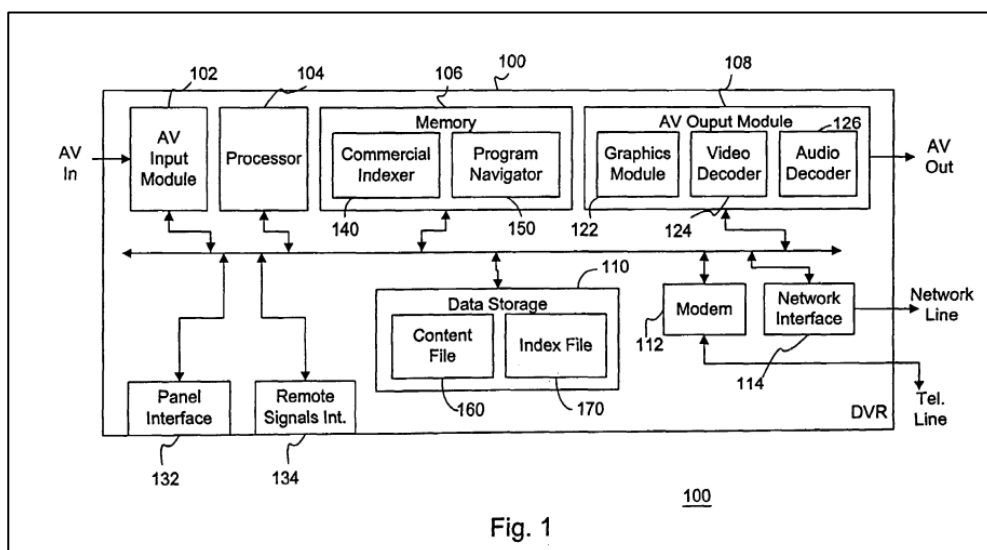


Dow explains that “[t]he program 300 contains content of varying features, for example, program segments and commercials.” *Id.* at 9:48-49. Figure 3 of Dow depicts a video program 300, a first portion comprising content 343, a second portion comprising a commercial group 352, and a third portion comprising content 344.

401. Therefore, Dow describes a tuner for receiving a video program as transmitted, wherein at least one of the plurality of video programs includes at least first, second, and third portions played in sequential order.

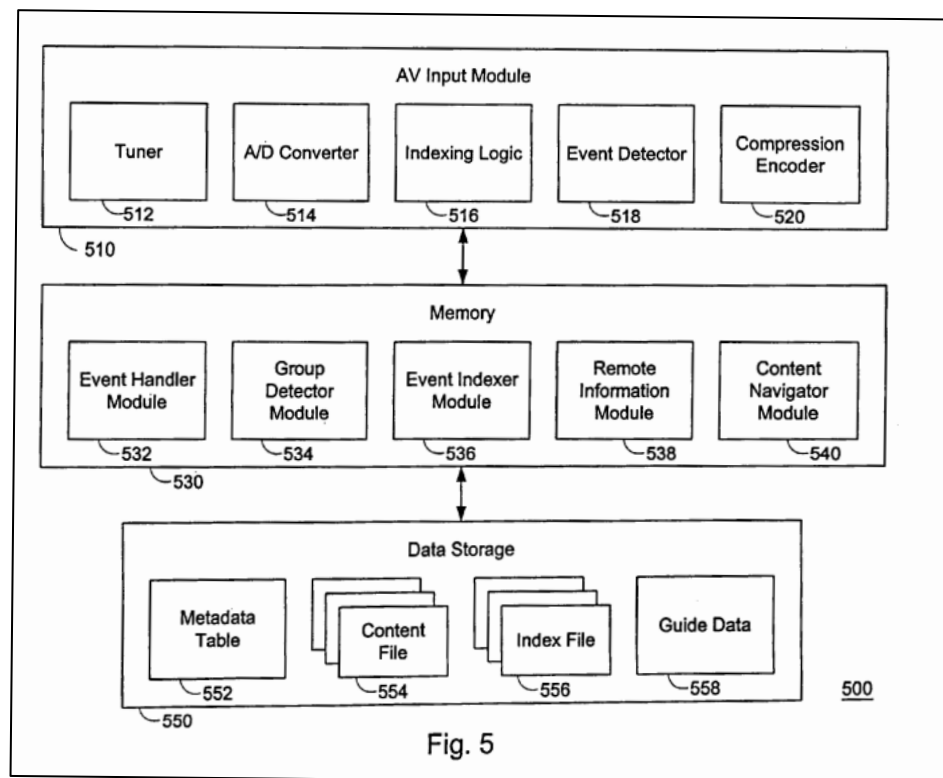
5. Claim element 1[b]: “a memory device for storing said plurality of video programs, allowing said one of said plurality of video programs to be played back at a later time;”

402. Figure 1 of Dow “illustrates a DVR 100” that “includes an AV input module, 102, a processor, 104, a memory 106, an AV Output module 108, a data storage medium 110, a modem 112 and a network interface 114 interconnected by a conventional bus architecture.” Dow at 5:3-9; Fig. 1 (below):



As depicted in Fig. 1 of Dow, “the DVR memory 106 includes an [sic] commercial indexer 140 and a program navigator 150 and the data storage 110 includes at least one content file 160 and at least one index file 170.” *Id.* at 6:45-48.

403. Figure 5 of Dow “shows a modular configuration 400 for implementing an improved commercial skip feature.” Dow at 12:5-7. “The structures include an AV input module 510, a memory 530, and a data storage 550.” *Id.* at 12:9-11. “The memory 530 includes software modules for processing received data, selectively storing secondary data, and providing navigation of stored content. The data storage 550 includes files for storing content and other data used in the operation of the DVR.” *Id.* at 12:11-17. *See also id.* at Fig. 5 (below).



404. Dow also discloses that the content file “includes the stored video data of one or more recorded video transmissions.” Dow at 7:40-41.

405. Thus, Dow discloses a memory device for storing said plurality of video programs, allowing one of said plurality of programs to be played back at a later time.

6. Claim element 1[c]: “a controller configured to receive commands from a user of said DVR, wherein a first command changes said DVR from a first payback state to a second playback state, and a second command initiates playback of said one of said plurality of video programs from said memory device, and a third command instructs said DVR to receive and store said plurality of video programs; and”

406. The first portion of claim element 1[c], a controller configured to receive commands from a user of said DVR, generally claims devices related to remotely controlling the DVR system. The controller, as described in the ’122 Patent, is “in communication with a remote control 770 (e.g., operated by a user of the DVR system)” and receives a command from the user via the remote control, subsequently transmitting the command to the processor of the DVR system. ’122 Patent at 7:32–34. This technology is disclosed in Dow.

407. Dow teaches a controller in view of the ability to control the device or alone renders it obvious. Specifically, Dow teaches that “[t]he user may control the operation of the DVR 100 through control signals provided on the exterior of the DVR 100 housing through the panel interface 132, or through control signals

originating from a remote control, which are received through the remote signals interface 134, in conventional fashion.” Dow at 5:21-26. To be sure, such controllers were notoriously well-known in the art prior to the earliest possible priority date.

408. Similarly, Dow discloses a processor that generally “executes instructions such as those stored in the memory 106 to provide functionality” to the DVR. Dow at 5:9-13.

409. Moreover, Dow provides that the “control interface module 818 provides an interface between operation of the navigation module 814 and general operation of the DVR For example, a commercial skip function may be active or inactive during playback. The control interface module 818 may define one or more control signals for toggling the commercial skip function between active and inactive modes, such as a button on (and corresponding control signal from a remote control.” Dow at 24:29-32.

410. Dow teaches a second command initiating the playback of stored video programs through “a global default,” wherein the global default includes “a menu system for defining whether the commercial skip function is active or inactive at the start of playback (e.g., when the play button is pressed).” Dow at 24:37-40. Additionally, Dow describes a menu overlay that displays “ways of viewing the previously recorded programs, including using the commercial skipping feature. Display of menu overlay 420 may be initiated based on a control signal received

from the user, e.g., when the user presses select on the remote control.” *Id.* at 11:42-47.

411. Lastly, Dow teaches a third command instructing the DVR to receive and store the plurality of video programs. Specifically, Dow teaches “[a] channel guide [that] displays available content from which individual pieces of content may be selected for current or future recording and viewing.” Dow at 6:10-13. For example, “[i]n a specific case, the channel guide may list numerous broadcast television programs, and the user may select one or more of the programs for recording. The playback guide displays content that is stored or immediately storable by the DVR 100.” *Id.* at 6:31-17.

412. Thus, I find that Dow teaches or renders obvious all the limitations of this claim element.

7. Claim element 1[d][i]: “at least one processor configured to (i) provide said one of said plurality of video programs in its entirety to a display device in response to received said second command regardless of a playback state of said DVR if said second command is received during a first period of time.”

413. As an initial matter, Dow discloses at least one processor. For example, Dow discloses that “[g]enerally, the processor 104 executes instructions such as those stored in the memory 106 to provide functionality.” Dow at 5:9-11.

414. Dow also discloses a control interface module that “defines triggering events, both mode and control signals, for the navigation function” present in Dow’s

DVR system. Dow at 24:21-22. For example, Dow discloses an embodiment in which the control interface module 818 defines “variables governing activation of the navigation function when the DVR is in a particular state, such as playback mode, playback menu mode, live view mode, program guide menu mode, etc.” *Id.* at 24:24-27. In that same embodiment, the control interface module defines “control signals for toggling the commercial skip function between active,” when the user may skip commercials, “and inactive modes,” when the user may not skip commercials. *Id.* at 24:30-31. Further, Dow’s control interface module defines “that the commercial skip is always inactive in live view mode or delayed mode (a form of playback) where there is insufficient time to buffer and process events for identifying commercial groups (e.g., a time delay of less than two minutes).” *Id.* at 24:44-48.

415. Thus, Dow teaches all the limitations present in this claim element.

8. Claim element 1[d][ii]: “provide said one of said plurality of video programs in its entirety to said display device in response to receiving said second command during a second period of time if said DVR is in said first playback state, and”

416. Dow teaches that the DVR’s control interface module defines “one or more control signals for toggling the commercial skip function between active and inactive modes, such as a button on (and corresponding control signal from) a remote control.” Dow at 24:29-32. When the commercial skip is inactive, for example, when the DVR is in live view mode or delayed view mode, Dow teaches that the

video program is played back in its entirety due to “insufficient time to buffer and process events for identifying commercial groups (e.g., a time delay of less than two minutes).” *Id.* at 24:46-48. As a result, a user of Dow’s DVR would view a video program in its entirety if the commercial skip function is inactive. Therefore, Dow discloses this claim limitation.

417. To the extent that Dow does not disclose lifting the restrictions on skipping interstitials, thereby creating a first period of time wherein skipping is restricted, and a second period of time wherein skipping is allowed, that limitation is disclosed by Russ. Russ discloses restrictions on removing commercials that are directly linked to a first and second period of time through trick play functionality. According to Russ, using trick play to skip commercials “could be restricted” such that “[t]he commercial slot could also preclude trick play for only a specified length of time, such as two weeks.” Russ ¶[0035]. Russ further explains that “[f]or example, a tag corresponding with a commercial could expire after a period of time.” *Id.* Thus, Russ discloses a first period of time wherein the user must watch the entire A/V stream, including commercials, such as when the operator or programmer has placed a two-week restriction on skipping commercials. Similarly, Russ discloses a second period of time (*i.e.*, once the restriction expires) in which the user may elect to skip the commercials or not.

418. A POSA would have been motivated to look to and combine Dow and Russ in order to effectuate the desired result of providing greater control of inactivating the commercial skipping functionality as taught by Dow. Dow teaches that “the control interface module 818 may define that the commercial skip is always inactive in live view mode or delayed view mode (a form of playback) where there is insufficient time to buffer and process events for identifying commercial groups (e.g., a time delay of less than two minutes).” Dow at 24:43-48. A POSA would have found it obvious to implement the time-based nature of the restrictions on trick-play taught in Russ to the “inactive” period found in Dow where commercial skipping is not allowed. For example, Dow and Russ both disclose restrictions on removing commercials that are directly linked to first and second periods of time. A POSA would have looked to the teachings of Russ for achieving Dow’s desired results.

419. A POSA would also have recognized that the time-based limits on restrictions of Russ were one of a finite number of identified solutions to providing restrictions to skipping or fast-forwarding through content. Thus, a POSA would have found it obvious to try the restrictions of Russ in the system of Dow. A POSA would understand, as confirmed by Russ’s disclosure, that some users would be willing to accept restrictions on commercial skipping soon after distribution of the content (*i.e.*, a first period beginning upon completion of transmission of the

program) while other users may be willing to wait several weeks to watch the program in order to allow commercial skipping. Accordingly, a POSA would have understood that combining Russ's techniques with Dow would allow the content provider to obtain additional revenue from advertisements shown to viewers who value watching the program during the initial release period while still appealing to viewers who are willing to delay watching the program in order to avoid commercials. *See* Russ ¶[0006].

- 9. Claim element 1[d][iii]: “provide only a portion of said video program to said display device in response to receiving said second command if said second command is received during said second period of time and said DVR is in said second playback state, said portion of said video program including at least said first and third portions of said video program, wherein said third portion of said video program is provided to said display device immediately following said first portion of said video program if said second command is received during said second period of time and said DVR is in said second playback state;”**

420. This limitation is obvious for substantially the same reasons as claim element 1[d][ii]. Dow describes the playback of only a portion of a video program when the commercial skip function is active, a second playback state. For example, Dow discloses the use of the DVR's “enhanced navigation features to view recorded content with substantially reduced commercials.” Dow at 9:37-39. Figure 3 of Dow (below) “shows a timeline of a program that has been recorded on a DVR, such as the DVR 100. The first timeline 310 is the program 300 as it may be viewed in

correspondence with how it was originally presented and stored on DVR 100. The second timeline 312 is the program 300 viewed with one embodiment of an automated commercial skipping feature enabled.” *Id.* at 9:39-45.

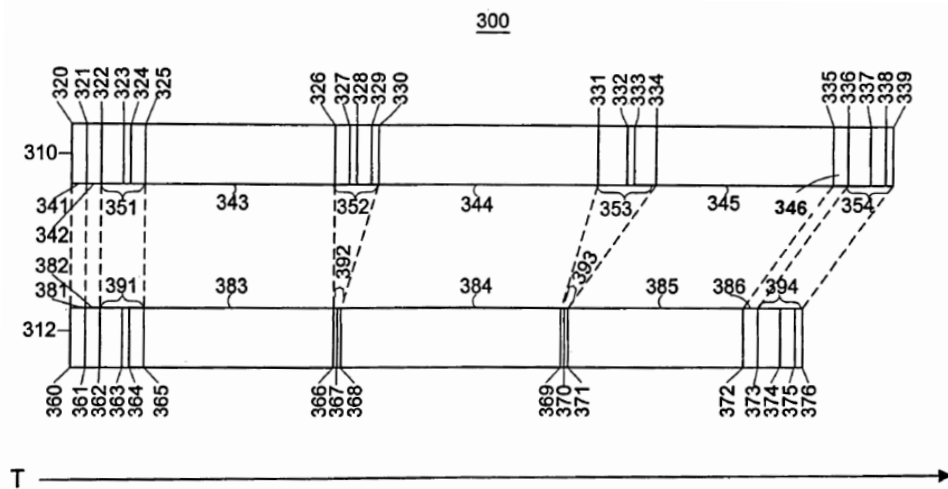


Fig. 3

As shown in Figure 3, Dow teaches that “[p]rogram segments 383, 384, and 385 would be presented sequentially without any interruption or other indication that commercials had been skipped.” *Id.* at 10:47-50. Essentially, “the second timeline 312 provides a substantially different viewing experience, including a shortened total running time for the presentation.” *Id.* at 9:45-47.

421. Thus, a POSA would have understood that Dow and Russ disclose all limitations of claim element 1[d]. As a result, claim element 1[d] is rendered obvious by Dow alone or in combination with Russ.

10.Claim element 1[e]: “wherein said second period of time is a period of time after said first period of time.”

422. Dow explicitly states that the second period of time follows the first period of time. For example, as mentioned above, Dow teaches that its control interface module defines that “the commercial skip is always inactive in live view mode or delayed view mode (a form of playback) where there is insufficient time to buffer and process events for identifying commercial groups (e.g., a time delay of less than two minutes).” Dow at 24:43-48. Thus, this limitation is disclosed in Dow.

423. As also noted above, Russ explains that “[t]he commercial slot could also preclude trick play for only a specified length of time, such as two weeks.” Russ ¶[0035]. Russ further explains that “[f]or example, a tag corresponding with a commercial could expire after a period of time after which the tag would become inactive or replaceable.” *Id.* Thus, a POSA would have understood that the combination of Dow and Russ as described above in relation to claim element 1[d] also discloses “said second period of time” occurring “after said first period of time.” Russ clearly defines a first period of time where trick play is “preclude[d].” In other words, during the first period of time, the combination of Dow and Russ teaches that only the “first timeline” of Dow’s Figure 3 may be played. In the second period of time, the commercial skip feature illustrated in Dow and in Russ is allowed once the temporal restriction expires. During the second period of time, the user attempting

to play the stream when the commercial skip function of Dow is active would result in playback of the program content segments without commercials.

424. Therefore, I conclude that Dow, alone or in combination with Russ, renders claim 1 obvious.

B. Claim 2: “The DVR of claim 1, further comprising a wireless transmitter in communication with said at least one processor and memory device, said wireless transmitter being configured to transmit said one of plurality of video programs in its entirety or said portion of said one of said plurality of programs at least indirectly to said display device, said display device being remotely located from said DVR.”

425. I understand that because claim 2 depends from claim 1, claim 2 requires all the elements from claim 1 in addition to those disclosed in claim 2. As discussed above, all elements of claim 1 are disclosed in Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 2.

426. Dow teaches a user “control[ling] the operation of the DVR 100...through signals originating from a remote control,” received through the remote signals interface. Dow at 5:21-26. Responsive to the remote signals transmitted, Dow’s DVR processes the signals and engages its AV output module to “obtain the MPEG data stored in the data storage medium 110 and convert it to [a] format compatible with the display device.” *Id.* at 5:64-67.

427. Dow teaches networking DVRs together using “conventional network technology and software.” Dow at 8:29-30. When referring to the interconnectivity of DVRs within a network, Dow refers to “wireless” connections, such that the DVRs communicate with one another on the network in a wireless fashion. Indeed, this arrangement was conventional during the time Dow was granted. As Dow explains, “local area networks 210 and 230” represent “home network systems for interconnecting a variety of home electronic devices. According to Dow, the local area networks include “the DVRs 216 and 218, as well as PCs 220 and 222. Each of the[] units may be in a different location in the home and connected using conventional network technology and software.” *Id.* at 8:27-30. Communication between the units “allow[s] remote operation and interchange between units.” *Id.* at 8:30-31. “[T]he DVRs 216 and 218 may share resources with and enable control from the PCs 220 and 222.” *Id.* at 8:35-37.

428. Moreover, the conventional network technology and software disclosed in the local area network taught in Dow include “a router 214 and a broadband interface 212. The broadband interface 212 may be a conventional digital subscriber line (DSL) modem, cable modem, or any device providing interface between the home network and a broadband connection, including wired, wireless, and any alternative broadband connections.” Dow at 8:40-45. From these disclosures, a POSA would have understood that Dow’s DVR includes wireless transmitters in

communication with the DVR's processor to wirelessly transmit entire or partial video programs to remotely located display devices.

429. Thus, Dow discloses or renders obvious the limitation recited in claim

2. As such, I conclude that claim 2 is rendered obvious by Dow.

C. Claim 3: “The DVR of claim 1, further comprising at least one other tuner, wherein said at least one other tuner allows said DVR to receive at least one other video program while said tuner is being used to receive said plurality of video programs, said at least one other video program being selected by said user.”

430. I understand that because claim 3 depends from claim 1, claim 3 requires all the elements from claim 1 in addition to those disclosed in claim 3. As discussed above, all elements of claim 1 are disclosed in Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 3.

431. As discussed above, Dow discloses a DVR containing an AV input module comprising at least one “conventional tuner for selecting a signal or channel from a spectrum of available signals or channels.” Dow at 12:31-33. Also disclosed in the AV input module of Dow's DVR is “any number of conversion modules for converting between conventional broadcast or communication signals and a digital format used within the DVR.” *Id.* at 12:46-48.

432. Dow contemplates that “where the data carrier consists of a single signal or channel,” then “a tuner may be unnecessary.” Dow at 12:33-34. Dow similarly discloses that a tuner allows the selection of a single signal or channel from a spectrum of available signals or channels. *See id.* at 12:31-33. To that end, Dow recognizes that as the DVR system incorporates multiple tuners for receiving video programs transmitted across multiple channels at the same time. In this way, the DVR system may record or display more than one video program airing at the same time.

433. Similarly, Miller discloses that “it may be desirable to access multiple program content streams concurrently.” Miller ¶[0031]. Specifically, Miller teaches that “the receiving device 118 may include at least two tuners” that each receive a program. *Id.* Miller continues, teaching that “[t]hen, the receiving device 118 may concurrently process the two program content streams by, for example, displaying the first program content stream on a presentation device 120 and recording the second program content stream on a user device 122” such as a DVR. *Id.* However, Miller explains that the multiple tuner approach has disadvantages “such as higher manufacturing costs for receiving devices 118, increased power consumption by receiving devices 118, and the like.” *Id.*

434. A POSA would have been motivated to expound upon Dow’s disclosure of “simultaneous[ly] processing and stor[ing] video program data.” Dow

at 12:39, provided through “the spectrum of available signals or channels.” *Id.* at 12:31-32. Using Miller, a reference specifically titled “[c]oncurrent program content processing apparatus, systems, and methods,” a POSA would have expected to yield the desired effects of being able to simultaneously receive and store multiple video programs using two or more tuners. Miller at Title.

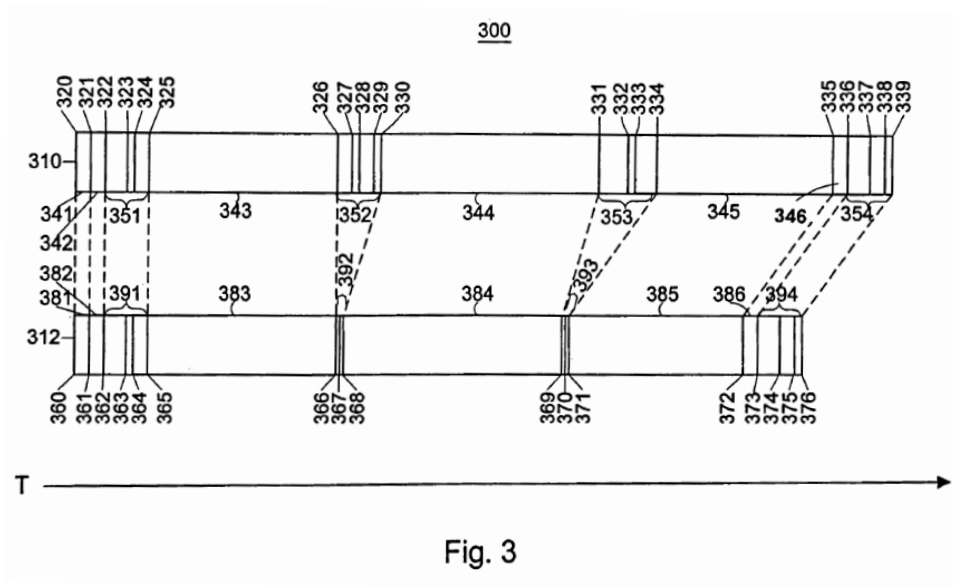
435. Thus, I find that Dow discloses or renders obvious all the limitations of claim 3. As such, I conclude that the limitation recited in claim 3 is rendered obvious by Dow alone or in combination with Russ, Miller, and well-known practices in the art by the priority date of the '122 Patent.

D. Claim 4: “The DVR of claim 1, wherein said one of said plurality of video programs includes at least primary and secondary video content, and said first and third portions of said one of said plurality of video programs consists of said primary video content.”

436. I understand that because claim 4 depends from claim 1, claim 4 requires all the elements from claim 1 in addition to those disclosed in claim 4. As discussed above, all elements of claim 1 are disclosed in Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 4.

437. As discussed above, Dow discloses a video program containing content of varying natures, “for example, program segments and commercials.” Dow at 9:48-49. Those portions of “commercials are embedded as commercial groups,

depicted as commercial groups 351-354 in the first timeline [of Figure 3 (below)] and commercial groups 391 and 394.” *Id.* at 10:19-22. Moreover, Dow explains that the “program content in program 300 is depicted as program content 341-346 in the first timeline 310 and program content 381-386 in the second timeline 312.” *Id.* at 10:6-8. *See id.* at Fig. 3 (below):



438. The program segments, labeled as 343, 344, and 345 in Figure 3 (above) “are viewed sequentially in a normal presentation, such as during a television broadcast or standard replay from a recorded source” but are viewed without commercials in presentations using the disclosed commercial skip function of Dow, shown in the second timeline of Figure 3. Dow at 9:49-52.

439. Therefore, the limitations of this claim are disclosed in or rendered obvious by Dow alone or in combination with Russ. As such, I conclude that claim 4 is rendered obvious by Dow alone or in combination with Russ.

E. Claim 5: “The DVR of claim 4, wherein said second portion of said one of said plurality of video programs consists of said secondary video content and said memory device is further configured to store at least one time when said second portion begins and at least one time when said second portion ends.”

440. As explained above, Dow discloses a video program containing content of varying natures, “for example, program segments and commercials.” Dow at 9:48-49. Those portions of “commercials are embedded as commercial groups, depicted as commercial groups 351-354 in the first timeline [of Figure 3 (below)] and commercial groups 391 and 394.” *Id.* at 10:19-22. Moreover, Dow explains that the “program content in program 300 is depicted as program content 341-346 in the first timeline 310 and program content 381-386 in the second timeline 312.” *Id.* at 10:6-8. *See id.* at Fig. 3 (below):

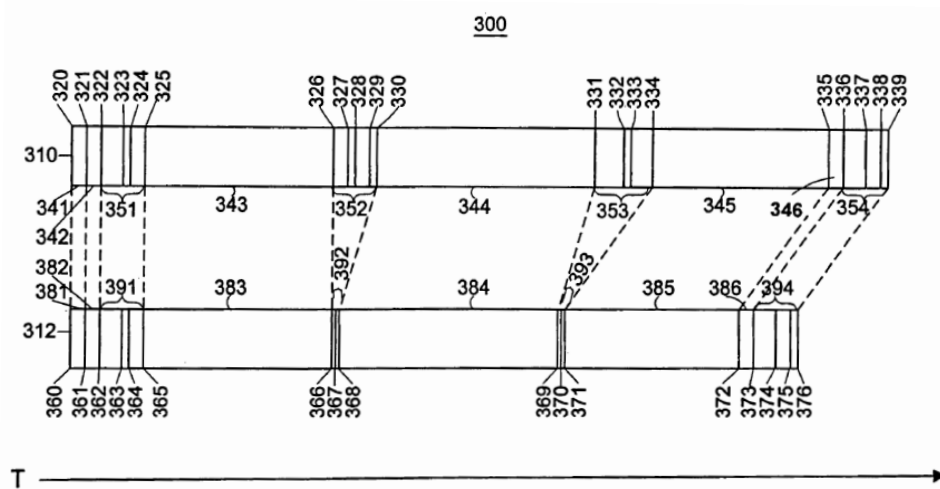


Fig. 3

441. The program segments, labeled as 343, 344, and 345 in Figure 3 (above) “are viewed sequentially in a normal presentation, such as during a television

broadcast or standard replay from a recorded source” but are viewed without commercials in presentations using the disclosed commercial skip function of Dow, shown in the second timeline of Figure 3. Dow at 9:49-52.

442. Moreover, Dow discloses having, among other features, a memory and a storage data medium. Dow’s DVR likewise contains an event indexer module, which “provides the logic for writing an event index into the data storage 550.” Dow at 14:48-49. “The event indexer receives one or more identifiers and corresponding file locations for those identifiers. For example, the event indexer module 536 may receive a first tag indicating a starting location for a commercial group and a second tag indicating an ending location for a commercial group. Other identifiers may include those corresponding to particular types of events (e.g., black field, silent frame, both, etc.),” which Dow explains are indicative of a scene change or upcoming commercial group. *Id.* at 14:49-57.

443. Dow also discloses that “event data or other metadata may be provided with received video data.” Dow at 14:17-19. The metadata is then indexed into a metadata table—which contains (among other data) “the location of a corresponding content file, corresponding index file (time-based index file and/or commercial index file),” and more—and stored in the storage unit of the DVR. *Id.* at 17L47-17; 16:59-60.

444. Therefore, Dow discloses secondary content, such as commercials, embedded between primary program content segments and a memory storage device on its DVR that is configured to store a time at which said commercials begin and end. Thus, I conclude that Dow, alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent renders obvious claim 5.

F. Claim 6: “The DVR of claim 1, wherein said first portion of time is a period of time that begins when said one of said plurality of video programs is stored on said memory device and available to be viewed and ends within a predetermined time thereafter, said predetermined time being less than one week.”

445. I understand that because claim 6 depends from claim 1, claim 6 requires all the elements from claim 1 in addition to those disclosed in claim 6. As discussed above, all elements of claim 1 are disclosed or rendered obvious by Dow, either alone or in combination with Russ, and I incorporate my analysis of those elements into my further analysis of claim 6.

446. As explained above, Dow discloses certain periods of time within which a user may be restricted from utilizing the DVR's commercial skip feature illustrated in Dow. For example, Dow teaches that the DVR's commercial skip feature may be “always inactive in live view mode or delayed view mode (a form of playback) where there is insufficient time to buffer and process the events for identifying commercial groups (e.g., a time delay of less than two minutes).” Dow at 24:44-48.

447. As discussed above, Russ teaches “trick play functionality” such as “fast forward” may be used to skip commercials. Russ ¶[0033]. However, Russ also teaches that trick play “could be restricted while viewing a portion of a presentation, such as commercials” and “would not work for certain commercials as specified, for example, by the local cable operator or the presentation programmer.” *Id.* Russ explains that “[t]he commercial slot could also preclude trick play for only a specified length of time, such as two weeks.” *Id.* ¶[0035].

448. A POSA would have understood that Russ’s disclosure of a two-week period is exemplary in nature. A POSA would have also understood that any period of time could have been used. Moreover, a POSA implementing the DVR system of Dow would have been motivated to combine the DVR system of Dow with the trick play restrictions of Russ in order to effectuate an embodiment valuable to program content providers depending on advertisement revenue. Similarly, a “local cable operator” or “presentation programmer” would have found it obvious to specify a shorter period of time, such as a day or less than a week, if a particular commercial were only relevant for said time period. For example, a “presentation programmer” may include a commercial for an event that takes place the next day or the coming weekend. Thus, the DVR of Dow may be able to automatically enable the commercial skip feature after the event has occurred.

449. Therefore, I conclude that claim 6 is rendered obvious by Dow in combination with Russ.

G. Claim 7: “The DVR of claim 1, wherein said single channel is stored in said memory and said at least one processor is configured to tune said tuner to said single channel in response to said controller receiving said third command.”

450. Dow discloses that its “DVR 100 processes guide information that describes and allows navigation among content from a system (e.g., a broadcast system) at present or future times, as well as content that has already been captured by the DVR 100.” Dow at 6:4-7. This information is displayed, according to Dow, in content guides, which include channel and playback guides. *Id.* at 6:7-10.

451. The channel guides of Dow “display[] available content from which individual pieces of content may be selected for current or future recording and viewing.” Dow at 6:10-13. For example, “the channel guide may list numerous broadcast television programs, and the user may select one or more of the programs for recording. The playback guide displays content that is stored or immediately storable by DVR 100.” *Id.* at 6:13-17.

452. Similarly, Miller “includes a receiving device comprising a tuner operable to receive a multiplexed signal via a satellite network that communicates digital video programming, the multiplexed signal comprising a plurality of program content portions, each program content portion corresponding to one of a plurality of programs.” Miller ¶[0002]. Further, Miller discloses a “content stream selector”

that “may comprise a single tuner” that may “tune to a frequency of a carrier signal that carries multiple program content streams [that are] multiplexed.” *Id.* ¶[0003]. Specifically, Miller explains that “[t]he content stream selector may then begin and continue to receive and forward, such as by storing in a buffer 412, program content portions from each of the multiple program content streams, as they arrive over the carrier signal.” *Id.* ¶[0003]. Thus, Miller renders obvious the limitation of tuning at least one of its multiple tuners to a particular channel to receive or record a video program communicated over said channel.

453. A POSA would have been motivated to combine Dow with Miller to further expound upon Dow’s disclosure of “simultaneous[ly] processing and stor[ing] video program data,” Dow at 12:39, provided through “the spectrum of available signals or channels.” *Id.* at 12:31-32. Using Miller, a reference specifically titled “[c]oncurrent program content processing apparatus, systems, and methods,” a POSA would have expected to achieve the desired results of being able to receive a video program by configuring the DVR’s processor to execute instructions tuning the on-board tuner to a particular channel to receive a video program. Miller at Title.

454. A POSA viewing Dow’s disclosure would have understood that the DVR’s ability to record a future program would necessarily engage the data storage to store the time and channels at which the program is set to air, the processor to

execute instructions stored on the DVR, and a tuner to receive the program when it is aired.

455. I find that all the limitations recited in claim 7 are disclosed in Dow alone or in combination with Miller.

H. Claim 8: “The DVR of claim 1, wherein data communicated via said single channel is compressed prior to transmission and said at least one processor is configured to decompress said data after its (sic) have been received so that said one of said plurality of video programs or said portion of said one of said plurality of video programs can be displayed, depending on when said second command is received and said playback state of said DVR.”

456. I understand that because claim 8 depends from claim 1, claim 8 requires all the elements from claim 1 in addition to those disclosed in claim 8. As discussed above, all elements of claim 1 are disclosed in Dow, and I incorporate my analysis of those elements into my further analysis of claim 8.

457. The AV input module 510 of Dow’s DVR is configured to receive external signals that include “packetized communication signals.” Dow at 12:23. As is widely known in the art, the packetization of a media stream entails the manipulation of a media file, typically with respect to the file size, such that the file may be compressed prior to transmission for easy transmission. Of course, this idea is contemplated in Dow, which provides for the ability to compress analog signals that have already been transmitted to the DVR or the ability to simply receive prior-compressed media files. Specifically, Dow teaches that its compression encoder

“may be unnecessary,” for example, when a system “share[s] data already formatted with the appropriate video compression.” *Id.* at 13:36-39. Thus, Dow discloses the compression of media files prior to transmission.

458. Similarly, Dow discloses a decoder configured to decompress any received data after it has been received such that the data may be subsequently displayed on a television or other display device. According to Dow, the DVR’s “video decoder 124 and audio decoder 126 are preferably MPEG decoders that can obtain the MPEG data stored in the data storage medium 110 and convert it to format compatible with the display device.” Dow at 5:62-66.

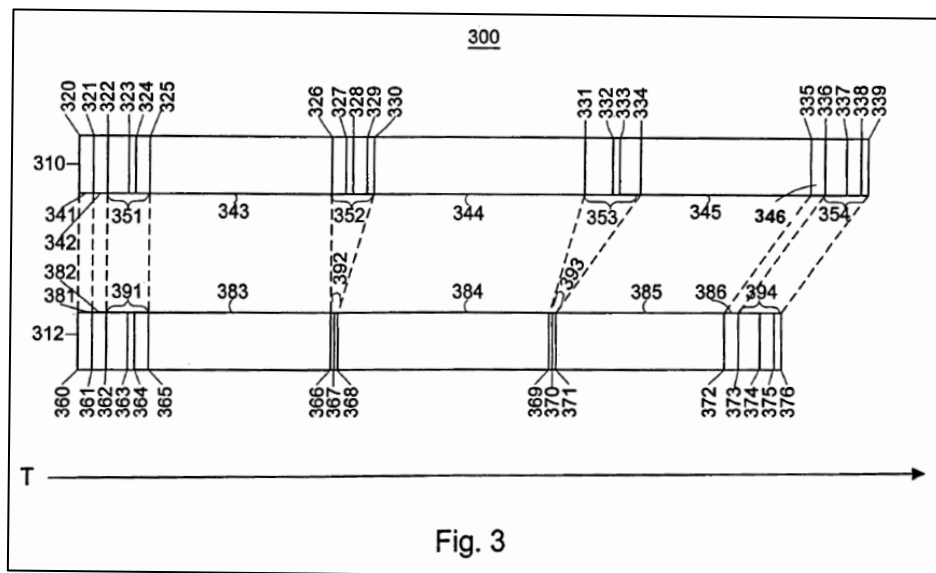
459. Additionally, Miller teaches that “the signal received by the receiving device 118 may include a plurality of multiplexed programs.” Miller ¶[0029]. Further, Miller discloses that “[p]rogram content portions may comprise MPEG (“Motion Picture Experts Group”) packets that contain compressed and/or encrypted video, audio, and/or other data.” *Id.* Additionally, “program content portions may be encapsulated and/or formatted in other ways, such as by use of other or additional transport, compression, and/or encryption techniques.” *Id.* Miller further explains that “[t]he video processing system 404 and/or the presenter 408 may perform additional processing on program content portions, such as decompression, decryption, encryption, scaling, and the like, prior to communicating the program content to the presentation device 120.” *Id.* ¶[0052].

460. Because all the limitations of claim 8 are disclosed or rendered obvious by Dow, Miller, and well-known practices in the art by the priority date of the '122 Patent, I conclude that claim 8 is obvious.

I. Claim 9: “The DVR of claim 5, wherein said secondary video content comprises at least one advertisement.”

461. I understand that because claim 9 depends from claim 5, which depends from claims 4 and 1, claim 9 requires all the elements from claims 5, 4, and 1 in addition to those disclosed in claim 9. As discussed above, all elements of claims 5, 4, and 1 are disclosed in Dow, and I incorporate my analysis of those elements into my further analysis of claim 9.

462. The term “secondary video content” as it is used throughout the '122 Patent to refer to “auxiliary data,” which includes advertisements, news tickers, or crawlers. *See* '122 Patent at 5:48–49. Dow discloses a video program that “includes a number of commercials embedded within the video presentation.” Dow at 10:17–18; Fig. 3 (below):



According to Dow, “[t]he commercials are embedded as commercial groups, depicted as commercial groups 351-354 in the first timeline 310 and commercial groups 301 and 304 in the second timeline 312. Each commercial group si composed of 3-4 commercials separated by a corresponding number of transitions. There are four commercial groups 351-354 contained in first timeline 310, representing the commercial groups as broadcast and recorded. There are only two complete commercial groups 391 and 294 in second timeline 312, representing operation of a commercial skip feature to substantially decrease the commercials presented during playback.” Dow at 10:19-29,

463. I find that all the limitations of claim 9 are disclosed by Dow or by well-known practices in the art by the priority date of the ’122 Patent. As such, I conclude that claim 9 is rendered obvious by Dow alone or in combination with well-known practices in the art by the priority date of the ’122 Patent.

J. Claim 10: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said one of said plurality of video programs from said memory if said second command is received during said second period of time and said DVR is in said second playback state, and (ii) retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and said DVR is switched to said first playback state at or before said time thereafter.”

464. I understand that because claim 10 depends from claim 1, claim 10 requires all the elements from claim 1 in addition to those disclosed in claim 10. As discussed above, all elements of claim 1 are disclosed or rendered obvious by Dow, and I incorporate my analysis of those elements into my further analysis of claim 10.

1. Claim element 10[a]: “The DVR of claim 1, wherein said processor is further configured to (i) retrieve said portion of said plurality of video programs from said memory if said second command is received during said second period of time and said DVR is in said second playback state,”

465. As discussed above, Dow discloses a processor that “executes instructions such as those stored in the memory 106 to provide functionality” to the DVR system. Dow at 5:9-12. Dow also teaches that “[t]he user may control the operation of the DVR 100 through control signals provided on the exterior of the DVR 100 housing through the panel interface 132, or through control signals originating from a remote control, which are received through the remote signals interface 134, in conventional fashion.” *Id.* at 5:21-26.

466. Moreover, Dow provides that the “control interface module 818 provides an interface between operation of the navigation module 814 and general operation of the DVR For example, a commercial skip function may be active or inactive during playback. The control interface module 818 may define one or more control signals for toggling the commercial skip function between active and inactive modes, such as a button on (and corresponding control signal from a remote control.” Dow at 24:29-32.

467. When the commercial skip feature of Dow’s DVR is activated, a user may use the DVR’s enhanced navigation features to view recorded content” that has been retrieved from memory “with substantially reduced commercials.” Dow at 9:37-39.

468. Thus, the control interface module and processor for executing instructions stored in the memory 106 to provide functionality teach the retrieval of said video program from the DVR’s memory device during the second period of time when the DVR is in a second playback state.

2. Claim element 10[b]: “retrieve said one of said plurality of video programs in its entirety from said memory device if another second command is received at a time thereafter and said DVR is switched back to said first playback state at or before said time thereafter.”

469. As explained above, the ’122 Patent’s description of “first” and “second” playback states refers to the original, unedited video stream communicated

to the display device and an edited or altered video stream removing “auxiliary data”, respectively. Dow discloses both.

470. Dow discloses the retrieval of a video program in its entirety via a menu overlay that may be opened to toggle the commercial skip feature during playback. Specifically, Dow states: “The menu overlay 420 displays one or more ways of viewing previously recorded programs, including using the commercial skipping features. Display of menu overlay 420 may be initiated based on a control signal received from the user, e.g., when the user presses select on the remote control. Menu overlay 420 is shown in conjunction with content guide 400 *a*, but could also be used with a recorded program presently being viewed . . . such as a scene or chapter selection interface.” Dow at 11:42-51.

471. Dow discloses offering other play modes and menu options through the menu overlay as well. Dow at 11:55-56. For example, “if the commercial skip toggle 426 is marked (as shown), the commercials will be skipped when the program is played, regardless of the play mode selected.” *Id.* at 11:58-61. “The toggle 426 and identifier 428 allow the user to toggle the commercial skip feature on and off.” *Id.* at 11:64-65.

472. Thus, Dow discloses the retrieval of a stored video program in its entirety from the DVR’s memory device when a second command is received at a later time and the DVR is switched to a first playback state before said time.

473. Because Dow discloses all the limitations of claim 10, I conclude that Dow alone or in combination with well-known practices in the art by the priority date of the '122 Patent renders obvious claim 10.

K. Claim 11:

11. A method for time shifting at least one video program transmitted to a digital video recorder (DVR) over a data distribution system, comprising:

receiving a plurality of video programs, wherein said plurality of video programs are transmitted as the same time and are received by a single tuner in said DVR, and at least one of said plurality of video programs includes at least first, second and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion;

receiving a third command from at least one user of said DVR, said third command indicating a desire to use said single tuner to receive said plurality of video programs and to store said plurality of video programs on at least one memory device in said DVR;

storing said plurality of video programs on said at least one memory device in said DVR in response to receiving said third command from said at least one user of said DVR;

receiving a second command from said at least one user of said DVR, said second command indicating a desire to playback at least a portion of said one of said plurality of video programs;

receiving a first command from said at least one user of said DVR, said first command indicating a playback state of said DVR; and

providing said at least a portion of said one of said plurality of video programs to a display device in response to receiving said second command from said at least one user of said DVR;

wherein said step of providing said at least a portion of said one of said plurality of video programs to said display device further comprises (i) providing said one of said plurality of video programs to said display device in response to receiving said second command during a first period of time, (ii) providing said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said first playback state, and (iii) providing only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said video program, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state;

wherein said second period of time is a period of time after said first period of time.

1. Claim element 11[pre]: “A method for time shifting at least one video program transmitted to a digital video recorder (DVR) over a data distribution system, comprising:”

474. To the extent it is limiting, Dow discloses the preamble. The preamble of claim 11 recites substantially the same limitations as the preamble of claim 1.

475. Therefore, in my opinion, the preamble of claim 11 is rendered obvious by Dow, alone or in combination with Russ, for the same reasons discussed for claim 1. *See supra* Claim Element 1[pre].

2. Claim element 11[a]: “receiving a plurality of video programs, wherein said plurality of video programs are transmitted as the same time and are received by a single tuner in said DVR, and at least one of said plurality of video programs includes at least first, second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is said to follow said second portion;”

476. Claim element 11[a] recites a method step that is substantially the same limitations as claim elements 1[a][i], 1[a][ii], and 1[a][iii].

477. Therefore, in my opinion, claim element 11[a] is disclosed in or is rendered obvious by Dow for the same reasons discussed for claim elements 1[a][i], 1[a][ii], and 1[a][iii]. *See supra* Claim Elements 1[a][i], 1[a][ii], and 1[a][iii].

3. Claim element 11[b]: “receiving a third command from at least one user of said DVR, said third command indicating a desire to use said single tuner to receive said plurality of video

programs and to store said plurality of video programs on at least one memory device in said DVR;”

478. Claim element 11[b] recites a method step containing limitations that are substantially the same limitations as claim elements 1[b] and 1[c].

479. Therefore, in my opinion, claim element 11[b] is disclosed in or is rendered obvious by Dow for the same reasons discussed for claim elements 1[b] and 1[c]. *See supra* Claim Elements 1[b] and 1[c].

4. Claim element 11[c]: “storing said plurality of video programs on said at least one memory device in said DVR in response to receiving said third command from said at least one user of said DVR;”

480. Claim element 11[c] recites a method step that is substantially the same limitations as claim elements 1[b] and 1[c].

481. Therefore, in my opinion, claim element 11[c] is disclosed in or is rendered obvious by Dow for the same reasons discussed for claim elements 1[b] and 1[c]. *See supra* Claim Elements 1[b] and 1[c].

5. Claim element 11[d]: “receiving a second command from said at least one user of said DVR, said second command indicating a desire to playback at least a portion of said one of said plurality of video programs;”

482. Claim element 11[d] recites a method step that is substantially the same limitations as claim element 1[c].

483. Therefore, in my opinion, claim element 11[d] is disclosed in or is rendered obvious by Dow for the same reasons discussed for claim element 1[c]. *See supra* Claim Element 1[c].

6. Claim element 11[e]: “receiving a first command from said at least one user of said DVR, said first command indicating a playback state of said DVR; and”

484. Claim element 11[e] recites a method step that is substantially the same limitations as claim element 1[c].

485. Therefore, in my opinion, claim element 11[e] is disclosed in or is rendered obvious by Dow for the same reasons discussed for claim element 1[c]. *See supra* Claim Element 1[c].

7. Claim element 11[f]: “providing said at least a portion of said one of said plurality of video programs to a display device in response to receiving said second command from said at least one user of said DVR;”

486. Claim element 11[f] recites a method step that is substantially the same limitations as claim elements 1[d][i], 1[d][ii], and 1[d][iii].

487. Therefore, in my opinion, claim element 11[f] is disclosed in or is rendered obvious by Dow for the same reasons discussed for claim elements 1[d][i], 1[d][ii], and 1[d][iii]. *See supra* Claim Elements 1[d][i], 1[d][ii], and 1[d][iii].

8. Claim element 11[g][i]: “wherein said step of providing at least a portion of said one of said plurality of video programs to said display device further comprises (i) providing said one of said plurality of video programs to said display device in response

to receiving said second command during a first period of time,”

488. Claim element 11[g][i] recites a method step that is substantially the same limitations as claim element 1[d][i].

489. Therefore, in my opinion, claim element 11[g][i] is disclosed in or is rendered obvious by Dow for the same reasons discussed for claim element 1[d][i].

See supra Claim Element 1[d][iii].

9. Claim element 11[g][ii]: “(ii) providing said one of said plurality of said video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said first playback state, and”

490. Claim element 11[g][ii] recites a method step that is substantially the same limitations as claim element 1[d][ii].

491. Therefore, in my opinion, claim element 11[g][ii] is disclosed in or is rendered obvious by Dow alone or in combination with Russ for the same reasons discussed for claim element 1[d][ii]. *See supra* Claim Element 1[d][ii].

10.Claim element 11[g][iii]: “(iii) providing only a portion of said one of said plurality of video programs to said display device in response to receiving said second command during said second period of time if said DVR is in said second playback state, said portion of said one of said plurality of video programs including at least said first and third portions of said video program, wherein said third portion is provided to said display device immediately following said first portion if said second

**command is received during said second period of time and
DVR is in said second playback state;**

492. Claim element 11[g][iii] recites a method step that is substantially the same limitations as claim element 1[d][iii].

493. Therefore, in my opinion, claim element 11[g][iii] is disclosed in or is rendered obvious by Dow alone or in combination with Russ for the same reasons discussed for claim element 1[d][iii]. *See supra* Claim Element 1[d][iii].

**11.Claim element 11[h]: “wherein said second period of time is a
period of time after said first period of time.”**

494. Claim element 11[h] recites a method step that is substantially the same limitations as claim element 1[e].

495. Therefore, in my opinion, claim element 11[h] is disclosed in or is rendered obvious by Dow alone or in combination with Russ for the same reasons discussed for claim element 1[e]. *See supra* Claim Element 1[e].

496. Therefore, I conclude that claim 11 is rendered obvious by Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent.

**L. Claim 12: “The method of claim 11, wherein said step of providing
said at least a portion of said one of said plurality of video programs
to a display device further comprises transmitting said at least a
portion of said one of said plurality of video programs to said display
device via a transmission path that includes at least one wireless**

connection, said display device being remotely located from said DVR.”

497. Claim 12 recites substantially the same limitations as claim 2.

498. Therefore, in my opinion, claim 12 is disclosed in or is rendered obvious by Dow, alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent, for the same reasons discussed for claim 2. *See supra* Claim 2.

M. Claim 13: “The method of claim 11, wherein said step of storing said plurality of video programs on said at least one memory device in said DVR further comprises storing at least one time of when said second portion of said video program begins and at least one time of when said second portion of said video program ends.

499. Claim 13 recites substantially the same limitations as claim 5.

500. Therefore, in my opinion, claim 13 is disclosed in or is rendered obvious by Dow, alone or in combination with Russ and well-known practices in the art by the art by the priority date of the '122 Patent, for the same reasons discussed for claim 5. *See supra* Claim 5.

N. Claim 14: “The method of claim 11, wherein said one of said plurality of video programs includes at least primary and secondary video content, said portion of said video program that is provided to said display device if said second command is received during said second period of time and said DVR is in second playback state

consists of said primary video content, and said secondary video content includes at least one advertisement.

501. Claim 14 recites substantially the same limitations as claims 4, 5, and 9.

502. Therefore, in my opinion, claim 14 is disclosed in or is rendered obvious by Dow, either alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent, for the same reasons discussed for claims 4, 5, and 9. *See supra* Claims 4, 5, 9.

O. Claim 15: “The method of claim 11, further comprising the steps of: compressing said plurality of video programs prior to said plurality of video programs being transmitted over said data distribution system, and decompressing said plurality of video programs after said plurality of video programs have been received by said DVRr (sic) and before said one of plurality of video programs or portion thereof is provided to said display device.”

503. Claim 15 recites substantially the same limitations as claim 8.

504. Therefore, in my opinion, claim 15 is disclosed in or is rendered obvious by Dow, alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent for the same reasons discussed for claim 8. *See supra* Claim 8.

P. Claim 16: “The method of claim 11, further comprising the step of tuning said single tuner to a particular channel at a particular time in response to receiving a third command, said particular channel

and said particular time being stored in said at least one memory device in said DVR.

505. Claim 16 recites substantially the same limitations as claim 7.

506. Therefore, in my opinion, claim 16 is disclosed in or is rendered obvious by Dow, alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent for the same reasons discussed for claim 7.

See supra Claim 7.

Q. Claim 17: “The method of claim 16, further comprising the step of receiving a fourth command from said at least one user of said DVR, said forth command indicating a desire to record a second video program, which is accomplished using another tuner if said second video program is being transmitted to said DVR while said plurality of video programs are being transmitted to said DVR.

507. I understand that because claim 17 depends from claim 16, which depends from claim 11, claim 17 requires all the elements from claims 16 and 11 in addition to those disclosed in claim 17. As discussed above, all elements of claims 16 and 11 are disclosed in or rendered obvious by Dow, and I incorporate my analysis of those elements into my further analysis of claim 17.

508. As an initial matter, the use of multiple tuners to receive multiple video programs aired simultaneously was a well-known practice in the art by the priority date of the '122 Patent.

509. As discussed above, Dow discloses a DVR containing an AV input module comprising at least one “conventional tuner for selecting a signal or channel

from a spectrum of available signals or channels.” Dow at 12:31-33. Also disclosed in the AV input module of Dow’s DVR is “any number of conversion modules for converting between conventional broadcast or communication signals and a digital format used within the DVR.” *Id.* at 12:46-48.

510. Dow contemplates that “where the data carrier consists of a single signal or channel,” then “a tuner may be unnecessary.” Dow at 12:33-34. Dow similarly discloses that a tuner allows the selection of a single signal or channel from a spectrum of available signals or channels. *See id.* at 12:31-33. To that end, Dow recognizes that as the DVR system incorporates multiple tuners for receiving video programs transmitted across multiple channels at the same time. In this way, the DVR system may record or display more than one video program airing at the same time responsive to the user’s selection of “one or more programs for recording.” *Id.* at 6:15.

511. Dow also teaches receiving commands “originating from a remote control” through the remote signals interface in conventional fashion. Dow at 5:24-26. Conventionally, users transmit signals indicating their desire to record or otherwise view a video program. Dow’s DVR system allows for users to “select one or more of the [available] programs for recording.” *Id.* at 6:15. However, Dow at least inherently discloses multiple tuners to allow the DVR to receive multiple video programs aired simultaneously. Dow’s DVR incorporates a “conventional tuner for

selecting *a signal or channel from a spectrum of available signals or channels.*” *Id.* at 12:31-32 (emphasis added). Dow recognizes that simultaneous video processing may be an attractive feature for DVRs and therefore discloses that the DVR’s AV input module (within which Dow’s tuner is located), “may include any number of conversion modules for converting between conventional broadcast or communication signals and a digital format used within the DVR.” *Id.* at 12:45-48. In this way, “event detection or other video processing may be carried out simultaneously with compression and storage of the video data.” *Id.* at 12:39-42.

512. Russ likewise teaches the use of tuners in DVR systems, explaining that “[a] processor and a tuner system, which may be a simplified processor and only one tuner, may be included to extract channels from the received downstream broadband signals.” Russ ¶[0020]. By teaching that its processor and tuner system “may be . . . only one tuner,” Russ inherently discloses that more than one tuner could be integrated into the DVR system. Indeed, Russ’s disclosures are consistent with widely known practices in the art by the priority date of the ’122 Patent. As such, a POSA would have understood that a DVR attempting to record two video programs airing on different channels at the same time would have utilized a second tuner to accomplish the recordings.

513. Lastly, Miller also explains that “[i]n some instances, it may be desirable to access multiple program content streams concurrently.” Miller ¶[0031].

Miller further explains that “a user may desire to view a first program and record a second program that are being communicated concurrently by a program distributor 106 to a receiving device 118.” *Id.* Miller teaches that “the receiving device 118 may include at least two tuners” that receive a first program and a second program.” *Id.*

514. Thus, I find that Dow, Miller, and Russ disclose or render obvious all the limitations of claim 17. As such, I conclude that claim 17 is rendered obvious by Dow alone or in combination with Miller, Russ, and well-known practices in the art by the priority date of the '122 Patent.

R. Claim 18:

18. A digital video recorder (DVR) for time shifting at least one of a plurality of video programs, said one of said plurality of video programs consisting of first, second and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion, comprising:

a first tuner for receiving data on said plurality of video programs, wherein said data on one of said plurality of video programs is transmitted together with said data on other ones of said plurality of video programs, so that said first tuner receives said data on said one of said plurality of video programs at the same time that it receives data on said other ones of said plurality of video programs;

at least one memory device for storing said data on said plurality of video programs, including at least said one of said plurality of video programs;

a controller for receiving commands including at least a first command for setting a playback state of said DVR, a second command for initiating a playback of said one of said plurality of video programs from said memory device, and a third command for initiating said reception and said storage of said data on said plurality of video programs; and

at least one processor for (i) providing said first, second and third portions of said one of said plurality of video programs respectively to a display device in response to receiving said second command during a first portion of time, (ii) providing said first, second and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during a second period of time if said DVR is in a first playback state, and (iii) providing said first and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during said second period of time if said DVR is in a second playback state, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state.

1. Claim element 18[pre]: “A digital video recorder (DVR) for time shifting at least one of a plurality of video programs, said one of said plurality of video programs consisting of first,

second, and third portions, wherein said second portion as transmitted is configured to follow said first portion, and said third portion as transmitted is configured to follow said second portion, comprising:

515. To the extent it is limiting, Dow discloses the preamble. The preamble of claim 18 recites substantially the same limitations as the preamble of claim 1 and claim element 1[a][iii].

516. Therefore, in my opinion, the preamble of claim 18 is disclosed in or rendered obvious by Dow alone or in combination with Russ and other well-known practices in the art by the priority date of the '122 Patent for the same reasons discussed for claim 1. *See supra* Claim Elements 1[pre] and 1[a][iii].

2. Claim element 18[a]: “a first tuner for receiving data on said plurality of video programs, wherein said data on one of said plurality of video programs is transmitted together with said data on other ones of said plurality of video programs, so that said first tuner receives said data on said one of said plurality of video programs at the same time that it receives data on said other ones of said plurality of programs;

517. Claim element 18[a] recites substantially the same limitations as claim elements 1[a][i] and 1[a][ii].

518. Therefore, in my opinion, claim element 18[a] is disclosed in or rendered obvious by Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent for the same reasons

discussed for claim elements 1[a][i] and 1[a][ii]. *See supra* Claim Elements 1[a][i] and 1[a][ii].

3. Claim element 18[b]: “at least one memory device for storing said data on said plurality of video programs, including at least said one of said plurality of video programs;”

519. Claim element 18[b] recites substantially the same limitations as claim element 1[b].

520. Therefore, in my opinion, claim element 18[b] is disclosed in or rendered obvious by Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent for the same reasons discussed for claim element 1[b]. *See supra* Claim Element 1[b].

4. Claim element 18[c]: “a controller for receiving commands including at least a first command for setting a playback state of said DVR, a second command for initiating a playback state of said one of said plurality of video programs from said memory device, and a third command for initiating said reception and said storage of said data on said plurality of video programs; and”

521. Claim element 18[c] recites substantially the same limitations as claim element 1[c].

522. Therefore, in my opinion, claim element 18[c] is disclosed in or rendered obvious by Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent for the same reasons discussed for claim element 1[c]. *See supra* Claim Element 1[c].

5. Claim element 18[d][i]: “at least one processor for (i) providing said first, second, and third portions of said one of said plurality of video programs respectively to a display device in response to receiving said second command during a first portion of time,”

523. Claim element 18[d][i] recites substantially the same limitations as claim element 1[d][i].

524. Therefore, in my opinion, claim element 18[d][i] is disclosed in or rendered obvious by Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent for the same reasons discussed for claim element 1[d][i]. *See supra* Claim Element 1[d][i].

6. Claim element 18[d][ii]: “(ii) providing said first, second, and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said second command during a second period of time if said DVR is in a first playback state, and”

525. Claim element 18[d][ii] recites substantially the same limitations as claim element 1[d][ii].

526. Therefore, in my opinion, claim element 18[d][ii] is disclosed in or rendered obvious by Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent for the same reasons discussed for claim element 1[d][ii]. *See supra* Claim Element 1[d][ii].

7. Claim element 18[d][iii]: “(iii) providing said first and third portions of said one of said plurality of video programs respectively to said display device in response to receiving said

second command during said second period of time if said DVR is in a second playback state, wherein said third portion is provided to said display device immediately following said first portion if said second command is received during said second period of time and said DVR is in said second playback state.”

527. Claim element 18[d][iii] recites substantially the same limitations as claim element 1[d][iii].

528. Therefore, in my opinion, claim element 18[d][iii] is disclosed in or rendered obvious by Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent for the same reasons discussed for claim element 1[d][iii]. *See supra* Claim Element 1[d][iii].

S. Claim 19: “The system of claim 18, wherein said third command further results in said first tuner being tuned to a particular frequency to receive said data on said plurality of video programs, said particular frequency being provided by a content provider and stored on said DVR.”

529. Claim 19 recites substantially the same limitations as claim element 1[c] and claim 7.

530. Therefore, in my opinion, claim 19 is disclosed in or rendered obvious by Dow alone or in combination with Russ and well-known practices in the art by the priority date of the '122 Patent for the same reasons discussed for claim element 1[c] and claim 7. *See supra* Claim Element 1[c] and 7.

T. Claim 20: “The system of claim 18, wherein said second portion comprises at least one commercial and said data on said plurality of

video program is packetized, with individual packets being linked at least indirectly to individual ones of said plurality of video programs and to individual channels associated with content owners thereof.”

531. I understand that because claim 20 depends from claim 18, claim 20 requires all the elements from claim 18 in addition to those disclosed in claim 20. As mentioned above, all the elements of claim 18 are disclosed in Dow, Russ, or were well-known practices in the art by the priority date of the '122 Patent, and I incorporate my analysis of those elements into my further analysis of claim 20.

532. As explained above, Dow's DVR contains an AV input module that “receives an external signal, such as a broadcast signal, signal from another playback device, or packetized communication signal.” Dow at 12:21-23. According to Dow, the external signals that are received are video programs having “a number of commercials embedded within the video presentation.” *Id.* at 10:17-18. Russ likewise teaches that “a typical MPEG stream 300 includ[es] a program and commercials.” Russ ¶[0026]. Specifically, Figure 6C of Russ “illustrates a presentation 670 that has ads 680 inserted during chapter breaks at varying intervals.” *Id.* ¶[0026].

533. Russ also discloses “a way to differentiate between the program and commercials . . . using ad-insertion tags, which may be specific or multipurpose. Ad-insertion tags can be embedded in a MPEG stream 300 by the programmer responsible for creating the presentation or by the local cable operator.” Russ

¶[0026]. “By knowing the location of commercials in a presentation, the primary device 140 could replace the originally provided commercials with new material saved on the primary device 140 or transmitted from the HE 120.” *Id.* ¶[0028]. A POSA would have understood that this disclosure in Russ corresponded to a direct or indirect link between a segment such as a commercial and the individual channel or content owner from which the video program was provided.

534. Miller also discloses that “[p]rogram content portions may comprise MPEG (“Motion Picture Experts Group”) packets that contain compressed and/or encrypted video, audio, and/or other data.” Miller ¶[0029]. Additionally, “program content portions may be encapsulated and/or formatted in other ways, such as by use of other or additional transport, compression, and/or encryption techniques.” *Id.* ¶[0029].

535. Further, A POSA viewing these disclosures in Dow, Miller, and Russ would have understood that the secondary content of a video program would have included at least one commercial. Similarly, a POSA would have understood that the reception of packetized communication signals from an external source requires the linkage of individual packets to specific portions of a particular video program and a specific channel upon which the program is aired. Indeed, Dow teaches that metadata associated with received video data includes “program name, one or more categories, program description rating information, running time, recording quality,

source, data/time of recording, etc.” Dow at 17:9-11. The metadata are received alongside the received video data and subsequently indexed into a metadata table including “the location of a corresponding content file, corresponding index file (time-based index file and/or commercial index file), a data pointer for where the last viewing left off, etc.” *Id.* at 17:14-21.

536. Thus, I find that Dow, Miller, and Russ disclose commercials embedded within a video program that is received at the DVR as a packetized communication signal. Similarly, I find that Dow teaches that the packetized communication signal includes information linking the packetized signal to a particular video program and particular channel associated with the content owners of the program. Having disclosed all the limitations of claim 20, Dow alone or in combination with Russ and Miller render obvious claim 20.

537. Because Dow, alone or in combination with Russ and other well-known practices in the art by the priority date of the ’122 Patent, discloses all the limitations of claims 1-20, I conclude that claims 1-20 are obvious.

XIII. Materials Considered

538. I have reviewed and considered the following documents in connection with my analysis of the ’122 Patent:

- The ’122 Patent and claims and prosecution history;
- U.S. Patent No. 8,510,771 (Casagrande);

- U.S. Patent Application Pub. No. 2006/0225105 (Russ);
- U.S. Patent Application Pub. No. 2009/0165057 (Miller); and
- The prior art discussed herein.

539. In addition, my opinions are based on my years of experience in the field of managed content delivery in multimedia networking and distribution systems and their associated software and equipment.

All statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true. I further understand that willful false statements and the like are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code. I declare under penalty of perjury that the foregoing is true and correct. Executed on May 25, 2023.



EXPERT NAME

ATTACHMENT A

CURRICULUM VITAE

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Education

Ph.D. Computer Science, University of Washington.

Honors: IBM Graduate Fellowship.

M.Sc. Computer Science, University of Toronto.

Honors: University of Toronto Open Fellowship.

B.S. Mathematics with Highest Distinction, University of Illinois at Urbana-Champaign.

Honors: Phi Beta Kappa, James Scholar.

Academic Experience

Chairman, Department of Computer Science, University of North Carolina at Chapel Hill, Chapel Hill, NC, 2014–2022.

Gillian T. Cell Distinguished Professor in Computer Science, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 2008–present.

S. S. Jones Distinguished Professor in Computer Science, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 2001–2008.

S. S. Jones Distinguished Term Associate Professor of Computer Science, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 2000.

Associate Professor, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 1996–2000.

Visiting Professor, Carnegie Mellon University, School of Computer Science, Pittsburgh, PA, 1994.

Assistant Professor, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 1989–1995.

Honors and Awards

Alumni Achievement Award, University of Washington, Department of Computer Science and Engineering, June 2015.

Excellence in Teaching Award, Computer Science Student Association, University of North Carolina at Chapel Hill, Department of Computer Science, May 2011.

Favorite Faculty Award, an award given by the Computer Science majors of the 2010 graduating class, May 2010.

Carolina Women's Center Women's Advocacy Award, University of North Carolina at Chapel Hill, Chapel Hill, NC, March 2010.

Gillian T. Cell Distinguished Professor in Computer Science, University of North Carolina at Chapel Hill, College of Arts and Sciences, Chapel Hill, NC, June 2008.

Outstanding Teaching Award, an award given by the Computer Science majors of the 2008 graduating class, May 2008.

Favorite Faculty Award, an award given by the Computer Science majors of the 2004 graduating class,

May 2004.

Edward Kidder Graham Outstanding Faculty Award, an award given by the Class of 2004 and the General Alumni Association, April 2004.

Edward Kidder Graham Advisor of the Year Award, an award given by the Class of 2004 and the General Alumni Association, April 2004.

IEEE Service Award, Service to the IEEE Technical Committee on Real-Time Systems, December 2001.

Outstanding Teaching Award, Computer Science Student Association, University of North Carolina at Chapel Hill, Department of Computer Science, May 2000.

S. Shepard Jones Distinguished Term Professorship, University of North Carolina at Chapel Hill, College of Arts and Sciences, Chapel Hill, NC, March 1999.

Award Papers:

ACM SIGCOMM 2000, 2003.

IEEE International Symposium on High Assurance Systems Engineering 1999, 2000.

IEEE Real-Time Technology and Applications Symposium, 1995.

ACM International Conference on Multimedia, 1994.

Computer Networks and ISDN Systems, 1994.

International Workshop on Network and Operating System Support for Digital Audio and Video, 1991, 1992, 1993, 1997.

**Testifying
Experience
(Within Last
Four Years)**

In re: Inter Partes review of U.S. Patent No. 9,878,243.

Provided deposition testimony on behalf of Petitioner DraftKings Inc.

Attila Csupo, et al., v. Google LLC, Superior Court of the State of California for the County of Santa Clara, Case No. 1:19CV352557.

Provided deposition testimony on behalf of defendant Google LLC.

WSOU Investment, LLC d/b/a Brazos Licensing and Development v. Dell Technologies Inc., Dell Inc., EMC Corporation, and VMware Inc., United States District Court for the Western District of Texas, Waco Division, Case Nos. 6:20-cv-00481 & -00486-ADA-DTG.

Provided deposition testimony on behalf of defendant VMware, Inc.

Voxer, Inc. and Voxer IP LLC v. Facebook, Inc. and Instagram LLC, United States District Court for the Western District of Texas, Austin Division, Case No. 1:20-cv-00655 [ADA].

Provided deposition and trial testimony on behalf of defendants Facebook, Inc., and Instagram LLC.

Koninklijke KPN N.V., v. Telefonaktiebolaget LM Ericsson and Ericsson, Inc., United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:21-cv-113.

Provided trial testimony on behalf of defendants Telefonaktiebolaget LM Ericsson and Ericsson, Inc.

In re: Inter Partes review of U.S. Patent No. 7,783,788.

Provided deposition testimony on behalf of Petitioner Hewlett Packard Enterprise Company.

Egenera, Inc., v. Cisco Systems, Inc., United States District Court for the District of Massachusetts, Case No. 1:16-cv-11613-RGS.

Provided deposition and trial testimony on behalf of defendant Cisco Systems, Inc.

In re: Inter Partes review of U.S. Patent No. US 8,243,593.

Provided deposition testimony on behalf of Petitioner Cloudflare, Inc. and Sonicwall, Inc.

Flexiworld Technologies, Inc., v. Roku, Inc., United States District Court for the Western District of Texas, Waco Division, Case No. 6:20-cv-00819-ADA.

Provided deposition testimony on behalf of defendant Roku, Inc.

Longhorn HD, LLC v. Netscout Systems, Inc., United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:20-cv-00349.

Provided deposition and trial testimony on behalf of defendant Netscout Systems, Inc.

ClearDoc, Inc. v. Riverside, Inc., United States District Court for the District of Delaware, Case No. 21-1422-RGA.

Provided deposition testimony on behalf of defendant RiversideFM, Inc.

AlterWAN, Inc. v. Amazon.com, Inc. and Amazon Web Services, Inc., United States District Court for the District of Delaware, Case No. 1:19-cv-01544-MN.

Provided deposition testimony on behalf of defendants Amazon.com, Inc. and Amazon Web Services, Inc.

In the Matter of: Certain Fitness Devices, Streaming Components Thereof, and Systems Containing Same, United States International Trade Commission, Investigation No. 337-TA-1265.

Provided deposition and trial testimony on behalf of complainants DISH DBS Corporation, DISH Technologies, LLC, and Sling TV LLC.

Huawei Technologies Co., Ltd., Huawei Device Co., Ltd., and Huawei Digital Technologies (Chengdu) Co., Ltd. v. Verizon Communications Inc., Cellco Partnership d/b/a Verizon Wireless, and Verizon Business Network Services, Inc., United States District Court for the Western District of Texas, Waco Division, Case No. 6:20-cv-00900.

Provided deposition testimony on behalf of defendants Verizon Communications Inc., *et al.*

In re: Inter Partes review of U.S. Patent No. US 7,450,507.

Provided deposition testimony on behalf of Petitioner NetApp, Inc.

In the Matter of: Certain Digital Video-Capable Devices and Components Thereof, United States International Trade Commission, Investigation No. 337-TA-1224.

Provided deposition and trial testimony on behalf of respondent Intel Corp.

Gigamon Inc., v. Apcon, Inc., United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:19-cv-300.

Provided deposition and trial testimony on behalf of plaintiff Gigamon Inc.

In re: Inter Partes review of U.S. Patent Nos. 10,022,590, 10,322,315, & 10,486,026.

Provided deposition testimony on behalf of Petitioner Echelon Fitness Multimedia, Inc.

Citrix Systems, Inc., v. Workspot Inc., United States District Court for the District of Delaware, Case No. 18-588-GMS.

Provided deposition testimony on behalf of defendant Workspot Inc.

In the Matter of: Certain Audio Players and Controllers, Components Thereof, and Products Containing the Same, United States International Trade Commission, Investigation No. 337-TA-1191.

Provided deposition and trial testimony on behalf of respondent Alphabet Inc. and Google LLC.

Monarch Networking Solutions LLC, v. Cisco Systems, Inc., United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:20-cv-00015-JRG.

Provided deposition testimony on behalf of defendant Cisco Systems, Inc.

Sprint Communications Company L.P., v. Cequel Communications, LLC d/b/a Suddenlink Communications, and CSC Holdings, LLC d/b/a Optimun-Cablevision, United States District Court for the District of Delaware, Case No. 18-1752-RGA.

Provided deposition testimony on behalf of defendants Suddenlink Communications and Optimun-Cablevision.

In re: Inter Partes review of U.S. Patent Nos. 7,710,978, 7,773,588 & 8,560,828.

Provided deposition testimony on behalf of Patent Owner directPacket Research, Inc.

Centripetal Networks, Inc., v. Cisco Systems, Inc., United States District Court for the Eastern District of Virginia, Norfolk Division, Case No. 2:18-cv-00094-HCM-LRL.

Provided deposition and trial testimony on behalf of defendant Cisco Systems, Inc.

In re: Inter Partes review of U.S. Patent Nos. 8,064,935 & 9,602,655.

Provided deposition testimony on behalf of Petitioner Resideo Technologies, Inc.

In the Matter of: Certain Wireless Communication Devices and Related Components Thereof, United States International Trade Commission, Investigation No. 337-TA-1180.

Provided deposition testimony on behalf of respondent HTC Corporation and HTC America, Inc.

Gummarus LLC, v. Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc., United States District Court for the Eastern District of Texas, Sherman Division, Case No. 4:19-cv-00251.

Provided deposition testimony on behalf of defendant Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.

Uniloc 2017, LLC, v. Netflix, Inc., United States District Court for the Central District of California, Los Angeles Division, Case No. 8:18-cv-02055-JVS-DFM.

Provided a tutorial at a Markman Hearing on behalf of defendant Netflix, Inc.

directPacket Research, Inc. v. Polycom, Inc., United States District Court for the Northern District of California, San Jose Division, Case No. 5:19-cv-03918-LHK.

Provided deposition testimony on behalf of plaintiff directPacket Research, Inc.

Symantec Corp. and Symantec Limited v. Zscaler, Inc., United States District Court for the Northern District of California, San Francisco Division, Case No. 3:17-cv-04426-JST.

Provided deposition testimony on behalf of defendant Zscaler, Inc.

In re: Inter Partes review of U.S. Patent Nos. 8,631,120 & 9,148,493.

Provided deposition testimony on behalf of Petitioner Avi Networks, Inc.

Finite State Machine Labs Inc., v. Spectracom Corporation, Orolia USA, Inc., and Orolia S.A., United States District Court for the Western District of Texas, Austin Division, Case Nos. 1:17-cv-01040-SS.

Provided deposition testimony on behalf of defendants Spectracom Corporation, Orolia USA, Inc. and Orolia S.A.

Implicit LLC, v. NetScout Systems Inc. and Sandvine Corporation, United States District Court for the Eastern District of Texas, Marshal Division, Case Nos. 2:18-cv-0053-JRG and 2:18-cv-0054-JRG.

Provided deposition testimony on behalf of defendants NetScout Systems Inc. and Sandvine Corporation, and trial testimony on behalf of defendant NetScout Systems Inc.

In re: Inter Partes review of U.S. Patent Nos. 7,844,037 and 9,203,940.

Provided deposition testimony on behalf of Patent Owner Qualcomm Inc.

Industry Experience

Consultant, Mälardalen University, Västerås, Sweden, 2001.

Member, Technical Advisory Board, Ganymede Software Inc., Research Triangle Park, NC, 1996–1999.

Consultant and Author, INTEROP Graduate Institute, SOFTBANK Inc., Foster City, CA, 1996–1997.

Consultant, National Science Foundation, Arlington, VA, 1995–2014.

Consultant, Monterey Technologies Inc., Cary, NC, 1994–1996.

Consultant, Hewlett-Packard Inc., Ink Jet Components Division, Corvallis, OR, 1993–1994.

Visiting Researcher, IBM T.J. Watson Research Center, Computer Systems Principles Group, Yorktown Heights, NY, 1986.

Consultant, Boeing Aerospace, Kent, WA, 1985–1986.

Software Engineer, R.R. Donnelley & Sons Company Inc., Technical Center, Chicago, IL, 1984.

Computer Programmer, US Army Corps of Engineers Construction Engineering Research Lab, Champaign, IL, 1981–1982.

Community Service Consultant (unpaid), Children’s Museum About the World (now called *Exploris*), Raleigh, NC, 1995–1996.

Professional Activities

Editor Associate Editor, *Real-Time Systems*, Kluwer Academic Publishers, The Netherlands, 2003–2012.

Editor in Chief, *Multimedia Systems*, ACM/Springer-Verlag, Heidelberg, Germany, 2000–2001.

Editorial Board *Journal of Multimedia Tools and Applications*, Kluwer Academic Publishers, 1994–1999.

Guest Editor *Computer Communications*, special issue on system support for multimedia computing, Volume 18, Number 10, October 1995.

Executive ACM/SIGCOMM Internet Measurement Conference Steering Committee, 2005–2009.

Committees College of Reviewers, Canada Research Chairs Program, 2004–2008.

Statistical and Applied Mathematical Sciences Institute (SAMSI) program on Network Modeling for the Internet, 2002–2004.

IEEE Technical Committee on Real-Time Systems, 2000–2007.

ACM Special Interest Group on Multimedia, 2000–2002.

Other Committees *IEEE Distinguished Visitors Program*, 2004–2007.

Conference 11th International Workshop on Quality-of-Service (Co-Chair), Monterey, CA, June 2003.

Program Chair Sixth IEEE Symposium on Computers and Communications, Hammamet, Tunisia, July 2001.

21st IEEE Real-Time Systems Symposium, Orlando, FL, November 2000.

Tenth International Workshop on Network and Operating System Support for Digital Audio and Video, Chapel Hill, NC, June 2000.

Seventh ACM International Conference on Multimedia (Co-Chair), Orlando, FL, November 1999.

SPIE/ACM Multimedia Computing and Networking 1999 (Co-Chair), San Jose, CA, January 1999.

Sixth ACM International Conference on Multimedia (Associate Chair), Bristol, UK, September 1998.

IEEE International Conference on Multimedia Computing Systems (Associate Chair), Austin, TX, June 1998.

SPIE/ACM Multimedia Computing and Networking 1998 (Co-Chair), San Jose, CA, January 1998.

SPIE/ACM Multimedia Computing and Networking 1997 (Associate Chair), San Jose, CA, February 1997.

IEEE Workshop on Resource Allocation Problems in Multimedia Systems, Washington D.C., December 1996.

Second IEEE Real-Time Technology and Applications Symposium, Boston, MA, June 1996.

- Conference General Chair* ACM SIGCOMM Internet Measurement Conference, San Diego, CA, October 2007.
- 22nd IEEE Real-Time Systems Symposium, London, UK, December 2001.
- Tenth International Workshop on Network and Operating System Support for Digital Audio and Video, Chapel Hill, NC, June 2000.
- Third IEEE Real-Time Technology and Applications Symposium, Montreal, Canada, June 1997.
- IEEE Workshop on Resource Allocation Problems in Multimedia Systems, Washington D.C., December 1996.
- Member of Conference Program Committee* 21st IEEE International Conference on Network Protocols, Goettingen, Germany, October 2013.
- 18th IEEE International Conference on Network Protocols, Kyoto, Japan, October 2010.
- ACM SIGCOMM 2010, New Delhi, India, August 2010.
- 17th IEEE International Conference on Network Protocols, Princeton, NJ, October 2009.
- 9th Passive and Active Measurement Conference 2008, Cleveland, OH, April 2008.
- ACM SIGMETRICS 2008, Annapolis, MA, June 2008.
- IEEE INFOCOM 2008, Phoenix, AZ, April 2008.
- 6th ACM SIGCOMM Workshop on Hot Topics in Networks, Atlanta, GA, November 2007.
- 15th IEEE International Conference on Network Protocols, Beijing, China, October 2007.
- 5th IEEE Workshop on Embedded Systems for Real-Time Multimedia, Salzburg, Austria, October 2007.
- Workshop on Experimental Computer Science, ACM FCRC, San Diego, CA, June 2007.
- 15th International Workshop on Quality-of-Service, Chicago, IL, June 2007.
- 17th International Workshop on Network and Operating System Support for Digital Audio and Video, Urbana-Champaign, IL, June 2007.
- 10th IEEE Global Internet Symposium 2007, Anchorage, AK, May 2007.
- ACM SIGMETRICS 2007, San Diego, CA, June 2007.
- 14th IEEE International Conference on Network Protocols, Santa Barbara, CA, October 2006.
- ACM Internet Measurement Conference 2006, Rio de Janeiro, Brazil, October 2006.
- Second ACM SIGCOMM Conference on Future Networking Technologies, Lisbon, Portugal, December 2006.
- 16th International Workshop on Network and Operating System Support for Digital Audio and Video, Newport, RI, June 2006.
- IEEE Workshop on Research Directions for Security and Networking in Critical Real-Time and Embedded Systems, San Jose, CA, April 2006.
- IEEE INFOCOM 2006, Barcelona, Spain, April 2006.
- 13th IEEE International Conference on Network Protocols, Boston, MA, November 2005.
- 15th International Workshop on Network and Operating System Support for Digital Audio and Video, Skamania, WA, June 2005.
- IEEE INFOCOM 2005, Miami, FL, March 2005.
- SPIE/ACM Multimedia Computing and Networking 2005, San Jose, CA, January 2005.
- ACM Multimedia 2004, New York, NY, October 2004.
- ACM Internet Measurement Conference 2004, Taormina, Italy, October 2004.
- 16th EUROMICRO Conference on Real-Time Systems, Catania, Italy, June-July 2004.
- 14th International Workshop on Network and Operating System Support for Digital Audio and Video,

Cork, Ireland, June 2004.

12th International Workshop on Quality-of-Service, Montreal, Canada, June 2004.

10th IEEE Real-time and Embedded Technology and Applications Symposium, Toronto, Canada, May 2004.

IEEE INFOCOM 2004, Hong Kong, March 2004.

24nd IEEE Real-Time Systems Symposium, Cancun, Mexico, December 2003.

19th ACM Symposium on Operating Systems Principles, Lake George, New York, October 2003.

15th EUROMICRO Conference on Real-Time Systems, Porto, Portugal, July 2003.

Ninth IEEE Real-Time and Embedded Technology and Applications Symposium, Toronto, CA, May 2003.

SPIE/ACM Multimedia Computing and Networking 2003, San Jose, CA, January 2003.

23rd IEEE Real-Time Systems Symposium, Austin, TX, November 2002.

10th International Conference on Network Protocols, Paris, France, November 2002.

Second Workshop on Embedded Software, Grenoble, France, October 2002.

22nd IFIP International Symposium on Computer Performance Modeling, Measurement and Evaluation (Performance 2002), Rome, Italy, September 2002.

Eighth IEEE Real-Time and Embedded Technology and Applications Symposium, San Jose, CA, September 2002.

10th International Workshop on Quality-of-Service, Miami, FL, June 2002.

Seventh Global Internet Symposium (held in conjunction with Globecom 2002), Taipei, Taiwan, November 2002.

14th EUROMICRO Conference on Real-Time Systems, Vienna, Austria, June 2002.

ACM SIGMETRICS 2002, Marina del Rey, CA, June 2002.

SPIE/ACM Multimedia Computing and Networking 2002, San Jose, CA, January 2002.

22nd IEEE Real-Time Systems Symposium, London, UK, December 2001.

Sixth Global Internet Symposium (held in conjunction with Globecom 2001), San Antonio, TX, November 2001.

27th EUROMICRO Conference, Warsaw, Poland, September 2001.

Sixth IEEE Symposium on Computers and Communications, Hammamet, Tunisia, July 2001.

Seventh IEEE Real-Time Technology and Applications Symposium, Taipei, Taiwan, June 2001.

Ninth IFIP International Workshop on Quality of Service, Karlsruhe, Germany, June 2001.

SPIE/ACM Multimedia Computing and Networking 2001, San Jose, CA, January 2001.

Fifth Global Internet Mini-Conference (held in conjunction with Globecom 2000), San Francisco, CA, November 2000.

21st IEEE Real-Time Systems Symposium, Orlando, FL, December 2000.

Tenth International Workshop on Network and Operating System Support for Digital Audio and Video, Chapel Hill, NC, June 2000.

Sixth IEEE Real-Time Technology and Applications Symposium, Washington, D.C., June 2000.

SPIE/ACM Multimedia Computing and Networking 2000, San Jose, CA, January 2000.

19th IEEE Real-Time Systems Symposium, Phoenix, AZ, December 1999.

Fourth Global Internet Mini-Conference (held in conjunction with Globecom '99), Rio de Janeiro, Brazil, November 1999.

Fifth International Workshop on Multimedia Information Systems, Palm Springs, CA, October 1999.

Ninth International Workshop on Network and Operating System Support for Digital Audio and Video, Basking Ridge, NJ, June 1999.

IEEE Workshop on QoS Support for Real-Time Internet Applications, Vancouver, Canada, June, 1999.

Second ACM Workshop on Internet Server Performance (held in conjunction with SIGMETRICS '99), Atlanta, GA, May 1999.

Seventh IEEE International Workshop on Parallel and Distributed Real-Time Systems, San Juan, Puerto Rico, April 1999.

SPIE/ACM Multimedia Computing and Networking 1998, San Jose, CA, January 1999.

19th IEEE Real-Time Systems Symposium, Madrid, Spain, December 1998.

Third Global Internet Mini-Conference (held in conjunction with Globecom '98), Sydney, Australia November 1998.

Sixth ACM International Conference on Multimedia, Bristol, UK, September 1998.

Third IEEE/ACM International Workshop on Multimedia Database Management Systems, Dayton, OH, August 1998.

Eighth International Workshop on Network and Operating System Support for Digital Audio and Video, Cambridge, UK, July 1998.

SPIE Interactive Multimedia Services and Equipment, Zurich, Switzerland, May 1998.

IEEE Workshop on Dependable and Real-Time E-Commerce Systems, Denver, CO, June 1998.

Fourth IEEE Real-Time Technology and Applications Symposium, Denver, CO, June 1998.

IEEE International Conference on Multimedia Computing Systems, Austin, TX, June 1998.

SPIE/ACM Multimedia Computing and Networking 1998, San Jose, CA, January 1998.

16th IEEE Symposium on Reliable Distributed Systems, Durham, NC, October 1997.

Third IEEE Real-Time Technology and Applications Symposium, Montreal, Canada, June 1997.

IEEE Real-Time Education Workshop, Montreal, Canada, June 1997.

Seventh International Workshop on Network and Operating System Support for Digital Audio and Video, St. Louis, MO, May 1997.

17th International Conference on Distributed Computing Systems, Distributed Real-Time Systems Track, Performance of Distributed Systems Track, Distributed Multimedia Track, Baltimore, MD, May 1997.

Fifth IFIP International Workshop on Quality of Service, New York, NY, May 1997.

Third International Conference on Computer Science & Informatics, Raleigh-Durham, NC, March 1997.

SPIE/ACM Multimedia Computing and Networking 1997, San Jose, CA, February 1997.

Fourth ACM International Conference on Multimedia, Boston, MA, November 1996.

Second USENIX Symposium on Operating Systems Design and Implementation, Seattle, WA, October/November 1996.

ACM SIGSOFT '96: Fourth Symposium on the Foundations of Software Engineering, San Francisco, CA, October 1996.

Second IEEE International Workshop on Multimedia Database Management Systems, Blue Mountain Lake, NY, August 1996.

Second IEEE Real-Time Technology and Applications Symposium, Boston, MA, June 1996.

Sixth International Workshop on Network and Operating System Support for Digital Audio and Video, Zushi, Japan, April 1996.

First International Workshop on Real-Time Databases: Issues and Applications, Newport Beach, CA, March 1996.

SPIE Multimedia Computing and Networking 1996, San Jose, CA, February 1996.

16th IEEE Real-Time Systems Symposium, Pisa, Italy, December 1995.

Third ACM International Conference on Multimedia, Technical Paper Program, San Francisco, CA, November 1995.

Third ACM International Conference on Multimedia, Video Program, San Francisco, CA, November 1995.

1995 ACM Conference on Organizational Computing Systems, Technical Track, Milpitas, CA, August 1995.

Fifth IEEE Workshop on Hot Topics in Operating Systems, Orcas Island, WA, May 1995.

15th International Conference on Distributed Computing Systems, Distributed Real-Time Systems Track and CSCW track, Vancouver, British Columbia, Canada, May 1995.

Fifth International Workshop on Network and Operating System Support for Digital Audio and Video, Durham, NH, April 1995.

IEEE Workshop on the Role of Real-Time in Multimedia, Research Triangle Park, NC, December 1993.

14th IEEE Real-Time Systems Symposium, Research Triangle Park, NC, December 1993.

13th International Conference on Distributed Computing Systems, Real-Time Issues Track, Pittsburgh, PA, May 1993.

12th IEEE Real-Time Systems Symposium, San Antonio, TX, December 1991.

IEEE Conference on Communication Software: Communications for Distributed Applications and Systems, Chapel Hill, NC, April 1991.

Conference Organizing Committees Finance Chair, IEEE Real-Time Systems Symposium, Miami, FL, December 2005.

Finance Chair, IEEE Real-Time Systems Symposium, Lisbon, Portugal, December 2004.

Finance Chair, IEEE Real-Time Systems Symposium, Cancun, Mexico, December 2003.

Poster Session Chair, ACM Symposium on Operating System Principles, Bolton Landing, NY, October 2003.

Demonstrations Chair, ACM Conference on Computer-Supported Cooperative Work, Research Triangle Park, NC, November 1994.

Wine Steward, ACM Symposium on Operating System Principles, Asheville, NC, December 1993.

Local Arrangements Chair, 14th IEEE Symposium on Real-Time Systems, Durham, NC, December 1993.

Refereed Publications

Technical Papers *Explicit Topology Management for Continental-Scale Airborne Networks*, B. Newton, J. Aikat, K. Jeffay, IEEE INFOCOM Workshop on Wireless Communications and Networking in Extreme Environments, Atlanta, GA, May 2017, pages 72-77.

Scientific Training in the Era of Big Data: A New Pedagogy for Graduate Education, J. Aikat, T. Carsey, K. Fecho, K. Jeffay, A. Krishnamurthy, P.J. Mucha, A. Rajasekar, S. Ahalt, Big Data, Volume 5, Number 1, 2017, pages 12-18.

Geographic Routing in Extreme-Scale Highly-Dynamic Mobile Ad hoc Networks, B. Newton, J. Aikat, K. Jeffay, Proceedings of the 24th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), London, UK, September 2016, pages 205-210.

Simulating Large-Scale Airborne Networks with ns-3, B. Newton, J. Aikat, K. Jeffay, Proceedings of the

2015 ACM Workshop on ns-3, Barcelona, Spain, May 2015, pages 32-39.

Explicit Topology Control for Airborne Networks, B. Newton, K. Jeffay, J. Aikat, Proceedings of the 22nd IEEE International Conference on Network Protocols, Research Triangle, NC, October 2014, pages 368-373.

The Continued Evolution of Web Traffic, B. Newton, K. Jeffay, J. Aikat, Proceedings of the 21st IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), San Francisco, CA, August 2013, pages 80-89.

Gini in a Bottle: A Case Study of Pareto's Principle in the Wild, A. Blate, K. Jeffay, International Journal of Computer Networks and Communications Security, Vol. 1, No. 1, June 2013, pages 30-39.

Experiment Replication Using ProtoGENI Nodes, D. O'Neill, J. Aikat, K. Jeffay, Proceedings of the Second GENI Research and Educational Experiment Workshop, Salt Lake City, UT, March 2013, pages 9-15.

Towards Traffic Benchmarks for Empirical Networking Research: The Role of Connection Structure in Traffic Workload Modeling, J. Aikat, S. Hasan, K. Jeffay, F.D. Smith, Proceedings of the 20th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), Arlington, VA, August 2012, pages 78-86.

Generating Realistic Synthetic TCP Application Workloads, J. Aikat, K. Jeffay, F.D. Smith, Proceedings, GENI Infrastructure Workshop, Princeton, NJ, June 2010, 8 pages.

Correlations of Size, Rate, and Duration in TCP Connections: The Case Against, C. Park, F. Hernández-Campos, J.S. Marron, K. Jeffay, F.D. Smith, Annals of Applied Statistics, Volume 4, Number 1, May 2010, pages 26-52.

Passive, Streaming Inference of TCP Connection Structure for Network Server Management, J. Terrell, K. Jeffay, F.D. Smith, J. Gogan, J. Keller, IFIP International Workshop on Traffic Monitoring and Analysis, Aachen, Germany, May 2009, in, Lecture Notes in Computer Science, Volume 5537, Springer, Berlin, Germany, pages 42-53.

Exposing Server Performance to Network Managers Through Passive Network Measurements, J. Terrell, K. Jeffay, F.D. Smith, J. Gogan, J. Keller, IEEE Internet Network Management Workshop 2008, Orlando, FL, October 2008, pages 1-6.

Multi-Resolution Anomaly Detection for the Internet, L. Zhang, Z. Zhu, K. Jeffay, J.S. Marron, F.D. Smith, IEEE Workshop on Network Management, Phoenix, AZ, April 2008, 6 pages.

The Effects of Active Queue Management and Explicit Congestion Notification on Web Performance, L. Le, J. Aikat, K. Jeffay, F.D. Smith, IEEE/ACM Transactions on Networking, Volume 15, Number 6, December 2007, pages 1217-1230.

Co-Scheduling Variable Execution Time Requirement Real-time Tasks and Non-Real-Time Tasks, A. Singh, K. Jeffay, Proceedings of the 19th Euromicro Conference on Real-Time Systems, Pisa, Italy, July 2007, pages 191-200.

Quantifying the Effects of Recent Protocol Improvements to Standards-Track TCP: Impact on Web Performance, M.C. Weigle, K. Jeffay, F.D. Smith, Computer Communications, Volume 29, Number 15, September 2006, pages 2853-2866.

Tmix: A Tool for Generating Realistic TCP Application Workloads in ns-2, M.C. Weigle, P. Adurthi, F. Hernández-Campos, K. Jeffay, F.D. Smith, ACM Computer Communications Review, Volume 36, Number 3, July 2006, pages 67-76.

A Loss and Queuing-Delay Controller for Router Buffer Management, L. Le, K. Jeffay, F.D. Smith, Proceedings of the 26th IEEE International Conference on Distributed Computing Systems, Lisbon,

Portugal, July 2006, 10 pages.

Understanding Patterns of TCP Connection Usage with Statistical Clustering, F. Hernández-Campos, A.B. Nobel, F.D. Smith, K. Jeffay, 13th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), Atlanta, GA, September 2005, pages 35-44.

Delay-Based Early Congestion Detection and Adaptation: Impact on Web Performance, M.C. Weigle, K. Jeffay, F.D. Smith, Computer Communications, Volume 8, Number 8, May 2005, pages 837-850.

Extremal Dependence: Internet Traffic Applications, F. Hernández-Campos, K. Jeffay, C. Park, J.S. Marron, S.I. Resnick, Stochastic Models, Volume 21, Number 1, 2005, pages 1-35.

Generating Realistic TCP Workloads, F. Hernández-Campos, F.D. Smith, K. Jeffay, Proceedings of the Computer Measurement Group's 2004 International Conference, Las Vegas, NV, December 2004, pages 273-284.

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Stochastic Models for Generating Synthetic HTTP Source Traffic, J. Cao, W.S. Cleveland, Y. Gao, K. Jeffay, F.D. Smith M.C. Weigle, Proceedings of IEEE INFOCOM 2004, Hong Kong, March 2004, Volume 3, pages 1546-1557.

Variability in TCP Roundtrip Times, J. Aikat, J. Kaur, D. Smith, K. Jeffay, Proceedings of the 2003 ACM SIGCOMM Internet Measurement Conference, Miami Beach, FL, October 2003, pages 279-284.

Tracking the Evolution of Web Traffic: 1995-2003, F. Hernández-Campos, K. Jeffay, F.D. Smith, Proceedings of the 11th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS), Orlando, FL, October 2003, pages 16-25.

The Effects of Active Queue Management on Web Performance, L. Le, J. Aikat, K. Jeffay, F.D. Smith, Proceedings of ACM SIGCOMM 2003, Karlsruhe, Germany, August 2003, pages 265-276.

Managing Latency and Buffer Requirements in Processing Graph Chains, S.M. Goddard, K. Jeffay, The Computer Journal, Volume 44, Number 6, 2001, (special issue on high-assurance systems), pages 486-503.

Rate-Based Resource Allocation Methods for Embedded Systems, K. Jeffay, S.M. Goddard, in, *Embedded Software*, Proceedings of the First International Workshop on Embedded Software (EMSOFT 2001), Tahoe City, CA, October 2001, Lecture Notes in Computer Science, Volume 2211, T. Henzinger, C. Kirsch, editors, Springer-Verlag, Berlin, Germany, 2001, pages 204-222.

Beyond Audio and Video: Multimedia Networking Support for Distributed, Immersive Virtual Environments, K. Jeffay, T. Hudson, M. Parris, Proceedings of the 27th EUROMICRO Conference, Warsaw, Poland, September 2001, pages 300-307.

Tuning RED for Web Traffic, M. Christiansen, K. Jeffay, D. Ott, F.D. Smith, IEEE/ACM Transactions on Networking, Volume 9, Number 3, (June 2001), pages 249-264.

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Experiments in Best-Effort Multimedia Networking for a Distributed Virtual Environment, T. Hudson, M.C. Weigle, K. Jeffay, R.M. Taylor II, in *Multimedia Computing and Networking 2001*, Proceedings, SPIE Proceedings Series, Volume 4312, San Jose, CA, January 2001, pages 88-98.

Analyzing the Real-Time Properties of a U.S. Navy Signal Processing System, S.M. Goddard, K. Jeffay, International Journal of Reliability, Quality and Safety Engineering, Volume 8, Number 4, December 2001, (special issue of HASE '99 best papers) pages 301-322.

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Towards a Better-Than-Best-Effort Forwarding Service for Multimedia Flows, K. Jeffay, IEEE Multimedia, Volume 6, Number 4, October-December 1999, pages 84-88.

A Theory of Rate-Based Execution, K. Jeffay, S.M. Goddard, Proceedings of the 20th IEEE Real-Time Systems Symposium, Phoenix, AZ, December 1999, pages 304-314.

Parallel Switching in Connection-Oriented Networks, S. Baruah, K. Jeffay, J. Anderson, Proceedings of the 20th IEEE Real-Time Systems Symposium, Phoenix, AZ, December 1999, pages 200-209.

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Efficient Object Sharing in Quantum-Based Real-Time Systems, J.H. Anderson, R. Jain, K. Jeffay, Proceedings of the 19th IEEE Real-Time Systems Symposium, Madrid, Spain, December 1998, pages 346-355.

A Better-Than-Best-Effort Service for Continuous Media UDP Flows, M. Parris, K. Jeffay, F.D. Smith, J. Borgersen, Proceedings of the Eighth International Workshop on Network and Operating System Support for Digital Audio and Video, Cambridge, UK, July 1998, pages 193-197.

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Fair On-Line Scheduling of a Dynamic Set of Tasks on a Single Resource, S.K. Baruah, J.E. Gehrke, C.G. Plaxton, I. Stoica, H. Abdel-Wahab, K. Jeffay, *Information Processing Letters*, Volume 64, Number 1, October 1997, pages 43-51.

A Two-Dimensional Audio Scaling Enhancement to an Internet Videoconferencing System, P. Nee, K. Jeffay, M. Clark, G. Danneels, Proceedings of the International Workshop on Audio-Visual Services over

Packet Networks, Aberdeen, Scotland, UK, September 1997, pages 201-206.

Feasibility Concerns in PGM Graphs With Bounded Buffers, S. Baruah, S. Goddard, K. Jeffay, Proceedings of the Third IEEE International Conference on Engineering of Complex Computer Systems, Como, Italy, September 1997, pages 130-139.

Analyzing the Real-Time Properties of a Dataflow Execution Paradigm Using a Synthetic Aperture Radar Application, S. Goddard, K. Jeffay, Proceedings of the Third IEEE Real-Time Technology and Applications Symposium, Montreal, Canada, June 1997, pages 60-71.

Real-Time Computing with Lock-Free Shared Objects, J.H. Anderson, S. Ramamurthy, K. Jeffay, ACM Transactions on Computing Systems, Volume 15, Number 2, May 1997, pages 134-165.

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Method for Understanding the Use of TCP/IP Networks by Users, and Non-Parametric Generation of Synthetic Internet Traffic, U.S. Patent Number 7,447,209, F. Hernández-Campos, K. Jeffay, F.D.

Smith, A. Nobel, November 2008.

User Controlled Adaptive Flow Control for Packet Networks, U.S. Patent Number 5,892,754, V. Kompella, F.D. Smith, J.P. Gray, and K. Jeffay, April 1999.

Public Demonstrations

Education Modules for Networking, Cloud Computing and Security in Systems Courses, J. Aikat, K. Jeffay, Demo session at the ACM SIGCSE, Special Interest Group for Computer Science Education, Memphis, TN, March 2016.

Exploring the Internet's Future with GENI (Global Environment for Network Innovations), J. Aikat, K. Jeffay, NSF Higher Education Technology Conference 2013, Morgantown, WV, October 2013.

Your first experiment on GENI: a Hands-on Tutorial, J. Aikat, K. Jeffay, NSF Higher Education Technology Conference 2013, Morgantown, WV, October 2013.

NSF Workshop on GENI in Education (one day), J. Aikat, K. Jeffay, New York University - Polytechnic, NY, October 2013.

Using the GENI Networking Testbed, J. Aikat, K. Jeffay, ACM SIGCSE, Special Interest Group for Computer Science Education, Denver, Colorado, March 2013.

Run your Systems/Networking Experiments using (free) GENI Resources, Lunchtime Table Topics, S. Zolayvar, W. Yau, J. Aikat, K. Jeffay, Grace Hopper Celebration of Women in Computing, Baltimore, Maryland, October 2012.

NSF Workshop on Designing Tools and Curricula for Undergraduate Courses in Distributed Systems, J. Aikat, K. Jeffay, Boston, MA, July 2012.

Introduction to Network Experiments using the GENI CyberInfrastructure, J. Aikat, K. Jeffay, ACM SIGMETRICS/Performance Joint International Conference on Measurement and Modeling of Computer Systems, London, UK, June 2012.

The nanoManipulator "reverse field trip" to Orange County High-School, G. Jones, R. Superfine, R.M. Taylor, M. Whitton, T. Lovelace, R. Parameswaran, K. Jeffay, F.D. Smith, Orange County High School, Hillsboro, NC, November 1999.

The Distributed NanoManipulator Project, R.M. Taylor, K. Jeffay, T. Hudson, M. Clark, an invited demonstration for the Internet 2 Spring 1999 Members Meeting, Washington, DC, April 1999.

A Demonstration of Internet Access to UNC-CH Advanced Microscopy Facilities for Science Education Outreach, K. Jeffay, F.D. Smith, R. Superfine, G. Jones, R.M. Taylor, T. Hudson, M. Clark, Orange County High School, Hillsboro, NC, June 1998.

The Artifact-Based Collaboration (ABC) System, J.B. Smith, K. Jeffay, D. Shackelford, J. Menges, J. Hilgedic, B. Ladd, M. Parris, E. Kupstas, T. Ellis, and T. Hudson, CSCW '94, ACM Conference on Computer-Supported Cooperative Work, RTP, NC, October 1994.

CONCUR: A Window System Supporting Window Sharing, J. Menges and K. Jeffay, CSCW '94, ACM Conference on Computer-Supported Cooperative Work, RTP, NC, October 1994.

Adaptive, Best-Effort Delivery of Live Audio and Video Across Packet-Switched Networks, K. Jeffay, Second MCNC/NSF Packet Video Workshop, Research Triangle Park, NC, December 1992.

Grants and Awards

GENI in the classroom: Course Modules for Teaching Networking Concepts, J. Aikat, K. Jeffay, National

Science Foundation (GENI Project: Raytheon Corporation), October 2013, 3 years, \$178,978.

II-New: Seeing the Future: Ubiquitous Computing in EyeGlasses, J.-M. Frahm, *et al.*, National Science Foundation, November 2013, 3 years, \$613,623.

GENI Tutorial at ACM SIGCSE, J. Aikat, K. Jeffay, National Science Foundation, grant number CNS 13-32340, March 2013, 1 year, \$13,388.

Development of Education and Training Resources for GENI Experimenters, K. Jeffay, J. Aikat, Global Environment for Network Innovations/National Science Foundation, December 2011, 3 years, \$388,590.

Exploring Privacy Breaches in Encrypted VoIP Communications, F. Monroe, K. Jeffay, National Science Foundation, grant number CNS 10-17318, August 2010, 3 years, \$496,492.

Synthetic Traffic Generation Tools and Resource: A Community Resource for Experimental Networking Research, K. Jeffay, F.D. Smith, UNC, M. Weigle, Old Dominion University, A. Vahdat, University of California San Diego, P. Barford, University of Wisconsin, National Science Foundation, grant number CRI 07-09081, August 2007, 3 years, \$799,745.

Modeling and Testing of Application Workloads on Corporate Enterprise Networks, K. Jeffay, F.D. Smith, IBM Global Services Faculty Award, September 2006, 2 years, \$70,000 (exempt from indirect costs).

Tera-pixels: Using High-resolution Pervasive Displays to Transform Collaboration and Teaching, K. Jeffay, A. Lastra, K. Mayer-Patel, L. McMillan, F.D. Smith, National Science Foundation (CISE RI Program), grant number EIA 03-03590, August 2003, 5 years, \$962,902.

Extracting and Using Semantic Information in Network Workloads, K. Jeffay, F.D. Smith, IBM Global Services Faculty Award, September 2006, 1 year, \$40,000 (exempt from indirect costs).

Modeling and Testing of Application Workloads on Corporate Enterprise Networks, K. Jeffay, F.D. Smith, IBM Global Services Faculty Award, September 2006, 1 year, \$40,000 (exempt from indirect costs).

Generation and Validation of Synthetic Internet Traffic, K. Jeffay, F.D. Smith, A.B. Noble, National Science Foundation, grant number ANI 03-23648, September 2003, 3 years, \$470,000.

Rate-Based Resource Allocation Methods for Real-Time Embedded Systems, K. Jeffay, F.D. Smith, National Science Foundation, grant number CCR 02-08924, August 2002, 3 years, \$179,990.

Empirical Workload Characterizations for Advanced Networks, K. Jeffay, F.D. Smith, Cisco Systems, November 2000, 3 years, \$212,500.

Support for Active Queue Management, Distributed XP Programming, and a Teaching Laboratory for Web Services, F.D. Smith, K. Jeffay, J.B. Smith, P.D. Stotts, IBM Shared University Research Grant, August 2002, 1 year, \$83,000.

Internet Traffic Measurement and Analysis and A Teaching Laboratory for Enterprise Java Computing, F.D. Smith, K. Jeffay, J.B. Smith, P.D. Stotts, IBM Shared University Research Grant, April 2001, 1 year, \$83,000.

An NS Implementation of the HTTP Connection Model, F.D. Smith, K. Jeffay, M. Clark Weigle, Lucent Technologies, April 2001, \$10,000.

Multimedia Networking Research in Support of Virtual Field Trips, K. Jeffay, F.D. Smith, R.M. Taylor II, Dell Computer Corporation Strategic Technology and Research (STAR) program, December 2000, 1 year, \$25,000.

Rate-based Scheduling Technology for Latency-Sensitive Graphics Applications, J. Anderson, S. Baruah,

K. Jeffay, R. Taylor, National Science Foundation, grant number ITR 00-82866, September 2000, 3.5 years, \$350,000.

Active Router Queue Management for Congestion Control and Quality-of-Service, K. Jeffay, F.D. Smith, National Science Foundation, grant number ITR 00-82870, September 2000, 3 years, \$451,903.

Internet Measurements and Analysis to Support the nanoManipulator and Tele-Immersion, F.D. Smith, K. Jeffay, P. Jones, IBM Shared University Research Grant, September 2000, 1 year, \$250,000.

The Performance of Differentiated Services Implementations for Supporting Distributed Virtual Environment Applications, K. Jeffay, North Carolina Network Initiative, September 2000, 1 year, \$25,000.

Empirical Application-Workload Characterizations for Advanced Networks, K. Jeffay, F.D. Smith, Sun Microsystems, September 2000, \$79,000.

Empirical Application-Workload Characterizations for Advanced Networks, F.D. Smith, K. Jeffay, MCNC, September 2000, 1 year, \$50,000.

A Quality-of-Service Network for the nanoManipulator, K. Jeffay, Cabletron Inc. and the North Carolina Network Initiative, September 1999, \$25,000.

Interactive Graphics for Molecular Studies and Microscopy — Supplement for Collaborative Science, F.P. Brooks, D. Erie (Chemistry), K. Jeffay, J. Samulski (Gene Therapy), F.D. Smith, D. Sonnenwald (Information and Library Science), R. Superfine (Physics and Astronomy), R. Taylor, National Institute of Health, October 1998, 4 years, \$1,902,544.

Computing Power for Collaborative Science, S.R. Aylward, G. Bishop, D.W. Brenner, E. Bullitt, E.L. Chaney, V.L. Chi, B.J. Dempsey, N. England, A.G. Gash, D. Fritsch, H. Fuchs, B. Hemminger, J. Hermans, K. Jeffay, K. Keller, A. Lastra, M. Lin, D. Manocha, L.S. Nyland, S.M. Pizer, J.W. Poulton, J.F. Prins, J. Rosenman, F.D. Smith, R. Superfine, R.M. Taylor, S. Tell, G. Tracton, A. Tropsha, S. Washburn, G. Welch, Intel Corporation, August 1998, 3 years, \$2,858,747. PI on *Multimedia Networking* and *A Distributed Teaching Laboratory for Networking and Internet Technologies* sections (F.D. Smith, B.J. Dempsey, Co-PIs), \$557,669.

Empirical Application-Workload Characterizations for Advanced Networks, F.D. Smith, K. Jeffay, North Carolina Network Initiative, September 1998, \$40,000.

Congestion control for high-speed networks, F.D. Smith, K. Jeffay, IBM Corporation, 1998, \$20,000.

A Communications Middleware For Immersive Distributed Virtual Environments, K. Jeffay, North Carolina Network Initiative, 1998, \$15,000.

Technology for Real-Time Services in Protocol Stack Implementations, K. Jeffay, IBM Corporation, 1997, \$80,000.

Internet Access to UNC-CH Advanced Microscopy Facilities for Science Education Outreach, K. Jeffay, R. Superfine (Physics and Astronomy), G. Jones (Education), University of North Carolina at Chapel Hill Instructional Technology Award, 1997, \$29,750.

Support for the Real-Time Technology and Applications Symposium, K. Jeffay, Office of Naval Research, 1997, \$7,000.

Research Experience For Undergraduates supplement to *Object Sharing Technology For Real-Time Systems*, J. Anderson, K. Jeffay, National Science Foundation, 1996, \$10,000.

Infrastructure for Research in Collaborative Systems, S.F. Weiss, J.B. Smith, K. Jeffay, P. Dewan, P. D. Stotts, D.K. Smith, F.D. Smith, W. Oliver (U.S. Armed Forces Institute of Pathology), National Science

Foundation, grant number CDA-9624662, August 1996, 5 years, \$1,260,830.

Collaboration Bus: An Infrastructure for Supporting Interoperating Collaborative Systems, P. Dewan, K. Jeffay, H. Abdel-Wahab (Old Dominion University), P. D. Stotts, L. Nyland, J.B. Smith, J. Mchugh (Portland State University), J. Menges (Hewlett Packard), Advanced Research Projects Agency, grant number 96-06580 (High Performance Distributed Services Technology), 1996, \$973,334.

Object Sharing Technology For Real-Time Systems, J. Anderson, K. Jeffay, National Science Foundation, grant number CCR 95-10156, 1996, \$209,442.

Flexible Shared Windows, P. Dewan, K. Jeffay, National Science Foundation, grant number IRIS 95-08514, 1995, \$343,811.

An ATM Testbed For Multimedia Networking and Computer-Supported Cooperative Work, K. Jeffay, IBM Corporation, 1995, \$400,000.

An Examination of Flow and Congestion Control Mechanisms for Media Transmission in Collaborative Systems, K. Jeffay, IBM Corporation, 1995, \$125,242.

Software Infrastructure for the Rapid Development of Interactive and Collaborative Educational Simulations, J.F. Prins, K. Jeffay, P.D. Stotts, L.S. Nyland, Advanced Research Projects Agency, grant number 95-36871 (Computer Aided Education and Training Initiative), 1995, \$200,000.

A Proposal For Network Routers, K. Jeffay, IBM Corporation, Research Triangle Park, NC, 1994, \$40,000.

System Support For Video Teleconferencing Across Local Area Networks, K. Jeffay, Intel Corporation, 1993, \$253,385.

The Integration and Use of Digital Audio and Video in Desktop Computing Environments, K. Jeffay, IBM Corporation, 1993, \$100,000.

Construction of a UNC-Tektronix MBONE Link, K. Jeffay, Tektronix Corporation, 1993, \$10,000.

An Empirical Determination of the Limits of Human Perception of Properties of Digital Audio and Video Streams, K. Jeffay, University of North Carolina Research Council, 1993, \$2,000.

Processor and Resource Allocation Problems in Hard-Real-Time Systems: Theory and Practice, K. Jeffay, National Science Foundation, RIA Award, 1991, \$59,400.

Accommodating Continuous Media in a Local Area Network: An exercise in distributed real-time computing, K. Jeffay, University of North Carolina Junior Faculty Development Award, 1990, \$3,000.

Building and Using a Collaboratory: A Foundation for Supporting and Studying Group Collaborations, J.B. Smith, F.D. Smith, P. Calingaert, K. Jeffay, J.R. Hayes, D. Holland, M. Lansman, National Science Foundation, grant number ICI-9015443, 1990, \$946,000.

Enhanced program of research and teaching in communications software and distributed systems, K. Jeffay, IBM Corporation, 1989, \$429,000.

The Design and Construction of Predictable Real-Time Systems, K. Jeffay, Digital Faculty Program Award, Digital Equipment Corporation, 1989, \$180,000.

Invited Presentations

<i>Keynote Addresses</i>	<i>Network Neutrality Considered Harmful</i>, <i>PearlHacks</i>, University of North Carolina at Chapel Hill, Chapel Hill, NC, March 2014. <i>Carolina Science Café</i>, University of North Carolina at Chapel Hill, Chapel Hill, NC,
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May 2015.

Network Neutrality Considered Harmful, Revisiting the Quality-of-Service Morass

ACM International Workshop on Network and Operating System Support for Digital Audio and Video, Newport, RI, May 2006.

Rate-Based Resource Allocation Methods for Multimedia Computing

SPIE Multimedia Computing and Networking 2003, Santa Clara, CA, January 2003.

Network Support For Distributed Virtual Environments: The Tele-nanoManipulator

NCNI Advanced Networking Symposium, Research Triangle Park, NC, May 1999.

The Internet 2 Spring Members Meeting (presented jointly with R.M. Taylor), Washington, DC, April 1999.

Network Support For Distributed, Immersive, Virtual Environments

Workshop on Automated Control of Distributed Instrumentation, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, Urbana, IL, April 1999.

The Future of Networking: The Networking Revolution Has Yet to Begin

North Carolina Governor's Board of Science and Technology Retreat, Banner Elk, NC, September 1998.

Distinguished Lectures *The Synthetic Traffic Generation Problem: The least sexy problem in computer networking*
University of Minnesota, Minneapolis, MN, January 2008.

The Effect of Active Queue Management on Web Performance: The Good, the Bad, and the Ugly

University of Nebraska, Lincoln, NE, November 2003.

University of Pennsylvania, April 2004.

The Evolution of Quality-of-Service on the Internet

Mälardalen University, Sweden, February 2001.

Colloquia *Efficient Topology Management and Geographic Routing in High-Capacity Continental- Scale Airborne Networks*

University of Virginia, November 2017.

The Evolution of Quality-of-Service on the Internet

IEEE Computer Society Seattle Chapter, Seattle, WA, September 2005.

Modeling and Generating TCP Application Workloads

Georgia Institute of Technology, Atlanta, GA, September 2005.

Microsoft Research, Redmond, WA, September 2005.

Worcester Polytechnic Institute, Worcester, MA, July 2005.

Cisco Systems, RTP, NC, May 2005 (presently jointly with F. Hernandez-Campos and F.D. Smith).

A Rate-Based Execution Abstraction For Embedded Real-Time Systems

University of Pennsylvania, April 2004.

How “Real” Can Synthetic Network Traffic Be?

University of Virginia, March 2004.

Non-Parametric Approach to Generation and Validation of Synthetic Network Traffic

Columbia University, New York, NY, January 2004.

Is Explicit Congestion Notification (ECN) Worthwhile?

Cisco Systems, San Jose, CA, October 2003.

Intel Architecture Labs, Hillsboro, OR, October 2003.

Tuning RED for Web Traffic: RED Considered Harmful?

Sprint Advanced Technology Research Laboratories, San Francisco, CA, March 2000.

University of Illinois at Urbana-Champaign, Urbana, IL, March 2000.

Internet Traffic: Measurement & Generation

Ganymede Software, Research Triangle Park, NC, June 1999. (Presented jointly with F.D. Smith.)

Lightweight Active Router-Queue Management for Multimedia Networking

University of Toronto, October 2000.

HP Laboratories, Palo Alto, CA, January 1999.

Sprint Advanced Technology Research Laboratories, San Francisco, CA, January 1999.

A Better-Than-Best-Effort Service For UDP: Lightweight Active Router-Queue Management for Multimedia Networking

University of Virginia, January 1999.

Congestion Control Mechanisms for Real-Time Communications on the Internet

IBM Networking Systems, Research Triangle Park, NC, November 1998.

A Better Than Best-Effort Forwarding Service For UDP

Microsoft Research, Redmond, WA, March 1998.

IBM Networking Systems, Research Triangle Park, NC, March 1998.

Multimedia Networking Research at UNC Chapel Hill

IBM Networking Systems, Research Triangle Park, NC, February 1998.

Lucent Technologies, Bell Laboratories, Holmdel, NJ, June 1997.

Design Principles for Distributed, Interactive, Virtual Laboratories

Mitsubishi Electric Research Laboratory, Cambridge, MA, January 1998.

Lucent Technologies, Bell Laboratories, Holmdel, NJ, June 1997.

The Performance of Two-Dimensional Media Scaling for Internet Videoconferencing

Mitsubishi Electric Research Laboratory, Cambridge, MA, January 1998.

Carnegie Mellon University, Pittsburgh, PA, March 1997.

Some Approaches to Enabling Real-Time Computation on Desktop Operating Systems

Honeywell Technology Center, Minneapolis, MN, October 1996.

Two-Dimensional Scaling Techniques for Adaptive, Rate-Based Transmission Control of Live Audio and Video Streams

Oregon State University, Corvallis, OR, May 1996.

A Router-Based Congestion Control Scheme For Real-Time Continuous Media

Intel Architecture Development Laboratory, Hillsboro, OR, May 1996.

NetEdge Inc., Research Triangle Park, NC, March 1996.

North Carolina State University, Raleigh, NC, March 1996.

A Hybrid Reservation-Based/Best-Effort Transmission Scheme For Real-Time Transmission of Multimedia Data

Intel Research Council, Hillsboro, OR, November 1995.

Operating System Support For Multimedia Computing

IBM Networking Systems, Research Triangle Park, NC, July 1995.

Network Support For Multimedia Computing

IBM Networking Systems, Research Triangle Park, NC, July 1995.

A Rate-Based Execution Abstraction For Multimedia Computing

Tektronix Computer Research Laboratory, Beaverton, OR, May 1996.

INRIA, Rocquencourt, France, December 1995.

AT&T Bell Laboratories, Murray Hill, NJ, July 1995.

A Theory of Rate-Based Scheduling

Carnegie Mellon University, Pittsburgh, PA, August 1994.

Demonstration of Videoconferencing Over Packet-Switched Internetworks

Global Lecture Hall of the U.S.-Russian Electronic Distance Education System/TELE-TEACHING '93, Trondheim, Norway (via satellite from Chapel Hill), August 1993.

Transport and Display Mechanisms For Multimedia Conferencing Across Packet-Switched Networks

York University, York, England, November 1993.

Purdue University, West Lafayette, IN, February 1993.

Intel Architecture Development Laboratory, Hillsboro, OR, February 1993.

Oregon Graduate Institute, Beaverton, OR, February 1993.

Second MCNC/NSF Packet Video Workshop, Research Triangle Park, NC, December 1992.

Carnegie Mellon University, Pittsburgh, PA, November 1992.

Multimedia and Conferencing Research at UNC-CH

IBM Multimedia Networking, Research Triangle Park, NC, September 1992.

System Support for Synchronous Collaboration

North Carolina Artificial Intelligence and Advanced Computing Symposium, Raleigh, NC, March 1992.

Software Architectures for Predictable Real-Time Computer Systems

Carnegie Mellon University, Pittsburgh, PA, March 1992.

Operating System Requirements for Digital Audio and Video

MCNC/NSF Packet Video Videoconferencing Workshop, Research Triangle Park, NC, December 1991.

Some Experiments With Live Digital Audio and Video on a Local-Area Network

IBM European Networking Center, Heidelberg, Germany, November 1991.

Network and Operating System Support for Digital Audio and Video

Duke University, Durham, NC, November 1994.
 Carnegie Mellon University, Pittsburgh, PA, April 1994.
 Intel Corporation, Hillsboro, OR, December 1993.
 IBM Networking Systems, Research Triangle Park, NC, June 1992.
 IBM TJ Watson Research Center, Yorktown Heights, NY, March 1992.
 University of Washington, Seattle, WA, February 1992.
 Old Dominion University, Norfolk, VA, October 1991.

Systems Research in the UNC Collaboration Project

Intel Architecture Development Laboratory, Hillsboro, OR, May 1992.
 University of Colorado, Boulder, CO, March 1991.

Some Deterministic Resource Allocation Problems in Real-Time Computer Systems

Research Triangle Institute, Research Triangle Park, NC, June 1990.
 University of North Carolina at Chapel Hill, Department of Operations Research, Chapel Hill, NC, October 1989.

The Real-Time Producer/Consumer Paradigm: Towards Verifiable Real-Time Computations

Carnegie-Mellon University, Pittsburgh, March 1991.
 Duke University, Durham, NC, June 1990.
 Technical University of Denmark, Lyngby, Denmark, September 1989.
 University of California at Davis, Davis, CA, April 1989.
 University of Minnesota, Minneapolis, MN, April 1989.
 Purdue University, West Lafayette, IN, April 1989.
 University of North Carolina at Chapel Hill, Chapel Hill, NC, April 1989.
 University of British Columbia, Vancouver, BC, Canada, April 1989.
 Rice University, Houston, TX, March 1989.
 University of Arizona, Tucson, AZ, March 1989.
 Oregon Graduate Center, Beaverton, OR, March 1989.
 Tektronix Computer Research Laboratory, Beaverton, OR, March 1989.
 University of Colorado, Boulder, CO, March 1989.
 IBM TJ Watson Research Center, Yorktown Heights, NY, March 1989.
 IBM Systems Integration Division, Owego, NY, March 1989.
 New York University, New York, NY, March 1989.
 Bell Communications Research, Morristown, NJ, March 1989.

Concurrent Programming With Time

Olivetti Research Center, Menlo Park, CA, December 1987.
 IBM TJ Watson Research Center, Yorktown Heights, NY, September 1987.
 Columbia University, New York, NY, September 1987.

Short Courses *Trends in Congestion Control and Quality-of-Service: Active queue management on the Internet of the future*

Mälardalen University, Sweden, February 2001.

Rate-Based Execution Models For Real-Time Multimedia Computing

Scuola Superiore Santa Anna, Pisa, Italy, September 1997.

Tutorials *Issues in Multimedia Delivery Over Today's Internet*

IEEE International Conference on Multimedia Computing Systems, Austin, TX, June 1998.

Systems Issues in the Design and Realization of Desktop Videoconferencing Systems,

Second ACM International Conference on Multimedia, San Francisco, CA, October 1994.