

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HP INC., DELL TECHNOLOGIES INC., DELL INC., LENOVO (UNITED
STATES) INC.,
Petitioners,

v.

UNIVERSAL CONNECTIVITY TECHNOLOGIES, INC.,
Patent Owner.

IPR2024-01428
U.S. Patent No. 7,154,905

**DECLARATION OF ANDREW WOLFE, PH.D.
UNDER 37 C.F.R. § 1.68 IN SUPPORT OF PETITION FOR
INTER PARTES REVIEW**

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I, Dr. Andrew Wolfe, do hereby declare as follows:

I. INTRODUCTION

1. I am making this declaration at the request of Petitioners HP Inc., Dell Technologies Inc., Dell Inc., and Lenovo (United States) Inc. (collectively, “Petitioners”) in the matter of this *Inter Partes* Review of U.S. Patent No. 7,154,905 (“the ’905 patent”).

2. I am being compensated for my work on this matter and for reasonable and customary expenses associated with my work and testimony in this proceeding. My compensation is not contingent on the outcome of this matter or the specifics of my testimony, and I have no other interest in this case or the parties thereto.

3. I have been asked to provide my opinions regarding whether claims 1-3, 5, 7-10, 12, 14-17, 20-23, and 26 (the “Challenged Claims”) of the ’905 patent are unpatentable insofar as they would have been anticipated and/or obvious to a person having ordinary skill in the art (“POSITA”) at the time of the alleged invention, in light of the prior art.

4. It is my opinion that every element of the Challenged Claims is found in the prior art references.

5. It is also my opinion that all of the Challenged Claims are unpatentable in that they would have been anticipated and/or obvious to a POSITA.

6. In the preparation of this declaration, I have reviewed the below as well as any other documents cited herein not listed below:

Ex. 1001	U.S. Patent No 7,154,905 (“’905 Patent”)
Ex. 1002	Prosecution History of U.S. Patent No. 7,154,905 (U.S. Patent Application Number 10/035,911)
Ex. 1004	U.S. Patent No. 5,557,608 to Calvignac <i>et al.</i> (“Calvignac”)
Ex. 1005	United Kingdom Patent Application No. GB 2344029 to Banes (“Banes”)
Ex. 1006	U.S. Patent No. 5,974,464 to Shin <i>et al.</i> (“Shin ’464”)
Ex. 1007	European Patent Application 0582537 to Cidon (“Cidon”)
Ex. 1008	U.S. Patent No. 5,999,571 (“Shin ’571”)
Ex. 1009	U.S. Patent No. 4,486,739 to Franaszek (“Franaszek”)
Ex. 1010	U.S. Patent No. 5,304,996, to Hsu <i>et al.</i> (“Hsu”)
Ex. 1011	<i>Commands for Host-Processed and Host-Controlled Modems, Reference Manual</i> , Conexant Systems, Inc. (April 5, 2001)
Ex. 1012	<i>IEEE Standard 802.3, Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications</i> , The Institute of Electrical and Electronics Engineers (1998) (“802.3”)
Ex.1013	U.S. Pat. No. 6,229,859 to Jeong (“’859 patent”)
Ex.1014	“8b/10b encoding,” located at https://en.wikipedia.org/wiki/8b/10b_encoding
Ex.1015	“High-Level Data Link Control,” located at https://en.wikipedia.org/wiki/High-Level_Data_Link_Control
Ex.1016	Curriculum Vitae of Andrew Wolfe, Ph.D
Ex.1017	<i>IEEE Standard Amendment 802.3ae</i> , The Institute of Electrical and Electronics Engineers (August 30, 2002) (“802.3ae”)

7. In forming the opinions expressed below, I have considered: the documents listed above, the relevant legal standards, including the standards for anticipation and obviousness; any additional authoritative documents as cited in the body of this declaration; and my own knowledge and experience based upon my work in the computer and electronics fields.

8. I may rely upon these materials, my knowledge and experience, and/or additional materials to rebut arguments raised by the patent owner. Further, I may also consider additional documents and information in forming any necessary opinions, including documents that may not yet have been provided to me.

9. Unless otherwise noted, all emphasis in any quoted material has been added.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

10. My complete qualifications and professional experience are described in my *Curriculum Vitae*, a current copy of which can be found in **Exhibit 1016**. The following is a brief summary of my relevant qualifications and professional experience.

11. In 1985, I earned a Bachelor's degree in Electrical Engineering and Computer Science from The Johns Hopkins University. In 1987, I received an Master's degree in Electrical and Computer Engineering from Carnegie Mellon University. In 1992, I received a Ph.D. in Computer Engineering from Carnegie

Mellon University. My doctoral dissertation proposed a new approach for the architecture of a computer processor.

12. I have more than 35 years of experience as a computer architect, computer system designer, personal computer graphics designer, educator, and executive in the electronics industry.

13. In 1983, I began designing touch sensors, microprocessor-based computer systems, and I/O (input/output) cards for personal computers as a senior design engineer for Touch Technology, Inc. During the course of my design projects with Touch Technology, I designed I/O cards for PC-compatible computer systems, including the IBM PC-AT, to interface with interactive touch-based computer terminals that I designed for use in public information systems.

14. I have extensive experience in the design, development, and analysis of portable computing devices including portable PCs. In the mid-late 1980s I worked as part of the development team for the Linus Write-Top, which is commonly acknowledged to be the first commercial tablet computer. I later worked on screen technology for many handheld computing devices including the Motorola Envoy and prototypes for the Apple Newton.

15. From 1986 through 1987, I designed and built a high-performance computer system as a student at Carnegie Mellon University. From 1986 through

early 1988, I also developed the curriculum and supervised the teaching laboratory for processor design courses.

16. At the end of 1989, I (along with some partners) reacquired the rights to the technology I had developed at Touch Technology and at AMP and founded The Graphics Technology Company. Over the next seven years, as an officer and a consultant for The Graphics Technology Company, I managed the company's engineering development activities and personally developed dozens of touch screen sensors, controllers, and interactive touch-based computer systems.

17. I have also served as a technology advisor to Motorola and to several venture capital funds in the U.S. and Europe. Currently, I am a director of Turtle Beach Corporation, providing guidance in its development of premium audio peripheral devices for a variety of commercial electronic products.

18. From 1991 through 1997, I served on the Faculty of Princeton University as an Assistant Professor of Electrical Engineering. At Princeton, I taught undergraduate and graduate-level courses in Computer Architecture, Advanced Computer Architecture, Display Technology, and Microprocessor Systems, and conducted sponsored research in the areas of embedded computing systems, multimedia, video signal processors, compiler optimization, and high performance computer architecture. I was also a principal investigator for DOD research in video

technology and a principal investigator for the New Jersey Center for Multimedia Research.

19. At Princeton, I received several teaching awards, both from students and from the School of Engineering. I have also taught advanced microprocessor architecture to industry professionals in seminars sponsored by the Institute of Electrical and Electronics Engineers (“IEEE”) and the Association for Computing Machinery (“ACM”).

20. In 1997, I was hired to run the research efforts at S3, Inc. (which later became SONIC|blue, Inc.) and served as Chief Technology Officer there from 1999 until 2002. At the time, S3 produced the 3D graphics hardware and driver software for more than half of new PCs, worldwide. I managed our display technology group. I led the development of components for laptop computers including the IBM Thinkpad and for desktop computers as well. I also worked with the teams that developed the FrontPath wireless tablet PC and the Diamond Mako handheld computer. My work at S3/Sonic included extensive work with and development of numerous serial data communications protocols, including HDMI, DVI, LVDS, USB, RS-232, 1394, 802.3, 802.11, RAMBUS, and SD cards, among others. My experience with serial data communications protocols throughout my career has also included SATA, PCI-E, and DisplayPort. This work has included the subjects of encoding, transmitting, and storing audio and video data, as well as control data, for

transmission over a serial link and packet encapsulation and decapsulation, encryption, and decryption, among many other similar subjects.

21. From 1999 through 2002, while a Consulting Professor at Stanford University, I taught computer architecture and microprocessor design to both undergraduate and graduate students.

22. Since 2002, I have operated Wolfe Consulting to provide services as a consultant on processor technology, computer systems, consumer electronics, software, design tools, and intellectual property issues. My consulting work relating to intellectual property has included serving as a testifying and consulting expert for IP and other technology-related litigation matters.

23. From 2013 to the present, I have been serving as a lecturer at Santa Clara University teaching courses on Microprocessor Systems, Integrated Circuit Design, Real-Time Computing, and Mechatronics and recently served as Faculty Senate President.

24. I have published more than fifty peer-reviewed papers in computer architecture and computer systems and IC design. I also have chaired IEEE and ACM conferences in microarchitecture and integrated circuit design and served as an associate editor for IEEE and ACM journals. I served on the IEEE Computer Society Awards committee. I am an IEEE Fellow, an IEEE Computer Society Distinguished Contributor and a Member of ACM. I am a named inventor on at least

fifty-seven U.S. patents and thirty-seven foreign patents, which are listed in my curriculum vitae.

25. In 2002, I was the invited keynote speaker at the ACM/IEEE International Symposium on Microarchitecture and at the International Conference on Multimedia. From 1990 through 2005, I was an invited speaker on various aspects of technology and the PC industry at numerous industry events including the Intel Developer's Forum, Microsoft Windows Hardware Engineering Conference, Microprocessor Forum, Embedded Systems Conference, Comdex, and Consumer Electronics Show, as well as at the Harvard Business School and the University of Illinois Law School. I have been interviewed on subjects related to computer graphics and video technology and the electronics industry by publications such as the Wall Street Journal, New York Times, Los Angeles Times, Time, Newsweek, Forbes, and Fortune as well as on CNN, NPR, and the BBC. I have also spoken at dozens of universities including MIT, Stanford, University of Texas, Carnegie Mellon University, UCLA, University of Michigan, Rice University, and Duke University.

III. LEVEL OF ORDINARY SKILL IN THE ART

26. I understand that my assessment of the claims of the '905 patent and the teachings of the prior art and my analysis and opinions herein must be undertaken from the perspective of what would have been known or understood by a person

having ordinary skill in the art, reading the '905 patent on its priority date and in light of the specification and file history of the '905 patent. I refer to such a person as a "POSITA."

27. I further understand there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including: (1) the levels of education and experience of persons working in the field at the time of the invention; (2) the sophistication of the technology; (3) the types of problems encountered in the field; and (4) the prior art solutions to those problems.

28. I have been instructed to simply assume that November 22, 2000, the filing date of the provisional application to which the '905 patent purports to claim priority, is the correct priority date for the '905 patent. I have not been asked to offer any opinion on whether the '905 patent is properly entitled to this priority date.

29. Based on my study of the '905 patent and my experience working in the field during the relevant timeframe, including my experience working with other skilled artisans in the field and educating undergraduate and graduate students in the field at the time, in my opinion, a POSITA in the field of the '905 patent, as of November 22, 2000 would have had a bachelor's degree in electrical engineering, computer engineering, computer science, or equivalent training, and three years of experience with data communications systems or interfaces, including at least some

experience with serial or display data communications systems or interfaces. Additional education can substitute for less work experience, and vice versa.

30. I note that I met at least these minimum qualifications to be considered a POSITA as of the assumed priority date of the '905 patent of November 22, 2000.

31. I understand that a person of ordinary skill in the art is not a specific real individual, but rather a hypothetical individual having the qualities reflected by the factors above. This hypothetical person has knowledge of all prior art in the relevant field and takes from each reference what it would teach to a person having the skills of a POSITA.

32. For purposes of this Declaration, in general, and unless otherwise noted, my statement and opinions, such as those regarding my experience and the understanding of a POSITA generally (and specifically related to the references I consulted herein), reflect the knowledge that existed in the field as of the assumed priority date of the '905 patent (i.e., November 22, 2000). Unless otherwise stated, when I provide my understanding and analysis below, it is consistent with the skill level of a POSITA as of the assumed priority date of the '905 patent.

IV. RELEVANT LEGAL STANDARDS

33. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the '905 patent, I am relying on certain basic legal principles that counsel have explained to me. These principles are discussed below.

34. I understand that prior art to the '905 patent includes patents and printed publications in the relevant art that predate the priority date of the alleged invention recited in the '905 patent. As noted, here, I have been instructed to assume November 22, 2000, is the priority date of the '905 patent.

35. I have been informed and understand that a patent claim is unpatentable as “anticipated” under 35 U.S.C. § 102 if each element of that claim is disclosed either explicitly or inherently in a single prior art reference. I understand that the question of anticipation is whether a POSITA would have reasonably understood or inferred from the prior art reference’s teachings that every claim element was disclosed in that single reference. I further understand that a disclosure is “inherent” if the missing element is necessarily present in view of the explicit disclosure. The fact that the reference might possibly practice or contain a claimed limitation is insufficient to establish that the reference inherently teaches the limitation. For anticipation by a prior art patent or printed publication, I further understand that the reference’s description must enable a POSITA to practice the claimed invention without undue experimentation.

36. I have been informed that a patent claim is unpatentable as “obvious” under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the

subject matter pertains. I have also been informed by counsel that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

37. I understand that for a claim to be unpatentable as obvious, the party asserting unpatentability must identify prior art references that alone or in combination with one or more other prior art references would have rendered the claim obvious to one of ordinary skill in the art at the time of the invention.

38. I understand that a single prior art reference can render a claim obvious if it would have been obvious to modify that reference to arrive at the patented invention. I understand that it is appropriate to look to the knowledge of a POSITA in assessing whether it would have been obvious to modify a single prior art reference to produce the claimed invention.

39. I understand that a conclusion of obviousness may be based on a combination of prior art references, particularly if the combination of elements does no more than yield predictable results. I understand that it may be helpful to identify a reason that would have prompted a POSITA in the relevant field to combine the elements in a way the claimed invention does. I understand that an invention would have been obvious where a POSITA pursues known options from a finite number of identified, predictable solutions. I understand that if trying a limited number of

solutions leads to expected success, it is likely the product is not one of innovation but of ordinary skill and common sense.

40. I understand that in order for a reference to be proper for use in an obviousness combination, the reference must be analogous art to the claimed invention. I understand a reference is analogous art to the claimed invention if: (1) the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or (2) the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention). I understand that the “same field of endeavor” and “reasonably pertinent” tests are two separate tests for establishing analogous art and it is not necessary for a reference to fulfill both tests in order to qualify as analogous art.

41. I have been informed by counsel that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable

expectation of success; and (f) 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.

42. I understand that in evaluating whether patent claims are obvious, secondary considerations of nonobviousness are considered. I understand that the secondary considerations of nonobviousness include commercial success, long-felt but unsolved needs, copying, praise, teaching away from the claimed invention by the prior art, unexpected results, industry acceptance, failure of others, and skepticism by experts. I understand that the secondary considerations are considered with the balance of obviousness evidence in the record to act as a check against impermissible hindsight bias. I further understand that the burden of presenting evidence of secondary considerations is on the patent owner, and the patent owner must establish a nexus between the merits of the claimed invention and the evidence of secondary considerations.

V. BACKGROUND

43. The '905 patent relates to transmission of data “packets” between two different devices—a “host” and a “data store” device—over a communications link. Ex. 1001, 6:43-44. The “host” may be “computers, CPUs, or any logic for accessing a data store device[.]” Id., 1:59-63. The “data store” devices may be “disk drives or high-speed memory devices[.]” Id., 8:17-21. A data “packet” is a unit of data carried

over a network. Packets can be of different types, using various standard protocols, including user Datagram Protocol (UDP) and Transmission Control Protocol (TCP). Packets generally contain: (1) a header, which includes information about the packet's origin, destination, and packet type; and a payload, which is the actual source data being transmitted in the packet. *Id.*, 8:47-50.

44. The background of the '905 patent specification explains that “[t]he speed and capacity of the data store devices, such as disk drives and memories, have increased significantly,” over the years preceding the '905 patent. *Ex.1001*, 1:54-56. Consequently, “these data store devices are being used in many new applications, such as database servers, Web servers, personal Video recorders, and digital displays,” which require “large amounts of data to be communicated between data store accessing devices (‘hosts’) and data store devices.” *Id.*, 1:56-63. Therefore, the speed of communication between hosts and data store devices “can have a significant impact on the overall performance of the application.” *Id.*, 1:63-66.

45. The '905 patent explains that serial communications techniques—wherein data is sent one bit at a time, sequentially over a communications channel, were known in the art. *Id.*, 2:26-28. The background section goes on to describe how it was known in the art for memory devices and hosts to be synchronous (sharing the same clock signal) and “are typically optimized for access patterns that are both temporally and spatially related” in order to “read and write arrays (or streams) of

data.” Id., 2:45-52. The ’905 patent also explains that the use of plesiosynchronous clocking, a method of transmitting data where the host and memory devices are not completely synchronous and the clock frequencies are slightly mismatched, was known in the art. Id., 4:3-24.

46. The ’905 patent specification also explains that “The receiving device can use techniques as described in U.S. Pat. No. 6,229,859, entitled ‘System and Method for High-Speed, Synchronized Data Communication,’ which is hereby incorporated by reference, to account for clock variations.” Ex.1013 (the “’859 patent”) further describes techniques known in the art at the time of the ’905 patent, including 8b/10b encoding, which is a method in which “the data before encoding may be organized in 8-bit frames (bytes),” and “[t]he encoding process may, for example, convert each of those 8-bit frames to 10-bit frames.” Ex.1013, 3:26-31. This encoding method serves several purposes. As illustrated in other art from the same time period, a well-known purpose of 8b/10b encoding is to “optimize” the transitions in the data stream to facilitate clock recovery (i.e., the ability of the transmitting and receiving devices to synchronize). For example, U.S. Patent No. 5,304,996, to Hsu et al., explains: “the 10 bit code words are selected to maximize the number of binary data transitions” and that “[t]he high transition rate improves the ability of the receiver to stay locked in synchronism with the transmitter.” Ex.1010, 1:26-37.

47. The '905 patent purports to improve upon methods of transmitting data between host and source devices using a plesiosynchronous technique by implementing systems and methods of packet preemption. Ex.1001, 1:54-59, 1:66-2:5, 3:15-33. This is a technique where a “communications node may preempt or interrupt the transmission of a packet when a packet with a higher priority is to be transmitted on the same communications link.” *Id.*, 19:62-65.

48. As explained in further detail below, this purported benefits of the '905 patent, including allowing for packet preemption, were not novel. Each of the limitations in the Challenged Claims is found in prior art references before the earliest priority date of the '905 patent.

VI. OVERVIEW OF THE '905 PATENT

49. As discussed, the '905 patent seeks to improve data transmission between hosts and source devices. Specifically, the Challenged Claims claim a system and method for packet preemption wherein packets are transmitted between two endpoints via a communications link.

50. As described in the '905 patent, initially, “the transmitting communications node transmits the first portion of data packet 1301[,]” which is a lower-priority packet. Ex.1001, 19:62-20:3, 20:27-31. This lower priority packet may be large—taking a longer time to transmit and cause network congestion, slowing transmission of higher-priority and smaller control packets. *Id.* During

transmission of the first lower-priority packet, if the packet transmission is to be preempted to allow for transmission of a second packet, such as higher-priority “control” packet, “the communications node then transmits the preempt primitive 1302. After transmitting the preempt primitive, the transmitting communications node transmits the preempting control packet 1303.” Id., 20:31-35, 20:3-9. Then, “[a]fter the control packet is transmitted, the communications node transmits the continue primitive 1304, and then resumes transmitting the remainder of the preempted data packet 1305.” Id., 20:35-39, 20:10-14.

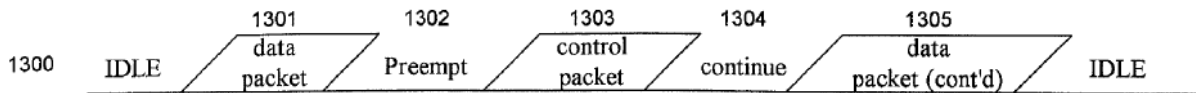


Fig. 13

51. The '905 patent specification describes “in-band symbols” as symbols that are “typically” transmitted in a packet on a serial communications link, which may have “certain desirable characteristics, such as with its number of bit transitions optimized[.]” Id., 11:49-52. The specification further describes that “in-band symbols” include 9-bit symbols “with at least four transitions.” Id., 21:41-43. Conversely, “out-of-band symbols” are described as “a symbol that does not normally appear within a packet because it may not have the same desirable characteristic as an in-band symbol (e.g., bit transitions not optimized).” Id., 11:56-

60. Importantly, the out-of-band symbols “can be inserted into a sequence of in-band symbols and readily detected as control symbols when received.” *Id.*, 12:3-6. The specification states that “[a]ll 9-bit symbols with three or less transitions are referred to as ‘out-of-band symbols.’” *Id.*, 24:44-45. “In-band” and “out-of-band” symbols would have been a well-known concept to a POSITA at the time of the ’905 patent. Further, the ’905 patent specification describes “primitives” as “pairs of out-of-band symbols.” *Id.*, 15:39-41. Such primitives comprised of two out-of-band symbols were also a well-known concept in the art at the time of the ’905 patent, as demonstrated by, for example the Hayes AT command set¹ used on traditional computer telephone modems since the 1980s. See Ex.1011, 3.1.1 (describing transmission of three-character primitives), 2.2.1 (describing two-character “AT” primitive).

52. The ’905 patent specification explains that the communications link (also referred to as “Storage Link”) architecture “may also specify encoding techniques to optimize transitions and to ensure DC-balance.” *Id.*, 7:6-8, 8:67-9:2. The specification further describes that “[a] transition is defined as a bit value of 1 followed by a bit value of 0 or a bit value of 0 followed by a bit value of 1,” and that, “[t]ransition control may be optimized to either maximize or minimize the number of transitions in symbols that are to be transmitted.” *Id.*, 23:50-53. It further explains

¹ See, e.g., https://en.wikipedia.org/wiki/Hayes_AT_command_set

the potential benefit of maximizing transitions, stating that, “When the number of transitions is maximized, clock information may be more accurately derived from the transmitted symbols,” and that, “[o]ne skilled in the art will appreciate that the link layer may be designed to minimize or maximize transitions depending on the overall design objectives.” *Id.*, 23:55-61. The ’905 patent indicates that once the number of transitions is “maximized,” in-band symbols have “at least four transitions.” *Id.*, 24:7-10, 24:41-45, 27:19-24.

VII. CLAIM CONSTRUCTION

53. It is my understanding that in order to properly evaluate the ’905 patent, the terms of the claims must first be construed. It is my understanding that for the purposes of this inter partes review, the claims are to be construed under the so-called Phillips standard, under which claim terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term. For purposes of my analysis below, I do not believe any claim terms require explicit construction.

VIII. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

54. I have been asked to provide my opinions as to whether the Challenged Claims of the ’905 patent would have been anticipated and/or obvious in view of the prior art. The discussion below provides a detailed analysis of how the prior art

references identified below teach the limitations of the Challenged Claims of the '905 patent.

55. As part of my analysis, I have considered the scope and content of the prior art and any differences between the alleged invention and the prior art. For each challenged claim of the '905 patent, I provide an element-by-element analysis of the scope and content of the prior art and any differences between the alleged invention and the prior art.

56. As described in detail below, the alleged invention of the Challenged Claims would have been anticipated and/or obvious in view of the teachings of the identified prior art references as well as the knowledge of a POSITA as of the time of the assumed priority date of the '905 patent.

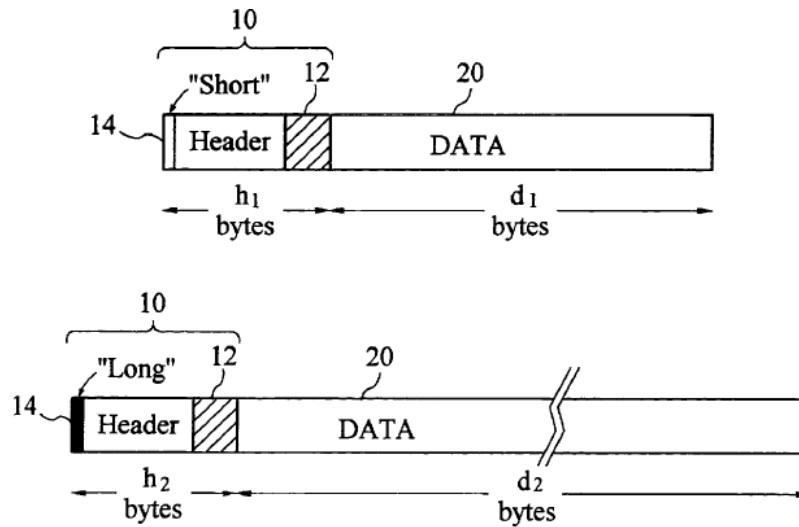
A. Summary of Prior Art References

1. Summary of Banes

57. Banes, which is titled "Transmission of data packets of different size and priority," filed on October 2, 1998, was never cited during the prosecution of the application which became the '905 patent. Ex.1005, codes (54), (22); Ex.1001, code (56). Like the '905 patent, Banes relates generally to transmission of multiple types of data packets between a transmitter and a receiver in a communications network. Ex.1005, 4:23-5:6.

58. Banes proposes a solution to a similar problem as the '905 patent—namely that data transmission on prior art networks may “cause unacceptable delays between packets” and “unduly delay[]transit of smaller or more important data packets.” Ex.1005, 2:2-8. According to Banes, the solution to this problem is an improvement upon existing methods of transmission using packet preemption. Ex.1005, 1:2, 2:9-13, 3:3-7. As I explained above concerning the '905 patent, packet preemption is a technique for packet transmission where the transmission of a lower-priority packet is paused or interrupted to allow for the transmission of a higher-priority packet on the same communications link. Ex.1001, 19:62-65.

59. Like the '905 patent, Banes' system transmits data “packets,” which include a header, “header 10,” and payload data, “data portion 20.” Ex.1005, 5:23-24. The “data packets” disclosed in Banes are described as compatible with ATM or Ethernet networks, such that “short packets may be similar to ATM cells and long packets may be similar to Ethernet frames.” Ex.1005, 3:27-4:1, Abstract (“Application is to ATM or Ethernet networks.”); *see also* 6:11-21. These packets are encoded using an 8b/10b coding scheme, which is a method of turning 8 bits of data into 10-bit “symbols.” 2:17-20, 12:8-13, 12:18-19. These packets are shown in Figure 1 of Banes below:

*Fig. 1*

Ex.1005, Fig. 1.

60. Banes discloses a system and method for packet preemption in which first, a portion of a first data packet is transmitted, including “data portion 102a.” *Id.*, 11:18-22. During transmission of that first data packet, if a higher-priority data packet arrives, an “interrupt code 110 is inserted in the data portion 102a,” signaling that the transmission of the first packet has been interrupted. *Id.*, 11:25-28, 12:8-13. The interrupt code is an out-of-band symbol, described in Banes as a “spare” or “unused code,” such as when “10 bit coding is used to carry 8 bit data,” and it is “used to flag an interruption” in the data transmission. Ex.1005, 2:17-20; 12:8-13 (“a pre-determined ‘spare’ code from the 10bit coding scheme”), 12:18-19 (“otherwise unused 10 bit code”).

61. After the interruption, and after the higher-priority packet is sent, a “resume code” / “resumption code 111” is sent, signaling to the transmitter to continue transmitting the remainder of the first data packet which was preempted. *Id.*, 11:28-30, 12:13-17.

62. Banes’ Figure 4 below shows Banes’ general method of packet preemption, including the first portion of the first lower-priority data packet 102a (after which the interrupt code 110 is transmitted), the second higher-priority data packet 122, the resumption code 111, and the remaining portion of the first data packet 102b:

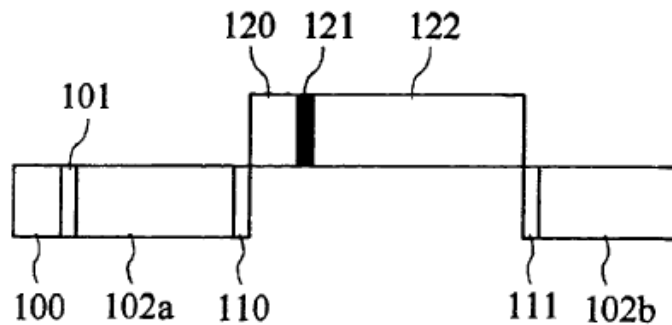


Fig. 4

Id., Fig. 4; see also 11:18-30.

2. Summary of Calvignac

63. Calvignac, which is titled “Method and apparatus for transmission of high priority traffic on low speed communication links,” filed on May 22, 1995, was

cited but not substantively considered during the prosecution of the application which became the '905 patent. Ex.1004, codes (54), (22); Ex.1001, code (56). Like the '905 patent, Calvignac relates generally to transmission of multiple types of data packets between a transmitter and a receiver in a communications network. Ex.1004, 3:23-27, 8:6-8, 9:4-8, Figs. 13-14.

64. Calvignac proposes a solution to a similar problem as the '905 patent—namely that data transmission of high priority packets on prior art networks may be delayed, and such delays are “incurred by having first to complete transmission of a low-priority traffic.” Ex.1004, 2:25-30, 3:51-52. According to Calvignac, the solution to this problem is an improvement upon existing methods of transmission using packet preemption. Ex.1004, 1:8-10, 2:31-35, Figs. 2, 5. As I explained above concerning the '905 patent, packet preemption is a technique for packet transmission where the transmission of a lower-priority packet is paused or interrupted to allow for the transmission of a higher-priority packet on the same communications link. Ex.1001, 19:62-65.

65. Like the '905 patent, Calvignac's system transmits data “packets,” which include a “header” and packet data. Ex.1004, 3:23-27, Fig. 5. The packets disclosed in Calvignac are described as using the HDLC protocol and may be comprised of higher-priority “real-time traffic” or lower-priority “non-real-time traffic.” Ex.1004, 2:36-38, 3:35-41, 3:51-60, 4:16-17 (describing that Calvignac's

“low speed interface uses the standard HDLC protocol”), Fig. 5. Consistent with the HDLC protocol’s use of a preempt/resume protocol that uses a ‘011111110’ “starting preempt flag” (SP) and a ‘011111110’ “ending preempt flag” (EP), Calvignac’s packets use indicators comprised of trailer bytes and “7E” flags as preempt and resume indicators in a packet preemption protocol. These indicators are inserted into the packet data by flag generator 46 (*i.e.*, not typically found in the data packet), so they may be easily recognized by the system and effectuate the preempt protocol. *Id.*, 2:5-13, 9:14-18, 9:39-42, 2:5-13, 24:44-46.

66. Calvignac’s packet preemption protocol uses “transmitter 40” to transmit packets over a communication link 48, and the transmitter 40 has subcomponents including a high-priority and low-priority buffer. Transmitter 40 transmits packets from packet source 41 to either high priority buffer 42 or low priority buffer 43. Ex.1004, 8:6-10, 8:13-15. When a low priority packet is received, the low priority packet is routed from low priority buffer 43 to the communications communication link for transmission if there are no packets in the high priority buffer. *Id.*, 8:21-34. Figure 13 below shows these components of transmitter 40:

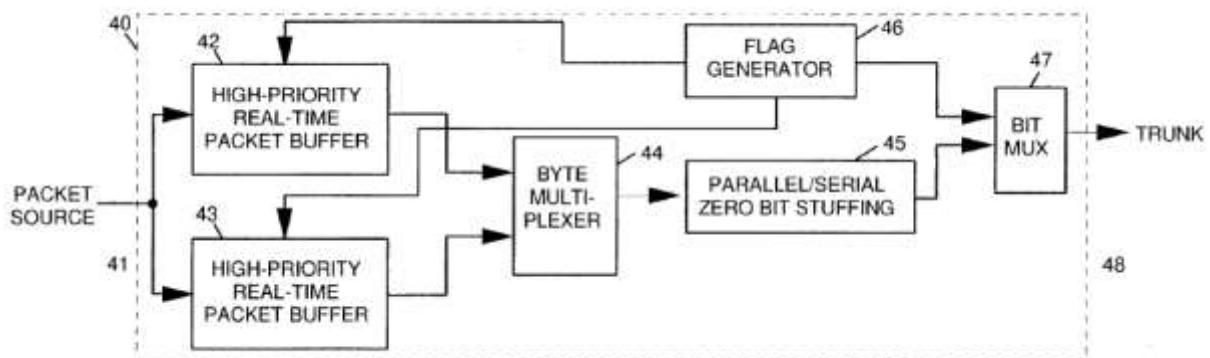


Figure 13

Ex.1004, Fig. 13.

67. The preemption protocol is triggered, however, if a high-priority packet is received and arrives in the high-priority buffer 43 while a low-priority packet is being transmitted. *Id.*, 8:41-53. In that case, a flag generator 46 signals that the low priority packet is preempted by inserting a trailer byte and X'7E' flag, which signals to the buffer to stop transmission of the low priority packet and begin transmission of the high-priority packet. *Id.* The flag generator then generates another trailer byte/idle flag after the high-priority packet has been fully transmitted, signaling that the low-priority should be released from the buffer to be transmitted over the link. *Id.*, 8:59-65. In Figure 5 below, a low priority “non-real-time” (“NRT”) data packet is preempted by a high priority “real time” (“RT”) data packet:

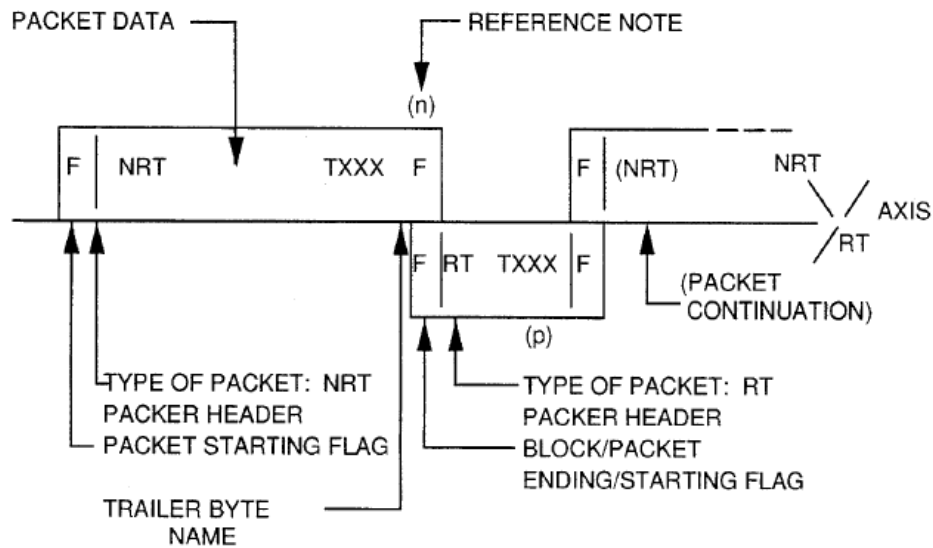


Figure 5

Id., Fig. 5, 2:65.

68. The packets transmitted by Calvignac's transmitter 40 over communications link 48 (as depicted in Figure 13 above) are then received via the corresponding communication link 51 coupled to a receiver 50, as shown below in

Figure

14

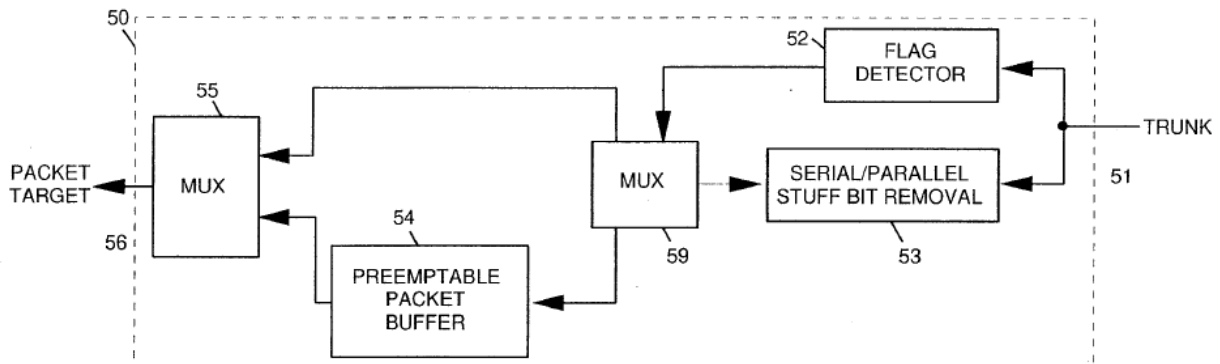


Figure 14

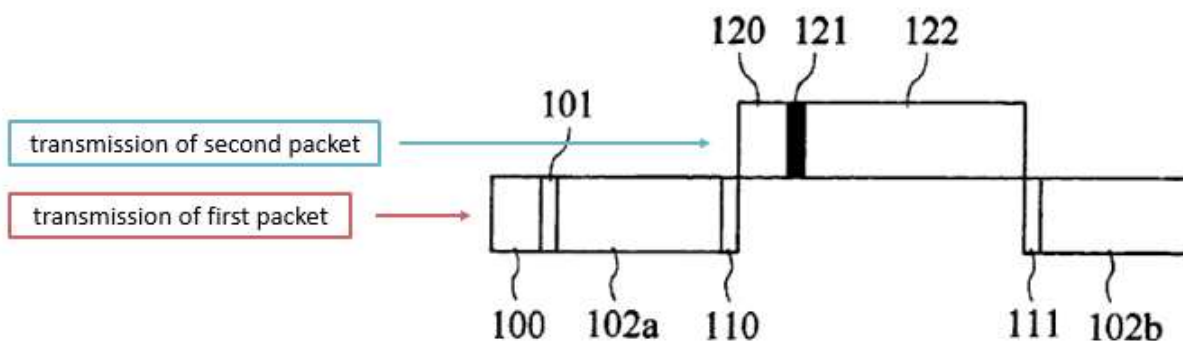
Id. Fig. 14, 8:6-10, 9:4-17. The packets received by the receiver are then passed on to a packet target 56, such as their final destination. *Id.* 9:4-12.

B. Ground 1 and Ground 2: Claims 1, 3, 5, 7-8, 10, 12, 14-15, 17, 20-21, 23, and 26 are anticipated under 35 U.S.C. § 102 by Banes and rendered obvious under 35 U.S.C. § 103 over Banes.

1. Claim 1

[1(pre)] A method for transmitting packets, the method comprising:

69. Banes discloses “a method of communicating data over a network comprising transmitting a first data packet, receiving a higher priority data packet, interrupting transmitting the first data packet to transmit the higher priority data packet, and resuming transmission of the first data packet.” Ex.1005, 2:9-13; see also Abstract, Figs. 4-5. I have annotated below Figure 4 of Banes to illustrate the transmission of a first packet 102 (comprised of portions 102a and 102b) and a second packet 122:



Ex.1005, Fig. 4 (annotated). Thus, Banes discloses “[a] method for transmitting packets” as claimed.

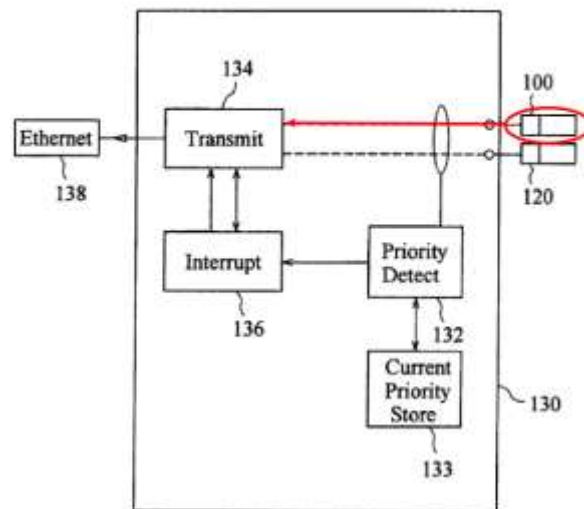
[1(a)] receiving a first packet;

70. Banes teaches that its “network interface 130 is arranged to receive data packets for onward transmission” (i.e., receiving a first packet). Ex.1005, 12:2-3,

12:3-5 (“[r]eceived packets pass by priority detector 132 which determines whether interruption is required”), 12:6-7 (“In the normal course of events, packets are passed to transmitter 134 in the order received for transmission over a network, here a 1Gbit/s ethernet 138.”).

71. In Figure 5 annotated below, the network interface 130, and then the transmitter 124, receive a first data packet having a header 100 for onward transmission via ethernet network 138.

Fig. 5



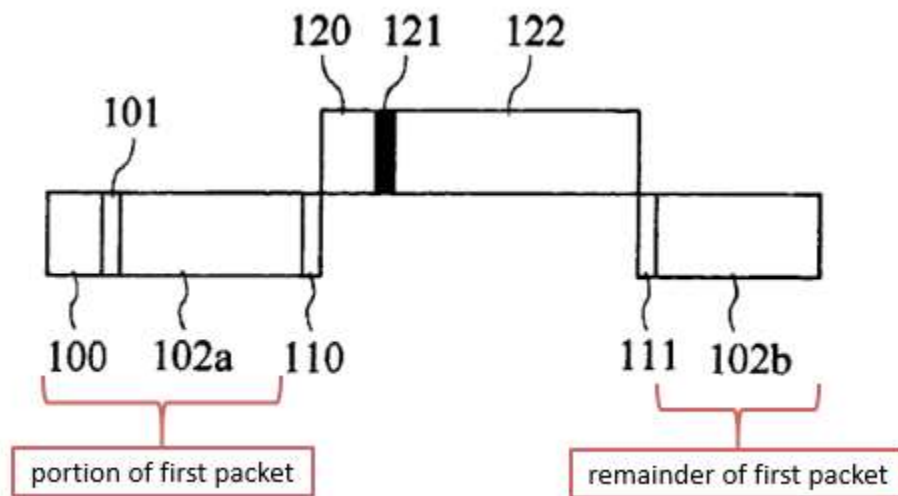
Ex.1005, Fig. 5 (annotated). Thus, Banes discloses “receiving a first packet” as claimed.

[1(b)] transmitting a portion of the received first packet;

72. My analysis above for limitation [1(a)] is also relevant here, as Banes describes **receiving** a first data packet (“first packet”) having a header 100, where said receiving occurs from the network interface 130 first receiving the packet and

then the transmitter 134 receiving the packet. Ex.1005, 12:2-7, Fig. 5. Second, Banes' description of "interrupting transmitting the first data packet to transmit the higher priority data packet" teaches transmitting an initial portion of this received first data packet. *Id.*, 2:9-13, 11:20-28. Specifically, Banes teaches transmitting a portion of the received first packet: "[a] first, lengthy, data packet is transmitted as a header 100 including a priority flag 101 and an initial data portion 102a." *Id.*, 11:20-22.

73. I have annotated Figure 4 below, which shows that before the higher-priority packet is received and sent, only a portion of this received first data packet is transmitted. *Id.*; see also 11:25-30. Specifically, this portion of the received first data packet that is transmitted includes the header 100 and initial data portion 102a:



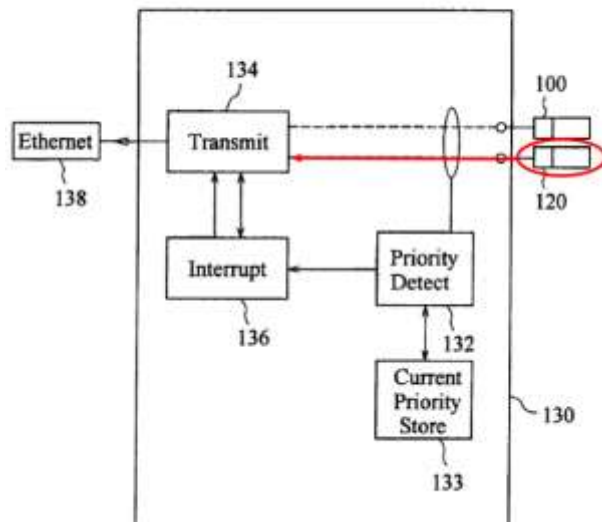
Id. at Fig. 4 (annotated). Thus, Banes discloses "transmitting a portion of the received first packet" as claimed.

[1(c)] receiving a second packet;

74. Banes discloses “receiving a second packet,” as it states: “[d]uring transmission of the initial data portion 102a, **a higher priority packet is received** for sending along the same path.” *Id.*, 11:22-23, 12:2-13. Claim 1 of Banes also recites “**receiving a higher priority data packet.**” *Id.*, 13:2-5. The higher priority packet (“second packet”) “comprises a header portion 120 including a priority flag 121, in this case set to high priority, and a data portion 122.” *Id.*, 11:23-25.

75. I have annotated Figure 5 below, showing that network interface 130 and transmitter 134 receive this higher priority packet containing a header portion 120:

Fig. 5



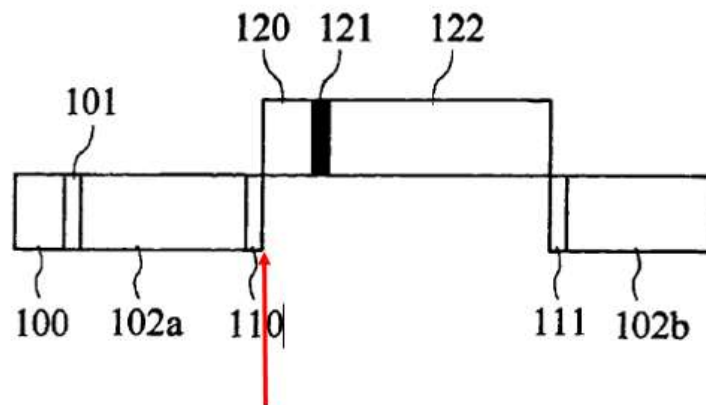
Id., Fig. 5 (annotated). Thus, Banes discloses “receiving a second packet” as claimed.

[1(d)] upon receiving the second packet, stopping the transmitting of the first packet so that not all of the first packet has been transmitted;

76. First, Banes discloses a structure, “priority detector 132,” which monitors packets received by the network interface 130 to “determine[] whether interruption is required[.]” Ex.1005, 12:3-5. In the course of this monitoring, the priority detector may determine that a higher-priority packet has been received, requiring preempting the transmission of the first packet. If so, “an interrupt code 110 is inserted in the [initial] data portion 102a, which signals to an appropriately configured receiver that sending of the first packet has been interrupted.” Ex.1005, 11:22-28. This is “*stopping the transmitting of the first packet,*” “*upon receiving the second packet.*”

77. Second, Banes describes that transmission of the first packet is paused such that the header 100 and initial data portion 102a of the first packet has been transmitted. *Id.*, 11:20-30. Banes describes that, “if the priority detector determines that interruption is required, a signal is sent to interrupt device 136 which inserts an interrupt code . . . , buffers the remainder of the packet in transit as necessary, and instructs the transmitter to commence output of the higher priority packet” (i.e., the second packet is transmitted while transmission of the first packet is paused). *Id.*, Fig. 4, 12:8-13.

78. I have indicated with a red arrow in Figure 4 below where the transmitting of the first packet is stopped after the second packet has been received, such that only a portion of the first packet has been transmitted:

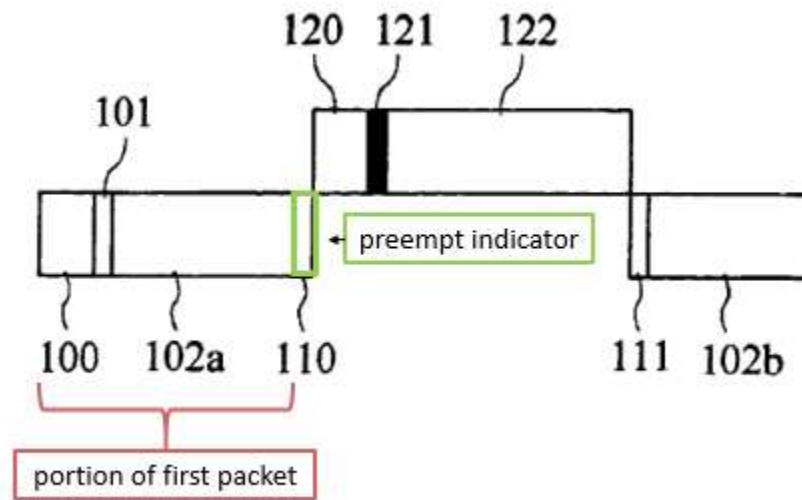


Ex.1005, Fig. 4 (annotated). Thus, Banes discloses “upon receiving the second packet, stopping the transmitting of the first packet so that not all of the first packet has been transmitted” as claimed.

[1(e)] transmitting a preempt indicator;

79. Banes describes transmitting an interrupt code (“*preempt indicator*”). The interrupt code is “inserted in the [initial] data portion 102a, which signals to an appropriately configured receiver that sending of the first packet has been interrupted.” *Id.*, 11:25-28, 12:8-13; *see also* 2:17-20 (“sending a special code to signify interruption”).

80. I have annotated below Figure 4 of Banes to show the interrupt code 110 (“*preempt indicator*”) transmitted at the end of the first portion of the first packet, right before the second packet is transmitted:

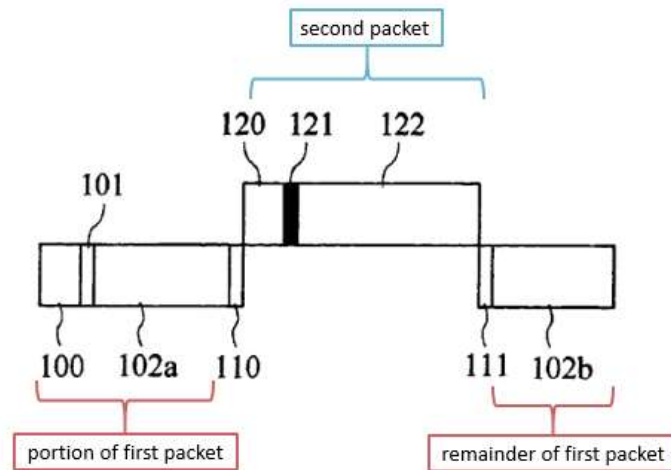


Id. at Fig. 4 (annotated). Thus, Banes discloses “transmitting a preempt indicator” as claimed.

[1(f)] transmitting the second packet; and

81. Banes discloses “interrupting transmitting the first data packet to transmit the higher priority data packet.” *Id.*, 2:9-13. In Banes, the transmitter transmits the “higher priority data packet” (“second packet”) after transmission of the interrupt code (“*preempt indicator*”). Ex.1005, 2:9-13, 11:23-30, 12:8-13.

82. I have annotated below Figure 4 of Banes to show that “[t]he higher priority packet [*second packet*] is then sent, followed by a resumption code 111, followed by the remainder 102b of the data of the first packet,” after interruption of the transmission of the first data packet. *Id.*, 11:28-30; *see also id.*, 12:8-13.

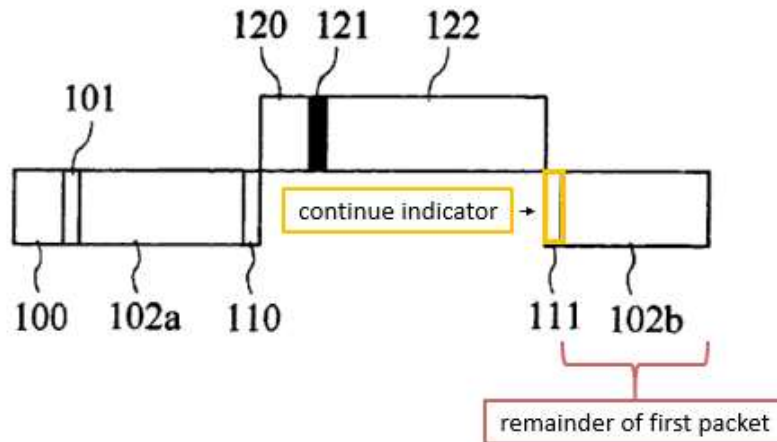


Id., Fig. 4 (annotated). Thus, Banes discloses “transmitting the second packet” as claimed.

[1(g)] upon completion of transmitting the second packet, transmitting a continue indicator; and

83. Banes discloses, upon completion of transmitting the second packet, transmitting a continue indicator, which Banes refers to as either a “resume code” or “resumption code 111”: “[t]he higher priority packet is then sent, followed by a resumption code 111.” Id. at 11:28-30; see also id. at 12:13-17 (“After the high priority packet has been sent, a resume code is sent . . .”); 11:28-30, 12:13-17.

84. I have annotated below Figure 4 of Banes to show the transmission of the resumption code 111 (“*continue indicator*”) after the transmission of the second packet:

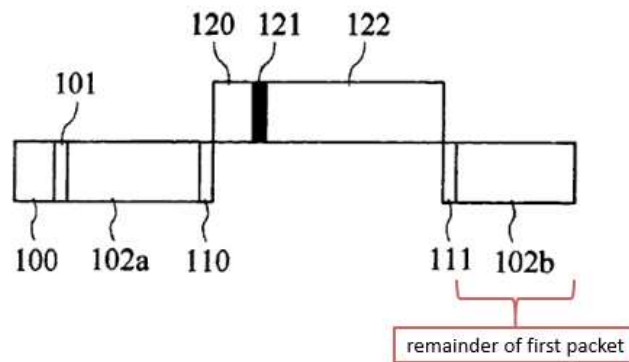


Id. at Fig. 4 (annotated). Thus, Banes discloses “upon completion of transmitting the second packet, transmitting a continue indicator” as claimed.

[1(h)] transmitting the portion of the first packet that has not yet been transmitted;

85. Banes discloses that after transmission of the resumption code (“continue indicator”), “the remainder 102b of the data of the first packet” is transmitted (“transmitting the portion of the first packet that has not yet been transmitted”). Id. at 11:28-30; see also id., Fig. 4. Banes also discloses that “after the higher priority packet has been sent, a resume code is sent . . . followed by the remainder of the first packet.” Id. at 12:13-17; see also id., Fig. 5.

86. I have annotated below Figure 4 of Banes to show the remainder 102b of the first packet being transmitted after the resume code 111 is transmitted:



Id. at Fig. 4 (annotated). Thus, Banes discloses “transmitting the portion of the first packet that has not yet been transmitted” as claimed.

[1(i)] wherein the packets include in-band symbols and the indicators include one or more out-of-band symbols.

87. The '905 patent describes an “out-of-band symbol” as “a symbol that does not normally appear within a packet because it may not have the same desirable characteristic as an in-band symbol[.]” Ex.1001, 11:56-60. “[I]n-band symbols” are described as the opposite—they can be symbols that “typically” comprise “[a] packet that is transmitted on a serial communications link.” Ex.1001, 11:49-50. The '905 Patent describes that its “link architecture” provides packet ordering based on the “use of out-of-band symbols to transmit control information.” *Id.*, Abstract; see also *id.*, 7:5-6 (same), 29:17-18 (architecture “may transmit control information using out-of-band symbols”).

88. According to the '905 patent, the distinction between in-band and out-of-band symbols serves a purpose—out-of-band symbols encode “control information” and “can be inserted into a sequence of in-band symbols and readily

detected as control symbols when received.” *Id.*, 12:3-6. These out-of-band symbols “can be interspersed with the transmission of symbols of a packet.” *Id.*, 12:6-11. In other words, out-of-band symbols can be recognized as control information when interspersed with the in-band packet symbols. As such, a POSITA at the time of the ’905 patent would have understood that the patent distinguishes between transmission of out-of-band “control symbols” and in-band “data symbols” containing the ordinary or normal data. *Id.* at 9:58-10:8; *see also id.* at 9:23-51.

89. Banes discloses and also renders obvious this limitation [1(i)] in a manner consistent with the teachings of the ’905 patent discussed above.

90. First, Banes discloses that the first packet and second packet “include in-band symbols.” As discussed above for limitations [1(a)] and [1(c)], Banes discloses an interrupted packet (“*first packet*”) and a preempting higher priority packet (“*second packet*”). The packet that is interrupted may be a “lower priority data packet,” and the preempting packet may be a “higher priority data packet”—specifically, Banes describes “interrupting transmitting the first data packet to transmit the higher priority data packet, and resuming transmission of the first data packet.” Ex.1005, Code (57) (Abstract), 13:3-5. This is so that “large blocks of data can be efficiently transmitted . . . without creating a bottleneck and holding up more urgent data.” Ex.1005, 2:14-16. The higher priority “*second packet*” is described as a “smaller or more important data packet[]” containing “more urgent data.” *Id.*, 2:4-

8, 2:14-16; *see also id.*, Code (57) (Abstract), 13:3-5. Because the “*first packet*” and “*second packet*” are both “data packets,” they both contain “data,” which is the type of information that normally or typically appears in packets.

91. Further, the “data packets” disclosed in Banes can be ATM cells or Ethernet frames, because Banes discloses that its system can be implemented in ATM or Ethernet networks. Ex.1005, 2:17-20, 3:27-4:1, 12:5-13, Abstract (“Application is to ATM or Ethernet networks.”); *see also* Ex.1005 at 6:11-21.

92. A POSITA at the time of the ’905 patent would have understood that Banes’ data packets implemented in the form of ATM cells and Ethernet frames would have included “symbols,” at least because Ethernet uses 8b/10b encoding, as expressly taught by Banes (Ex.1005, 2:17-20, 12:8-13)², which is a method of turning 8 bits of data into 10-bit “symbols.” Ex.1012 (Ethernet 802.3 standard), 967 (“The 8B/10B transmission code specified for use in this standard has a high transition density, is a run-length-limited code, and is dc-balanced. The transition density of the 8B/10B **symbols** ranges from 3 to 8 transitions per **symbol**.”); *see also* Ex.1017, 499; Ex.1014, at 1 (“8b/10b is a line code that maps 8-bit words to 10-

² “For example, in the case of high speed Ethernet, 10 bit coding is used to carry 8 bit data, and an unused code can be used to flag an interruption.” Ex.1005, 2:17-20. “However, if the priority detector determines that interruption is required, a signal is sent to interrupt device 136 which inserts an interrupt code, here chosen to be a pre-determined ‘spare’ code from the 10 bit coding scheme used for the Ethernet, buffers the remainder of the packet in transit as necessary, and instructs the transmitter to commence output of the higher priority packet.” Ex.1005, 12:8-13.

bit **symbols** to achieve DC balance and bounded disparity, and at the same time provide enough state changes to allow reasonable clock recovery.”); Ex.1010, 1:26-37.

93. Thus, a POSITA would have understood that Banes’ first packet (the interrupted packet) and second packet (the preempting packet), which Banes teaches can be “data packets,” would have included “*in-band symbols*,” because Banes discloses these packets can be Ethernet frames, which comprise *symbols* based on Ethernet’s 8b/10b encoding, and because these data packets include “data” (as opposed to control information), which is the type of information that typically or normally appears in packets, rendering it *in-band* in a manner consistent with the ’905 patent. Therefore, Banes discloses *wherein the packets include in-band symbols*.

94. If for some reason it is argued that Banes does not disclose *wherein the packets include in-band symbols*, it would have been obvious to a POSITA to use in-band symbols in Banes’ first and second data packets, because it was well-known to include such symbols in data packets so as to distinguish data or payload information from control information. See Ex.1017, Fig. 46-5, 269.

95. Second, Banes discloses and also renders obvious that *the indicators include one or more out-of-band symbols*. A POSITA would have understood Banes discloses that its preempt indicator includes one or more out-of-band symbols

because Banes describes the interrupt code (“*preempt indicator*”) as being a “spare” or “unused code” when “10 bit coding is used to carry 8 bit data.” Ex.1005, 2:17-20, 12:8-13. Banes specifically discloses that the interrupt code may be “a pre-determined ‘spare’ code from the 10bit coding scheme used for []Ethernet.” *Id.*, 12:8-13; *see also id.*, 12:18-19 (“using an otherwise unused 10 bit code in the case of Ethernet”). This spare or unused code in is a description of an “out-of-band symbol,” because 10-bit codes which were **used** in an 8b/10b coding scheme would be described as “in-band symbols,” which means an **otherwise unused** or **spare** code (*i.e.*, a code which does not fit the parameters of the in-band coding scheme), would be understood by a POSITA to be “out-of-band” given that it is unused and not in-band. Further, according to Banes, this interrupt code is “inserted in the [initial] data portion 102a” of the first packet. Ex.1005, 11:26-28. The fact that the interrupt code is **inserted** into the data packet, rather than “typically” or “normally” appearing in the packet, is another indication that the code is “out-of-band.” The interrupt code also would be understood to be conveying control information rather than data, and, as a result, is also consistent with the ’905 patent’s teaching of using out-of-band symbols to transmit control information (as opposed to the in-band symbols used for data). Thus, Banes discloses that its preempt indicator includes *one or more out-of-band symbols*.

96. Banes also discloses that its resume code (*continue indicator*) includes *one or more out-of-band symbols*. This is because Banes teaches that its “[s]ignaling of interruption is preferably implemented at the physical layer, for example by using an otherwise unused 10 bit code in the case of Ethernet.” *Id.*, 12:18-19. A POSITA would have understood this teaching to apply to the resume/resumption code in addition to the interrupt code, because Banes’ resume/resumption code would have been understood to be part of the collective “[s]ignaling of interruption” given that the interruption requires both the interrupt code and the resume code signaling to complete the interruption process. A POSITA would have also understood this teaching to apply to the resume/resumption code because Banes refers to the resume/resumption code using the term “code” and Banes uses it to transmit control information, not data, which would have indicated to a POSITA that—like the interrupt code—it is also an out-of-band “code” that is inserted using an available “spare code” or code that is “otherwise unused” and not one of the in-band codes used for encoding data in Banes’ 8b/10b coding scheme.

97. At a minimum, a POSITA would have been motivated to implement Banes’ resume/resumption code using a “spare” or “unused” code (which would have been comprised of out-of-band symbols for the reasons discussed above) in an 8b/10b encoding scheme because of Banes’ teaching to use such a “spare” or “unused” code for the interrupt code. Both are similarly described as “codes,” both

serve similar purposes in the “signaling of interruption” in Banes, and Banes does not disclose any other method of creating a code that may be easily recognized by the system as a “resume” signal, so use of the “spare” or “unused” code would have been the obvious choice. Thus, because use of such “spare” or “unused” codes in an 8b/10b encoding scheme would have been understood to include out-of-band symbols for the reasons discussed above, Banes discloses and also renders obvious that its resume/resumption code (*continue indicator*) *include[s] one or more out-of-band symbols*.

98. Therefore, Banes discloses and renders obvious that both its *preempt indicator* and its *continue indicator* (*the indicators*) can include *one or more out-of-band symbols*.

99. Thus, Banes discloses and also renders obvious “*wherein the packets include in-band symbols and the indicators include one or more out-of-band symbols*” as claimed.

2. Claim 3

[3] The method of claim 1 wherein the in-band symbols are transition optimized and the out-of-band symbols are not transition optimized.

100. As I explained above in my summary of the '905 patent, the '905 specification explains that the communications link architecture “may also specify encoding techniques to optimize transitions and to ensure DC-balance.” Ex.1001, 7:6-8, 8:67-9:2. The specification further describes that “[a] transition is defined as

a bit value of 1 followed by a bit value of 0 or a bit value of 0 followed by a bit value of 1,” and that, “[t]ransition control may be optimized to either maximize or minimize the number of transitions in symbols that are to be transmitted.” *Id.*, 23:50-53. It further explains the potential benefit of maximizing transitions, stating that, “[w]hen the number of transitions is maximized, clock information may be more accurately derived from the transmitted symbols,” and that, “[o]ne skilled in the art will appreciate that the link layer may be designed to minimize or maximize transitions depending on the overall design objectives.” *Id.*, 23:55-61. The ’905 patent indicates that once the number of transitions is maximized, in-band symbols have at least four transitions. *Id.*, 24:7-10, 24:41-45, 27:19-24, 41:41-46.

101. The ’905 patent specification itself admits that transition optimization of in-band data (and correspondingly lack of transition optimization of out-of-band symbols), was known in the art. The ’905 patent incorporates by reference a prior art coding technique from U.S. Patent No. 5,999,571 (“Shin ’571”), which was filed in 1995, which the ’905 Patent admits discloses a “[t]ransition control coding technique.” Ex.1001, 24:50-55; Ex.1008 (Shin ’571), Abstract. Other references that predate the ’905 patent similarly describe transition optimization of in-band symbols. For example, Shin ’464 describes an 8b/10b coding scheme where in-band symbols are transition optimized. Ex.1006, 2:40-45, 8:54:59. Specifically, Shin ’464 discloses a “high-speed digital interface incorporate[ing] a method and apparatus for

producing a **transition-controlled**, DC-balanced sequence of characters from an input sequence of data bytes.” Ex. 1006, Abstract. Shin ’464 further teaches that, “[e]ach high-transition in-band code character is derived from an input data byte in which four or more logical transitions exist between the eight bits thereof,” which is consistent with the ’905 patent’s description that four or more transitions constitutes transition optimization. *Id.*, 9:13-16, 9:28-32.

102. Also, because Banes discloses that its packets may be “Ethernet data packets,” Banes discloses using an 8b/10b coding scheme because Ethernet packets are 8b/10b encoded, which means Banes’ packets contain transition optimized data blocks, and thus, *in-band symbols [that] are transition optimized*, because 8b/10b encoding uses transition optimized data blocks. Ex.1005, Abstract, 2:17-20, 9:21-24, 12:5-13, 12:18-19; *see also* Ex.1012 (Ethernet 802.3 standard), 967 (“The 8B/10B transmission code specified for use in this standard has a high transition density, is a run-length-limited code, and is dc-balanced. The transition density of the 8B/10B symbols ranges from 3 to 8 transitions per symbol.”); *see also* Ex.1017, 336. Indeed transition optimization of in-band symbols was well known because it was an objective of the well-known 8b/10b encoding scheme. The fact that in-band symbols are transition optimized in 8b/10b encoding is exemplified in Shin ’464. Ex.1006, 9:13-16, 9:28-32. 8b/10b encoding is a method in which “the data before encoding may be organized in 8-bit frames (bytes),” and “[t]he encoding process

may, for example, convert each of those 8-bit frames to 10-bit frames.” Ex.1013, 3:26-31. Because two extra bits are added to the 8-bit data in this scheme, additional transitions may be added to transition “maximize” (and therefore *optimize*) the in-band data. Using this method to transition optimize data was known in the art before the time of the ’905 patent. For example, U.S. Patent No. 5,304,996, to Hsu *et al.* explains: “the 10 bit code words are selected to maximize the number of binary data transitions” and “[t]he high transition rate improves the ability of the receiver to stay locked in synchronism with the transmitter.” Ex.1010, 1:26-37.

103. As explained above in my analysis for limitation [1(i)], a POSITA would have also understood that the “spare” or “unused” Ethernet codes disclosed by Banes as the “interrupt” and “resume” codes must be distinguishable from the regular data blocks in order for preemption to be able to be triggered. See Ex.1005, 12:5-19, 12:2-4. Since, as explained above, Banes’ in-band data is transition optimized, A POSITA would have understood that Banes’ out-of-band codes (“*out-of-band symbols*”) to be **not** transition optimized to allow them to be easily distinguishable from the transition optimized in-band data.

104. Second, because transition optimization of in-band symbols was well known in the art at the time of the ’905 patent, a POSITA would have also been motivated to use non-transition-optimized out-of-band symbols to provide the benefit of making out-of-band symbols distinguishable from in-band symbols. Shin

'571 discusses this benefit, stating that “various synchronization and other special characters are defined using the high-transition and low-transition sets of out-of-band characters” and that “[t]he difference in the number of transitions between in-band and out-of-band characters allows selected out-of-band characters to serve as control characters, and to be readily distinguished from in-band characters[.]” Ex.1008, 5:15-27. Because these out-of-band characters are “low-transition,” they are not transition optimized in Shin '571's system.

105. Shin '464 is another example, as it teaches that “each character corresponding to one of these ‘out-of-band’ characters associated with the high-transition set includes less than four logical transitions,” and “[t]he difference in the number of transitions between in-band and out-of-band characters allows selected out-of-band characters to serve as control characters, and to be readily distinguished from in-band characters within the transmitted data stream.” Ex.1006, 9:66-10:8.

106. As is further discussed above in my analysis for limitation [1(i)], a POSITA would have understood that Banes' interrupt and resume codes are out-of-band symbols because they can use “spare” symbols or “unused” symbols not used in the 8b/10b scheme used by Ethernet. *See, e.g.*, Ex.1005, 2:17-20, 12:8-13, 12:18-19. Because such 8b/10b encoding uses transition-optimized in-band data symbols, Banes would have been understood to use transition-optimized in-band symbols, as discussed above. A POSITA also would have known that Banes' out-of-band

interrupt and resume codes would need to be distinguishable from the in-band data to be able to perform their function of triggering interruption and resumption. As such, a POSITA would have been motivated to use the well-known technique of using out-of-band symbols that are not transition optimized to make such out-of-band symbols distinguishable from the transition optimized in-band symbols contained in the 8b/10b encoded Ethernet packets used by Banes.

107. Given how well-known it was to use in-band symbols that are transition optimized and out-of-band symbols that are not transition optimized, a POSITA would have had a reasonable expectation of success in using this technique to render the in-band and out-of-band symbols distinguishable from each other.

108. Thus, Banes discloses and renders obvious “the in-band symbols are transition optimized and the out-of-band symbols are not transition optimized” as claimed.

3. Claim 5

[5] The method of claim 1 wherein the first and second packets are transmitted through the same communications link.

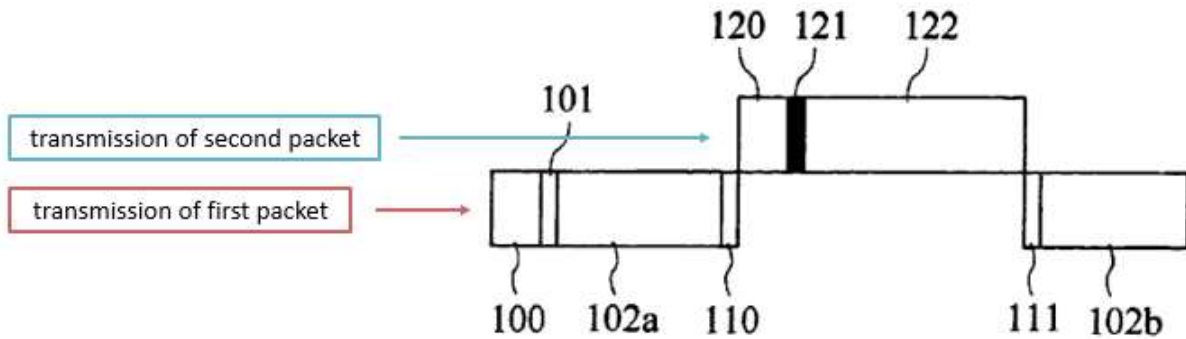
109. Banes’ disclosure indicates that the “first data packet” (“*first packet*”) and “higher priority data packet” (“*second packet*”) are transmitted via the same communications link, stating that: “[d]uring transmission of the initial data portion 102a [of the first data packet], a higher priority packet is received for sending along

the same path[.]” Ex.1005, 11:22-23. A POSITA would have understood the “same path” over which the packets are transmitted is the same communications link.

110. As explained above, Banes discloses that its system is applicable “to ATM or Ethernet networks” (Ex.1005, Abstract), and that “both types of packet [ATM cells and Ethernet frames] may be packaged and efficiently transported over a common medium, and readily separated for transmission over dedicated networks.” Ex.1005, 4:1-3. This “packag[ing]” and “transport[] over a common medium,” followed by “separat[ion]” of the packets would have been understood by a POSITA as referring to transmission those separate packet types over the **same communications link**. Otherwise, the packets would not require “separating” after they are received.

111. In addition, the stated aim in Banes indicates that the packets are transmitted over the same communications link. A POSITA would have understood that the fact that the packets are being transmitted over the same link is what gives rise to the need to interrupt transmission of the first packet to allow transmission of the second packet. Ex.1005, Fig. 4, 11:18-30. Figure 4 and its accompanying description depicts the first and second packets being transmitted via the same communications link, because it depicts the transmission of the first packet needing to be stopped to allow for transmission of the second packet, which indicates that the packets are being transmitted over a single link rather than two different

communications links. A POSITA also would have understood (and logic dictates) that the single communications link contributes to the creation of the potential “bottleneck” which “hold[s] up more urgent data,” as more urgent data would not be held up by less urgent data if the more urgent data were being transmitted and received over a second communications link that is separate from the link being used for the less urgent data. *Id.*, 2:14-16; *see also id.*, 2:2-8 (Banes’ invention seeks to “transfer large blocks of data efficiently without unduly delaying transit of smaller or more important data packets”). Both packets could be transmitted at the same time via two different communications links, eliminating the need for interruption, if two links were present instead of one, and, thus, this indicates that only one link is used, rather than multiple links. I have annotated Banes’ Figure 4 below, which illustrates transmitting the first and second packets via the same communications link, because it illustrates that the first packet must be paused to allow the second packet to be transmitted, demonstrating that only one packet can be transmitted at a given time, rather than multiple packets being able to be transmitted at a time (which would have been indicative of the presence of multiple links):



Ex.1005, Fig. 4 (annotated).

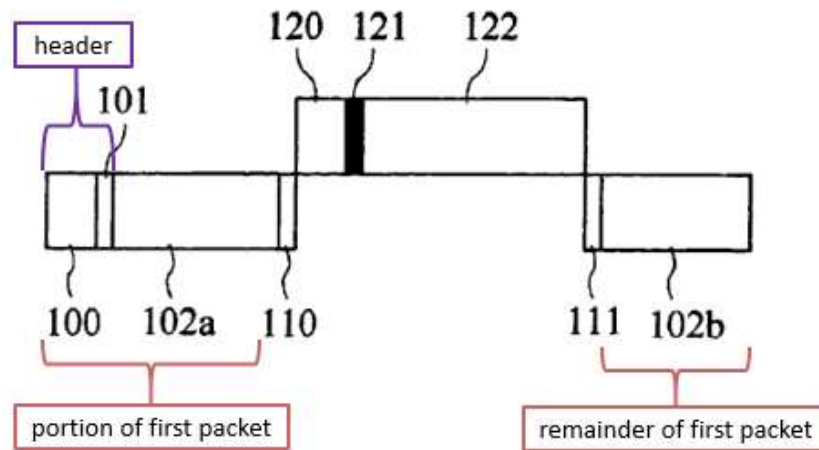
112. Thus, Banes discloses “the first and second packets are transmitted via the same communications link ” as claimed.

4. Claim 7

[7] The method of claim 1 wherein the first packet includes a header that is transmitted only once.

113. Banes discloses the first packet having a “header 10” which is transmitted only once. Banes’ first data packet “comprises a header 10 and a data portion 20. The header comprises routing information 12 and a length or type field 14, which in this embodiment comprises a single bit signifying ‘long’ or ‘short’. The header may also contain information such as priority information.” Ex.1005, 5:23-25; Fig 1.

114. I have annotated Figure 4 below to show that the “header 100 including a priority flag 101” of the first packet, is transmitted only once, with the first portion of the first packet, “data portion 102a.” The header 100 is not transmitted again with the “remainder 102b of the data of the first packet.” *Id.*, 11:20-22, 11:28-30.



Ex.1005, Fig. 4 (annotated).

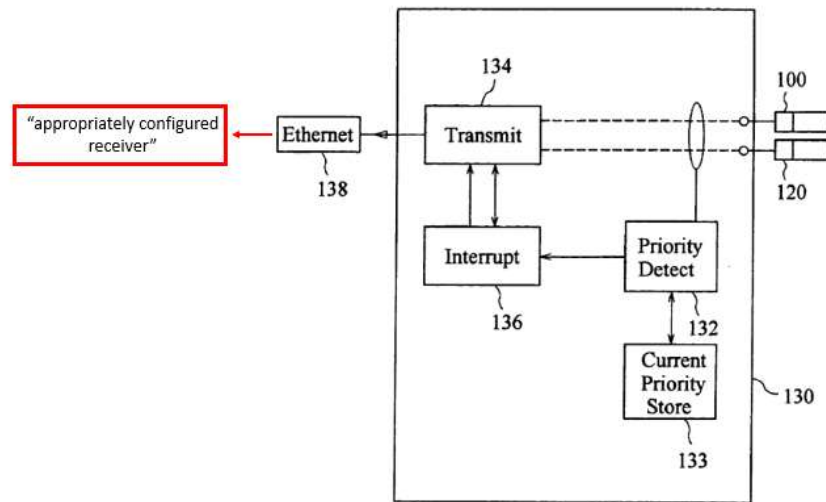
115. Thus, Banes discloses and renders obvious “the first packet includes a header that is transmitted only once” as claimed.

5. Claim 8

[8(pre)] A method for receiving packets, the method comprising:

116. Banes discloses an “appropriately configured receiver” that receives packets (*i.e.*, a method for receiving packets), as well as interrupt codes and resume/resumption codes. Ex.1005, 11:25-30. I have annotated Banes’ Figure 5 below to show the “appropriately configured receiver” that receives packets transmitted by the transmitter 134 over the Ethernet network 138:

Fig. 5



Ex.1005, Fig. 5 (annotated); 12:1-7.

117. My analysis above pertaining to [1(pre)] is relevant here, although the preamble of claim 1 requires a method for *transmitting* packets, as opposed to a method for *receiving* packets. “Transmitting” and “receiving” are two ends of the same “method of communicating data over a network,” disclosed by Banes, and for such data to be communicated over a network, such packets that are transmitted are also received to complete this communication. Ex.1005 at 2:9-10 (“the invention provides **a method of communicating data over a network** comprising transmitting a first data packet, receiving a higher priority data packet, interrupting transmitting the first data packet to transmit the higher priority data packet, and resuming transmission of the first data packet”), 3:3-4 (same). Banes teaches that an “appropriately configured receiver” receives the initial portion of the first packet

during Banes' disclosure of its packet preemption method, which demonstrates that the transmitted packets are received by a receiver. Ex.1005, 11:25-30. Banes' teaching that its packets are transmitted by transmitter 134 "over a network, here a 1Gbit/s Ethernet 138," which further demonstrates that the packets received by this appropriately configured receiver are received from the transmitter 134 over this Ethernet network, because for the data to be "communicated over a network" as taught by Banes, the packets must be "received." Ex.1005, 12:5-7.

118. Banes' teaching that "the fragmented packets" undergo "reassembly," also demonstrates that the packets are "received" by a receiver, because otherwise it would be impossible to reassemble them if they were not received. Ex.1005, 12:13-17.

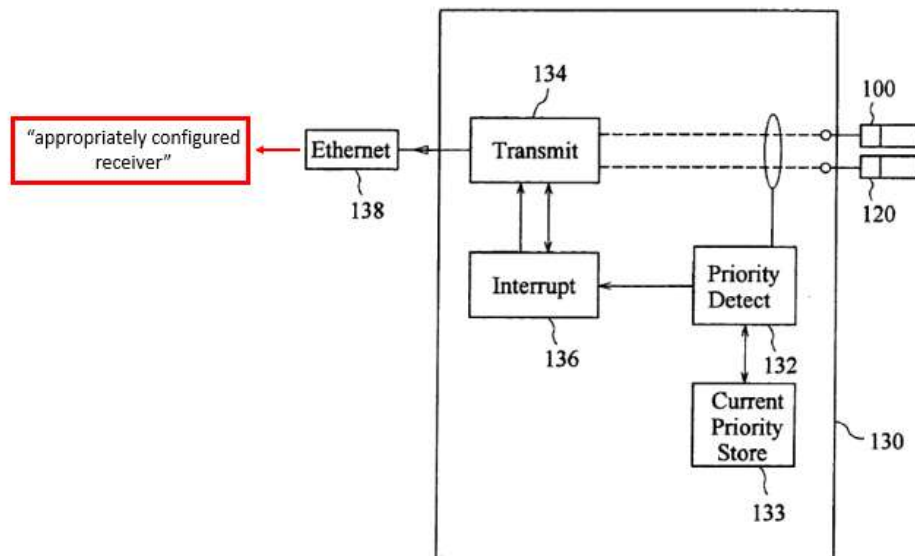
119. Thus, Banes discloses "a method for receiving packets" as claimed.

[8(a)] receiving a first portion of symbols of a first packet;

120. My analysis above for element [1(b)] is applicable here—Banes discloses "*receiving a first portion of . . . a first packet*" for the same reasons Banes discloses "*transmitting a portion of the received first packet*" as set forth above for [1(b)], because, as I explained above in my analysis of element [8(pre)], Banes discloses an "appropriately configured receiver" that receives packets in Banes' "method of communicating data over a network," which requires packets to be received in order to be "communicated." Ex.1005 at 2:9-10, 3:3-4.

121. Like discussed above for [8(pre)], a POSITA would have understood that, in a data communications system such as Banes where a first packet is being transmitted over a communications link, such packets would have been received by the “appropriately configured receiver” as shown below in annotated Figure 5 of Banes:

Fig. 5



Ex.1005, Fig. 5 (annotated); 12:1-7.

122. Banes teaches that the “appropriately configured receiver” in Banes receives the initial portion of the first packet, and receives an interrupt code that signals to the “receiver” that sending of the first packet to it has been interrupted. Ex.1005, 11:25-30 (“[A]n interrupt code 110 is inserted in the data portion 102a, which signals to an appropriately configured receiver that sending of the first packet has been interrupted.”). Because the interrupt code 110 is inserted in the first portion

of the first packet and it signals the interruption to the receiver, a POSITA would have understood the receiver receives the first portion. Further, in a system like Banes, where a first packet is being communicated over a communications network, a POSITA would have understood (and logic dictates) that such packets are received by the “appropriately configured receiver” to complete the “communication.” As also explained above, Banes discloses that “the fragmented packets” undergo “reassembly,” which further demonstrates that such fragmented packets, including the *first portion of a first packet*, are received. Ex.1005, 12:13-17.

123. In addition, Banes discloses that its packets are comprised of *symbols*. The fact that Banes’ packets may be Ethernet packets (Ex.1005 at Abstract, 12:5-13), which use 8b/10b encoding, as taught by Banes, means that a POSITA would have understood the packets to be comprised of 10-bit *symbols* encoded from 8-bit data. Ex.1005, 2:17-20 (“in the case of high speed Ethernet, 10 bit coding is used to carry 8 bit data.”); Ex.1012 (Ethernet 802.3 standard), 967 (“The 8B/10B transmission code specified for use in this standard has a high transition density, is a run-length-limited code, and is dc-balanced. The transition density of the 8B/10B **symbols** ranges from 3 to 8 transitions per **symbol**.”); *see also* Ex.1017, 499; Ex.1014, at 1 (“8b/10b is a line code that maps 8-bit words to 10-bit **symbols** to achieve DC balance and bounded disparity, and at the same time provide enough state changes to allow reasonable clock recovery.”); Ex.1010, 1:26-37; Ex.1008,

4:55-64. As such, because a POSITA would have understood that Banes' Ethernet packets, which are 8b/10b encoded, are comprised of 10-bit are comprised of 10-bit *symbols*, a POSITA would have understood that the first portion of the first packet received in Banes consists of *symbols* of a first packet.

124. Thus, Banes discloses “receiving a first portion of symbols of a first packet” as claimed.

[8(b)] receiving a preempt indicator indicating that a second packet of symbols is to be received;

125. My analysis above for element [1(e)] is applicable here. Banes discloses both “*transmitting a preempt indicator*” and “*receiving a preempt indicator indicating that a second packet . . . is to be received,*” for the same reasons I explained above in my analysis of element [8(a)]—Banes' method is “a method of communicating data over a network,” which requires the preempt indicator to be received for it to be communicated over a network. Ex.1005 at 2:9-10, 3:3-4. Otherwise, the preempt indicator would not be “communicated.”

126. In Banes, “an interrupt code 110 is inserted” in the data portion of the first packet when a higher-priority packet (second packet) is detected, which then “signals to an appropriately configured **receiver** that sending of the first packet has been interrupted.” Ex.1005, 11:22-28, 12:8-13. From this disclosure, POSITA would have understood that the receipt of the interrupt code 110 (“*preempt indicator*”) is

what indicates that an interrupting higher priority packet (“*second packet*”) is to be received.

127. For the same reasons given above in my analysis of element [8(a)], a POSITA would have understood that Banes’ higher priority packet (“*second packet*”) would have been comprised of symbols.

128. Thus, Banes discloses “receiving a preempt indicator indicating that a second packet of symbols is to be received” as claimed.

[8(c)] receiving the second packet of symbols;

129. My analysis above for element [1(f)] is applicable here. Banes discloses both “*transmitting the second packet*” and “*receiving the second packet*,” for the same reasons I explained above in my analysis of element [8(a)]—Banes’ method is “a method of communicating data over a network,” which requires the second packet be received for it to be communicated over a network. Ex.1005 at 2:9-10, 3:3-4. Otherwise, the second packet would not be “communicated.”

130. In addition, my analysis regarding element [8(a)] above is applicable. Banes’ packets are received by an “appropriately configured receiver.” Ex.1005, 11:25-30. A POSITA would have understood that the same receiver receives the transmitted higher priority packet (“*second packet*”). Ex.1005 at 11:22-23. Also as explained above in my analysis regarding element [8(a)], POSITA would have understood Banes’ packets to include symbols.

131. Thus, Banes discloses “receiving the second packet of symbols” as claimed.

[8(d)] receiving a continue indicator indicating that a second portion of symbols of the first packet is to be received; and

132. My analysis above for elements [1(g)] and [1(h)] are applicable here. Banes discloses both “transmitting a continue indicator” and “receiving a continue indicator,” ***and both*** “transmitting the portion of the first packet that has not yet been transmitted” ***and receiving*** “a second portion . . . of the first packet” for the same reasons I explained above in my analysis of element [8(a)]. Banes’ method is “a method of communicating data over a network,” which requires the second packet be received for it to be communicated over a network. Ex.1005 at 2:9-10, 3:3-4. Otherwise, the second packet would not be “communicated.”

133. My analysis regarding element [8(a)] above is also applicable. Banes’ packets are received by an “appropriately configured receiver.” Ex.1005, 11:25-30. In Banes, “the fragmented packets,” including the “remainder 102b” (“*second portion*”) of the first packet, are “reassembl[ed],” meaning those fragmented packets, including “*the second portion . . . of the first packet,*” must be received. Ex.1005, 12:13-17. This analysis is equally applicable to the “resume code” or “resumption code 111” (“*continue indicator*”)—a POSITA would also have understood that this would be received by the same “appropriately configured receiver.” The resume/resumption code indicate to the receiver that transmission of

the first packet is being resumed, therefore indicating that the second portion of the first packet is to be received. See Ex.1005, 11:28-30 (“The higher priority packet is then sent, followed by a resumption code 111, followed by the remainder 102b of the data of the first packet.”), 12:13-17 (“a resume code is sent . . . followed by the remainder of the first packet”). Also as explained above in my analysis regarding element [8(a)], POSITA would have understood Banes’ packets to include symbols.

134. Thus, Banes discloses “receiving a continue indicator indicating that a second portion of symbols of the first packet is to be received” as claimed.

[8(e)] receiving the second portion of symbols of the first packet;

135. My analysis above for element [1(h)] is applicable here. Banes discloses both “*transmitting the portion of the first packet that has not yet been transmitted*” and receiving “*the second portion . . . of the first packet,*” for the same reasons I explained above in my analysis of element [8(a)]—Banes’ method is “a method of communicating data over a network,” which requires the second packet be received for it to be communicated over a network. Ex.1005 at 2:9-10, 3:3-4. Otherwise, the second packet would not be “communicated.”

136. My analysis regarding element [8(a)] above is also applicable. Banes’ packets are received by an “appropriately configured receiver.” Ex.1005, 11:25-30. In Banes, “the fragmented packets,” including the “remainder 102b” (“*second portion*”) of the first packet, are “reassembl[ed],” meaning those fragmented

packets, including the “*second portion . . . of the first packet*,” must be received. Ex.1005, 12:13-17. A POSITA would have therefore understood that the remainder 102b of the first packet (“*second portion . . . of the first packet*”) is also received by the same “appropriately configured receiver.” Ex.1005, 11:28-30, 12:13-17.

137. Also as explained above in my analysis regarding element [8(a)], POSITA would have understood Banes’ packets to include symbols.

138. Thus, Banes discloses “receiving the second portion of symbols of the first packet” as claimed.

[8(f)] wherein the symbols of the packets include in-band symbols and the indicators include one or more out-of-band symbols.

139. Banes discloses and renders obvious this limitation for the reasons set forth in my analysis above for limitation [1(i)].

6. Claim 10

[10] The method of claim 8 wherein the in-band symbols are transition optimized and the out-of-band symbols are not transition optimized.

140. Banes discloses and renders obvious this limitation for the reasons set forth in my analysis above for claim [3].

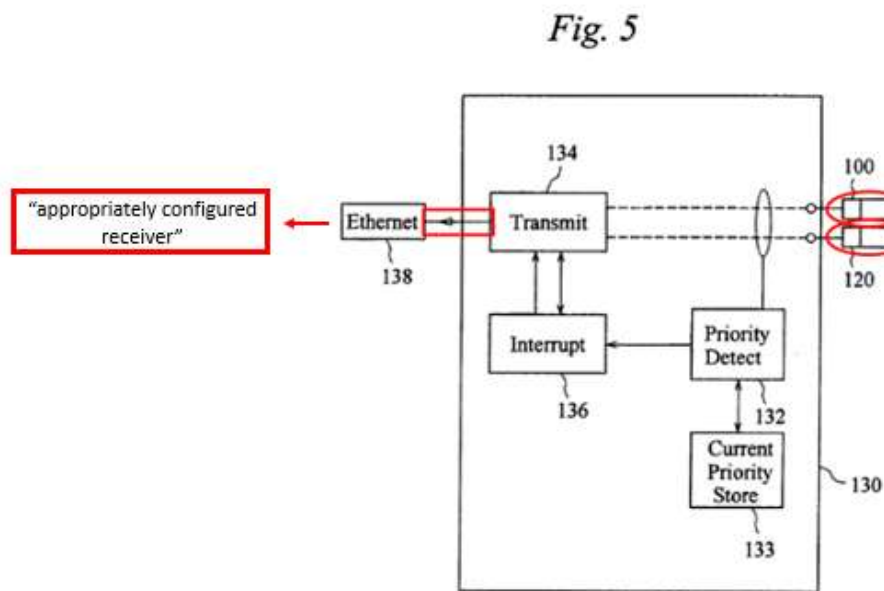
7. Claim 12

[12] The method of claim 8 wherein the first and second packets are received via the same communications link.

141. Banes discloses this limitation for the reasons set forth in my analysis above for claim [5].

142. In addition, as explained below in my analysis regarding element [8(a)], Banes' packets are received over this path by an "appropriately configured receiver[.]" *Id.*, 11:25-30. A POSITA would have understood the "same path" over which the packets are transmitted and received by the "appropriately configured receiver" is the same communications link.

143. I have annotated below Banes' Figure 5 to show that both the first data packet containing header 100, and the higher priority packet containing header 120 (circled in red) are received by the network interface 130 and transmitter 134, and they are then transmitted by the transmitter 134 along the "same path" (boxed in red) over "a 1 Gbit/s ethernet 138," to the "appropriately configured receiver" that receives these packets:

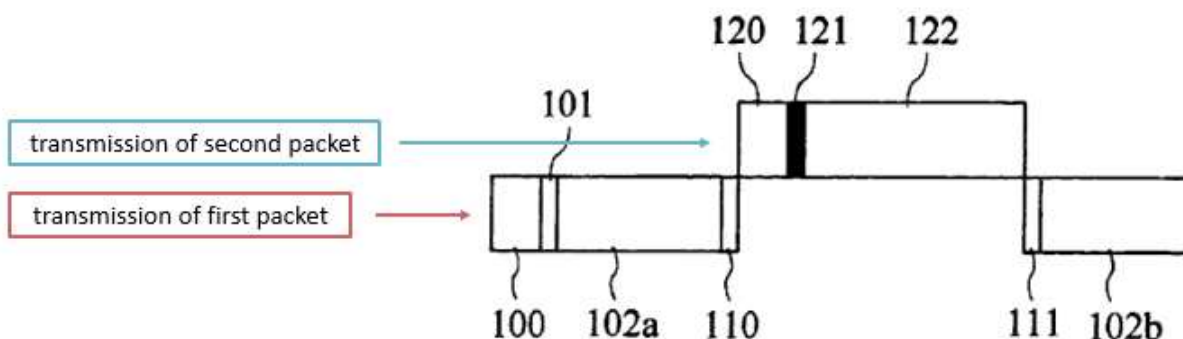


Ex.1005, Fig. 5 (annotated), 12:5-7, 11:25-30.

144. As explained above, Banes discloses that its system is applicable “to ATM or Ethernet networks” (Ex.1005, Abstract), and that “both types of packet [ATM cells and Ethernet frames] may be packaged and efficiently transported over a common medium, and readily separated for transmission over dedicated networks.” Ex.1005, 4:1-3. This “packag[ing]” and “transport[] over a common medium,” followed by “separat[ion]” of the packets would have been understood by a POSITA as referring to transmission those separate packet types over the **same communications link**. Otherwise, the packets would not require “separating” after they are received.

145. In addition, the stated aim in Banes indicates that the packets are transmitted over the same communications link. A POSITA would have understood that the fact that the packets are being transmitted over the same link is what gives rise to the need to interrupt transmission of the first packet to allow transmission of the second packet. Ex.1005, Fig. 4, 11:18-30. Figure 4 and its accompanying description depicts the first and second packets being transmitted and received via the same communications link, because it depicts the transmission of the first packet needing to be stopped to allow for transmission of the second packet, which indicates that the packets are being transmitted over a single link rather than two different communications links. A POSITA also would have understood (and logic dictates) that the single communications link contributes to the creation of the potential

“bottleneck” which “hold[s] up more urgent data,” as more urgent data would not be held up by less urgent data if the more urgent data were being transmitted and received over a second communications link that is separate from the link being used for the less urgent data. *Id.*, 2:14-16; *see also id.*, 2:2-8 (Banes’ invention seeks to “transfer large blocks of data efficiently without unduly delaying transit of smaller or more important data packets”). Both packets could be transmitted at the same time via two different communications links, eliminating the need for interruption, if two links were present instead of one, and, thus, this indicates that only one link is used, rather than multiple links. I have annotated Banes’ Figure 4 below, which illustrates transmitting and receiving the first and second packets via the same communications link, because it illustrates that the first packet must be paused to allow the second packet to be transmitted, demonstrating that only one packet can be transmitted at a given time, rather than multiple packets being able to be transmitted at a time (which would have been indicative of the presence of multiple links):



Ex.1005, Fig. 4 (annotated).

146. Thus, Banes discloses “the first and second packets are received via the same communications link ” as claimed.

8. Claim 14

[14] The method of claim 8 wherein the first packet includes a header that is received only once.

147. Banes discloses and renders obvious this limitation for the reasons set forth in my analysis above for claim [7].

9. Claim 15

[15(pre)] A method for transmitting packets via a communications link, the method comprising:

148. Banes discloses this limitation for the reasons set forth in my analysis above for limitations [1(pre)] and [12].

[15(a)] transmitting a first portion of a first packet;

149. Banes discloses this limitation for the reasons set forth in my analysis above for limitation [1(b)].

[15(b)] transmitting a preempt indicator indicating that a second packet is to be transmitted;

150. Banes discloses this limitation for the reasons set forth in my analysis above for limitation [1(e)] regarding *transmitting a preempt indicator* and for the reasons set forth above for limitation [8(b)] regarding *indicating that a second packet is to be transmitted*.

[15(c)] transmitting the second packet;

151. Banes discloses this limitation for the reasons set forth in my analysis above for limitation [1(f)].

[15(d)] transmitting a continue indicator indicating that a second portion of the first packet is to be transmitted; and

152. Banes discloses this limitation for the reasons set forth in my analysis above for limitation [1(g)] regarding *transmitting a continue indicator* and for the reasons set forth above for limitation [8(d)] regarding *indicating that a second portion of the first packet is to be transmitted*.

[15(e)] transmitting the second portion of the first packet

153. Banes discloses this limitation for the reasons set forth in my analysis above for limitation [1(h)].

[15(f)] wherein the first and second packets and the preempt and continue indicators are transmitted via the same communications link and

154. Banes discloses *the first and second packets . . . are transmitted via the same communications link* for the reasons set forth in my analysis above for claim [5]. In addition, a POSITA would have understood the preempt and continue indicators to be transmitted *via the same communications link* as the first and second packets for the same reasons as set forth in my analysis above for claim [12], including because they are transmitted via the same link to ethernet 138 and then to the “appropriately configured receiver.” A POSITA also would have understood the preempt and continue indicators to be transmitted *via the same communications link* as the first and second packets, because the indicators are inserted into the first

packet that is transmitted *via the same communications link* as the second packet, indicating that they are transmitted within the first packet over that same link.

Ex.1005, Fig. 4.

[15(f.1)] further the packets include in-band symbols and the indicators include one or more out-of-band symbols.

155. Banes discloses and renders obvious this limitation for the reasons set forth in my analysis above for limitation [1(i)].

10. Claim 17

[17] The method of claim 15 wherein the in-band symbols are transition optimized and the out-of-band symbols are not transition optimized.

156. Banes discloses and renders obvious this limitation for the reasons set forth in my analysis above for claim [3].

11. Claim 20

[20] The method of claim 15 wherein the first packet includes a header that is transmitted only once.

157. Banes discloses and renders obvious this limitation for the reasons set forth in my analysis above for claim [7].

12. Claim 21³

[21(pre)] A communications device for transmitting packets via a communications link, comprising:

³ I have been asked to assume that the *component* limitations in claim 21 should be construed to have their plain and ordinary meaning and are not means-plus-function limitations governed by 35 U.S.C. § 112(6). As such, I have applied this assumed construction in my analysis.

158. Banes discloses *a communications device for transmitting packets via a communications link* for the reasons set forth in my analysis above for limitation [1(pre)] and claim [5].

[21(a)] *a transmission component that transmits a first packet; and*

159. Banes discloses *transmit[ting] a first packet* for the reasons set forth in my analysis above for limitation [1(b)].

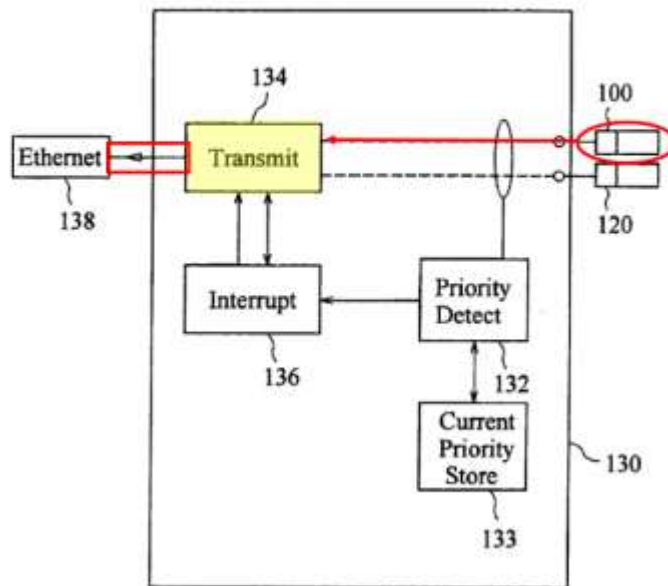
160. I offer two alternative analyses regarding the *transmission component*. To the extent it is argued that the *transmission component* and the *preemption component* of claim 21 do not need to be separate physical structures, then Banes' "network interface 130" constitutes a transmission component. The network interface 130 both performs the function of the transmission component and the preemption component.

161. The network interface 130 includes a "transmitter for connection to a communication network" including a "means for transmitting the data packet over the communication medium," meaning it transmits a first packet. Ex.1005, 4:23-28, 13:17-21, 14:11-16. The network interface 130 includes a "transmitter 134" that transmits received data packets for onward transmission, including the first, lower priority data packet ("*first packet*"). Ex.1005, 12:2-7, 11:18-23, Fig. 5.

162. Alternatively, if the transmission and preemption components must be separate physical structures, then "transmitter 134" in Banes meets this limitation.

Banes' "transmitter 134" is a *transmission component that transmits a first packet* because it receives data packets and then transmits them onward, including the first, lower priority data packet ("*first packet*"). Ex.1005, 12:2-7, 11:18-23, Fig. 5. I have annotated below Figure 5 showing the first packet (shown here with header 100) being transmitted by the transmitter 134 to Ethernet 138:

Fig. 5



Ex.1005, Fig. 5 (annotated).

163. As is explained in further detail for elements [21(b)]-[21(b.3)] below, under this alternative theory, the "interrupt device 136," which is separate from the transmitter 134, constitutes the *preemption component* as claimed.

164. Thus, Banes discloses "a transmission component that transmits a first packet" as claimed.

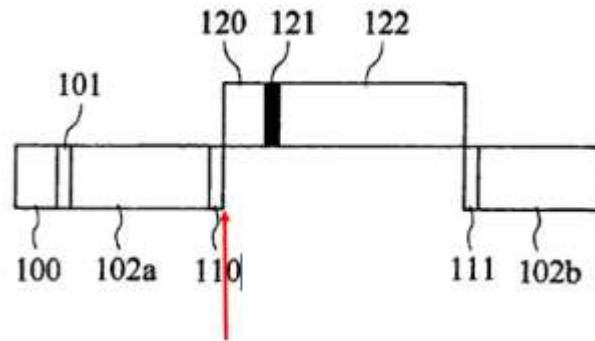
[21(b)] a preemption component that signals the transmission component to stop transmitting the first packet,

165. Banes discloses *stop[ping] transmitting the first packet* for the reasons set forth in my analysis above for limitation [1(d)].

166. If the transmission component and preemption component do not need to be separate structures, then “network interface 130” is a *preemption component that signals the transmission component to stop transmitting the first packet*. To signal the transmission component to stop transmitting the first packet, network interface 130 inserts an interrupt code if it is “determine[d] that interruption is required” and which “signals . . . that sending of the first packet has been interrupted” via the “interrupt device 136.” Ex.1005, 12:1-13, 11:25-28. Specifically, the network interface 130’s interrupt device 136 “buffers the remainder of the [first] packet in transit” and “instructs the transmitter [134] [of the network interface 130] to commence output of the higher priority packet.” *Id.*, 12:8-13.

167. Alternatively, if the transmission and preemption components must be separate physical structures, Banes’ “interrupt device 136” is a preemption component. As described above, it “inserts an interrupt code” that “signals . . . that sending of the first packet has been interrupted,” and then “buffers the remainder of the [first] packet in transit” before “instructs[ing] the transmitter [134] [transmission component] to commence output of the higher priority packet.” Ex.1005, 11:25-28, 12:1-13, Figs. 4-5.

168. I have annotated Figure 4 below to show “interrupt code 110” being inserted by the interrupt device (at the point indicated by the red arrow), at which point the transmitter pauses transmission of the first packet. *Id.*, Fig. 4, 11:25-28.



Ex.1005, Fig. 4 (annotated).

169. Thus, Banes discloses “a preemption component that signals the transmission component to stop transmitting the first packet” as claimed.

[21(b.1)] transmits a preempt indicator indicating that a second packet is to be transmitted,

170. Banes discloses *transmit[ing] a preempt indicator* for the reasons set forth in my analysis above for limitation [1(d)].

171. As set forth above for element [21(b)], the “network interface 130” constitutes a preemption component that . . . transmits a preempt indicator indicating that a second packet is to be transmitted if the transmission component and preemption component need not be separate structures. The “network interface 130” includes an “interrupt device 136” which “inserts an interrupt code” (“preempt indicator”). This interrupt code “signals . . . that sending of the first packet has been

interrupted” and “instructs the transmitter to commence output of the higher priority packet,” which indicates that the second packet is to be transmitted. Ex.1005, 12:5-13, 11:25-28, Figs. 4-5.

172. To the extent the transmission and preemption components must be separate physical structures, then the “interrupt device 136” in Banes constitutes a preemption component that . . . transmits a preempt indicator indicating that a second packet is to be transmitted. Ex.1005, 12:5-13, 11:25-28, Figs. 4-5.

173. Thus, Banes discloses “a preemption component that . . . transmits a preempt indicator indicating that a second packet is to be transmitted” as claimed.

[21(b.2)] transmits the second packet, and

174. Banes discloses *transmit[ting] the second packet* for the reasons set forth in my analysis above for limitation [1(f)].

175. Banes discloses and renders obvious *a preemption component that . . . transmits the second packet*. First, if the transmission and preemption components need not be separate physical structures, then the “network interface 130” constitutes *a preemption component*. The network interface 130 contains a “transmitter 134” which is what transmits the higher priority packet (“*second packet*”) after “an interrupt code” (“*preempt indicator*”) is inserted and the transmitter is “instruct[ed] . . . to commence output of the higher priority packet.” Ex.1005, 12:5-13, 11:28-30, Figs. 4-5.

176. Alternatively, if the transmission and preemption components must be separate physical structures, Banes renders obvious a *preemption component that . . . transmits the second packet*. As described above for element [21(b.1)], Banes discloses that the “interrupt device 136” transmits an “interrupt code” (“*preempt indicator*”) and “instructs the transmitter to commence output of the higher priority packet.” Ex.1005, 12:1-13. Banes is silent as to whether the interrupt device can participate in the transmission of the higher-priority packet. Ex.1005, 12:1-13. But it would have been obvious to a POSITA for the “interrupt device 136” (“*preemption component*”) to participate in *transmit[ting]* the second packet for the reasons set forth in my analysis below.

177. As disclosed in Banes, the interrupt device 136 already includes a “buffer[]” that can store “the remainder of the packet in transit as necessary,” while the packet’s transmission is being interrupted. Ex.1005, 12:8-13. Banes also discloses a priority detector 132 for reading the priority flag in the header of an incoming packet and then comparing that priority to the priority of the packet in transit (first packet) stored in a current priority store 133. Ex.1005, 12:3-13, 11:20-25, Fig. 5. This comparison is made to determine whether the second packet has a higher priority than the first packet and needs to preempt the first packet. Ex.1005, 12:3-13, 11:20-25, Fig. 5.

178. It would have been obvious to a POSITA for the interrupt device 136 to participate in transmitting the second packet given the role the interrupt device already plays in Banes' system and given the necessity of temporarily storing incoming packets for analysis. A POSITA would have understood that it would have been necessary to temporarily store an incoming packet—such as the high priority packet (“*second packet*”)—to allow the priority flag in its header to be read and compared against the stored priority in the priority store 133 for the first packet. Banes' interrupt device 136's buffer already exists in Banes and is described as having the ability to temporarily store packet data in transit including the portion of the interrupted first packet. As such, a POSITA would have been motivated to use the interrupt device 136's buffer to temporarily store the second packet, because this would have been understood to be necessary to allow its priority flag to be analyzed and compared, because Banes already teaches this buffer can temporarily store packets including the portion of the interrupted first packet, and because it would have been efficient to use this buffer to temporarily store the second packet in addition to the portion of the first packet so that an additional buffer is unnecessary. And because a POSITA would have been motivated to temporarily store the second packet in the interrupting device 136's buffer, a POSITA would have also been motivated to have the interrupting device 136 participate in the transmission of the

second packet by transmitting it from its buffer to the transmitter 134 for onward transmission.

179. A POSITA would have appreciated that this design would have furthered Banes' goal of detecting packet priority and performing interruption of lower priority packets with high priority packets by allowing for the incoming second packet to be temporarily stored in a buffer for analysis. A POSITA also would have had a reasonable expectation of success because this design would have used Banes' existing hardware (including its interrupt device 136 and its buffer), and to the extent any modification was necessary, it would have only involved a minor software modification.

180. The '905 patent itself contemplates that "[o]ne skilled in the art" would have "appreciate[d]" that a "serial communications architecture" like that disclosed in the '905 patent could "be implemented using different combinations of logic circuits and/or firmware," which further shows that a POSITA would have had the requisite skill needed implement such a software modification. Ex.1001 at 7:67-8:2.

181. Thus, Banes discloses and renders obvious "a preemption component that . . . transmits the second packet" as claimed.

[21(b.3)] signals the transmission component to continue transmitting the first packet;

182. Banes discloses and renders obvious this limitation. To the extent the transmission and preemption components need not be separate structures, the

“network interface 130” is a *preemption component that . . . signals the transmission component to continue transmitting the first packet*. The “network interface 130” contains the interrupt device 136 which inserts an interrupt code, signalling to the transmitter 134 of the network interface 130 to continue the transmission of the first packet. Banes discloses that: “[a]fter the higher priority packet has been sent, a resume code is sent . . . followed by the remainder of the first packet.” Ex.1005, 12:13-17, 11:28-30 (“The higher priority packet is then sent, followed by a resumption code 111, followed by the remainder 102b of the data of the first packet.”), Figs. 4-5.

183. Alternatively, if the transmission and preemption components must be separate physical structures, the “interrupt device 136” constitutes a *preemption component that . . . signals the transmission component to continue transmitting the first packet*. Again, the “interrupt device 136” inserts an interrupt code, which signals the “transmitter 134” (“*transmission component*” in this alternative) to continue transmitting the first packet. Ex.1005, 12:5-17, 11:28-30; Figs. 4-5.

184. Thus, Banes discloses “a preemption component that . . . signals the transmission component to continue transmitting the first packet” as claimed.

[21(c)] wherein packets include in-band symbols and the indicators include one or more out-of-band symbols.

185. Banes discloses and renders obvious this limitation for the reasons set forth in my analysis above for limitation [1(i)].

13. Claim 23

[23] The communications device of claim 21 wherein the in-band symbols are transition optimized and the out-of-band symbols are not transition optimized.

186. Banes discloses and renders obvious this limitation for the reasons set forth in my analysis above for claim [3].

14. Claim 26

[26] The communications device of claim 21 wherein the first packet includes a header that is transmitted only once.

187. Banes discloses and renders obvious this limitation for the reasons set forth in my analysis above for limitation [7].

C. Ground 3 and Ground 4: Claims 1-2, 5, 8-9, 12, 15-16, and 20-22 are anticipated by Calvignac under 35 U.S.C. § 102 and are obvious over Calvignac under 35 U.S.C. §103

1. Claim 1

[1(pre)] A method for transmitting packets, the method comprising:

188. Calvignac discloses a “packet switched communications system” in which packets are transmitted through “transmit/receive adapters connected to the communication links.” Ex.1004, Abstract, 3:13-17.

189. Thus, Calvignac discloses “[a] method for transmitting packets” as claimed.

[1(a)] receiving a first packet;

190. Calvignac's system uses "nodes" which are linked through "one or more communication links." *Id.*, 3:13-17. "At each node, incoming data packets are selectively routed to one or more of the outgoing communication links terminated at another node." *Id.*, 3:17-20. Calvignac discloses two types of data packets, a first type in the form of "non-real-time traffic" or a "low priority packet" ("*first packet*"), which is of a lower priority than the second type, "real-time traffic" or a "high priority packet" ("*second packet*"). *Id.*, 2:31-35, 4:4-4:10, 4:52-67, 5:43-55, Fig. 2, Fig. 5.

191. Calvignac's packets "received from the switch are stored in one of the buffers, according to their class" and then, "forward[ed]" to the output trunk. *Id.*, 3:44-46. These packets "arrive" (meaning they are *receiv[ed]*) before they are "served." *Id.*, 3:57-59.

192. In Calvignac, low-priority packets ("*first packet[s]*") may be received and stored in the low priority buffer, as Calvignac specifically discloses serving/transmitting low priority packets from the low priority buffer. *Id.*, 4:4-10.

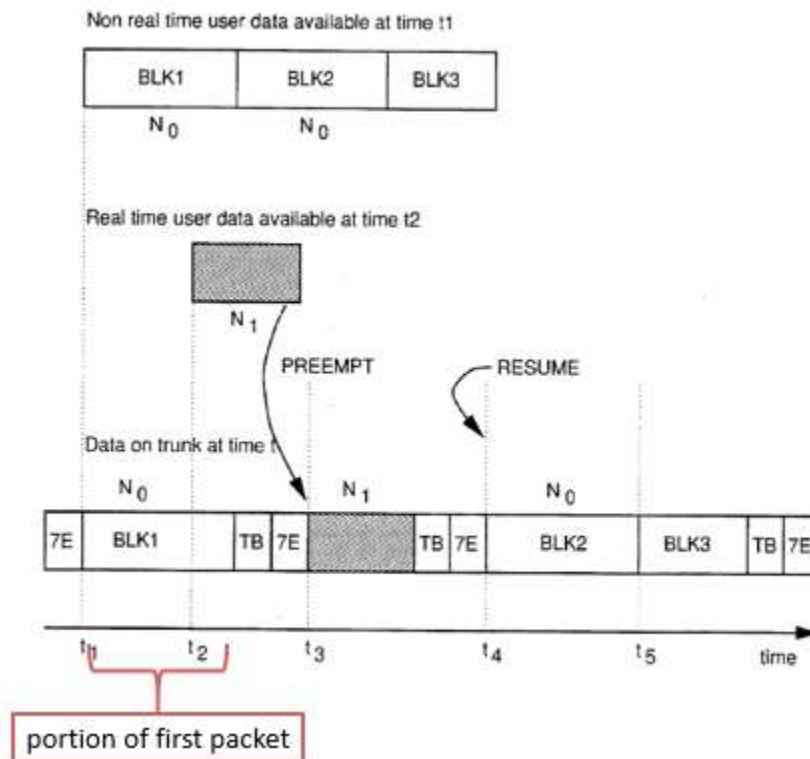
193. Thus, Calvignac discloses "receiving a first packet" as claimed.

[1(b)] transmitting a portion of the received first packet;

194. As I explained above for element [1(a)], Calvignac discloses a non-real time/low priority *first packet*. Transmission of this *first packet* begins at time t_1 , after which a portion of the received *first packet* is transmitted. *Id.*, 4:52-53; *see also id.*,

1:50-56, 9:25-26. Calvignac discloses that, “[i]f a low-priority packet is being transmitted from low priority buffer 43 and a high-priority packet arrives in the high priority buffer 42, then the transmission of the low-priority packet is preempted.” *Id.*, 8:41-44.

195. I have annotated Calvignac’s Figure 2 below to show that BLK1, which is a part of a non-real-time data packet (a “*portion of the received first packet*”), is transmitted before preemption occurs and transmission is stopped at time t_2 :



Id., Fig. 2 (annotated).

196. I have also annotated Calvignac’s Figure 5 to show a portion, “PACKET DATA” of a non-real-time packet, “NRT,” that is transmitted

(“transmitting a portion of the received first packet”) before it is preempted by a real-time packet, “RT”:

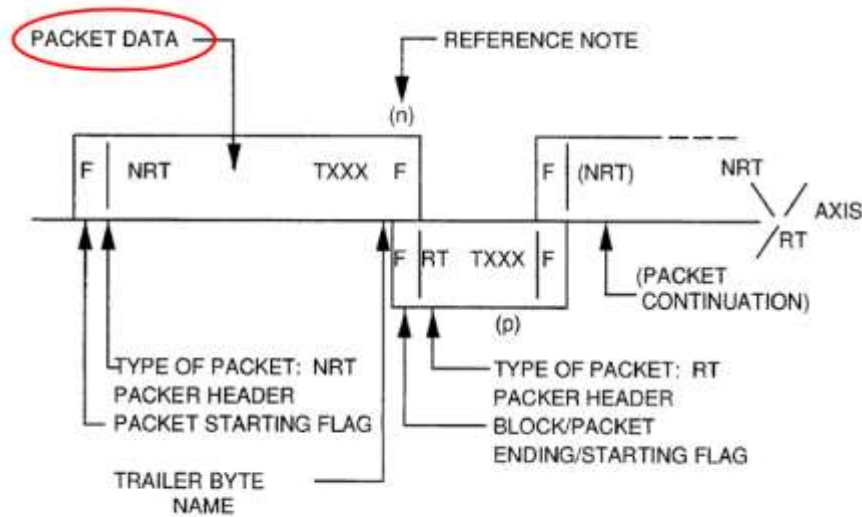


Figure 5

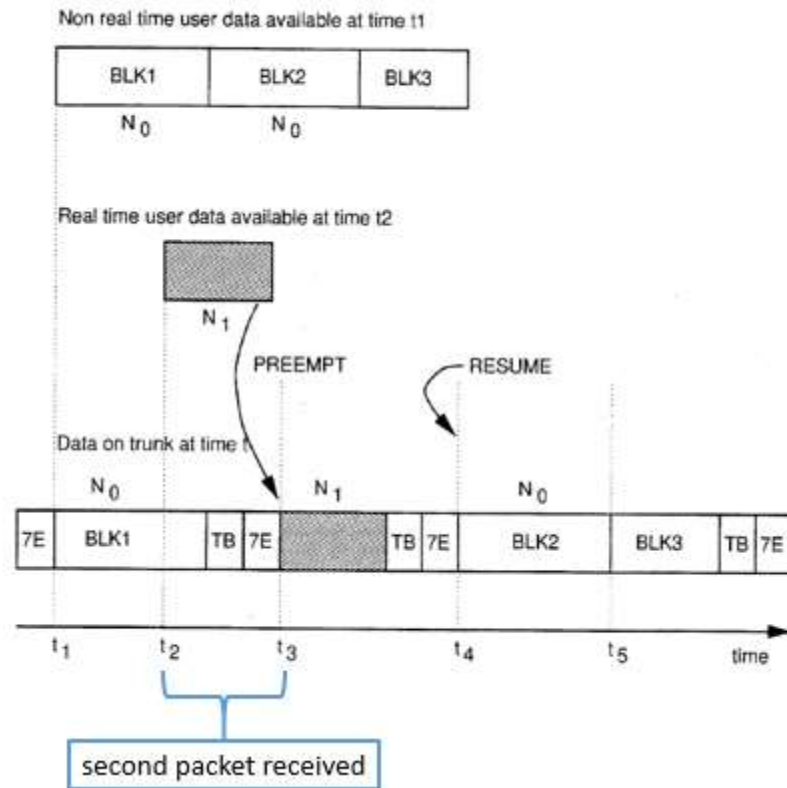
Id., Fig. 5 (annotated).

197. Thus, Calvignac discloses “transmitting a portion of the received first packet” as claimed.

[1(c)] receiving a second packet;

198. Calvignac discloses that “a real-time packet [a second packet] arrives at the output trunk at time t_2 before the end of the transmission of the non-real-time packet” (“receiving a second packet”) *Id.*, 4:53-55; see also *id.*, 4:4-10 (a high priority packet” can “arrive[]” at the high priority buffer “before the end of” transmission of a low priority packet), 8:41, 2:42-44.

199. I have annotated Figure 2 below to illustrate the real-time packet N_1 becoming “available” (i.e., when the *second packet* is *receiv[ed]*) at the time t_2 :



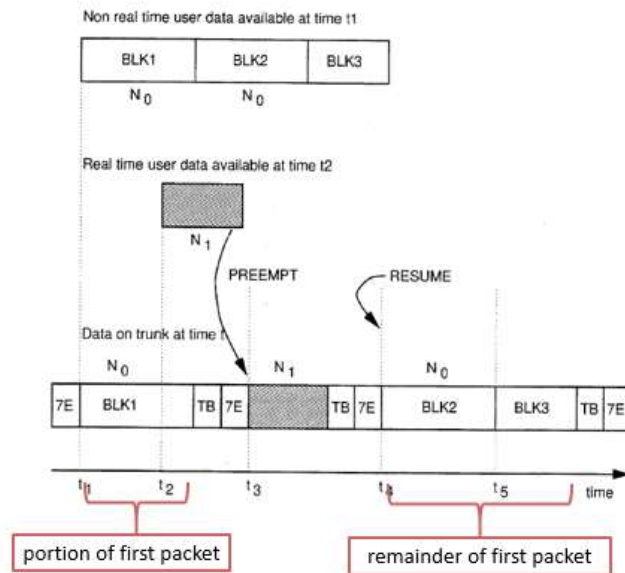
Id., Fig. 2 (annotated) (“Real time user data available at time t_2 ”).

200. Thus, Calvignac discloses “receiving a second packet” as claimed.

[1(d)] upon receiving the second packet, stopping the transmitting of the first packet so that not all of the first packet has been transmitted;

201. Calvignac discloses that after the real-time packet (“second packet”) arrives “at time t_2 before the end of the transmission of the non-real-time packet” (“upon receiving the second packet, stopping the transmitting of the first packet”), the transmission of the non-real-time packet (“first packet”) is preempted, such that “the service of the low priority packets is interrupted when a high priority packet arrives before the end of the service.” *Id.*, 4:53-55, 4:4-10.

202. Calvignac teaches that “a block always references a part of a NRT packet.” Ex.1004, 7:10-11. As such, when the packet is preempted, the transmission of the first packet stops at the next “block” of data. I have annotated Figure 2 below to show the first “block” of data (BLK1) of the first packet being transmitted before the receipt of the second packet N_1 , while transmission of the remaining blocks of data (BLK2, BLK3) in the first packet is stopped (“so that not all of the first packet has been transmitted”) until the full real-time packet N_1 (“second packet”) has been transmitted:



Id., Fig. 2 (annotated); see also 5:56-64.

203. Thus, Calvignac discloses “upon receiving the second packet, stopping the transmitting of the first packet so that not all of the first packet has been transmitted” as claimed.

[1(e)] transmitting a preempt indicator;

204. Calvignac discloses a *preempt indicator* in the form of a “1-byte trailer” (or “trailer byte”) plus an “X‘7E’ flag” at the end of a block, BLK1, of a non-real-time packet (together, “*a preempt indicator*”). Ex.1004, 5:34-35; *see also* 5:43-49.

205. This “trailer byte” and “X‘7E’ flag” together indicate that a particular non-real-time packet is to be preempted for a real-type packet to be transmitted. The first portion of the non-real-time packet “is transmitted along with at least a 1-byte trailer which is used to indicate whether the packet is preempted. Each preempt/resume transition is marked by the transmission of a X‘7E’ flag preceded by a 1-byte trailer” (“*transmitting a preempt indicator*”). *Id.*, 5:34-35; *see also* 5:43-49. The trailer byte includes “three state control bits that are used by the preempt/resume protocol; one reserved bit; and four other bits used for protection.” *Id.*, 5:65-67. The X‘7E’ flag inserted after the trailer byte can have the format ‘011111110’ (seven “1’s”) to indicate the start of preemption. *Id.*, 4:47.

206. I have annotated Figure 8 below, which Calvignac discloses “represents a [non-real time] NRT packet preempted once with one inserted [real-time] RT packet” and depicts a preempt indicator collectively comprised of a X‘7E’ flag denoted “F” and a trailer byte having its last three bits denoted as “T110.” *Id.*, 6:55-59, 6:37.

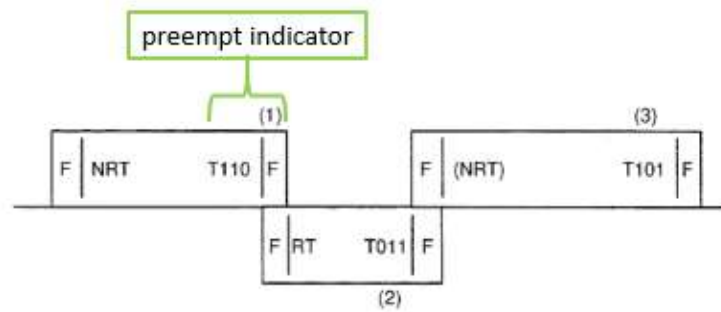
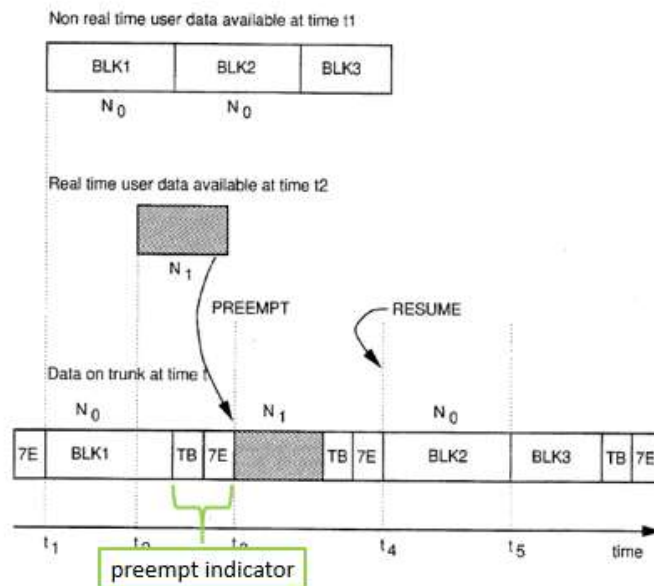


Figure 8

Id., Fig. 8 (annotated); see also 6:31-49.

207. I have also annotated Figure 2 below to show *transmitting a preempt indicator* comprised of a X'7E' flag (denoted "7E") and a trailer byte (denoted "TB"):



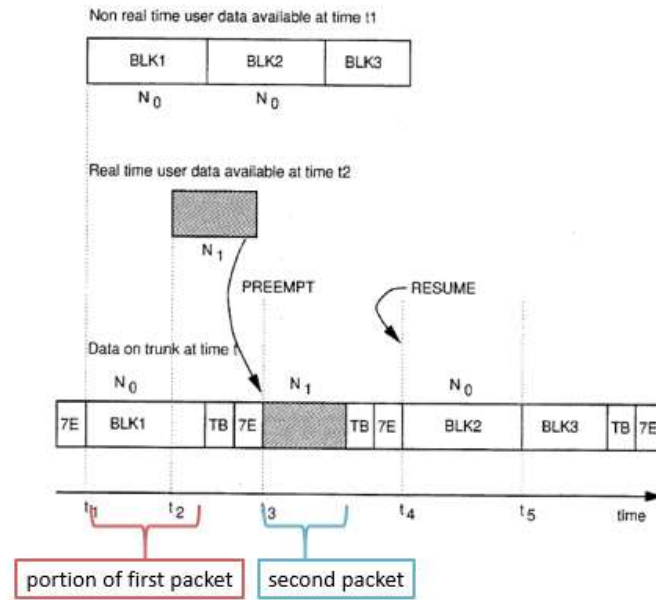
Id., Fig. 2 (annotated), 5:37-38, 6:34.

208. Thus, Calvignac discloses "transmitting a preempt indicator" as claimed.

[1(f)] transmitting the second packet; and

209. Calvignac discloses that transmission of the low-priority packet is resumed “after the high-priority packet has been served,” (i.e., after the *second packet* is transmitted). Ex.1004, 4:4-10; *see also* 5:43-53 (referring to “transmit[ing]” the “RT packet”). Calvignac discloses that “if a RT [real-time] packet arrives after the transmission of a NR or NRT packet has started, the scheduler notices the presence of the RT packet at the next inter-block checking. It then inserts a 1-byte trailer into the current NR or NRT packet which indicates that this packet is going to be preempted by at least one RT packet, triggers the transmission of a X’7E’ flag and inserts the RT packet[.]” *Id.*, 5:43-49.

210. I have annotated Figure 2 below to show that the real-time packet, N₁, (“*second packet*”) is transmitted after the first block (BLK1) of the non-real-time packet:



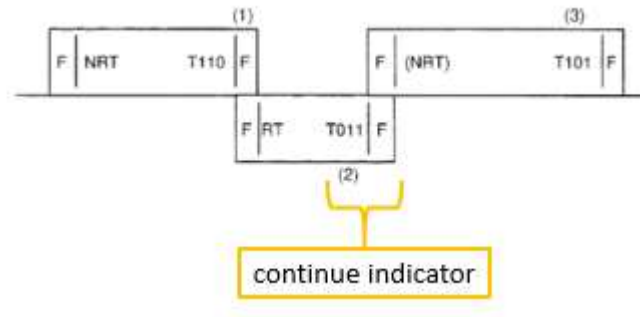
Id., Fig 2; see also 5:56-64.

211. Thus, Calvignac discloses “transmitting the second packet” as claimed.

[1(g)] upon completion of transmitting the second packet, transmitting a continue indicator; and

212. Calvignac’s “1-byte trailer” (or “trailer byte”) plus an “X’7E’ flag” can be encoded with different values indicating the end of preemption and can together constitute a *continue indicator*. Calvignac discloses that the trailer byte and 7E flag may be inserted together at the end of the real-time packet (“*second packet*”) indicating that the transmission of the real-time packet has been completed and that transmission of the non-real-time packet may be resumed (i.e., *upon completion of transmitting the second packet, transmitting a continue indicator*). Ex.1004, 2:45-49, 5:34-38, 5:50-56, 6:55-59.

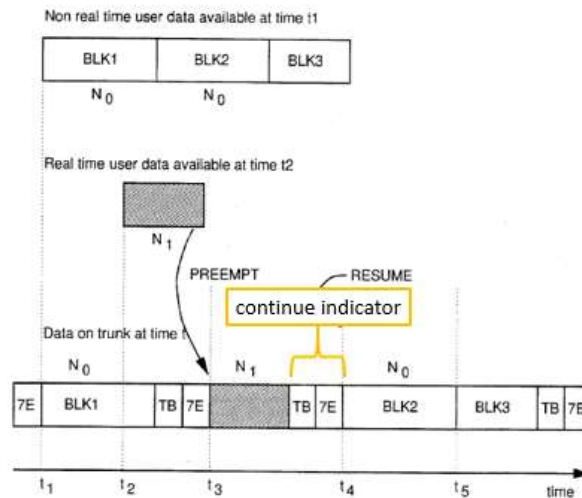
213. I have annotated Figure 8 below to show how the trailer byte can be encoded with its last three bits being “T011” to signals that the “RT packet [is] inserted, followed by a NRT block,” which indicates to the system that the next block of the non-real-time packet may be transmitted. *Id.*, 6:55-59; *see also* 5:50-56.



Id., Fig. 8 (annotated); *see also* 6:31-49.

214. As can be seen in Figure 2 above, along with the trailer byte, Calvignac’s continue indicator also includes a X’7E’ flag (denoted “F” above), which may have the sequence “011111110” (eight “1’s”) to indicate the end of preemption. Ex.1004, 4:48; *see also id.*, 2:5-13. Thus, Calvignac teaches use of a continue indicator which is separate from and different from the preempt indicator, as different bit values and sequences are used for the trailer byte (i.e., T110 for the preempt indicator and T011 for the continue indicator) and X’7E’ flag (i.e., 011111110 having seven “1’s” for the preempt indicator and 0111111110 having eight “1’s” for the continue indicator), respectively, to indicate the start of preemption and the end of preemption.

215. I have also annotated Figure 2 below to show the transmission of a continue indicator including the trailer byte (“TB”) and the X‘7E’ flag (“7E”) upon completion of transmitting the second packet (real-time packet “N₁”):



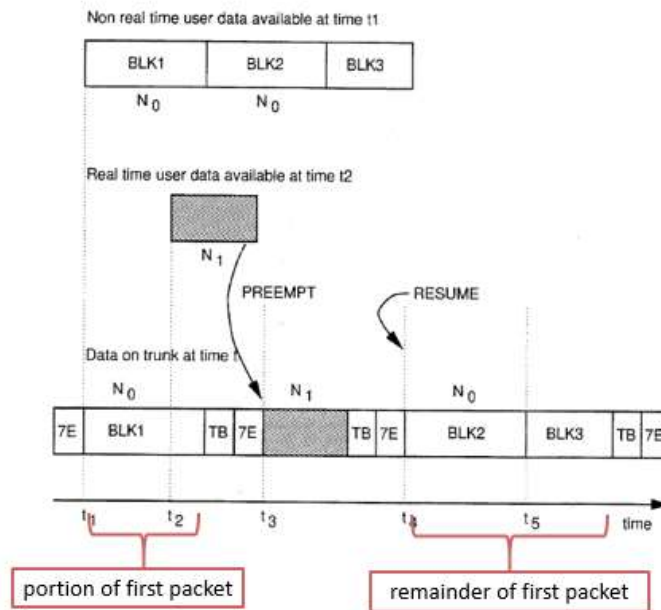
Id., Fig. 2 (annotated).

216. Thus, Calvignac discloses “upon completion of transmitting the second packet, transmitting a continue indicator” as claimed.

[1(h)] transmitting the portion of the first packet that has not yet been transmitted;

217. Calvignac discloses that, after the entire higher-priority real-time packet (“second packet”) has been transmitted, “the scheduler inserts a 1-byte trailer which indicates that this packet was a RT packet, triggers the transmission of a X‘7E’ flag, and checks again the RT queue,” and then, “the scheduler **resumes the transmission of the NRT (or NR) packet**” (i.e., the remaining *portion* of the *first packet* is transmitted). *Id.*, 5:50-56; *see also* 5:61-64, 10:8-22, 11:4-11.

218. I have annotated Figure 2 below to show the transmission of the remaining blocks of the non-real-time packet (“*first packet*”), labelled BLK2 and BLK3 below, after the real-time packet N_1 (“*second packet*”) is transmitted:



Id., Fig 2; see also 5:62-64.

219. Thus, Calvignac discloses “transmitting the portion of the first packet that has not yet been transmitted” as claimed.

[1(i)] wherein the packets include in-band symbols and the indicators include one or more out-of-band symbols.

220. As I explained above in my '905 patent summary, the '905 patent describes that “in-band symbols” can be symbols that “typically” make up “[a] packet that is transmitted on a serial communications link[.]” Ex.1001, 11:49-52. These in-band symbols are further described as symbols “with at least four transitions.” Ex.1001, 24:41-43. Conversely, out-of-band symbols are described as

the opposite of in-band symbols—namely, an out-of-band symbol can be “a symbol that does not normally appear within a packet because it may not have the same desirable characteristic as an in-band symbol[.]” *Id.* at 11:56-60. And out-of-band symbols can be “symbols with three or less transitions.” *Id.*, 24:44-46.

221. Calvignac discloses that its communications network uses the HDLC protocol. Ex.1004, 2:36-39; 4:16-17, *see also* 4:38-44. Consequently, Calvignac’s packets include “in-band” symbols, because the HDLC packet format includes an “Information” field, which is the field that contains the normal payload data that typically appears in a packet. Ex.1015, 3. This packet format is shown below:

Flag	Address	Control	Information	FCS	Flag
8 bits	8 or more bits	8 or 16 bits	Variable length, $8 \times n$ bits	16 or 32 bits	8 bits

Ex.1015, 3.

222. Second, Calvignac’s *preempt* and *continue* indicators include one or more out-of-band symbols because the trailer byte and the X‘7E’ flag are comprised of one or more out-of-band symbols. Specifically, first, the trailer byte is comprised of one or more out-of-band symbols. Calvignac teaches that “on trunks that support preempt/resume protocol, each packet is transmitted along with at least a 1-byte trailer which is used to indicate whether the packet is preempted.” Ex.1004, 5:34-38. The disclosure in Calvignac indicates that these “trailer bits” are *out-of-band symbols*, because they are described as being “insert[ed] [] into the current NR or

NRT packet[.]” *Id.*, 5:43-49. As such, they are not “typically” contained within the packet.

223. In addition, Calvignac’s discloses that the *preempt* and *continue* indicators include one or more out-of-band symbols because the purpose of out-of-band symbols (as described in the ’905 patent) is to be recognizable from in-band symbols, and in Calvignac, the “flag detector” which “continuously monitors the bit stream received from a communications link 51” is able to detect the trailer byte as separate from the packet data (in-band symbols) to commence preemption or resumption of transmission. Ex.1004, 9:14-18, 9:39-42.

224. Calvignac’s X’7E’ flag also includes one or more out-of-band symbols, because it can be “insert[ed]” in the RT packet along with the new 1-byte trailer, meaning it is not “typically” contained within the packet. *Id.* at 5:55-56. The sequence of the X’7E’ flag also indicates that it is out-of-band—Calvignac discloses that it can have a sequence of “011111110” (seven “1’s”) when forming part of a *preempt indicator* (to indicate the start of preemption) and can have a sequence of “0111111110” (eight “1’s”) when forming part of a *continue indicator* (to indicate the end of preemption). *Id.* at 4:47-48. Each of these sequences has “three or less transitions” and therefore both include out-of-band symbols in a manner described by the ’905 Patent. Ex.1004, 4:48; see also 2:5-13; Ex.1001, 24:44-46.

225. If it is argued that Calvignac does not disclose *wherein the packets include in-band symbols and the indicators include one or more out-of-band symbols*, (it does), this limitation would have been obvious to a POSITA given the disclosure recited above from Calvignac. Specifically, it was a well-known technique to include such in-band symbols in data packets and to include such out-of-band symbols in control indicators, the benefit being that packet data or payload information could be readily distinguished from control information (like the preempt and continue indicators), with this benefit being recited in the art, such as Shin '464, as discussed above.

226. Thus, Calvignac discloses and renders obvious “the packets include in-band symbols and the indicators include one or more out-of-band symbols” as claimed.

2. Claim 2

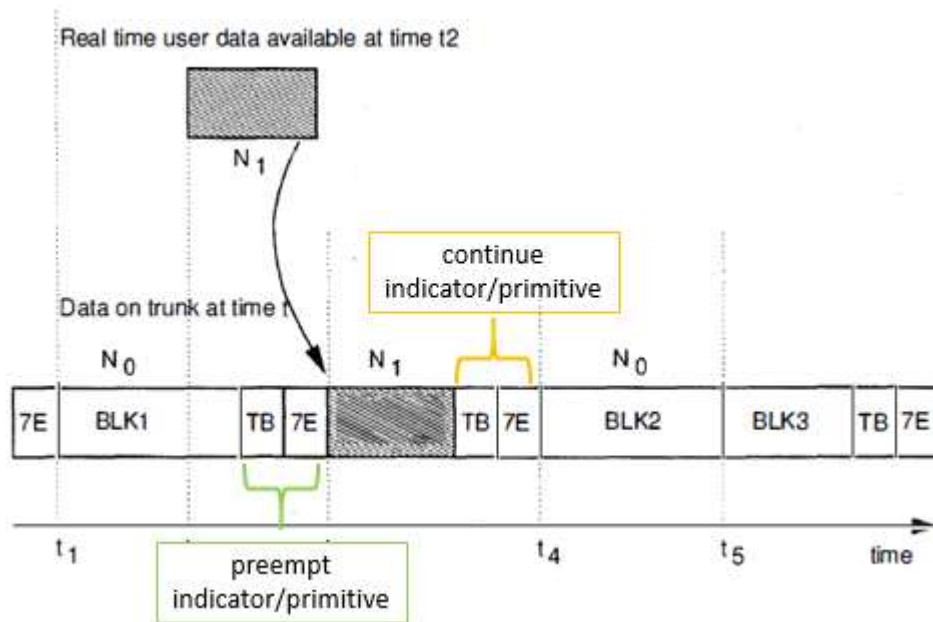
[2] The method of claim 1 wherein the transmitted indicators are primitives.

227. Calvignac discloses this element. Like discussed above, the '905 Patent describes that “primitives” can be a “sequence of two” or “pair” of “out-of-band symbols.” Ex.1001 at 11:678-12:3, 15:39-40, 26:35-41.

228. Calvignac discloses this limitation, because it teaches techniques for using recognizable pairs of out-of-band characters for preempt and continue indicators, such as its pairs of its out-of-band “trailer byte” and out-of-band “X'7E’

flag” (i.e., *primitives*). Ex.1004, 4:48, 5:34-38, Fig. 2. Calvignac, thus, discloses that the *preempt* and *continue indicators* are *primitives*. As explained in my analysis above for limitation [1(i)], Calvignac discloses and renders obvious that its “*preempt*” and “*continue*” indicators can each be a sequence of two out-of-band symbols: (1) its out-of-band “trailer byte”; and (2) its out-of-band “X’7E’ flag.” Ex.1004, 4:48, 5:34-38.

229. I have annotated Figure 2 below to show these *primitives*:



Id., Fig. 2 (annotated).

230. Thus, Calvignac discloses “the transmitted indicators are primitives” as claimed.

3. Claim 5

[5] The method of claim 1 wherein the first and second packets are transmitted through the same communications link.

231. In Calvignac, its packets are transmitted to the receiver by the transmitter 40 over a communication link 48, and these packets include both the “low-priority packet”/“non-real-time traffic” (“*first packet*”) and “high-priority packet”/“real-time traffic” (“*second packet*”). *Id.*, 8:6-10, 8:25-34, 8:51-53, 8:62-65, Fig. 13. Further, Calvignac discloses that the nodes in its communication system can use “**one** or more communication links,” like any packet-switching network, to transmit packet data, meaning Calvignac explicitly discloses that one link can be used. Ex.1004, 3:13-18.

232. If it is argued that Calvignac does not explicitly disclose the first and second packets being received via the same communications link, at a minimum a POSITA would have found this limitation obvious given the stated aims of Calvignac, stating that the purpose of its invention is to efficiently regulate the transfer of high-priority packets over the single link “without a delay incurred by having first to complete transmission of a low-priority traffic.” Ex.1004, 2:25-30. Logic dictates that if these high and low priority packets were sent and received over separate communications links, rather than the same link, there would have not been a need to preempt the first packet in order to send the second packet, as both could be sent at the same time over separate links.

233. Thus, Calvignac discloses and renders obvious “the first and second packets are transmitted via the same communications link” as claimed.

4. Claim 8

[8(pre)] A method for receiving packets, the method comprising:

234. Calvignac discloses this for the reasons set forth in my analysis above for limitation [1(pre)].

235. In addition, Calvignac discloses a “receiver,” which it calls a “HDLC receiver” or “receiver 50” that “receive[s] whole packets” and passes the packets to a “destination for the received packets.” (i.e., a method for *receiving* packets). Ex.1004, 4:23-29, 9:4-13, Fig. 14, Fig. 15.

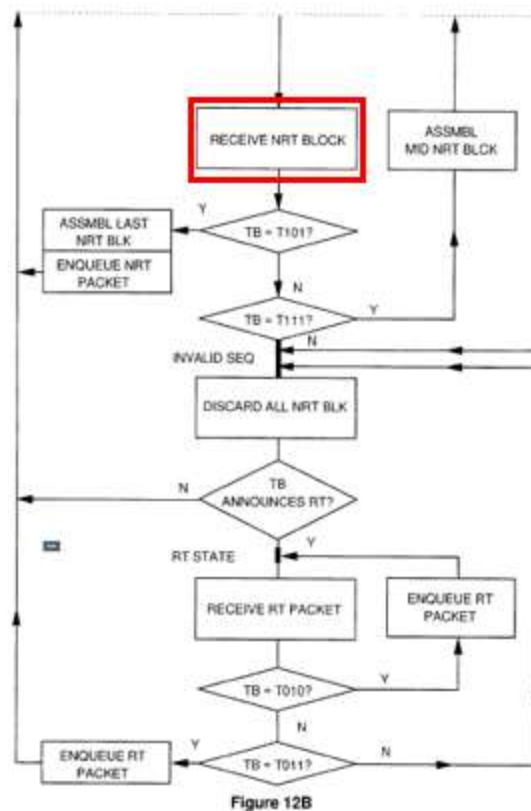
236. Thus, Calvignac discloses “[a] method for receiving packets” as claimed.

[8(a)] receiving a first portion of symbols of a first packet;

237. Calvignac discloses this limitation for the reasons set forth in my analysis above for limitations [1(a)] and [1(b)].

238. In addition, Calvignac’s receiver 50 is described as receiving a “low-priority, non-real-time packet” (“*first packet*”). See Ex.1004, 9:26-31. The receiver is further described as including detection logic “for identifying data currently being received[.]” *Id.*, 10:35.

239. I have annotated Figure 12b below to show the first block of non-real-time data being received (labelled as “Receive NRT Block”) (*first portion of . . . a first packet*):



Ex.1004, Fig. 12b (*annotated*), 7:8-18; 7:43-45 (describing “receiving a first valid preempted NRT data block”). This first block of non-real-time data is received by the receiver via a communication link 51 that receives the first block from the communication link 48 over which the transmitter 40 transmits it. *Id.*, 8:6-10, 9:4-17, Fig. 13, Fig. 14.

240. In addition, the '905 patents describes that symbols can be groups or sequences of bits, such as 9-bit sequences. Ex.1001, 24:18-21 (“The encoding technique adds a ninth bit (i.e., a transition inversion indicating bit) to the 8-bit code to indicate whether the alternate bits of the code were inverted, which results in a 9-

bit symbol.”). As such, a POSITA would have understood that the packets in Calvignac, which may be HDLC packets, are necessarily made up of symbols, because HDLP packets are comprised of sequences of bits. Ex.1004, 2:36-38; Ex.1015, at 2 (describing that “HDLC frames . . . us[e] a unique sequence of bits” such as a “frame delimiter” or “flag”), 3 (depicting the sequence of bits making up an HDLC frame). So, when a first portion of the packet transmitted by the transmitter in Calvignac is received by the receiver, such as receiver 50, (as described above in my analysis for limitation [1(a)]), a POSITA would recognize that the receiver is receiving a first portion of *symbols* of a first packet.

241. Thus, Calvignac discloses “receiving a first portion of symbols of a first packet” as claimed.

[8(b)] receiving a preempt indicator indicating that a second packet of symbols is to be received;

242. Calvignac discloses this limitation for the reasons set forth in my analysis above for limitation [1(e)].

243. In addition, Calvignac’s receiver 50 has a flag detector 52, which “continuously monitors the bit stream received from a communication link 51 [for] trailer byte and idle flags” and receives the contents of the trailer byte which “indicates the beginning of a high-priority preempting packet and therefore the beginning of preempt mode[.]” Ex.1004, 9:14-15, 9:31-34, Fig. 12b. This indicates that the preempt indicator is *received*, indicating that the second packet is to be

received. And, as discussed above Calvignac's packets may be HDLC packets, which are comprised of *symbols*, as discussed above for [8(a)].

244. Thus, Calvignac discloses "receiving a preempt indicator indicating that a second packet of symbols is to be received" as claimed.

[8(c)] receiving the second packet of symbols;

245. Calvignac discloses this limitation for the reasons set forth in my analysis above for limitation [1(f)].

246. In addition, in Calvignac's "preempt mode," the "bit stream" of the high-priority preempting packet ("*second packet*") is received by the receiver 50 before being "passed through the serial/parallel converter 53[.]" Ex.1004, 9:31-38.

247. In addition, a POSITA would have understood that receiving the code or "bit stream" of the second packet includes receiving the *symbols* of the second packet for the same reasons given above in my analysis of element [8(a)]. A POSITA would have also understood that the second packet is comprised of *symbols* because Calvignac discloses it can be an HDLC packet, which is comprised of symbols, as also discussed above for [8(a)].

248. Thus, Calvignac discloses "receiving the second packet of symbols" as claimed.

[8(d)] receiving a continue indicator indicating that a second portion of symbols of the first packet is to be received; and

249. Calvignac discloses this limitation for the reasons set forth in my analysis above for limitation [1(g)].

250. In addition, Calvignac discloses that its receiver receives “a trailer byte indicating the end of preemption” which then “resum[es] reception of the preempted low priority packet.” Ex.1004, 9:45-50, Fig. 12b.

251. Thus, Calvignac discloses “receiving a continue indicator indicating that a second portion of symbols of the first packet is to be received” as claimed.

[8(e)] receiving the second portion of symbols of the first packet;

252. Calvignac discloses this limitation for the reasons set forth in my analysis above for limitation [1(h)].

253. In addition, Calvignac teaches that the receiver “resum[es] reception of the preempted low priority packet” after preempt mode is ended. Ex.1004, 9:45-50, Fig. 12b.

254. In addition, a POSITA would have understood that receiving the code or “bit stream” of the second portion of the first packet includes receiving the *symbols* of the second portion of the first packet for the same reasons given above in my analysis of element [8(a)]. A POSITA would have also understood that the second portion of the first packet is comprised of *symbols* because Calvignac discloses it can be an HDLC packet, which is comprised of symbols, as also discussed above for [8(a)].

255. Thus, Calvignac discloses “receiving the second portion of symbols of the first packet” as claimed.

[8(f)] wherein the symbols of the packets include in-band symbols and the indicators include one or more out-of-band symbols.

256. Calvignac discloses and renders obvious this limitation for the reasons set forth in my analysis above for limitation [1(i)].

5. Claim 9

[9] The method of claim 8 wherein the received indicators are primitives.

257. Calvignac discloses this limitation for the reasons set forth in my analysis above for claim [2].

6. Claim 12

[12] The method of claim 8 wherein the first and second packets are received via the same communications link.

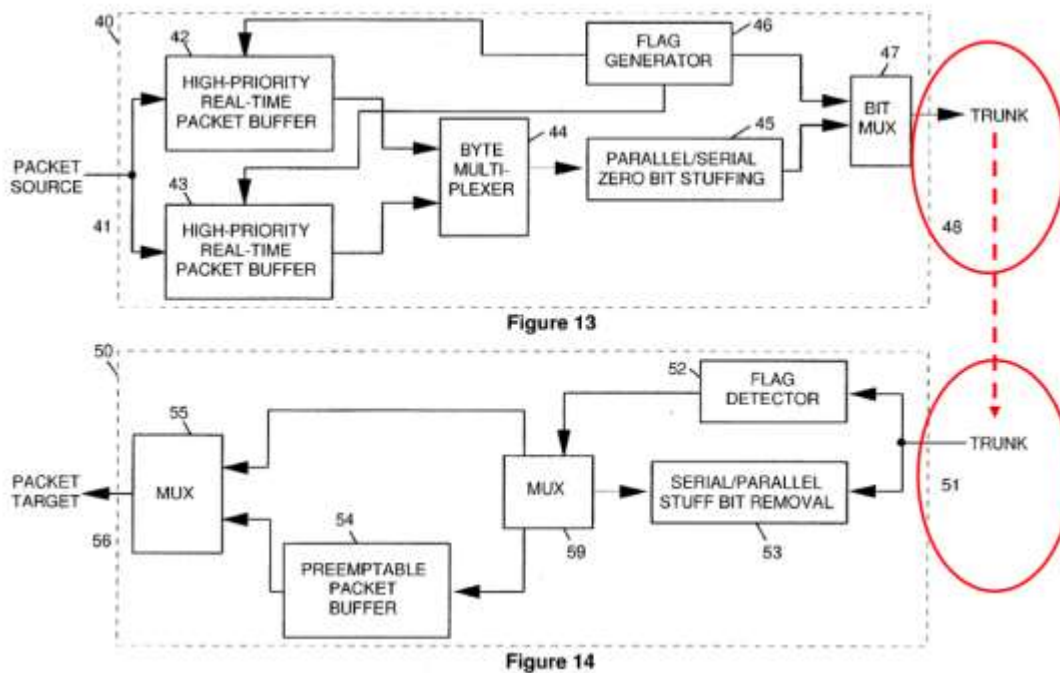
258. Calvignac discloses and renders obvious this limitation for the reasons set forth in my analysis above for claim [5].

259. In addition, Calvignac’s receiver receives the first and second packets via the same communications link (“communication link 51”). Ex.1004, 9:4-17, Fig. 14. These packets are transmitted to the receiver by the transmitter 40 over a communication link 48, and these packets include both the “low-priority packet”/“non-real-time traffic” (“*first packet*”) and “high-priority packet”/“real-time traffic” (“*second packet*”). *Id.*, 8:6-10, 8:25-34, 8:51-53, 8:62-65, Fig. 13. Further, Calvignac discloses that the nodes in its communication system can use

“**one** or more communication links,” like any packet-switching network, to transmit packet data, meaning Calvignac explicitly discloses that one link can be used. Ex.1004, 3:13-18.

260. Further, a POSITA would have understood that the transmitter’s communication link 48 (shown in Figure 13) would have been coupled to the receiver’s communication link 51 (shown in Figure 15) so as to allow the packets transmitted by the transmitter 40 to be received by the receiver 50.

261. I have annotated Calvignac’s Figures 13 and 14 below to show how the packets transmitted by the transmitter 40 out via link 48 are received in by the receiver 50 via the link 51, and, thus, the packets are received via *the same communications link* (i.e., link 51):



Id. Figs. 13-14 (annotated).

262. If it is argued that Calvignac does not explicitly disclose the first and second packets being received via the same communications link, at a minimum a POSITA would have found this limitation obvious given the stated aims of Calvignac, stating that the purpose of its invention is to efficiently regulate the transfer of high-priority packets over the single link “without a delay incurred by having first to complete transmission of a low-priority traffic.” Ex.1004, 2:25-30. Logic dictates that if these high and low priority packets were sent and received over separate communications links, rather than the same link, there would have not been a need to preempt the first packet in order to send the second packet, as both could be sent at the same time over separate links.

263. Thus, Calvignac discloses and renders obvious “the first and second packets are received via the same communications link” as claimed.

7. Claim 15

[15(pre)] A method for transmitting packets via a communications link, the method comprising:

264. Calvignac discloses a method for transmitting packets via a *communications link* for the reasons set forth in my analysis above for element [1(pre)].

[15(a)] transmitting a first portion of a first packet;

265. Calvignac discloses this element for the reasons set forth in my analysis above for element [1(b)].

[15(b)] transmitting a preempt indicator indicating that a second packet is to be transmitted;

266. Calvignac discloses this element for the reasons set forth in my analysis above for element [1(e)].

[15(c)] transmitting the second packet;

267. Calvignac discloses this element for the reasons set forth in my analysis above for element [1(f)].

[15(d)] transmitting a continue indicator indicating that a second portion of the first packet is to be transmitted; and

268. Calvignac discloses this element for the reasons set forth in my analysis above for element [1(g)].

[15(e)] transmitting the second portion of the first packet;

269. Calvignac discloses this element for the reasons set forth in my analysis above for element [1(h)].

[15(f)] wherein the first and second packets and the preempt and continue indicators are transmitted via the same communications link and

270. Calvignac discloses and renders obvious this element for the reasons set forth in my analysis above for claim [5].

[15(f.1)] wherein further the packets include in-band symbols and the indicators include one or more out-of-band symbols.

271. Calvignac discloses and renders obvious this element for the reasons set forth in my analysis above for element [1(i)].

8. Claim 16

[16] The method of claim 15 wherein the indicators are primitives.

272. Calvignac discloses this limitation for the reasons set forth in my analysis above for claim [2].

9. Claim 20

[20] The method of claim 15 wherein the first packet includes a header that is transmitted only once.

273. Calvignac discloses this limitation for the reasons set forth in my analysis above for claim [7].

10. Claim 21⁴

[21(pre)] A communications device for transmitting packets via a communications link, comprising:

274. Calvignac discloses *a communications device for transmitting packets via a communications link* for the reasons set forth in my analysis above for [1(pre)].

275. Calvignac discloses a “transmitter 40 portion of the trunk interface of that communications system,” at which “[p]ackets arrive from the communications system’s packet source 41 for transmission on communication link 48” (i.e., *a communications device for transmitting packets via a communications link*). Ex.1004, 8:6-10.

⁴ I have been asked to assume that the *component* limitations in claim 21 should be construed to have their plain and ordinary meaning and are not means-plus-function limitations governed by 35 U.S.C. § 112(6). As such, I have applied this assumed construction in my analysis.

276. Thus, Calvignac discloses “a communications device for transmitting packets via a communications link” as claimed.

[21(a)] a transmission component that transmits a first packet; and

277. Calvignac discloses *transmit[ting] a first packet* for the reasons set forth in my analysis above for [1(b)].

278. I offer two alternative analyses for this element. If the *transmission* and *preemption components* of claim 21 are not required to be separate physical structures, then Calvignac’s “transmitter 40” is the *transmission component* which performs the function of *transmit[ting] a first packet*. Calvignac describes that the packets arrive at the transmitter 40 “from the communications system’s packet source 41 for transmission on communication link 48,” and then the system places “the low-priority packets into a low priority buffer 43.” Ex.1004, 8:8-10, 8:14-15. Then, if no high-priority packets are waiting, Calvignac’s transmitter 40 transmits the “low-priority packet” (*a transmission component that transmits a first packet*). *Id.*, 8:21-34.

279. In the alternative, if the *transmission* and *preemption components* are required to be separate physical structures, Calvignac’s “low priority buffer 43” constitutes a transmission component (and the “flag generator 46” constitutes a *preemption component*, as will be explained below for element [21(b)]). The “low priority buffer 43” (“*transmission component*”) transmits the low-priority packet

(“*first packet*”). See Ex.1004, 8:41-42 (“If a low-priority packet is being transmitted from low priority buffer 43 . . .”); see also *id.*, 8:25-34, Fig. 13.

280. Thus, Calvignac discloses “a transmission component that transmits a first packet” as claimed.

[21(b)] a preemption component that signals the transmission component to stop transmitting the first packet,

281. Calvignac discloses *stop[ping] transmitting the first packet* for the reasons set forth in my analysis above for [1(d)].

282. Further, if the *transmission* and *preemption components* of claim 21 are not required to be separate physical structures, the “transmitter 40” constitutes a preemption component that signals the transmission component to stop transmitting the first packet, as it includes a “flag generator 46” which sends a trailer byte (described above) and an idle flag X’7E” (described above) when a high-priority packet is detected in the “high-priority buffer 42.” Ex.1004, 8:41-48.

283. As described above in my analysis regarding element [1(e)], the trailer byte and X’7E’ flag signal to the “low-priority buffer 43” that the “low-priority packet” (“*first packet*”) is preempted and to stop transmission at the next block of data. *Id.*, 8:41-51.

284. Alternatively, if the *transmission* and *preemption components* must be separate physical structures, Calvignac’s “flag generator 46” coupled with its “high-priority buffer 42” collectively constitute a *preemption component*, as the flag

generator is what inserts the trailer byte and X'7E' flag, signaling to the "low-priority buffer 43" that the "low-priority packet" ("*first packet*") is preempted and to stop transmission at the next block of data; and the high-priority buffer is what transmits the "high-priority packet" ("*second packet*") (which is also a recited function of the *preemption component* in [21(b.2)]). *Id.*, 8:41-53, Figs. 5, 13.

285. Thus, Calvignac discloses "a *preemption component* that signals the transmission component to stop transmitting the first packet" as claimed.

[21(b.1)] transmits a preempt indicator indicating that a second packet is to be transmitted,

286. Calvignac discloses *transmit[ing] a preempt indicator* for the reasons set forth in my analysis above for [1(d)].

287. Further, if the *transmission* and *preemption components* of claim 21 are not required to be separate physical structures, the "transmitter 40" constitutes a *preemption component* which *transmits a preempt indicator indicating that a second packet is to be transmitted* because, as explained above in my analysis for element [21(b)], the "transmitter 40" includes "flag generator 46." The flag generator is what "inserts the trailer byte and X'7E' flag (together, a "*preempt indicator*"), signaling to the "low-priority buffer 43" that the "low-priority packet" ("*first packet*") is preempted by a high priority packet, and indicating that the system should stop transmission at the next block of data of the low priority packet. *Id.*, 8:41-51, Figs. 5, 13.

288. In the alternative, to the extent the transmission and preemption components must be separate physical structures, “flag generator 46” and “high-priority buffer 42” in Calvignac collectively constitute a *preemption component that . . . transmits a preempt indicator indicating that a second packet is to be transmitted*, because, again, the “flag generator 46” of “transmitter 40” inserts (and thereby transmits) the trailer byte and X‘7E’ flag (together, a “*preempt indicator*”). Ex.1004, 8:41-51, Figs. 5, 13.

289. Thus, Calvignac discloses “a preemption component that . . . transmits a preempt indicator indicating that a second packet is to be transmitted” as claimed. ***[21(b.2)] transmits the second packet, and***

290. Calvignac discloses *transmit[ing] the second packet* for the reasons set forth in my analysis above for [1(f)].

291. Further, if the *transmission* and *preemption components* of claim 21 are not required to be separate physical structures, the “transmitter 40” constitutes a *preemption component that . . . transmits the second packet* because the transmitter 40 begins transmitting the high-priority packet (“*second packet*”) after “flag generator 46” inserts the trailer byte and X‘7E’ flag (“*preempt indicator*”). Calvignac discloses that, “Bytes from the high priority buffer 42 are then transferred through the byte multiplexer 44 to the parallel/serial converter 45 which performs

serialization and zero bit stuffing. The resulting high-priority packet is then transferred to the communication link 48.” Ex.1004, 8:47-53, Fig. 13.

292. Alternatively, to the extent the transmission and preemption components must be separate physical structures, Calvignac discloses this limitation. Calvignac’s “flag generator 46” and “high priority buffer 42” collectively constitute a *preemption component that . . . transmits the second packet*, because, after the flag generator inserts the trailer byte and X‘7E’ flag (*preempt indicator*), the “high priority buffer 42” transmits the second packet. *Id.*, 8:41-53 , Fig. 13. Further, Calvignac’s “flag generator 46” and “high priority buffer 42” (collectively, *preemption component*) are depicted as being separate from the “low priority buffer 43,” as shown in the annotated version of Figure 13 (below). I note that a POSITA would have understood that the labeling of item 43 as a “high-priority real-time packet buffer” was inadvertent and was intended to be labeled as “low-priority non-real-time packet buffer” 43 to align with the specification’s repeated and numerous references to “low priority buffer 43.” *Id.*, 8:12-65. I have annotated Figure 13 below accordingly to indicate this issue and to also illustrate how Calvignac’s *preemption component* (i.e., flag generator 46 and high priority buffer 42, collectively) and *transmission component* (i.e., low priority buffer 43) are separate.

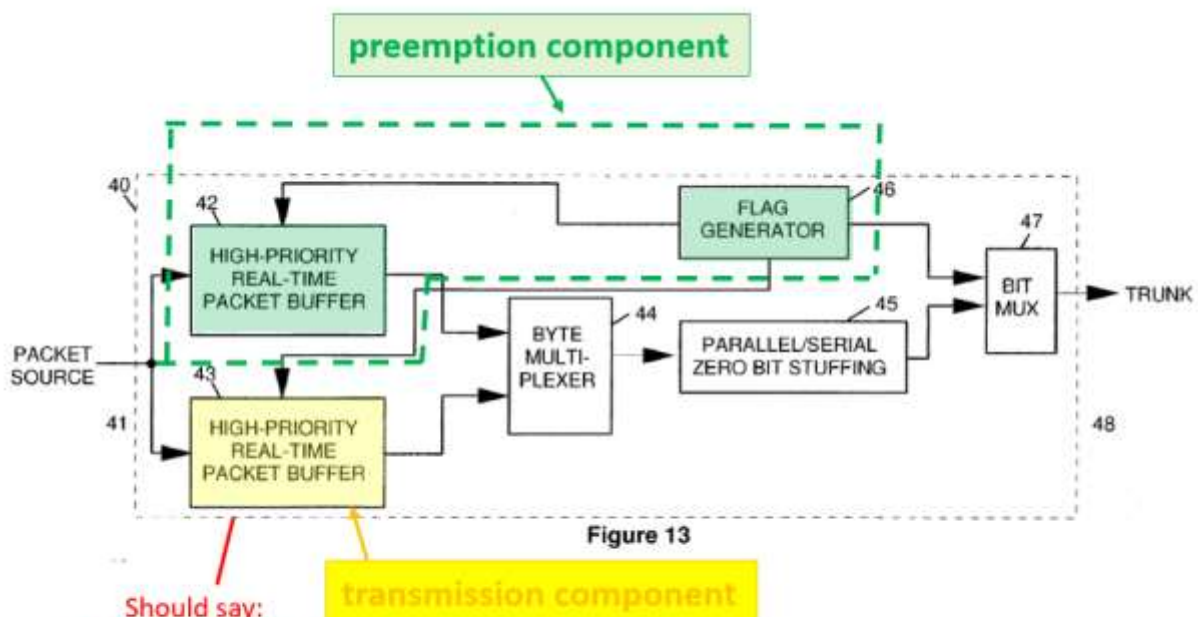


Fig. 13 (annotated).

293. Thus, Calvignac discloses “a preemption component that . . . transmits the second packet” as claimed.

[21(b.3)] signals the transmission component to continue transmitting the first packet;

294. Calvignac discloses and renders obvious this element. First, if the transmission and preemption components do not need to be separate physical structures, “transmitter 40” meets this limitation because the subcomponents of the transmitter 40, specifically the “flag generator 46” is what signals to the low-priority buffer 43 to continue the transmission. Calvignac discloses that, “[w]hen the last of the series of high-priority packets has been sent (there are not more packets waiting

in the high priority buffer 42), the flag generator 46 sends again a trailer byte and an idle flag.” Ex.1004, 8:59-62. After which, “The remaining bytes from the preempted low-priority packet in the low priority buffer 43 are released to the parallel/serial converter 45 and the communication link 48.” *Id.*, 8:62-65. Therefore the “trailer byte and an idle flag” signal the low priority buffer component 43 of the transmitter 40 to continue transmission of the low priority packet (“*first packet*”).

295. In the alternative, if the *transmission* and *preemption components* must be separate physical structures, the “flag generator 46” and “high priority buffer 42” collectively constitute a *preemption component*, as discussed above, which meets this limitation, because the flag generator 46 signals the “low priority buffer 43” (“*transmission component*”) to continue transmitting the “low priority packet” (“*first packet*”). Ex.1004, 8:59-62.

296. Thus, Calvignac discloses the “preemption component . . . signals the transmission component to continue transmitting the first packet” as claimed.

[21(c)] wherein packets include in-band symbols and the indicators include one or more out-of-band symbols.

297. Calvignac discloses and renders obvious this element for the reasons set forth in my analysis above for element [1(i)].

11. Claim 22

[22] The communications device of claim 21 wherein the indicators are primitives.

298. Calvignac discloses this element for the reasons set forth in my analysis above for claim [2].

D. Secondary Considerations of Non-obviousness.

299. I am not aware of any evidence of the existence of any secondary considerations of non-obviousness regarding the Challenged Claims. In the event patent owner asserts any such evidence, I reserve the right to address it.

IX. CONCLUSION

This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code.

Date: 10/1/2024



Andrew Wolfe, Ph.D.