US006226618B1

(12) **United States Patent**
Downs et al.

(10) **Patent No.: US 6,226,618 B1**
(45) **Date of Patent: May 1, 2001**

(54) **ELECTRONIC CONTENT DELIVERY SYSTEM**

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(73) Assignee: **International Business Machines Corporation**, Armonk, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/133,519**

(22) Filed: **Aug. 13, 1998**

(51) **Int. Cl.**[7] **H04L 9/00**

(52) **U.S. Cl.** **705/1**; 705/1; 705/26; 705/27; 705/51; 705/53; 705/57; 705/59; 705/71; 380/4; 380/23; 380/24; 380/25; 380/44; 380/279; 380/281; 380/282

(58) **Field of Search** 705/4, 51, 53, 705/57, 59, 71, 26, 27; 380/4, 44, 23, 25, 281, 282, 279; 707/9

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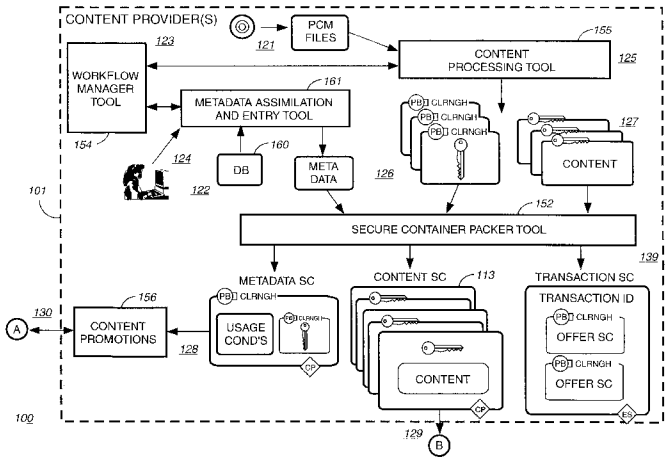
Assistant Examiner—Nga B. Nguyen
(74) *Attorney, Agent, or Firm*—Steven J. Meyers; Steven J. Soucar; Fleit, Kain, Gibbons, Gutman & Bongini P.L.

(57) **ABSTRACT**

Disclosed is a method and apparatus of securely providing data to a user's system. The data is encrypted so as to only be decryptable by a data decrypting key, the data decrypting key being encrypted using a first public key, and the encrypted data being accessible to the user's system, the method comprising the steps of: transferring the encrypted data decrypting key to a clearing house that possesses a first private key, which corresponds to the first public key; decrypting the data decrypting key using the first private key; re-encrypting the data decrypting key using a second public key; transferring the re-encrypted data decrypting key to the user's system, the user's system possessing a second private key, which corresponds to the second public key; and decrypting the re-encrypted data decrypting key using the second private key.

26 Claims, 20 Drawing Sheets



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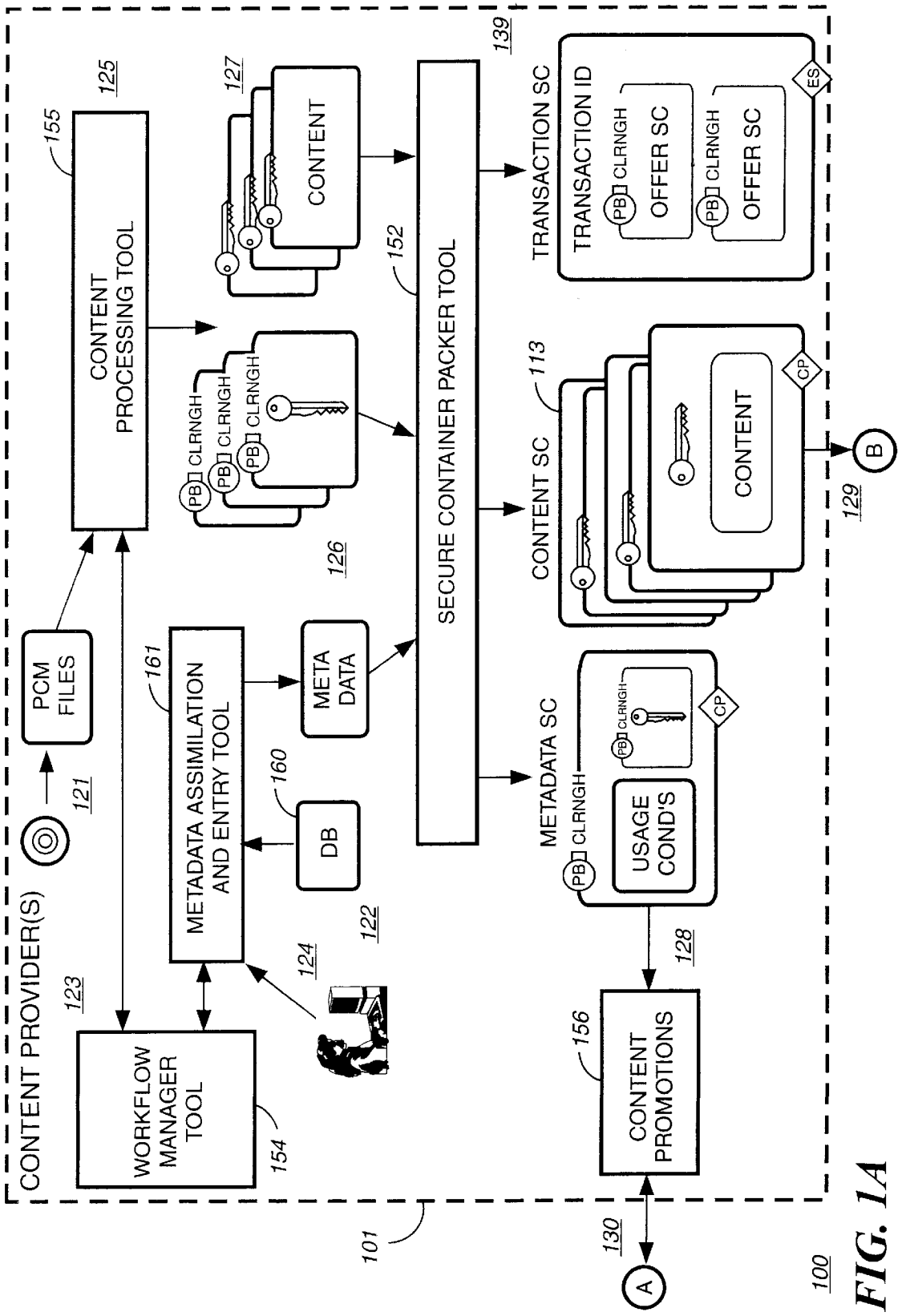

CONTENT PROVIDER(S)
PCM FILES
121
CONTENT PROCESSING TOOL
125
155
WORKFLOW MANAGER TOOL
123
154
METADATA ASSIMILATION AND ENTRY TOOL
161
124
DB
160
122
META DATA
126
PB
CLRNGH
CONTENT
127
SECURE CONTAINER PACKER TOOL
152
139
TRANSACTION SC
TRANSACTION ID
OFFER SC
ES
CONTENT SC
113
CONTENT
CP
129
B
METADATA SC
USAGE COND'S
128
CONTENT PROMOTIONS
156
130
A
101
100

FIG. 1A

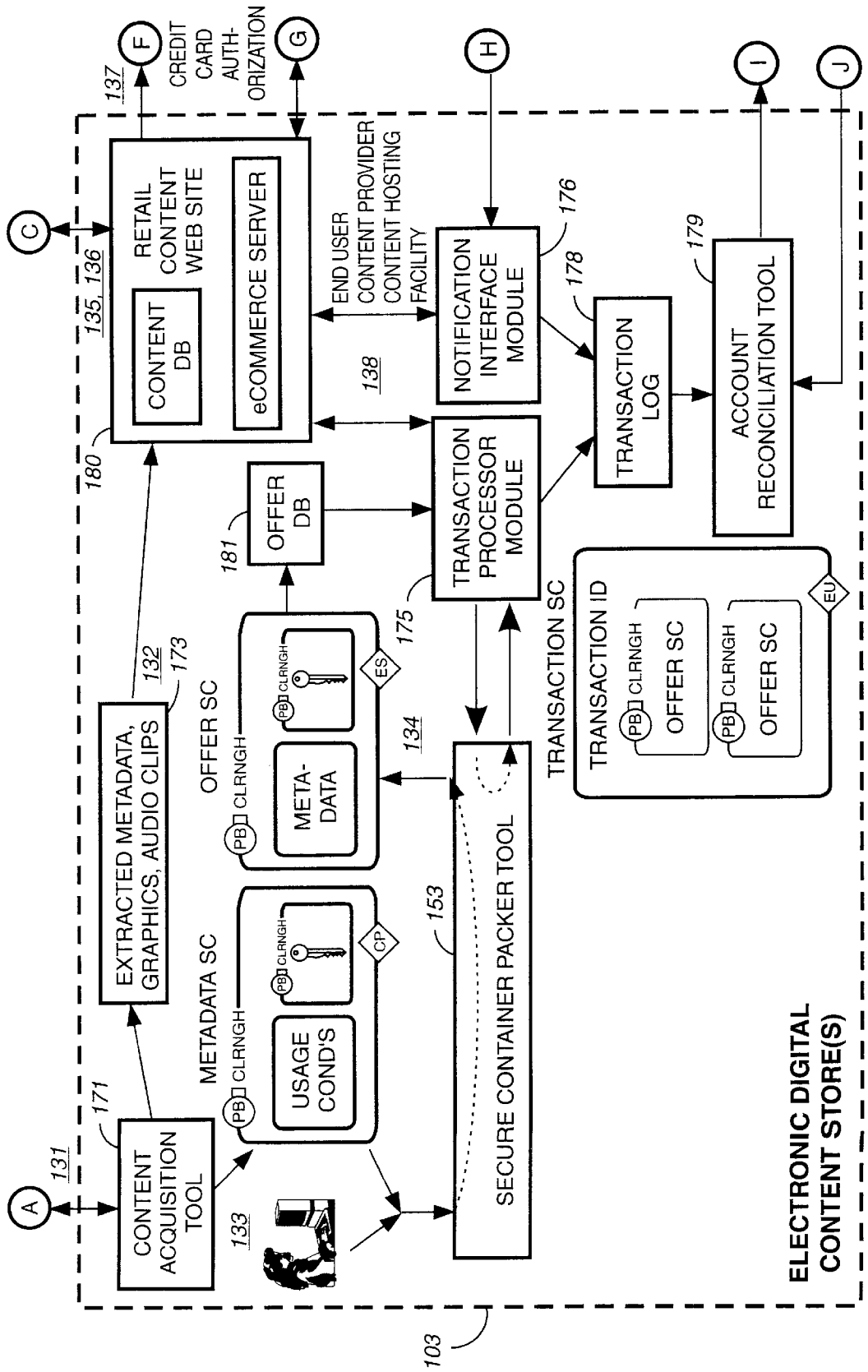

A
131
CONTENT ACQUISITION TOOL
171
EXTRACTED METADATA, GRAPHICS, AUDIO CLIPS
132
173
133
METADATA SC
PB
CLRNGH
USAGE COND'S
CP
OFFER SC
META-DATA
ES
134
153
SECURE CONTAINER PACKER TOOL
OFFER DB
181
TRANSACTION PROCESSOR MODULE
175
C
135, 136
RETAIL CONTENT WEB SITE
CONTENT DB
eCOMMERCE SERVER
180
137
F
CREDIT CARD AUTH-ORIZATION
G
END USER
CONTENT PROVIDER
CONTENT HOSTING FACILITY
138
H
NOTIFICATION INTERFACE MODULE
176
178
TRANSACTION LOG
179
ACCOUNT RECONCILIATION TOOL
I
J
TRANSACTION SC
TRANSACTION ID
OFFER SC
EU
ELECTRONIC DIGITAL CONTENT STORE(S)
103

FIG. 1B 100

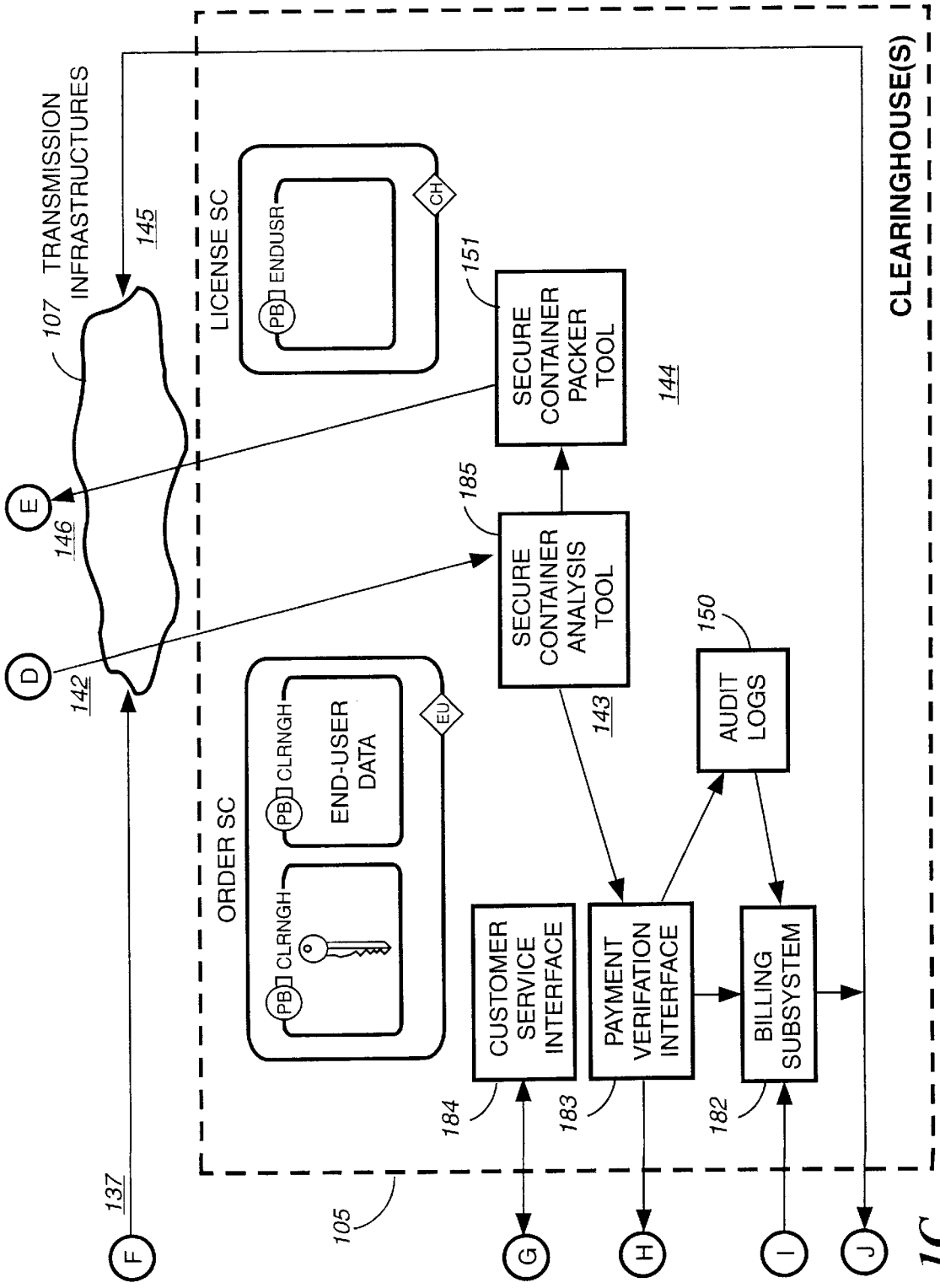

TRANSMISSION INFRASTRUCTURES
107
145
146
142
137
E
D
F
LICENSE SC
PB
ENDUSR
CH
151
SECURE CONTAINER PACKER TOOL
144
185
SECURE CONTAINER ANALYSIS TOOL
143
ORDER SC
PB
CLRNGH
PB
CLRNGH
END-USER DATA
EU
150
AUDIT LOGS
CUSTOMER SERVICE INTERFACE
PAYMENT VERIFATION INTERFACE
BILLING SUBSYSTEM
184
183
182
105
G
H
I
J
CLEARINGHOUSE(S)
100

FIG. 1C

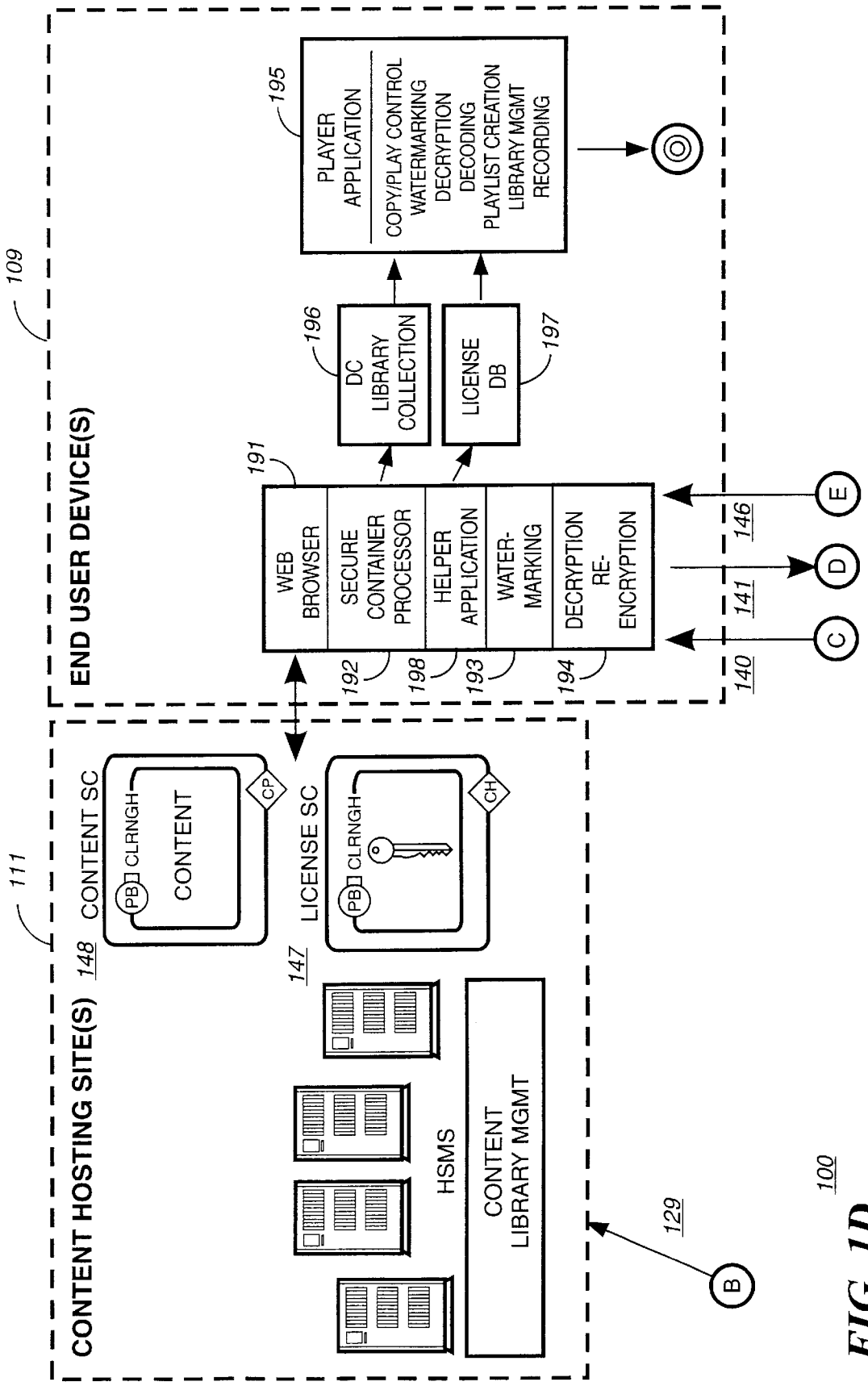
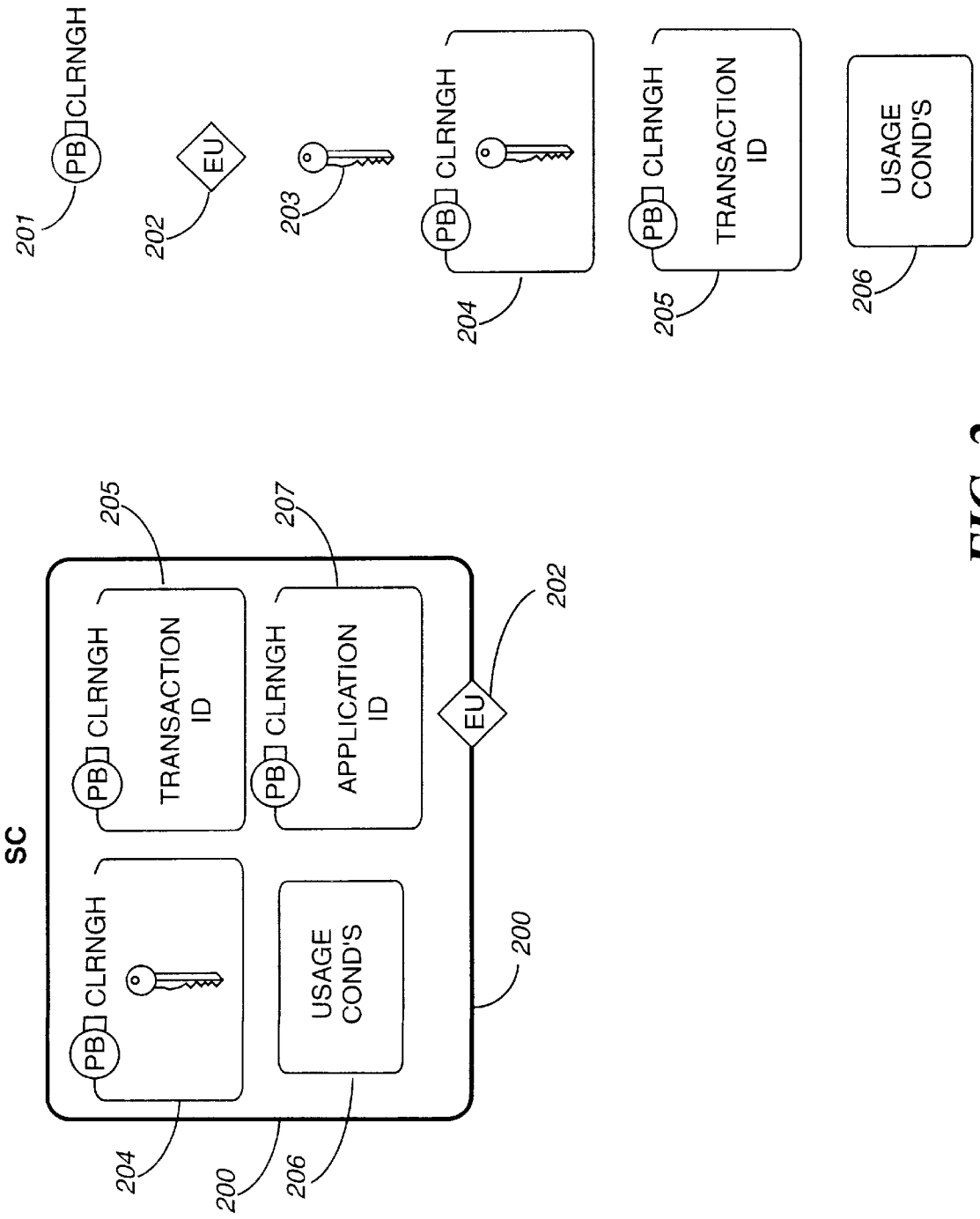

END USER DEVICE(S)
109
PLAYER APPLICATION
COPY/PLAY CONTROL
WATERMARKING
DECRYPTION
DECODING
PLAYLIST CREATION
LIBRARY MGMT
RECORDING
195
DC LIBRARY COLLECTION
196
LICENSE DB
197
WEB BROWSER
SECURE CONTAINER PROCESSOR
HELPER APPLICATION
WATER-MARKING
DECRYPTION RE-ENCRYPTION
191
192
198
193
194
140
141
146
C
D
E
CONTENT HOSTING SITE(S)
111
CONTENT SC
148
PB
CLRNGH
CONTENT
CP
LICENSE SC
147
PB
CLRNGH
CH
HSMS
CONTENT LIBRARY MGMT
129
B
100

FIG. 1D


SC
PB
CLRNGH
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APPLICATION ID
USAGE COND'S
EU
200
201
202
203
204
205
206
207

FIG. 2

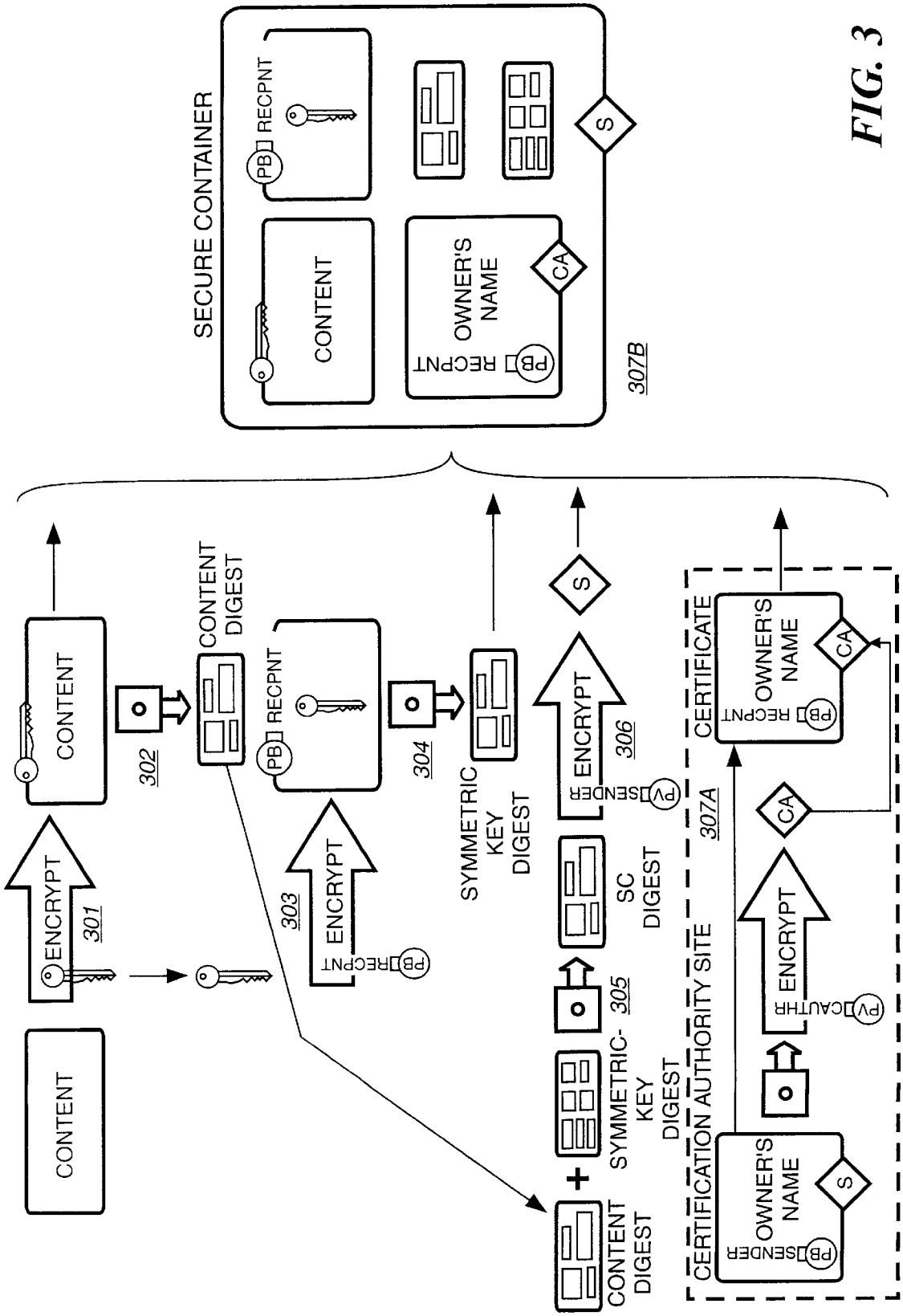
SECURE CONTAINER
CONTENT
PB RECPNT
OWNER'S NAME
CA
PB RECPNT
S
307B
CONTENT
ENCRYPT
301
CONTENT
302
CONTENT DIGEST
PB RECPNT
ENCRYPT
303
PB RECPNT
304
SYMMETRIC KEY DIGEST
S
ENCRYPT
306
PV SENDER
SC DIGEST
SYMMETRIC-KEY DIGEST
305
CONTENT DIGEST
CERTIFICATE
OWNER'S NAME
CA
PB RECPNT
CA
ENCRYPT
PV CAUTHR
CERTIFICATION AUTHORITY SITE
307A
OWNER'S NAME
S
PB SENDER

FIG. 3

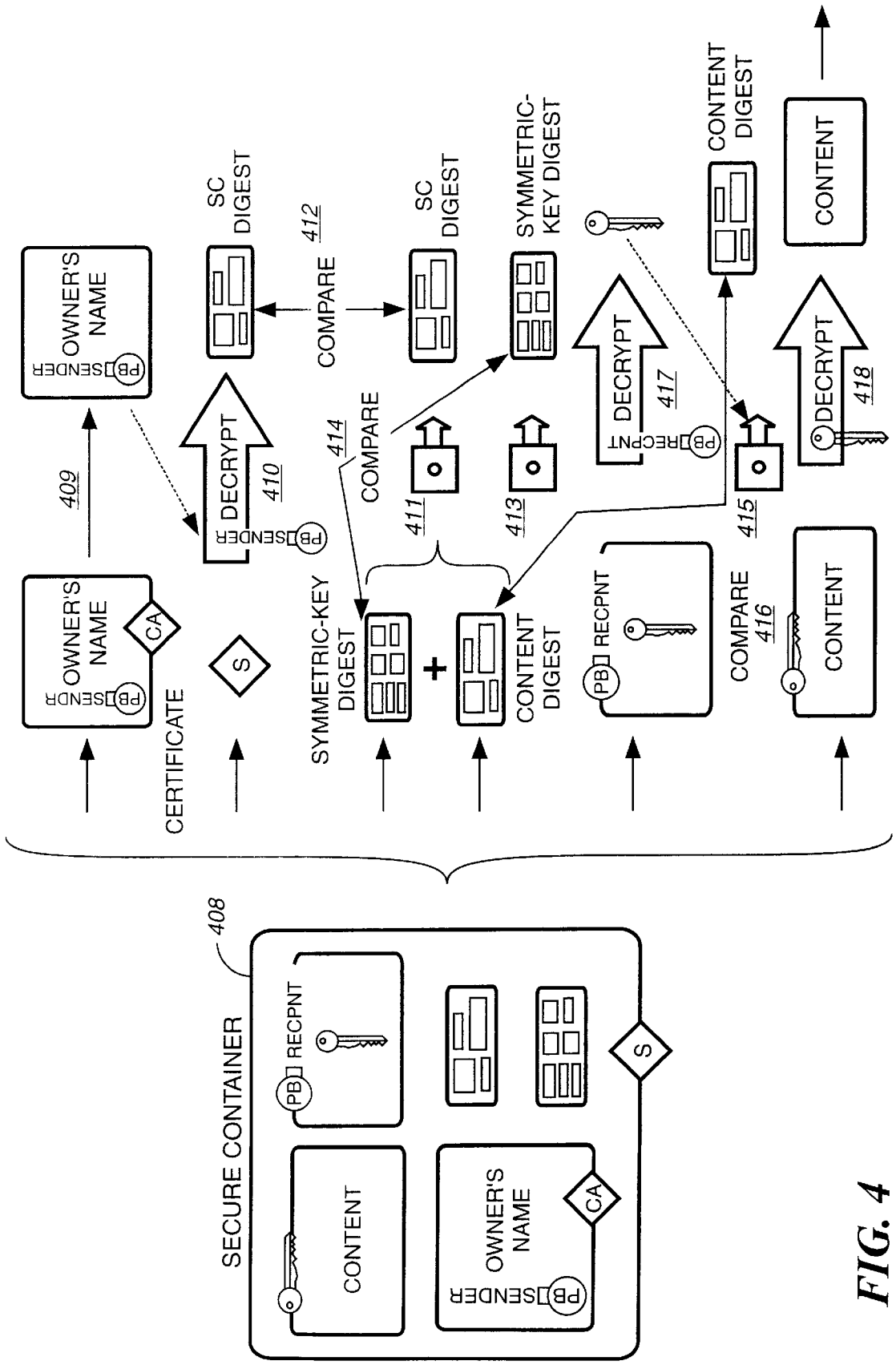
SECURE CONTAINER
408
CONTENT
PB RECPNT
OWNER'S NAME
CA
PB SENDER
S
CERTIFICATE
OWNER'S NAME
CA
PB SENDER
409
DECRYPT
PB SENDER
410
SC DIGEST
COMPARE
412
SC DIGEST
414
COMPARE
SYMMETRIC-KEY DIGEST
411
413
SYMMETRIC-KEY DIGEST
CONTENT DIGEST
PB RECPNT
DECRYPT
PB RECPNT
417
CONTENT DIGEST
415
COMPARE
416
CONTENT
DECRYPT
418
CONTENT

FIG. 4

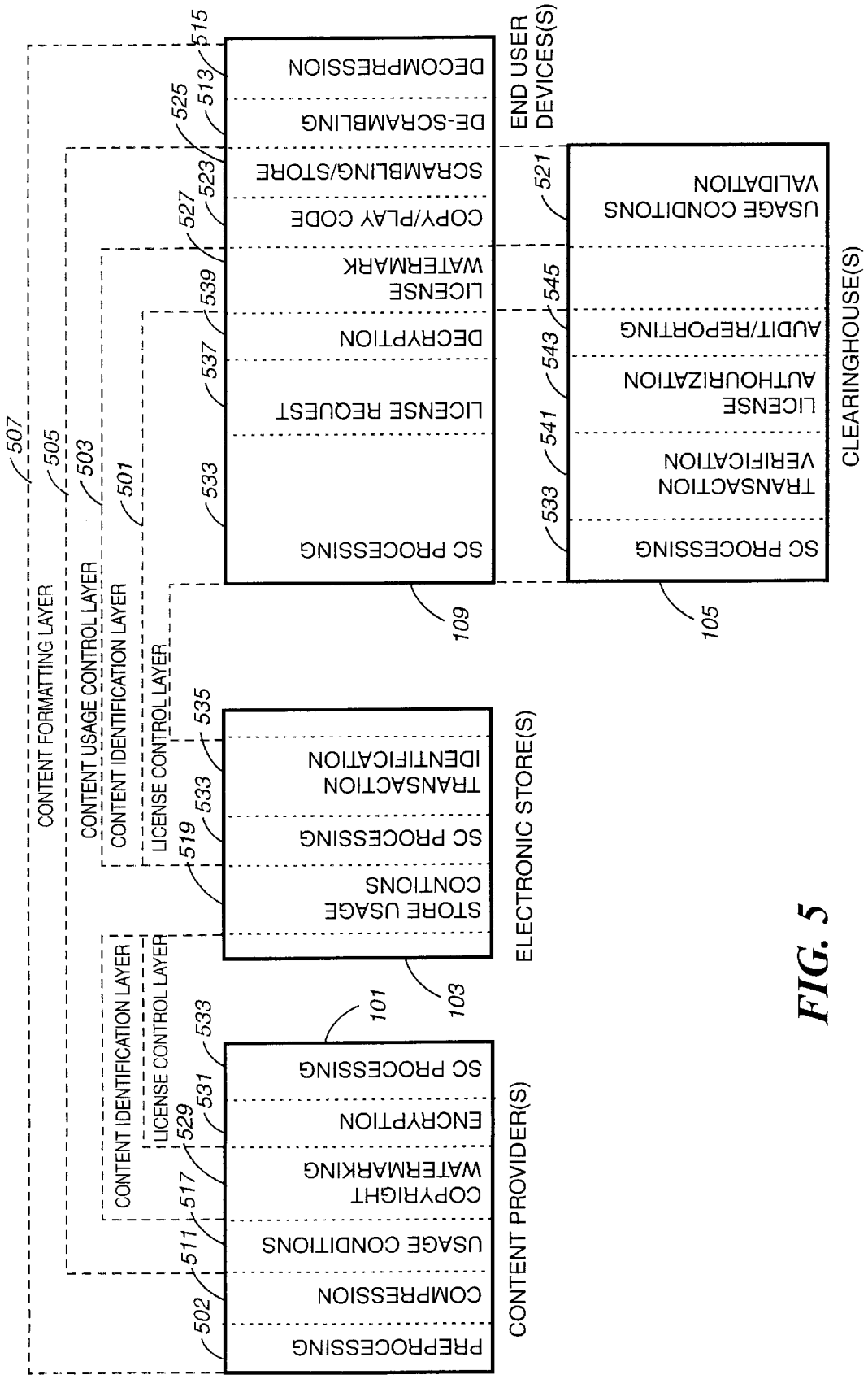
CONTENT FORMATTING LAYER
CONTENT USAGE CONTROL LAYER
CONTENT IDENTIFICATION LAYER
LICENSE CONTROL LAYER
CONTENT IDENTIFICATION LAYER
LICENSE CONTROL LAYER
PREPROCESSING
COMPRESSION
USAGE CONDITIONS
COPYRIGHT WATERMARKING
ENCRYPTION
SC PROCESSING
CONTENT PROVIDER(S)
STORE USAGE CONTIONS
SC PROCESSING
TRANSACTION IDENTIFICATION
ELECTRONIC STORE(S)
SC PROCESSING
LICENSE REQUEST
DECRYPTION
LICENSE WATERMARK
COPY/PLAY CODE
SCRAMBLING/STORE
DE-SCRAMBLING
DECOMPRESSION
END USER DEVICES(S)
SC PROCESSING
TRANSACTION VERIFICATION
LICENSE AUTHOURIZATION
AUDIT/REPORTING
USAGE CONDITIONS VALIDATION
CLEARINGHOUSE(S)
501
502
503
505
507
511
513
515
517
519
521
523
525
527
529
531
533
535
537
539
541
543
545
101
103
105
109

FIG. 5

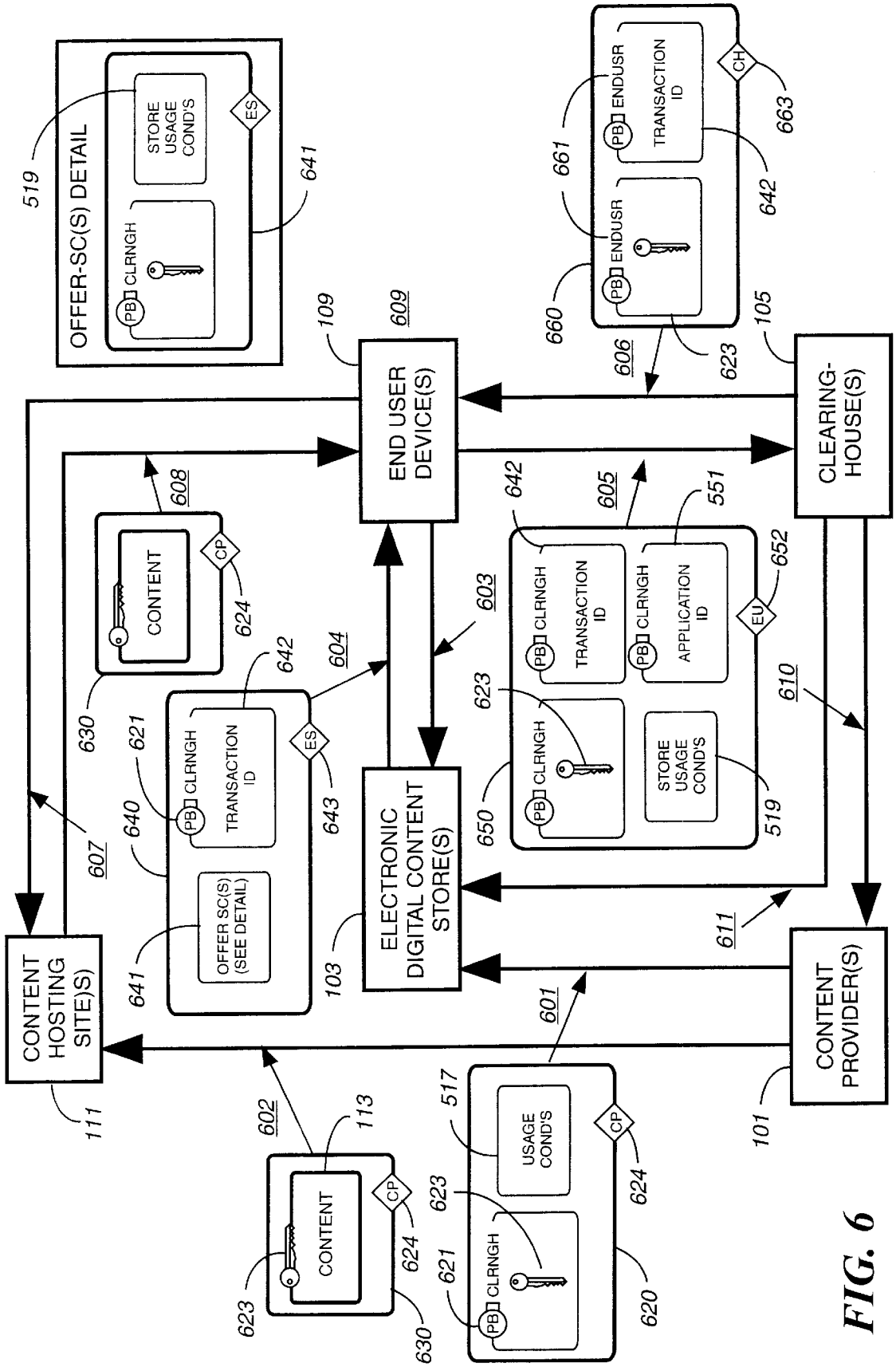
OFFER-SC(S) DETAIL
PB
CLRNGH
STORE USAGE COND'S
ES
519
641
END USER DEVICE(S)
109
609
CLEARING-HOUSE(S)
105
PB
ENDUSR
TRANSACTION ID
CH
661
663
642
660
623
606
CONTENT
CP
608
624
630
604
603
605
551
652
EU
APPLICATION ID
TRANSACTION ID
CLRNGH
STORE USAGE COND'S
650
610
621
640
643
OFFER SC(S) (SEE DETAIL)
607
ELECTRONIC DIGITAL CONTENT STORE(S)
103
611
CONTENT HOSTING SITE)S)
111
CONTENT PROVIDER(S)
101
601
602
113
USAGE COND'S
517
620

FIG. 6

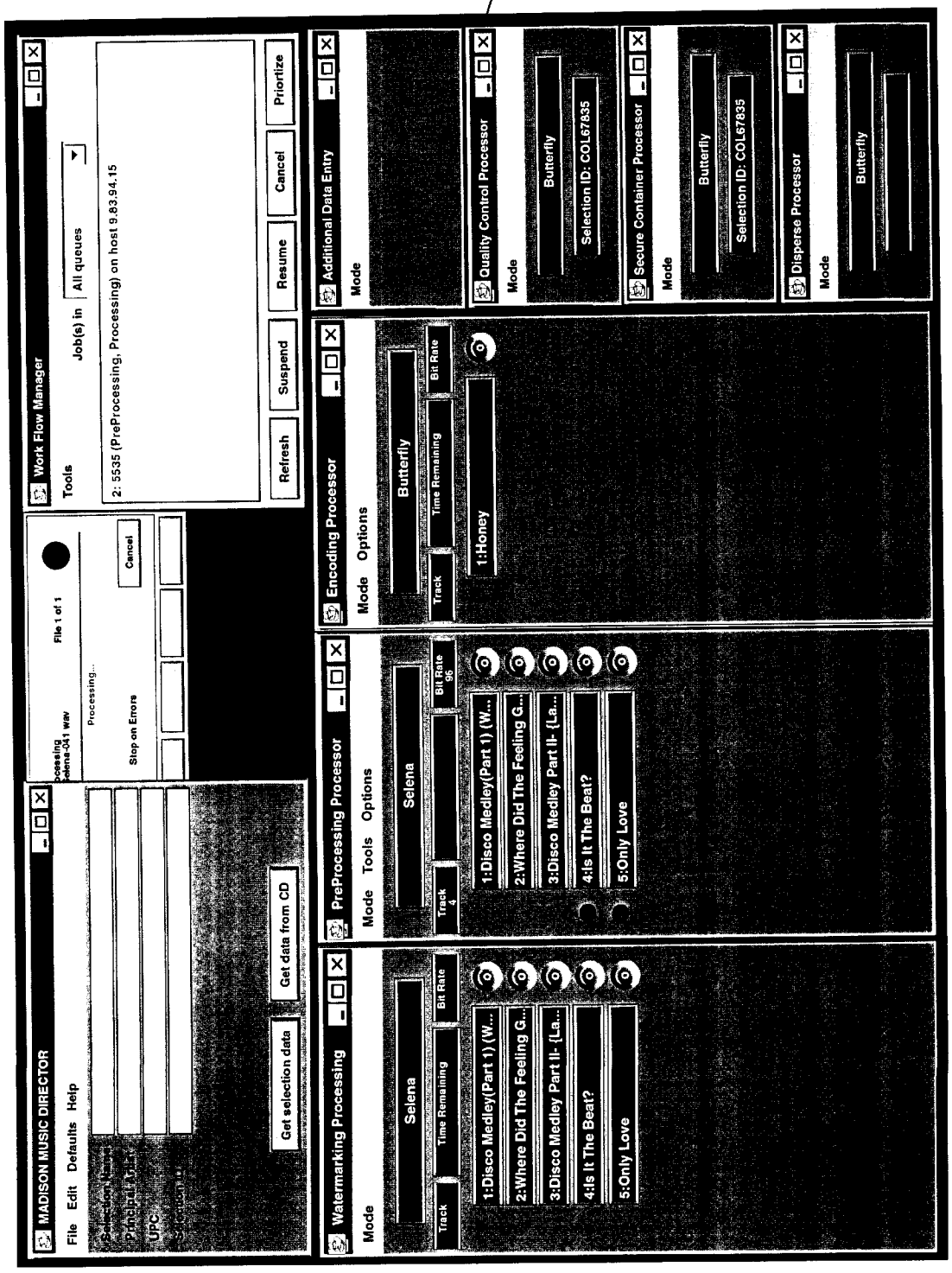
700
MADISON MUSIC DIRECTOR
File Edit Defaults Help
Get selection data
Get data from CD
Processing
Selena-041.wav
File 1 of 1
Processing...
Stop on Errors
Cancel
Work Flow Manager
Tools
Job(s) in
All queues
2: 5535 (PreProcessing, Processing) on host 9.83.94.15
Refresh
Suspend
Resume
Cancel
Priortize
Watermarking Processing
Mode
Selena
Track
Time Remaining
Bit Rate
1:Disco Medley(Part 1) (W...
2:Where Did The Feeling G...
3:Disco Medley Part II- (La...
4:Is It The Beat?
5:Only Love
PreProcessing Processor
Mode Tools Options
Bit Rate 96
Encoding Processor
Mode Options
Butterfly
1:Honey
Additional Data Entry
Mode
Quality Control Processor
Selection ID: COL67835
Secure Container Processor
Disperse Processor

FIG. 7

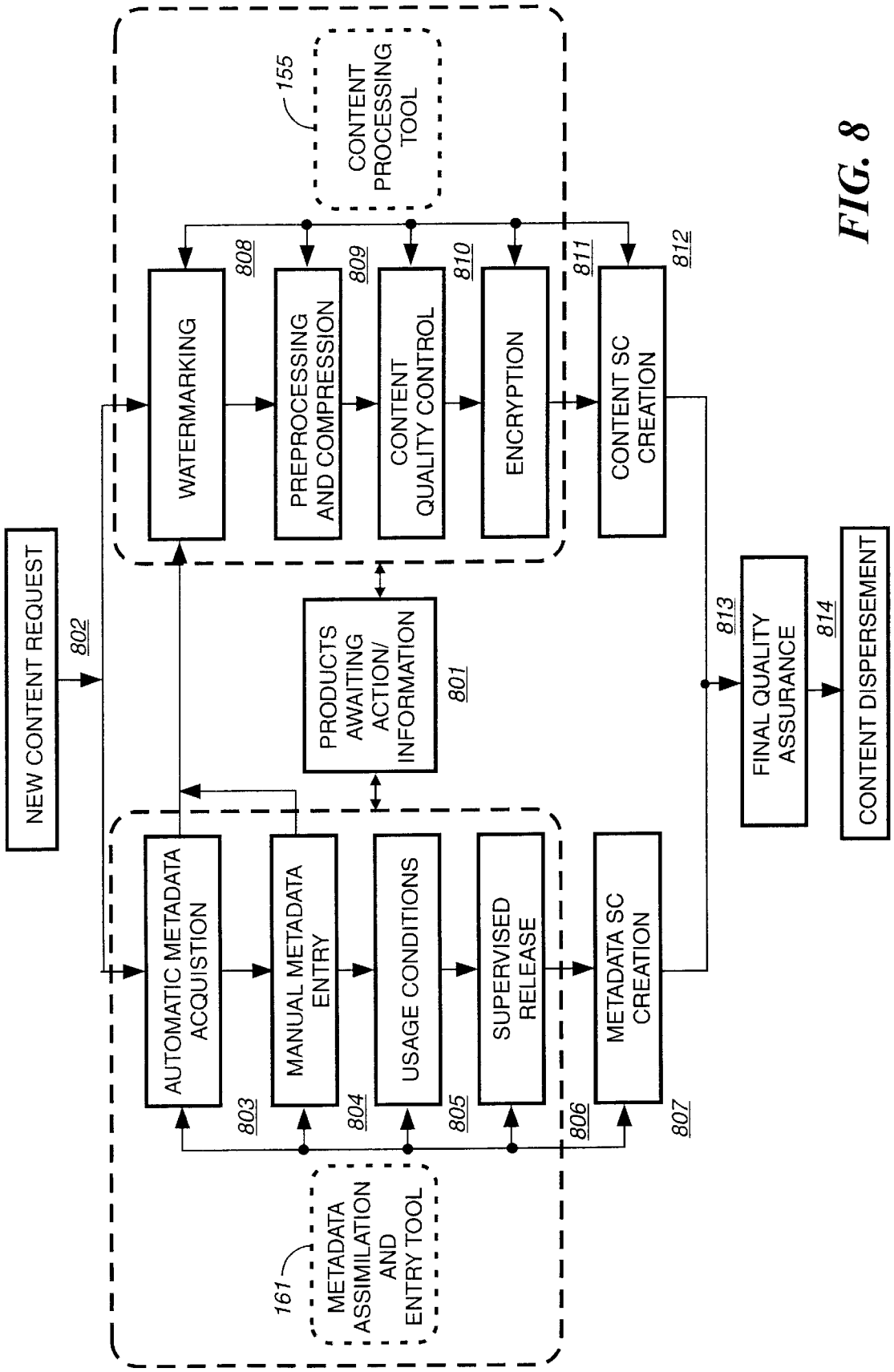
NEW CONTENT REQUEST
802
WATERMARKING
808
PREPROCESSING AND COMPRESSION
809
CONTENT QUALITY CONTROL
810
ENCRYPTION
811
CONTENT SC CREATION
812
155
CONTENT PROCESSING TOOL
PRODUCTS AWAITING ACTION/ INFORMATION
801
AUTOMATIC METADATA ACQUISTION
803
MANUAL METADATA ENTRY
804
USAGE CONDITIONS
805
SUPERVISED RELEASE
806
METADATA SC CREATION
807
161
METADATA ASSIMILATION AND ENTRY TOOL
813
FINAL QUALITY ASSURANCE
814
CONTENT DISPERSEMENT

FIG. 8

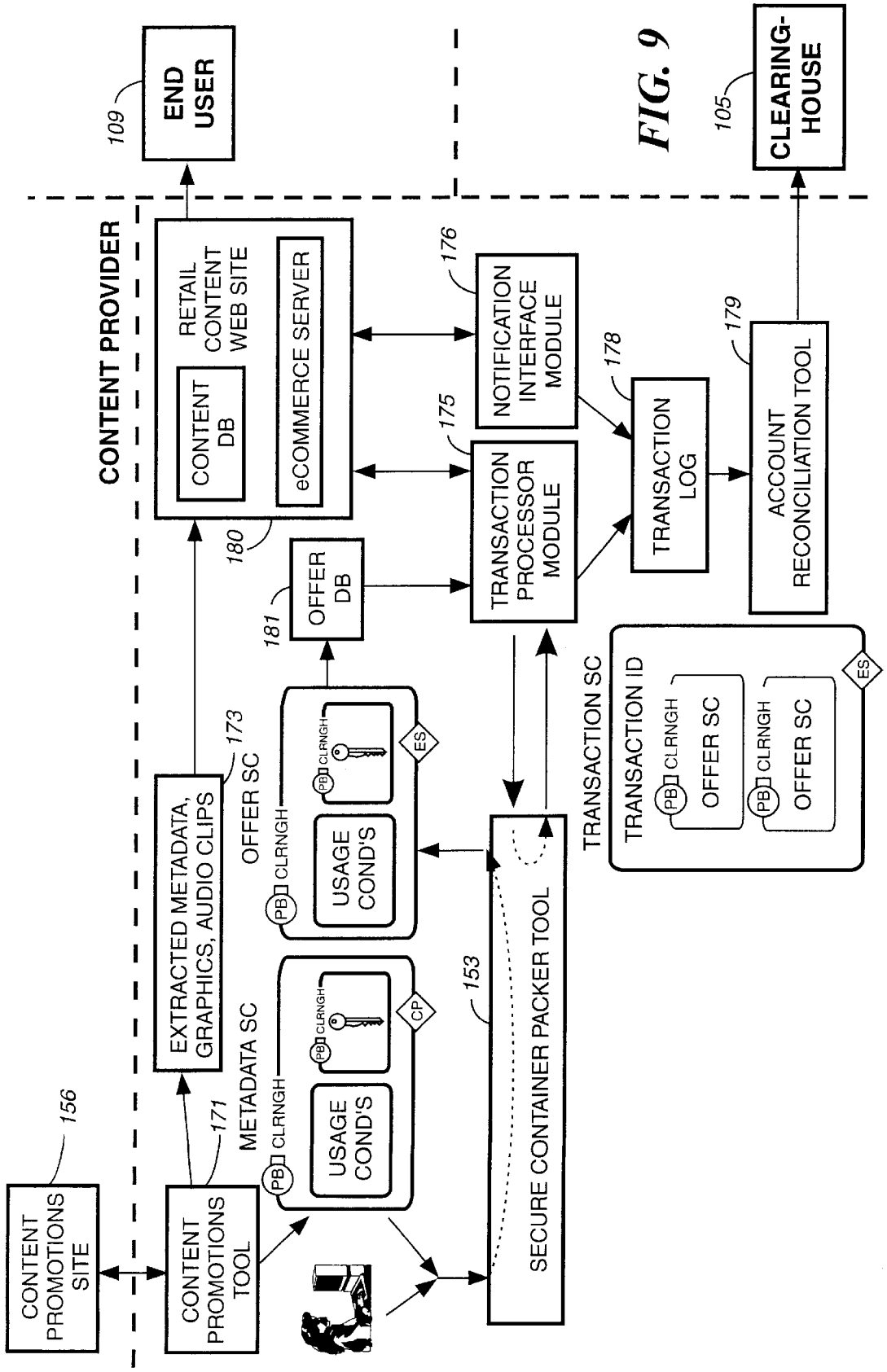
CONTENT PROVIDER
109
END USER
RETAIL CONTENT WEB SITE
CONTENT DB
eCOMMERCE SERVER
180
176
NOTIFICATION INTERFACE MODULE
175
TRANSACTION PROCESSOR MODULE
178
TRANSACTION LOG
179
ACCOUNT RECONCILIATION TOOL
105
CLEARING-HOUSE
181
OFFER DB
173
EXTRACTED METADATA, GRAPHICS, AUDIO CLIPS
OFFER SC
PB
CLRNGH
USAGE COND'S
ES
METADATA SC
CP
153
SECURE CONTAINER PACKER TOOL
TRANSACTION SC
TRANSACTION ID
OFFER SC
156
CONTENT PROMOTIONS SITE
171
CONTENT PROMOTIONS TOOL

FIG. 9

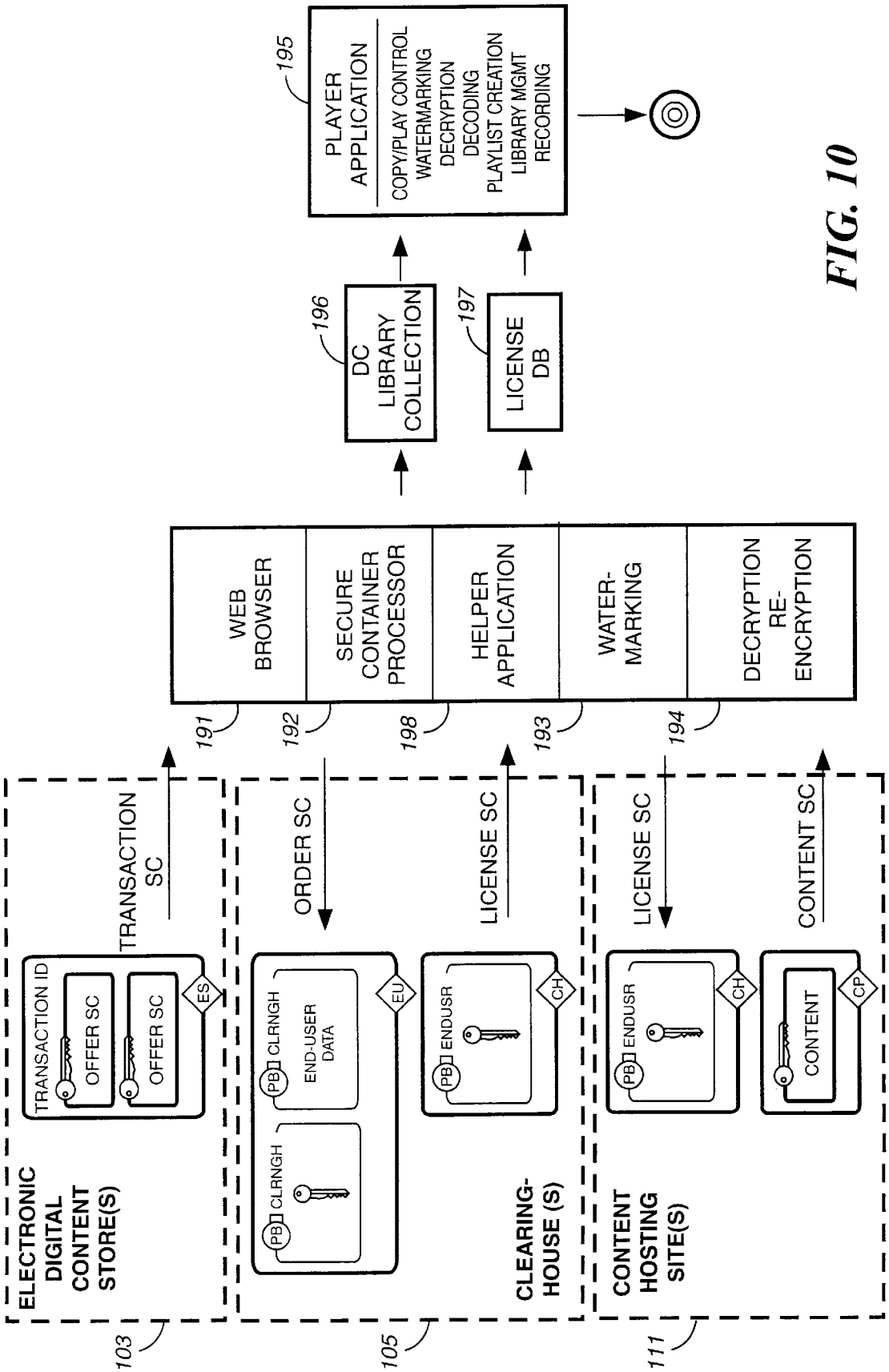
ELECTRONIC DIGITAL CONTENT STORE(S)
103
TRANSACTION ID
OFFER SC
OFFER SC
ES
TRANSACTION SC
ORDER SC
PB
CLRNGH
END-USER DATA
PB
CLRNGH
EU
LICENSE SC
PB
ENDUSR
CH
CLEARING-HOUSE (S)
105
LICENSE SC
PB
ENDUSR
CH
CONTENT SC
CONTENT
CP
CONTENT HOSTING SITE(S)
111
191
WEB BROWSER
192
SECURE CONTAINER PROCESSOR
198
HELPER APPLICATION
193
WATER-MARKING
194
DECRYPTION RE-ENCRYPTION
196
DC LIBRARY COLLECTION
197
LICENSE DB
195
PLAYER APPLICATION
COPY/PLAY CONTROL
WATERMARKING
DECRYPTION
DECODING
PLAYLIST CREATION
LIBRARY MGMT
RECORDING

FIG. 10

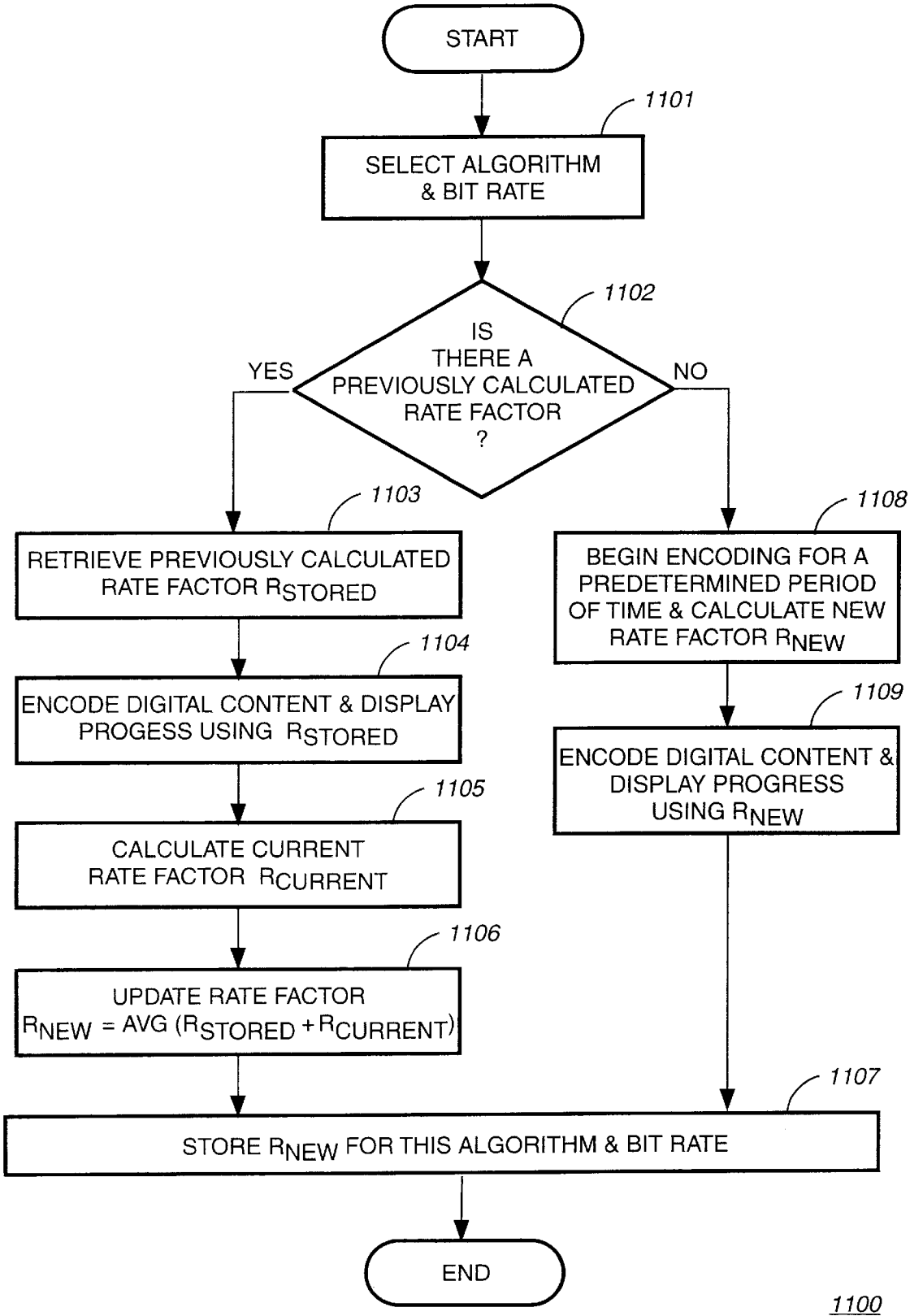
START
1101
SELECT ALGORITHM & BIT RATE
1102
IS THERE A PREVIOUSLY CALCULATED RATE FACTOR ?
YES
NO
1103
RETRIEVE PREVIOUSLY CALCULATED RATE FACTOR R_{STORED}
1104
ENCODE DIGITAL CONTENT & DISPLAY PROGESS USING R_{STORED}
1105
CALCULATE CURRENT RATE FACTOR $R_{CURRENT}$
1106
UPDATE RATE FACTOR R_{NEW} = AVG (R_{STORED} + $R_{CURRENT}$)
1108
BEGIN ENCODING FOR A PREDETERMINED PERIOD OF TIME & CALCULATE NEW RATE FACTOR R_{NEW}
1109
ENCODE DIGITAL CONTENT & DISPLAY PROGRESS USING R_{NEW}
1107
STORE R_{NEW} FOR THIS ALGORITHM & BIT RATE
END
1100

FIG. 11

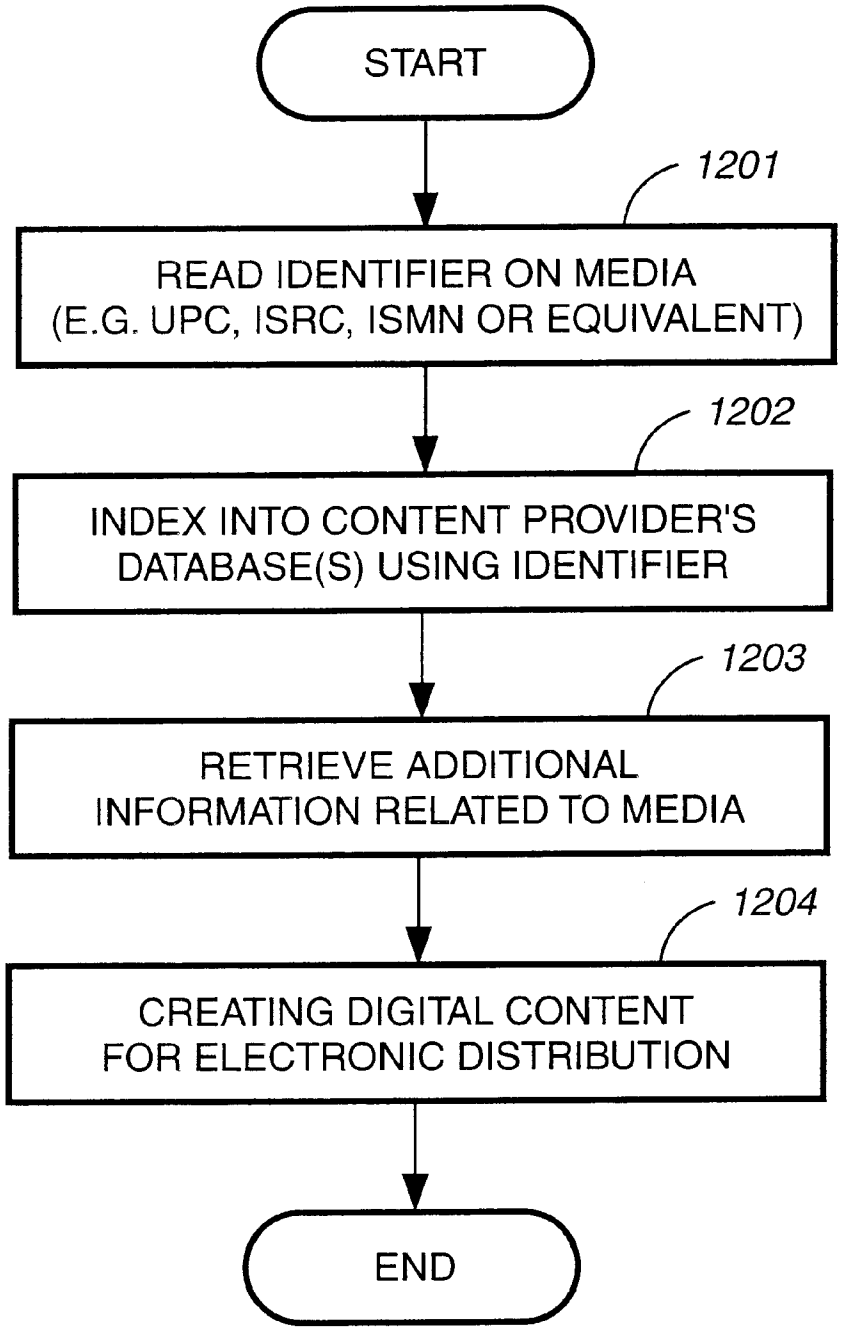
START
1201
READ IDENTIFIER ON MEDIA
(E.G. UPC, ISRC, ISMN OR EQUIVALENT)
1202
INDEX INTO CONTENT PROVIDER'S
DATABASE(S) USING IDENTIFIER
1203
RETRIEVE ADDITIONAL
INFORMATION RELATED TO MEDIA
1204
CREATING DIGITAL CONTENT
FOR ELECTRONIC DISTRIBUTION
END

FIG. 12

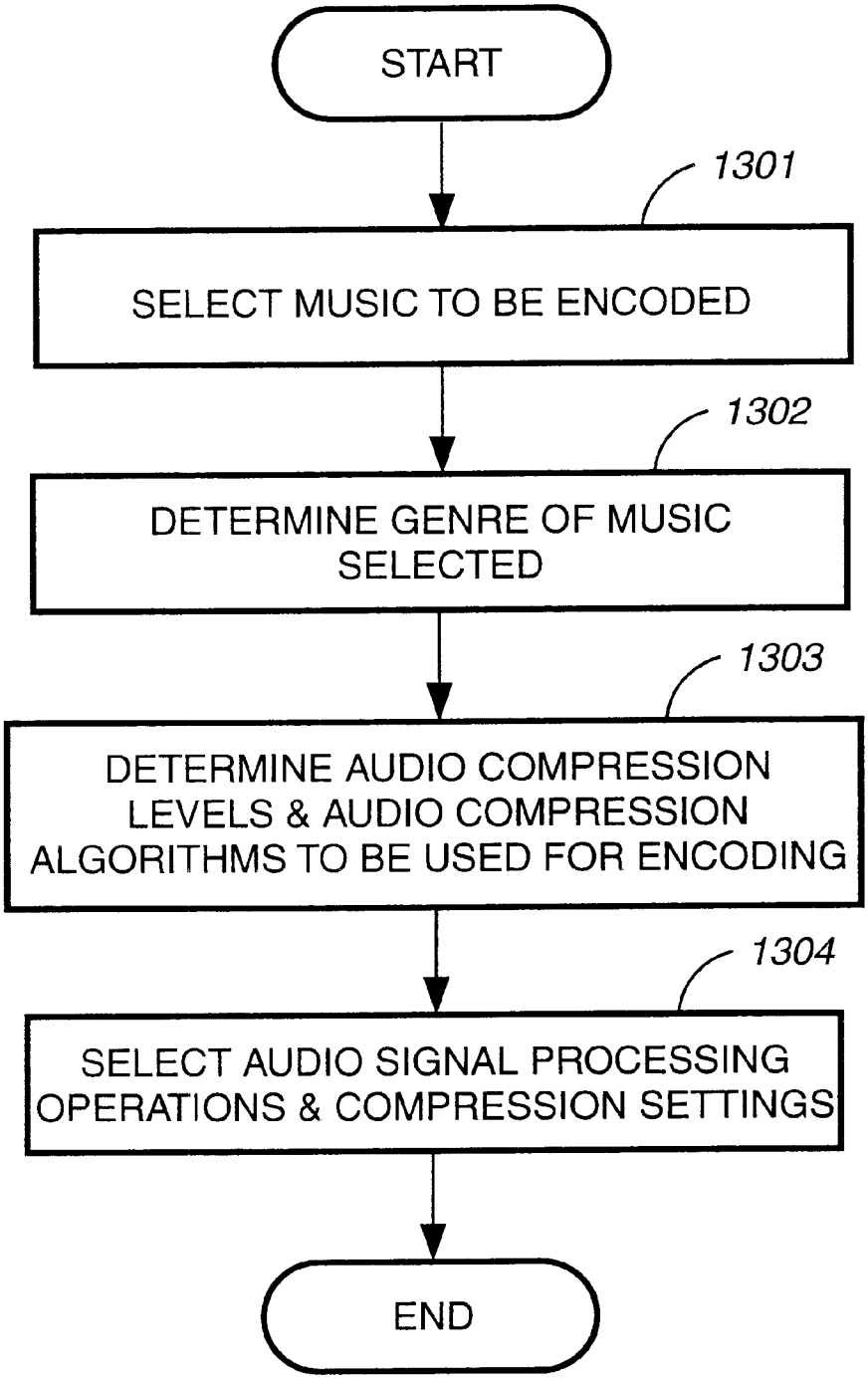
START
1301
SELECT MUSIC TO BE ENCODED
1302
DETERMINE GENRE OF MUSIC SELECTED
1303
DETERMINE AUDIO COMPRESSION LEVELS & AUDIO COMPRESSION ALGORITHMS TO BE USED FOR ENCODING
1304
SELECT AUDIO SIGNAL PROCESSING OPERATIONS & COMPRESSION SETTINGS
END

FIG. 13

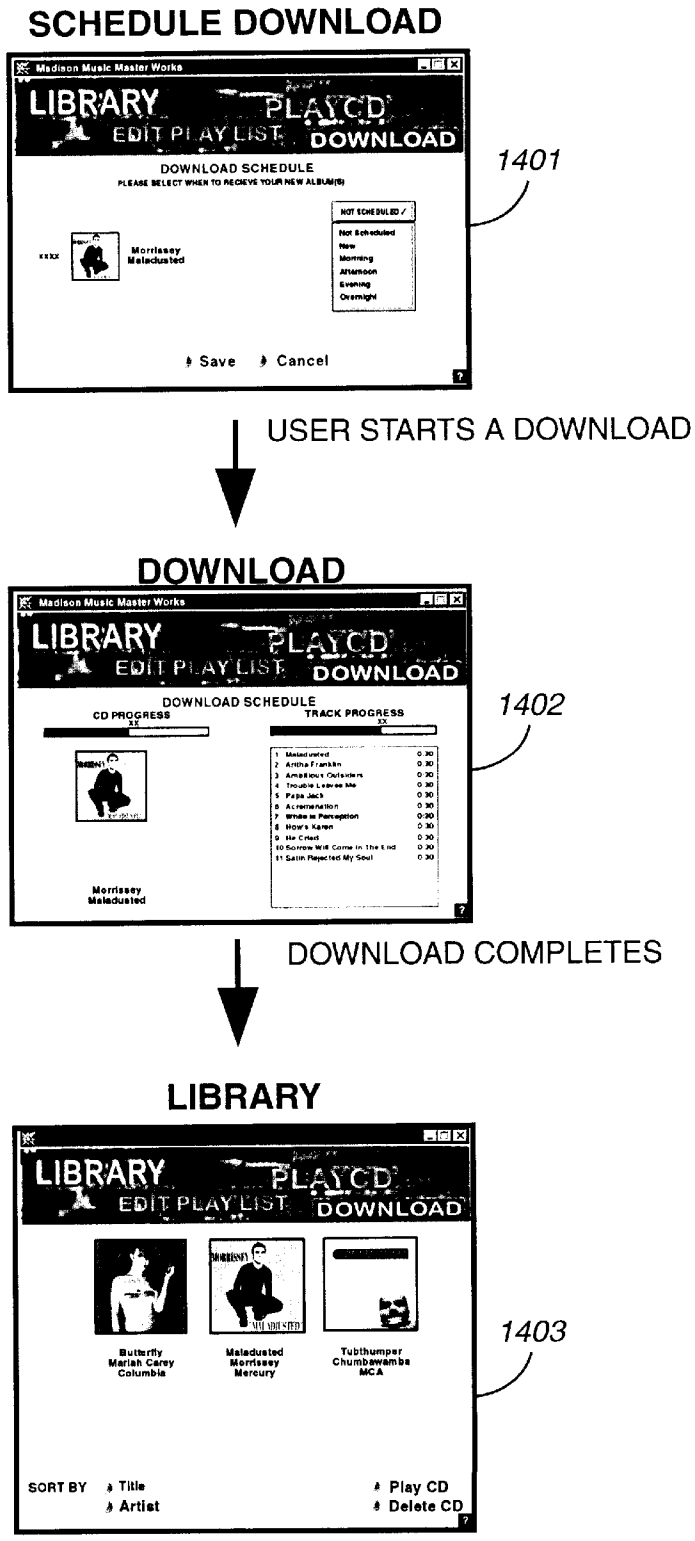
SCHEDULE DOWNLOAD
Madison Music Master Works
LIBRARY
PLAYCD
EDIT PLAY LIST
DOWNLOAD
DOWNLOAD SCHEDULE
PLEASE SELECT WHEN TO RECIEVE YOUR NEW ALBUM(S)
Morrissey
Maladusted
NOT SCHEDULED
Not Scheduled
Now
Morning
Afternoon
Evening
Overnight
Save
Cancel
1401
USER STARTS A DOWNLOAD
DOWNLOAD
Madison Music Master Works
LIBRARY
PLAYCD
EDIT PLAY LIST
DOWNLOAD
DOWNLOAD SCHEDULE
CD PROGRESS
TRACK PROGRESS
Morrissey
Maladusted
1402
DOWNLOAD COMPLETES
LIBRARY
LIBRARY
PLAYCD
EDIT PLAY LIST
DOWNLOAD
Butterfly
Mariah Carey
Columbia
Maladusted
Morrissey
Mercury
Tubthumper
Chumbawamba
MCA
SORT BY
Title
Artist
Play CD
Delete CD
1403

FIG. 14

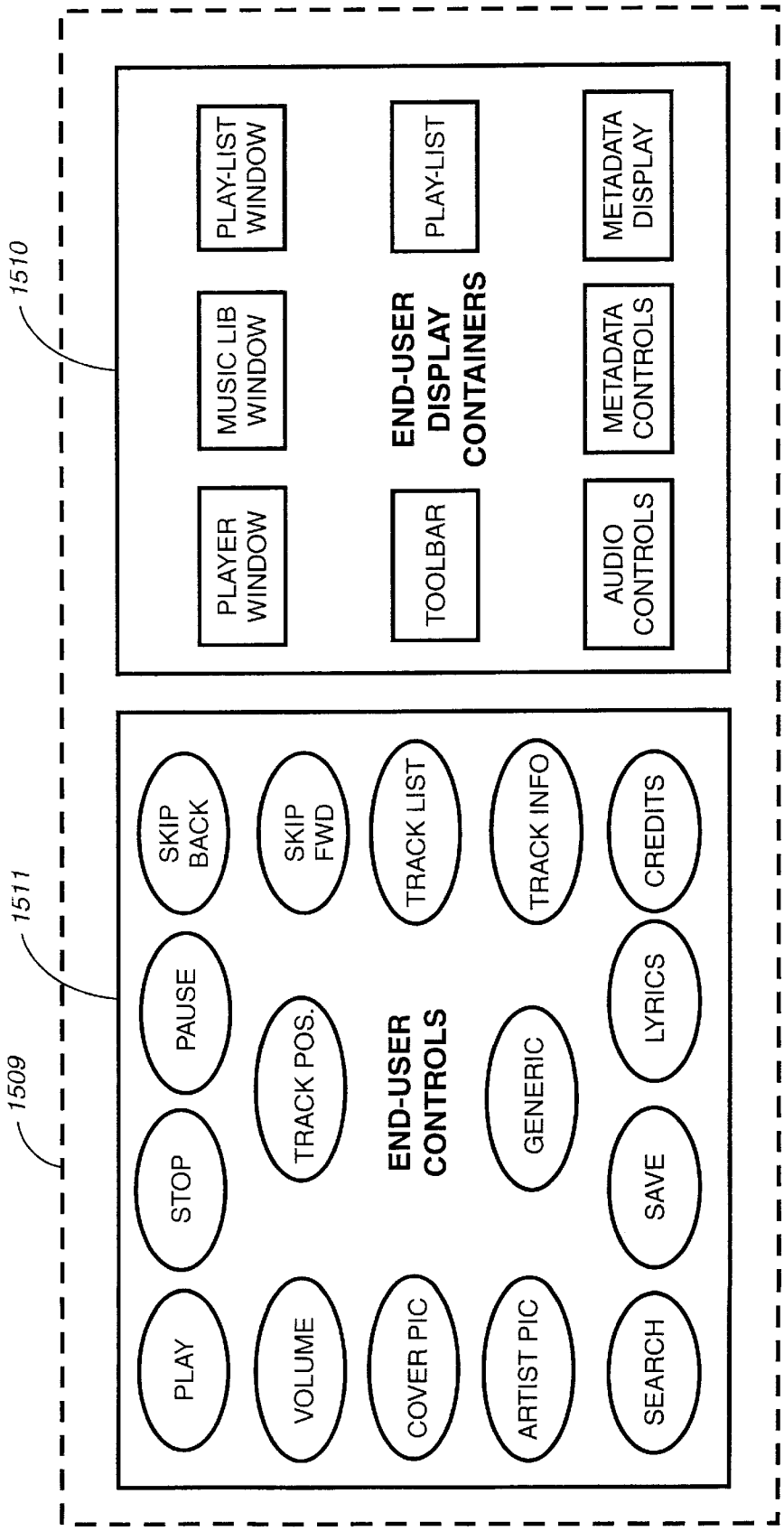
1509
1510
1511
PLAY
STOP
PAUSE
SKIP BACK
VOLUME
TRACK POS.
SKIP FWD
COVER PIC
END-USER CONTROLS
TRACK LIST
ARTIST PIC
GENERIC
TRACK INFO
SEARCH
SAVE
LYRICS
CREDITS
PLAYER WINDOW
MUSIC LIB WINDOW
PLAY-LIST WINDOW
TOOLBAR
END-USER DISPLAY CONTAINERS
PLAY-LIST
AUDIO CONTROLS
METADATA CONTROLS
METADATA DISPLAY

FIG. 15A

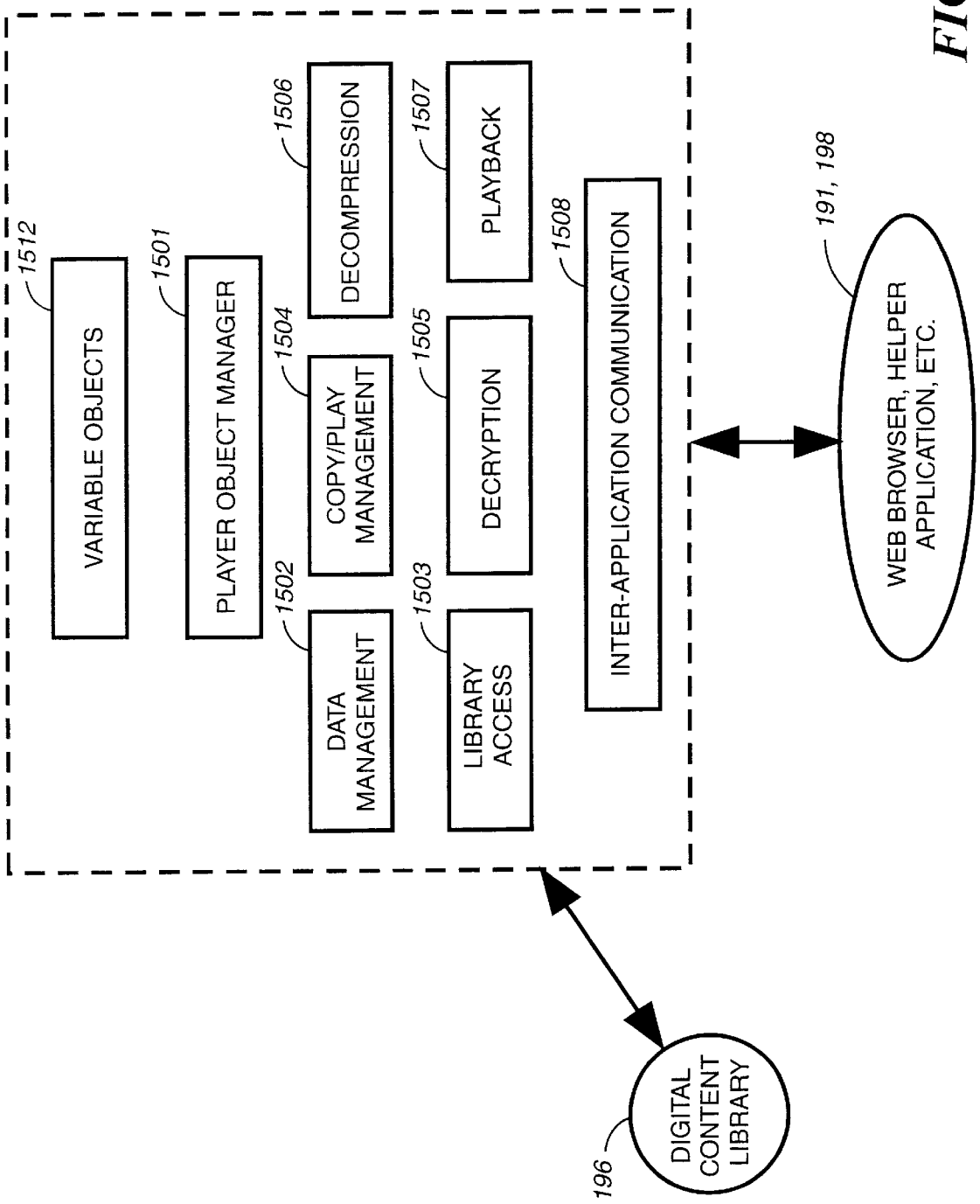
1512
VARIABLE OBJECTS
1501
PLAYER OBJECT MANAGER
1502
DATA MANAGEMENT
1504
COPY/PLAY MANAGEMENT
1506
DECOMPRESSION
1503
LIBRARY ACCESS
1505
DECRYPTION
1507
PLAYBACK
1508
INTER-APPLICATION COMMUNICATION
191, 198
WEB BROWSER, HELPER APPLICATION, ETC.
196
DIGITAL CONTENT LIBRARY

FIG. 15B

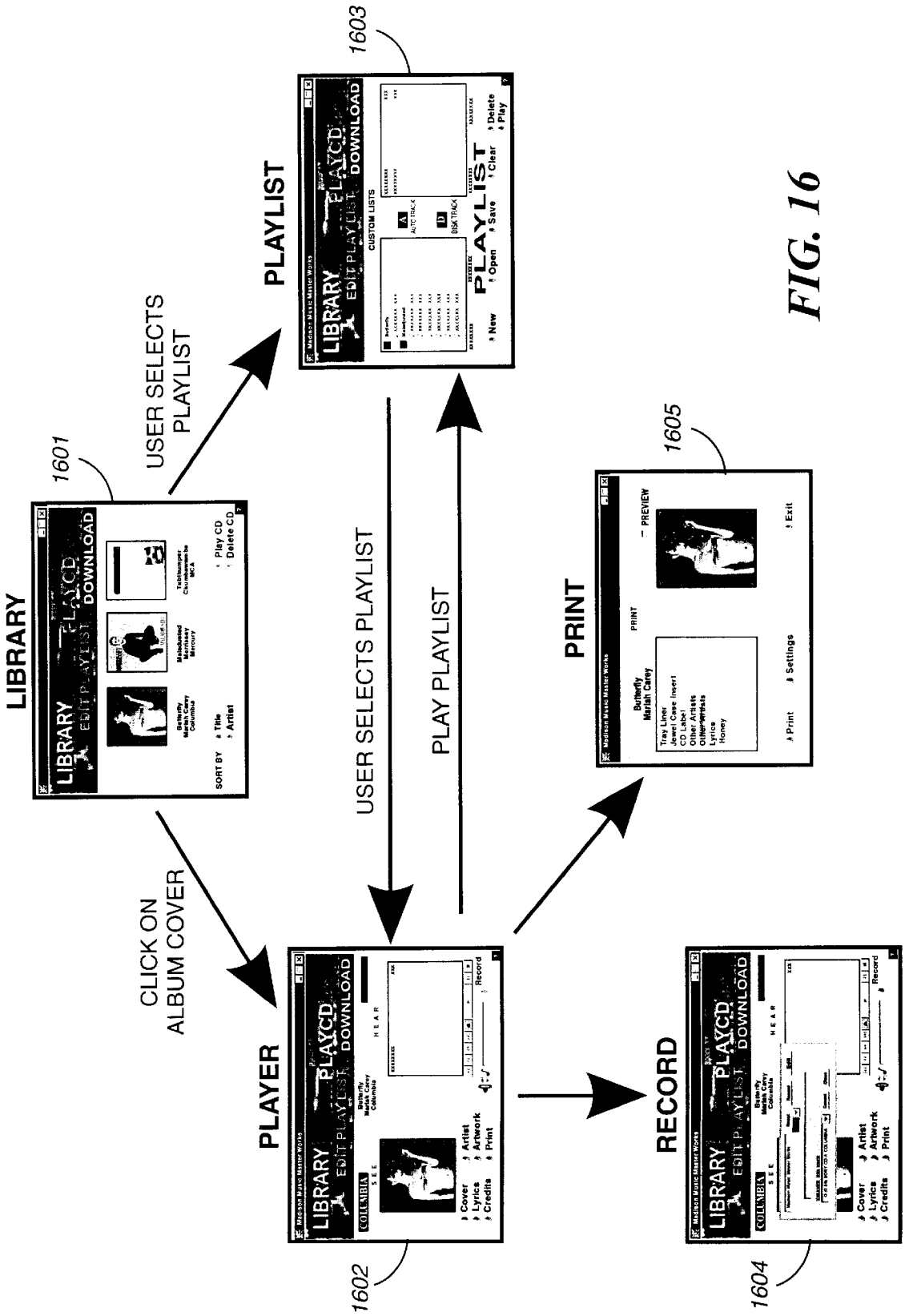
LIBRARY
1601
USER SELECTS PLAYLIST
PLAYLIST
1603
CLICK ON ALBUM COVER
USER SELECTS PLAYLIST
PLAY PLAYLIST
PRINT
1605
PLAYER
1602
RECORD
1604

FIG. 16

ELECTRONIC CONTENT DELIVERY SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This non-provisional application claims subject matter that is technically related to the following applications that are commonly assigned herewith to International Business Machines (IBM).

ATTORNEY DOC. NO.	APPLICATION SERIAL NO.	TITLE OF THE INVENTION	INVENTOR(S)
SE9-98-006	09/152,756	Secure Electronic Content Management	Kenneth L. Milsted George Gregory Gruse Marco M. Hurtado Edgar Downs Cesar Medina
SE9-98-007	09/209,440	Multimedia Player Toolkit	George Gregory Gruse John J. Dorak, Jr. Kenneth L. Milsted
SE9-98-008	09/241,276	Multimedia Content Creation System	Kenneth L. Milsted Qing Gong Edgar Downs
SE9-98-009	09/177,096	System for Tracking End-User Electronic Content	George Gregory Gruse John J. Dorak, Jr. Kenneth L. Milsted
SE9-98-010	09/203,307	Key Management System for End-User Digital Player	Jeffrey B. Lotspiech Marco M. Hurtado George Gregory Gruse Kenneth L. Milsted
SE9-98-011	09/208,774	Multi-media player for an Electronic Content Delivery System	Marco M. Hurtado George Gregory Gruse Edgar Downs Kenneth L. Milsted
SE9-98-013	09/203,306	A method to identify CD content	Kenneth L. Milsted Craig Kindell Qing Gong
SE9-98-014	09/203,315	Toolkit for delivering electronic content from an Online store.	Richard Spagna Kenneth L. Milsted David P. Lybrand Edgar Downs
SE9-98-015	09/201,622	A method and apparatus to automatically create encode audio	Kenneth L. Milsted Kha Kinh Nguyen Qing Gong
SE9-98-016		A method and apparatus to indicate an encoding rate for audio	Kenneth L. Milsted Qing Gong

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention disclosed broadly relates to the field of electronic commerce and more particularly to a system and related tools for the secure delivery and rights management of digital assets, such as print media, films, games, and music over global communications networks such as the Internet and the World Wide Web.

2. Description of the Related Art

The use of global distribution systems such as the Internet for distribution of digital assets such as music, film, computer programs, pictures, games and other content continues to grow. At the same time owners and publishers of valuable digital content have been slow to embrace the use of the Internet for distribution of digital assets for several reasons. One reason is that owners are afraid of unauthorized copying or pirating of digital content. The electronic delivery of digital content removes several barriers to pirating. One

barrier that is removed with electronic distribution is the requirement of the tangible recordable medium itself (e.g., diskettes or CD ROMs). It costs money to copy digital content on to tangible media, albeit, in many cases less than a dollar for a blank tape or recordable CD. However, in the case of electronic distribution, the tangible medium is no longer needed. The cost of the tangible medium is not a factor because content is distributed electronically. A second barrier, is the format of the content itself i.e. is the content stored in an analog format versus a digital format. Content stored in an analog format, for example, a printed picture, when reproduced by photocopying, the copy is of lesser quality than the original. Each subsequent copy of a copy, sometimes called a generation, is of less quality than the original. This degradation in quality is not present when a picture is stored digitally. Each copy, and every generation of copies can be as clear and crisp as the original. The aggregate effect of perfect digital copies combined with the very low cost to distribute content electronically and to distribute content widely over the Internet makes it relatively easy pirate and distribute unauthorized copies. With a couple of keystrokes, a pirate can send hundred or even of thousands of perfect copies of digital content over the Internet. Therefore a need exists to ensure the protection and security of digital assets distributed electronically.

Providers of digital content desire to establish a secure, global distribution system for digital content that protects the rights of content owners. The problems with establishing a digital content distribution system includes developing systems for digital content electronic distribution, rights management, and asset protection. Digital content that is distributed electronically includes content such as print media, films, games, programs, television, multimedia, and music.

The deployment of an electronic distribution system provides the Digital Content Providers the ability to achieve fast settlement of payment through immediate sales reporting and electronic reconciliation as well as gain secondary sources of revenue through redistribution of content. Since the electronic digital content distribution system is not affected by physical inventory outages or returns, the Digital Content Providers and retailers may realize reduced costs and improved margins. Digital Content Providers could facilitate new, or augment existing, distribution channels for better timed-release of inventory. The transactional data from the electronic distribution system could be used to obtain information regarding consumer buying patterns as well as to provide immediate feedback on electronic marketing programs and promotions. In order to meet these goals, a need exists for Digital Content Providers to use an electronic distribution model to make digital content available to a wide range of users and businesses while ensuring protection and metering of digital assets.

Other commercially available electronic distribution systems for digital content, such as real audio, A2B from AT&T, Liquid Audio Pro Corp. from Liquid Audio Pro, City Music Network from Audio Soft and others offer transmission of digital data over secured and unsecured electronic networks. The use of secured electronic networks greatly reduces the requirement of Digital Content Providers of distributing digital to a wide audience. The use of unsecured networks such as the Internet and Web allows the digital content to arrive to an end-user securely such as through the use of encryption. However, once the encrypted digital content is de-encrypted on the end-user's machine, the digital content is readily available to the end-user for unauthorized re-distribution. Therefore a need exists for a secure digital

content electronic distribution system that provides protection of digital assets and ensures that the Content Provider (s)' rights are protected even after the digital content is delivered to consumers and businesses. A need thus exists for rights management to allow for secure delivery, licensing authorization, and control of the usage of digital assets.

Another reason owners of digital content have been slow to embrace electronic distribution is their desire to maintain and foster existing channels of distribution. Most content owners sell through retailers. In the music market these U.S. retailers include Tower Records, Peaches, Blockbuster, Circuit City and others. Many of these retailers have Web sites that allow Internet users to makes selections over the Internet and have selections mailed to the end-user. Example music Web sites include @tower, Music Boulevard and Columbia House. The use of electronic distribution can remove the ability of the retail stores from differentiating themselves from each other and differentiate themselves from the content owners, especially on the Web. Therefore a need exists to provide retailers of electronic content such as pictures, games, music, programs and videos a way to differentiate themselves from each other and the content owners when selling music through electronic distribution.

Further information on the background of protecting digital content can be found from the following three sources. "Music on the Internet and the Intellectual Property Protection Problem" by Jack Lacy, James Snyder, David Maher, of AT&T Labs, Florham Park, N.J. available online URL http://www.a2bmusic.com/about/papers/musicipp.htm. Cryptographically protected container, called DigiBox, in the article "Securing the Content, Not the Wire for Information Commerce" by Olin Sibert, David Bernstein and David Van Wie, InterTrust Technologies Corp. Sunnyvale, Calif. available online URL http://www.intertrust.com/architecture/stc.html. And "Cryptolope Container Technology", an IBM White Paper, available online URL http:///cyptolope.ibm.com/white.htm.

SUMMARY OF THE INVENTION

Briefly, in accordance with the present invention, disclosed is a method and apparatus of securely providing data to a user's system. The data is encrypted so as to only be decryptable by a data decrypting key, the data decrypting key being encrypted using a first public key, and the encrypted data being accessible to the user's system, the method comprising the steps of: transferring the encrypted data decrypting key to a clearing house that possesses a first private key, which corresponds to the first public key; decrypting the data decrypting key using the first private key; re-encrypting the data decrypting key using ia second public key; transferring the re-encrypted data decrypting key to the user's system, the user's system possessing a second private key, which corresponds to the second public key; and decrypting the re-encrypted data decrypting key using the second private key.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram illustrating an over view of a Secure Digital Content Electronic Distribution System according to the present invention.

FIG. **2** is a block diagram illustrating an example Secure Container (SC) and the associated graphical representations according to the present invention.

FIG. **3** is a block diagram illustrating an overview of the encryption process for a Secure Container (SC) according to the present invention.

FIG. **4** is a block diagram illustrating an overview of the de-encryption process for a Secure Container (SC) according to the present invention.

FIG. **5** is a block diagram illustrating an overview of the layers for the Rights Management Architecture of the Secure Digital Content Distribution System of FIG. **1** according to the present invention.

FIG. **6** is a block diagram illustrating an overview of the Content Distribution and Licensing Control as it applies to the License Control Layer of FIG. **5**.

FIG. **7** is an illustration of an example user interface for the Work Flow Manager Tool of FIG. **1** according to the present invention.

FIG. **8** is a block diagram of the major tools, components and processes of the Work Flow Manager corresponding to the user interface in FIG. **7** according to the present invention.

FIG. **9** is a block diagram illustrating the major tools, components and processes of an Electronic Digital Content Store of FIG. **1** according to the present invention.

FIG. **10** is a block diagram illustrating the major components and processes of an End-User Device(s) of FIG. **1** according to the present invention.

FIG. **11** is a flow diagram of a method to calculate an encoding rate factor for the Content Preprocessing and Compression tool of FIG. **8** according to the present invention.

FIG. **12** is a flow diagram of a method to automatically retrieve additional information for the Automatic Metadata Acquisition Tool of FIG. **8** according to the present invention.

FIG. **13** is a flow diagram of a method to automatically set the Preprocessing and Compression parameters of the Preprocessing and Compression Tool of FIG. **8** according to the present invention.

FIG. **14** is an example of user interface screens of the Player Application downloading content to a local library as described in FIG. **15** according to the present invention.

FIG. **15** is a block diagram illustrating the major components and processes of a Player Application running on End-User Device of FIG. **9** according to the present invention.

FIG. **16** is an example user interface screens of the Player Application of FIG. **15** according to the present invention.

DETAILED DESCRIPTION OF AN EMBODIMENT

A Table of Contents is provided for this present invention to assist the reader in quickly locating different sections in this embodiment.

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I. SECURE DIGITAL CONTENT ELECTRONIC DISTRIBUTION SYSTEM

A. System Overview

The Secure Digital Content Electronic Distribution System is a technical platform that encompasses the technology, specifications, tools, and software needed for the secure delivery and rights management of Digital Content and digital content-related content to an end-user, client device. The End-User Device(s) include PCS, set top boxes (IRDs), and Internet appliances. These devices may copy the content to external media or portable, consumer devices as permitted by the content proprietors. The term Digital Content or simply Content, refers to information and data stored in a digital format including: pictures, movies, videos, music, programs, multimedia and games.

The technical platform specifies how Digital Content is prepared, securely distributed through point-to-point and broadcast infrastructures (such as cable, Internet, satellite, and wireless) licensed to End-User Device(s), and protected against unauthorized copying or playing. In addition, the architecture of the technical platform allows for the integration and migration of various technologies such as watermarking, compression/encoding, encryption, and other security algorithms as they evolve over time.

The base components of the Secure Digital Content Electronic Distribution System are: (1) rights management for the protection of ownership rights of the content proprietor; (2) transaction metering for immediate and accurate compensation; and (3) an open and well-documented architecture that enables Content Provider(s) to prepare content and permit its secure delivery over multiple network infrastructures for playback on any standard compliant player.

1. Rights Management

Rights management in the Secure Digital Content Electronic Distribution System is implemented through a set of

functions distributed among the operating components of the system. Its primary functions include: licensing authorization and control so that content is unlocked only by authorized intermediate or End-User(s) that have secured a license; and control and enforcement of content usage according to the conditions of purchase or license, such as permitted number of copies, number of plays, and the time interval or term the license may be valid. A secondary function of rights management is to enable a means to identify the origin of unauthorized copies of content to combat piracy.

Licensing authorization and control are implemented through the use of a Clearinghouse(s) entity and Secure Container (SC) technology. The Clearinghouse(s) provides licensing authorization by enabling intermediate or End-User(s) to unlock content after verification of a successful completion of a licensing transaction. Secure Containers are used to distribute encrypted content and information among the system components. A SC is a cryptographic carrier of information or content that uses encryption, digital signatures, and digital certificates to provide protection against unauthorized interception or modification of electronic information and content. It also allows for the verification of the authenticity and integrity of the Digital Content. The advantage of these rights management functions is that the electronic Digital Content distribution infrastructure does not have to be secure or trusted. Therefore transmission over network infrastructures such as the Web and Internet. This is due to the fact that the Content is encrypted within Secure Containers and its storage and distribution are separate from the control of its unlocking and use. Only users who have decryption keys can unlock the encrypted Content, and the Clearinghouse(s) releases decryption keys only for authorized and appropriate usage requests. The Clearinghouse(s) will not clear bogus requests from unknown or unauthorized parties or requests that do not comply with the content's usage conditions as set by the content proprietors. In addition, if the SC is tampered with during its transmission, the software in the Clearinghouse(s) determines that the Content in a SC is corrupted or falsified and repudiate the transaction.

The control of Content usage is enabled through the End-User Player Application **195** running on an End-User Device(s). The application embeds a digital code in every copy of the Content that defines the allowable number of secondary copies and play backs. Digital watermarking technology is used to generate the digital code, to keep it hidden from other End-User Player Application **195**, and to make it resistant to alteration attempts. When the Digital Content is accessed in a compliant End-User Device(s), the End-User Player Application **195** reads the watermark to check the use restrictions and updates the watermark as required. If the requested use of the content does not comply with the usage conditions, e.g., the number of copies has been exhausted, the End-User Device(s) will not perform the request.

Digital watermarking also provides the means to identify the origin of authorized or unauthorized copies of Content. An initial watermark in the Content is embedded by the content proprietor to identify the content proprietor, specify copyright information, define geographic distribution areas, and add other pertinent information. A second watermark is embedded in the Content at the End-User Device(s) to identify the content purchaser (or licensee) and End-User Device(s), specify the purchase or license conditions and date, and add any other pertinent information.

Since watermarks become an integral part of the Content, they are carried in the copies independent of whether the copies were authorized or not. Thus the Digital Content always contains information regarding its source and its permitted use regardless of where the content resides or where it comes from. This information may be used to combat illegal use of the Content.

2. Metering

As part of its rights management functions, the Clearinghouse(s) keeps a record of all transactions where a key exchange is cleared through the Clearinghouse(s). This record allows for the metering of licensing authorization and the original conditions of use. The transaction record can be reported to responsible parties, such as, content proprietors or Content Provider(s), retailers, and others, on an immediate or periodic basis to facilitate electronic reconciliation of transaction payments and other uses.

3. Open Architecture

The Secure Digital Content Electronic Distribution System (System) is an open architecture with published specifications and interfaces to facilitate broad implementation and acceptance of the System in the market place while maintaining rights protection for the content proprietors. The flexibility and openness of the System architecture also enable the System to evolve over time as various technologies, transmission infrastructures, and devices are delivered to the marketplace.

The architecture is open regarding the nature of the Content and its format. Distribution of audio, programs, multimedia, video, or other types of Content is supported by the architecture. The Content could be in a native format, such as linear PCM for digital music, or a format achieved by additional preprocessing or encoding, such as filtering, compression, or pre/de-emphasis, and more. The architecture is open to various encryption and watermarking techniques. It allows for the selection of specific techniques to accommodate different Content types and formats and to allow the introduction or adoption of new technologies as they evolve. This flexibility allows Content Provider(s) to pick and evolve the technologies they use for data compression, encryption, and formatting within the Secure Digital Content Electronic Distribution System.

The architecture is also open to different distribution networks and distribution models. The architecture supports content distribution over low-speed Internet connections or high-speed satellite and cable networks and can be used with point-to-point or broadcast models. In addition, the architecture is designed so that the functions in the End-User Device(s) can be implemented on a wide variety of devices, including low cost consumer devices. This flexibility allows Content Provider(s) and retailers to offer Content to intermediate or End-User(s) through a variety of service offerings and enables the users to purchase or license Content, play it back, and record it on various compliant player devices.

B. System Functional Elements

Turning now to FIG. **1**, there is shown a block diagram illustrating an overview of a Secure Digital Content Electronic Distribution System **100** according to the present invention. The Secure Digital Content Electronic Distribution System **100** encompasses several business elements that comprise an end-to-end solution, including: Content Provider(s) **101** or the proprietors of the Digital Content, Electronic Digital Content Store(s) **103**, Intermediate Market Partners (not shown), Clearinghouse(s) **105**, Content Hosting Site **111**, Transmission Infrastructures **107**, and End-User Device(s) **109**. Each of these business elements use various components of the Secure Digital Content Electronic Distribution System **100**. A high level description

of these business elements and system components, as they pertain specifically to electronic Content **113** distribution, follows.

1. Content Provider(s) **101**

Content Provider(s) **101** or content proprietor(s) are owners of original Content **113** and/or distributors authorized to package independent Content **113** for further distribution. Content Provider(s) **101** may exploit their rights directly or license Content **113** to the Electronic Digital Content Store (s) **103**, or Intermediate Market Partners (not shown), usually in return for Content usage payments related to electronic commerce revenues. Examples of Content Provider(s) **101** include Sony, Time-Warner, MTV, IBM, Microsoft, Turner, Fox and others.

Content Provider(s) **101** use tools provided as part of the Secure Digital Content Electronic Distribution System **100** in order to prepare their Content **113** and related data for distribution. A Work Flow Manager Tool **154** schedules Content **113** to be processed and tracks the Content **113** as it flows through the various steps of Content **113** preparation and packaging to maintain high quality assurance. The term metadata is used throughout this document to mean data related to the Content **113** and in this embodiment does not include the Content **113** itself. As an example, metadata for a song may be a song title or song credits but not the sound recording of the song. The Content **113** would contain the sound recording. A Metadata Assimilation and Entry Tool **161** is used to extract metadata from the Content Provider (s)' Database **160** (for a music example the Content **113** information such as CD title, artist name, song title, CD artwork, and more) and to package it for electronic distribution. The Metadata Assimilation and Entry Tool **161** is also used to enter the Usage Conditions for the Content **113**. The data in Usage Conditions can include copy restriction rules, the wholesale price, and any business rules deemed necessary. A Watermarking Tool is used to hide data in the Content **113** that identifies the content owner, the processing date, and other relevant data. For an embodiment where the Content **113** is audio, an audio preprocessor tool is used to adjust the dynamic range and/or equalize the Content **113** or other audio for optimum compression quality, compress the Content **113** to the desired compression levels, and encrypt the Content **113**. These can be adapted to follow technical advances in digital content compression/encoding, encryption, and formatting methods, allowing the Content Provider(s) **101** to utilize best tools as they evolve over time in the marketplace.

The encrypted Content **113**, digital content-related data or metadata, and encrypted keys are packed in SCs (described below) by the SC Packer Tool and stored in a content hosting site and/or promotional web site for electronic distribution. The content hosting site can reside at the Content Provider (s) **101** or in multiple locations, including Electronic Digital Content Store(s) **103** and Intermediate Market Partners (not shown) facilities. Since both the Content **113** and the Keys (described below) are encrypted and packed in SCs, Electronic Digital Content Store(s) **103** or any other hosting agent can not directly access decrypted Content **113** without clearance from the Clearinghouse(s) and notification to the Content Provider(s) **101**.

2. Electronic Digital Content Store(s) **103**

Electronic Digital Content Store(s) **103** are the entities who market the Content **113** through a wide variety of services or applications, such as Content **113** theme programming or electronic merchandising of Content **113**. Electronic Digital Content Store(s) **103** manage the design, development, business operations, settlements, merchandising, marketing, and sales of their services. Example online Electronic Digital Content Store(s) **103** are Web sites that provide electronic downloads of software.

Within their services, Electronic Digital Content Store(s) **103** implement certain functions of the Secure Digital Content Electronic Distribution System **100**. Electronic Digital Content Store(s) **103** aggregate information from the Content Provider(s) **101**, pack content and metadata in additional SCs, and deliver those SCs to consumers or businesses as part of a service or application. Electronic Digital Content Store(s) **103** use tools provided by the Secure Digital Content Electronic Distribution System **100** to assist with: metadata extraction, secondary usage conditions, SC packaging, and tracking of electronic content transactions. The secondary usage conditions data can include retail business offers such as Content **113** purchase price, pay-per-listen price, copy authorization and target device types, or timed-availability restrictions.

Once an Electronic Digital Content Store(s) **103** completes a valid request for electronic Content **113** from an End-User(s), the Electronic Digital Content Store(s) **103** is responsible for authorizing the Clearinghouse(s) **105** to release the decryption key for the Content **113** to the customer. The Electronic Digital Content Store(s) also authorizes the download of the SC containing the Content **113**. The Electronic Digital Content Store(s) may elect to host the SCs containing the Digital Content at its local site and/or utilize the hosting and distribution facilities of another Content hosting site.

The Electronic Digital Content Store(s) can provide customer service for any questions or problems that an End-User(s) may have using the Secure Digital Content Electronic Distribution System **100**, or the Electronic Digital Content Store(s) **103** may contract their customer service support to the Clearinghouse(s) **105**.

3. Intermediate Market Partners (not shown)

In an alternate embodiment, the Secure Digital Content Electronic Distribution System **100** can be used to provide Content **113** securely to other businesses called Intermediate Market Partners. These partners may include digital content-related companies offering a non-electronic service, such as televisions stations or video clubs, radio stations or record clubs, that distribute Content **113**. These Partners may also include other trusted parties who handle material as part of making or marketing sound recordings, such as record studios, replicators, and producers. These Intermediate Market Partners requires clearance from the Clearinghouse(s) **105** in order to decrypt the Content **113**.

4. Clearinghouse(s) **105**

The Clearinghouse(s) **105** provides the licensing authorization and record keeping for all transactions that relate to the sale and/or permitted use of the Content **113** encrypted in a SC. When the Clearinghouse(s) **105** receives a request for a decryption key for the Content **113** from an intermediate or End-User(s), the Clearinghouse(s) **105** validates the integrity and authenticity of the information in the request; verifies that the request was authorized by an Electronic Digital Content Store(s) or Content Provider(s) **101**; and verifies that the requested usage complies with the content Usage Conditions as defined by the Content Provider(s) **101**. Once these verifications are satisfied, the Clearinghouse(s) **105** sends the decryption key for the Content **113** to the requesting End-User(s) packed in a License SC. The key is encrypted in a manner so that only the authorized user can retrieve it. If the End-User's request is not verifiable, complete, or authorized, the Clearinghouse(s) **105** repudiates the request for the decryption key.

The Clearinghouse(s) **105** keeps a record of all transactions and can report them to responsible parties, such as Electronic Digital Content Store(s) **103** and Content Provider(s) **101**, on an immediate, periodic, or restricted basis. This reporting is a means by which Content Provider (s) **101** can be informed of the sale of Content **113** and the Electronic Digital Content Store(s) **103** can obtain an audit trail of electronic delivery to their customers. The Clearinghouse(s) **105** can also notify the Content Provider(s) **101** and/or Electronic Digital Content Store(s) **103** if it detects that information in a SC has been compromised or does not comply with the Content's Usage Conditions. The transaction recording and repository capabilities of the Clearinghouse(s) **105** database is structured for data mining and report generation.

In another embodiment, the Clearinghouse(s) **105** can provide customer support and exception processing for transactions such as refunds, transmission failures, and purchase disputes. The Clearinghouse(s) **105** can be operated as an independent entity, providing a trusted custodian for rights management and metering. It provides billing and settlement as required. Examples of electronic Clearinghouse(s) include Secure-Bank.com and Secure Electronic Transaction (SET) from Visa/Mastercard. In one embodiment, the Clearinghouse(s) **105** are Web sites accessible to the End-User Device(s) **109**. In another embodiment, the Clearinghouse(s) **105** is part of the Electronic Digital Content Store(s) **103**.

5. End-User Device(s) **109**

The End-User Device(s) **109** can be any player device that contains an End-User Player Application **195** (described later) compliant with the Secure Digital Content Electronic Distribution System **100** specifications. These devices may include PCS, set top boxes (IRDs), and Internet appliances. The End-User Player Application **195** could be implemented in software and/or consumer electronics hardware. In addition to performing play, record, and library management functions, the End-User Player Application **195** performs SC processing to enable rights management in the End-User Device(s) **109**. The End-User Device(s) **109** manages the download and storage of the SCs containing the Digital Content; requests and manages receipt of the encrypted Digital Content keys from the Clearinghouse(s) **105**; processes the watermark(s) every time the Digital Content is copied or played; manages the number of copies made (or deletion of the copy) in accordance with the Digital Content's Usage Conditions; and performs the copy to an external media or portable consumer device if permitted. The portable consumer device can perform a subset of the End-User Player Application **195** functions in order to process the content's Usage Conditions embedded in the watermark. The terms End-User(s) and End-User Player Application **195** are used throughout this to mean through the use or running-on an End-User Device(s) **109**.

6. Transmission Infrastructures **107**

The Secure Digital Content Electronic Distribution System **100** is independent of the transmission network connecting the Electronic Digital Content Store(s) **103** and End-User Device(s) **109**. It supports both point-to-point such as the Internet and broadcast distribution models such as broadcast television.

Even though the same tools and applications are used to acquire, package, and track Content **113** transactions over various Transmission Infrastructures **107**, the presentation and method in which services are delivered to the customer may vary depending on the infrastructure and distribution model selected. The quality of the Content **113** being transferred may also vary since high bandwidth infrastructures can deliver high-quality digital content at more acceptable response times than lower bandwidth infrastructures. A service application designed for a point-to-point distribution model can be adapted to support a broadcast distribution model as well.

C. System Uses

The Secure Digital Content Electronic Distribution System **100** enables the secure delivery of high-quality, electronic copies of Content **113** to End-User Device(s) **109**, whether consumer or business, and to regulate and track usage of the Content **113**.

The Secure Digital Content Electronic Distribution System **100** could be deployed in a variety of consumer and business-to-business services using both new and existing distribution channels. Each particular service could use a different financial model that can be enforced through the rights management features of the Secure Digital Content Electronic Distribution System **100**. Models such as wholesale or retail purchase, pay-per-listen usage, subscription services, copy/no-copy restrictions, or redistribution could be implemented through the rights management of the Clearinghouse(s) **105** and the End-User Player Application **195** copy protection features.

The Secure Digital Content Electronic Distribution System **100** allows Electronic Digital Content Store(s) **103** and Intermediate Market Partners a great deal of flexibility in creating services that sell Content **113**. At the same time it provides Content Provider(s) **101** a level of assurance that their digital assets are protected and metered so that they can receive appropriate compensation for the licensing of Content **113**.

II. CRYPTOGRAPHY CONCEPTS AND THEIR APPLICATION TO THE SECURE DIGITAL CONTENT ELECTRONIC DISTRIBUTION SYSTEM

License Control in the Secure Digital Content Electronic Distribution System **100** is based on the use of cryptography. This section introduces basic cryptography technologies of the present invention. The use of public key encryption, symmetric key encryption, digital signatures, digital watermarks and digital certificates is known.

A. Symmetric Algorithms

In the Secure Digital Content Electronic Distribution System **100** the Content Provider(s) **101** encrypts the content using symmetric algorithms. They are called symmetric algorithms because the same key is used to encrypt and decrypt data. The data sender and the message recipient must share the key. The shared key is referred to here as the symmetric key. The Secure Digital Content Electronic Distribution System **100** architecture is independent of the specific symmetric algorithm selected for a particular implementation.

Common symmetric algorithms are DES, RC2 and RC4. Both DES and RC2 are block cipher. A block cipher encrypts the data using a block of data bits at a time. DES is an official US government encryption standard, has a 64-bit block size, and uses a 56-bit key. Triple-DES is commonly used to increase the security achieved with simple DES. RSA Data Security designed RC2. RC2 uses a variable-key-size cipher and has a block size of 64 bits. RC4, also designed by RSA Data Security, is a variable-key-size stream cipher. A stream cipher operates on a single data bit at a time. RSA Data Security claims that eight to sixteen machine operations are required for RC4 per output byte.

IBM designed a fast algorithm called SEAL. SEAL is a stream algorithm that uses a variable-length key and that has

been optimized for 32-bit processors. SEAL requires about five elementary machine instructions per data byte. A 50 MHZ, 486-based computer runs the SEAL code at 7.2 megabytes/second if the 160-bit key used has already been preprocessed into internal tables.

Microsoft reports results of encryption performance benchmark in its Overview of CryptoAPI document. These results were obtained by an application using Microsoft's CryptoAPI, running on a 120-MHZ, Pentium-based computer with Windows NT 4.0.

Cipher	Key Size	Key Setup Time	Encryption Speed
DES	56	460	1,138,519
RC2	40	40	286,888
RC4	40	151	2,377,723

B. Public Key Algorithms

In the Secure Digital Content Electronic Distribution System **100**, symmetric keys and other small data pieces are encrypted using public keys. Public key algorithms use two keys. The two keys are mathematically related so that data encrypted with one key can only be decrypted with the other key. The owner of the keys keeps one key private (private key) and publicly distributes the second key (public key).

To secure the transmission of a confidential message using a public key algorithm, one must use the recipient's public key to encrypt the message. Only the recipient, who has the associated private key, can decrypt the message. Public key algorithms are also used to generate digital signatures. The private key is used for that purpose. The following section provides information on digital signatures.

The most common used public-key algorithm is the RSA public-key cipher. It has become the de-facto public key standard in the industry. Other algorithms that also work well for encryption and digital signatures are ElGamal and Rabin. RSA is a variable-key length cipher.

Symmetric key algorithms are much faster than the public key algorithms. In software, DES is generally at least 100 times as fast as RSA. Because of this, RSA is not used to encrypt bulk data. RSA Data Security reports that on a 90 MHZ Pentium machine, RSA Data Security's toolkit BSAFE 3.0 has a throughput for private-key operations (encryption or decryption, using the private key) of 21.6 kilobits/second with a 512-bit modulus and 7.4 kilobits/second with a 1024-bit modulus.

C. Digital Signature

In the Secure Digital Content Electronic Distribution System **100**, the issuer of SC(s) protects the integrity of SC(s) by digitally signing it. In general, to create a digital signature of a message, a message owner first computes the message digest (defined below) and then encrypt the message digest using the owner's private key. The message is distributed with its signature. Any recipient of the message can verify the digital signature first by decrypting the signature using the public key of the message owner to recover the message digest. Then, the recipient computes the digest of the received message and compare it with the recovered one. If the message has not being altered during distribution, the calculated digest and recovered digest must be equal.

In the Secure Digital Content Electronic Distribution System **100**, since SC(s) contain several data parts, a digest is calculated for each part and a summary digest is calculated for the concatenated part digests. The summary digest is encrypted using the private key of the issuer of the SC(s). The encrypted summary digest is the issuer's digital signature for the SC(s). The part digests and the digital signature are included in the body of the SC(s). The recipients of SC(s) can verify the integrity of the SC(s) and its parts by means of the received digital signature and part digests.

A one-way hash algorithm is used to calculate a message digest. A hash algorithm takes a variable-length-input message and converts it into a fixed length string, the message digest. A one-way hash algorithm operates only in one direction. That is, it is easy to calculate the digest for an input message, but it is very difficult (computationally infeasible) to generate the input message from its digest. Because of the properties of the one-way hash functions, one can think of a message digest as a fingerprint of the message.

The more common one-way hash functions are MD5 from RSA Data Security and SHA designed by the US National Institute of Technology and Standards (NITS).

D. Digital Certificates

A digital certificate is used to authenticate or verify the identity of a person or entity that has sent a digitally signed message. A certificate is a digital document issued by a certification authority that binds a public key to a person or entity. The certificate includes the public key, the name of the person or entity, an expiration date, the name of the certification authority, and other information. The certificate also contains the digital signature of the certification authority.

When an entity (or person) sends a message signed with its private key and accompanied with its digital certificate, the recipient of the message uses the entity's name from the certificate to decide whether or not to accept the message.

In the Secure Digital Content Electronic Distribution System **100**, every SC(s), except those issued by the End-User Device(s) **109**, includes the certificate of the creator of the SC(s). The End-User Device(s) **109** do not need to include certificates in their SC(s) because many End-User(s) do not bother to acquire a certificate or have certificates issued by non bona-fide Certification Authorities. In the Secure Digital Content Electronic Distribution System **100**, the Clearinghouse(s) **105** has the option of issuing certificates to the Electronic Digital Content Store(s) **103**. This allows the End-User Device(s) **109** to independently verify that the Electronic Digital Content Store(s) **103** have been authorized by the Secure Digital Content Electronic Distribution System **100**.

E. Guide To The SC(s) Graphical Representation

This document uses a drawing to graphically represent SC(s) that shows encrypted parts, non-encrypted parts, the encryption keys, and certificates. Referring now to FIG. **2** is an example drawing of SC(s) **200**. The following symbols are used in the SC(s) figures. Key **201** is a public or private key. The teeth of the key e.g. CLRNGH for Clearinghouse indicate the key owner. PB inside the handle indicates that it is a public key thus key **201** is a Clearinghouse public key. PV inside the handle indicates that it is a private key. Diamond shape is an End-User Digital Signature **202**. The initials indicate which private key was used to create the signature thus in EU is the End-User(s) digital signature from table below. Symmetric key **203** is used to encrypt content. An encrypted symmetric key object **204** comprising a symmetric key **203** encrypted with a PB of CLRNGH. The key on the top border of the rectangle is the key used in the encryption of the object. The symbol or text inside the rectangle indicates the encrypted object (a symmetric key in this case). Another encrypted object, in this example a Transaction ID encrypted object **205** is shown. And Usage Conditions **206** for content licensing management as

described below. The SC(s) **200** comprises Usage Conditions **206**, Transaction ID encrypted object **205**, an Application ID encrypted object **207**, and encrypted symmetric key object **204**, all signed with an End-User Digital Signature **202**.

The table below shows the initials that identify the signer of SC(s).

Initial	Component
CP	Content Provider(s) 101
MS	Electronic Digital Content Store(s) 103
HS	Content Hosting Site(s) 111
EU	End-User Device(s) 109
CH	Clearinghouse(s) 105
CA	certification authority(ies) (not shown)

F. Example of a Secure Container Encryption

The tables and diagrams below provide an overview of the encryption and decryption process used to create and recover information from SC(s). The SC(s) that is created and decrypted in this process overview is a general SC(s). It does not represent any of the specific SC(s) types used for rights management in the Secure Digital Content Electronic Distribution System **100**. The process consists of the steps described in FIG. **3** for encryption process.

Process Flow for Encryption Process of FIG. **3**

Step	Process
301	Sender generates a random symmetric key and uses it to encrypt the content.
302	Sender runs the encrypted content through a hash algorithm to produce the content digest.

-continued

Step	Process
303	Sender encrypts the symmetric key using the recipient's public key. PB RECPNT refers to the recipient's public key.
304	Sender runs the encrypted symmetric key through the same hash algorithm used in step 2 to produce the symmetric key digest.
305	Sender runs the concatenation of the content digest and symmetric key digest through the same hash algorithm used in step 2 to produce the SC(s) digest.
306	Sender encrypts the SC(s) digest with the sender's private key to produce the digital signature for the SC(s). PV SENDER refers to the sender's private key.
307B	Sender creates a SC(s) file that includes the encrypted content, encrypted symmetric key, content digest, symmetric key digest, sender's certificate, and SC(s) signature.
307A	Sender must have obtained the certificate from a certification authority prior to initiating secure communications. The certification authority includes in the certificate the sender's public key, the sender's name and signs it. PV CAUTHR refers to the certifications authority's private key. Sender transmits the SC(s) to the recipient.

Process Flow for Decryption Process of FIG. **4**

Step	Process
408	Recipient receives the SC(s) and separates its parts.
409	Recipient verifies the digital signature in the sender's certificate by decrypting it with the public key of the certification authority. If the certificate's digital signature is valid, recipient acquires the sender's public key from the certificate.
410	Recipient decrypts the SC(s) digital signature using the sender's public key. This recovers the SC(s) digest. PB SENDER refers to the sender's public key.
411	Recipient runs the concatenation of the received content digest and encrypted key digest through the same hash algorithm used by the sender to compute the SC(s) digest.
412	Recipient compares the computed SC(s) digest with the one recovered from the sender's digital signature. If they are the same, recipient confirms that the received digests have not been altered and continues with the decryption process. If they are not the same, recipient discards the SC(s) and notifies the sender.
413	Recipient runs the encrypted symmetric key through the same hash algorithm used in step 411 to compute the symmetric key digest.
414	Recipient compares the computed symmetric key digest with the one received in the SC(s). If it is the same, recipient knows that the encrypted symmetric key has not been altered. Recipient continues with the decryption process. If not valid, recipient discards the SC(s) and notifies the sender.
415	Recipient runs the encrypted content through the same hash algorithm used in step 411 to compute the content digest.
416	Recipient compares the computed content digest with the one received in the SC(s). If it is the same, recipient knows that the encrypted content has not been altered. Recipient then continues with the decryption process. If not valid, recipient discards the SC(s) and notifies the sender.
417	Recipient decrypts the encrypted symmetric key using the recipient's private key. This recovers the symmetric key. PV RECPNT refers to the recipient's private key.
418	Recipient uses the symmetric key to decrypt the encrypted content. This recovers the content.

III. SECURE DIGITAL CONTENT ELECTRONIC DISTRIBUTION SYSTEM FLOW

The Secure Electronic Digital Content Distribution System **100**, consists of several components that are used by the different participants of the system. These participants include the Content Provider(s) **101**, Electronic Digital Content Store(s) **103**, End-User(s) via End-User Device(s) **109** and the Clearinghouse(s) **105**. A high level system flow is used as an overview of the Secure Digital Content Electronic Distribution System **100**. This flow outlined below tracks Content as it flows throughout the System **100**. Additionally it outlines the steps used by the participants to conduct the transactions for the purchase, unlocking and use of the Content **113**. Some of the assumptions made in the system flow include:

This is a system flow for a Digital Content service (Point-to-Point Interface to a PC).

Content Provider(s) **101** submits audio Digital Content in PCM uncompressed format (as a music audio example).

Content Provider(s) **101** has metadata in an ODBC compliant database or Content Provider(s) **101** will enter the data directly into the Content Information Processing Subsystem.

Financial settlement is done by the Electronic Digital Content Store(s).

Content **113** is hosted at a single Content Hosting Site(s) **111**.

It should be understood by those skilled in the art that these assumptions can be altered to accommodate the exact nature of the Digital Content e.g. music, video and program and electronic distribution systems broadcast.

The following process flow in illustrated in FIG. **1**.

Step	Process
121	A uncompressed PCM audio file is provided as Content 113 by the Content Provider(s) 101. Its filename is input into the Work Flow Manager 154 Tool along with the Content Provider(s)' 101 unique identifier for the Content 113.
122	Metadata is captured from the Content Provider(s)' Database 160 by the Content Information Processing Subsystem using the Content Provider(s)' 101 unique identifier for the Content 113 and information provided by the Database Mapping Template.
123	The Work Flow Manager Tool 154 is used to direct the content flow through the acquisition and preparation process at the Content Provider(s) 101. It can also be used to track the status of any piece of content in the system at any time.
124	The Usage Conditions for the Content 113 are entered into the Content Information Processing Subsystem, this can be done either manually or automatically. This data includes copy restriction rules and any other business rules deemed necessary. All of the metadata entry can occur in parallel with the Audio Processing for the data.
125	The Watermarking Tool is used to hide data in the Content 113 that the Content Provider(s) 101 deems necessary to identify the content. This could include when it was captured, where it came from (this Content Provider(s) 101), or any other information specified by the Content Provider(s) 101. • The Content 113 Encoding Tool performs equalization, dynamic range adjustments and re-sampling to the Content 113 as necessary for the different compression levels supported. • The Content 113 is compressed using the Content 113 Encoding Tool to the desired compression levels. The Content 113 can then be played back to verify that the compression produces the required level of Content 113 quality. If necessary the equalization, dynamic range adjustments, compression and playback quality checks can be performed as many times as desired. • The Content 113 and a subset of its metadata is encrypted with a Symmetric Key by the SC Packer. This tool then encrypts the key using the Public Key of the Clearinghouse(s) 105 to produce an Encrypted Symmetric Key. This key can be transmitted anywhere without comprising the security of the Content 113 since the only entity that can decrypt it is the Clearinghouse(s) 105.
126	The Encrypted Symmetric Key, metadata and other information about the Content 113 is then packed into a Metadata SC by the SC Packer Tool 152.
127	The encrypted Content 113 and metadata are then packed into a Content SC. At this point the processing on the Content 113 and metadata is complete.
128	the Metadata SC(s) is then sent to the Content Promotions Web Site 156 using the Content Disbursement Tool (not shown).
129	The Content Disbursement Tool sends the Content SC(s) to the Content Hosting Site(s) 111. The Content Hosting Site(s) can reside at the Content Provider(s) 101, the Clearinghouse(s) 105 or a special location dedicated for Content Hosting. the URL for this site is part of the metadata that was added to the Metadata SC.
130	The Content Promotions Web Site 156 notifies Electronic Digital Content Store(s) 103 of new Content 113 that is added to the System 100.
131	Using the Content Acquisition Tool, Electronic Digital Content Store(s) 103 then download the Metadata SCs that correspond to the Content 113 they wish to sell.
132	The Electronic Digital Content Store(s) 103 will use the Content Acquisition Tool to pull out any data from the Metadata SC(s) that they want to use to promote the Content 113 on their Web Site. Access to portions of this metadata can be secured and charged for if desired.
133	The Usage Conditions for the Content 113, specific to this Electronic Digital Content Store(s) 103, are entered using the Content Acquisition Tool. These Usage Conditions include the retail prices and copy/play restrictions for the different compression levels of the Content 113.
134	The Electronic Digital Content Store(s) 103 specific Usage Conditions and the original Metadata SC(s) are packed into an Offer SC by the SC Packer Tool.
135	After the Electronic Digital Content Store(s) 103 Web Site is updated, the Content 113 is available to End-User(s) surfing the Web.
136	When an End-User(s) finds Content 113 that they want to buy, they click on a content icon, such as a music icon, and the item is added to his/her shopping cart which is maintained by the Electronic Digital Content Store(s) 103. When the End-User(s) completes shopping they submit the purchase request to the Electronic digital Content Store(s) 103 for processing.

-continued

Step	Process
137	The electronic Digital Content Store(s) 103 then interacts with credit card clearing organizations to place a hold on the funds in the same way they do business today.
138	Once the Electronic Digital Content Store(s) 103 receives the credit card authorization number back from the credit card clearing organization, it stores this into a database and invokes the SC Packer Tool to build a Transaction SC. This Transaction SC includes all of the Offer SCs for the Content 113 that the End-Users(s) has purchased, a Transaction ID that can be tracked back to the Electronic Digital Content Store(s) 103, information that identifies the End-User(s), compression levels, Usage Conditions and the price list for the songs purchased.
139	This Transaction SC is then transmitted to the End-User Device(s) 109.
140	When the Transaction SC arrives on the End-User Device(s) 109, it kicks off the End-User Player Application 195 which opens the Transaction SC and acknowledges the End-User's purchase. The End-User Player Application 195 then opens the individual Offer SCs and informs the user with an estimate of the download time. It then asks the user to specify when they want to download the Content 113.
141	Based on the time the End-User(s) requested the download, the end-User Player Application 195 will wake up and initiate the start of the download process by building a Order SC that contains among other things the Encrypted symmetric Key for the Content 113, the Transaction ID, and End-User(s) information.
142	This Order SC is then sent to the Clearinghouse(s) 105 for processing.
143	The Clearinghouse(s) 105 receives the Order SC, opens it and verifies that none of the data has been tampered with. The Clearinghouse(s) 105 validates the Usage Conditions purchased by the End-User(s). These Usage Conditions must comply with those specified by the Content Provider(s) 101. This information is logged in a database.
144	Once all the checks are complete, the Encrypted symmetric Key is decrypted using the private key of the Clearinghouse(s) 105. The symmetric Key is then encrypted using the public key of the End-User(s). This new Encrypted symmetric Key is then packaged into a License SC by the SC Packer.
145	The License SC is then transmitted to the End-User(s).
146	When the License SC is received at the End-User Device(s) 109 it is stored in memory until the Content SC is downloaded.
147	The End-User Device(s) 109 request form the Content Hosting Facility 111, sending the corresponding License SC for the purchased Content 113.
148	Content 113 is sent to the end-User Device(s) 109. Upon the receipt the Content 113 is de-encrypted by the End-User Device(s) 109 using the Symmetric Key.

IV. RIGHTS MANAGEMENT ARCHITECTURE MODEL

A. Architecture Layer Functions

FIG. **5** is a block diagram of the Rights Management Architecture of the Secure Digital Content Electronic Distribution System **100**. Architecturally, four layers represent the Secure Digital Content Electronic Distribution System **100**: the License Control Layer **501**, the Content Identification Layer **503**, Content Usage Control Layer **505**, and the Content Formatting Layer **507**. The overall functional objective of each layer and the individual key functions for each layer are described in this section. The functions in each of the layers are fairly independent of the functions in the other layers. Within broad limitations, functions in a layer can be substituted with similar functions without affecting the functionality of the other layers. Obviously, it is required that the output from one layer satisfies format and semantics acceptable to the adjacent layer.

The License Control Layer **501** ensures that:

- the Digital Content is protected during distribution against illegal interception and tampering;
- the Content **113** originates from a rightful content owner and is distributed by a licensed distributor, e.g. Electronic Digital Content Store(s) **103**;
- the Digital Content purchaser has a properly licensed application;
- the distributor is paid by the purchaser before a copy of the Content **113** is made available to the purchaser or End-User(s); and
- a record of the transaction is kept for reporting purposes.

The Content Identification Layer **503** allows for the verification of the copyright and the identity of the content purchaser. The content's copyright information and identity of the content purchaser enables the source tracking of any, authorized or not, copy of the Content **113**. Thus, the Content Identification Layer **503** provides a means to combat piracy.

The Content Usage Control Layer **505** ensures that the copy of the Content **113** is used in the purchaser's device according to the Store Usage Conditions **519**. The Store Usage Conditions **519** may specify the number of plays and local copies allowed for the Content **113**, and whether or not the Content **113** may be recorded to an external portable device. The functions in the Content Usage Control Layer **505** keep track of the content's copy/play usage and update the copy/play status.

The Content Formatting Layer **507** allows for the format conversion of the Content **113** from its native representation in the content owner's facilities into a form that is consistent with the service features and distribution means of the Secure Digital Content Electronic Distribution System **100**. The conversion processing may include compression encoding and its associated preprocessing, such as frequency equalization and amplitude dynamic adjustment. For Content **113** which is audio, at the purchaser's side, the received Content **113** also needs to be processed to achieve a format appropriate for playback or transfer to a portable device.

B. Function Partitioning and Flows

The Rights Management Architectural Model is shown in FIG. **5** and this illustrates the mapping of the architectural layers to the operating components making up the Secure Digital Content Electronic Distribution System **100** and the key functions in each layer.

1. Content Formatting Layer **507**

The general functions associated with the Content Formatting Layer **507** are Content Preprocessing **502** and Compression **511** at the Content Provider(s) **101**, and Content De-scrambling **513** and Decompression **515** at the End-User Device(s) **109**. The need for preprocessing and the examples of specific functions were mentioned above. Content Compression **511** is used to reduce the file size of the Content **113** and its transmission time. Any compression algorithm appropriate for the type of Content **113** and transmission medium can be used in the Secure Digital Content Electronic Distribution System **100**. For music, MPEG 1/2/4, Dolby AC-2 and AC-3, Sony Adaptive Transform Coding (ATRAC), and low-bit rate algorithms are some of the typically used compression algorithms. The Content **113** is stored in the End-User Device(s) **109** in compressed form to reduce the storage size requirement. It is decompressed during active playback. De-scrambling is also performed during active playback. The purpose and type of scrambling will be described later during the discussion of the Content Usage Control Layer **505**.

2. Content Usage Control Layer **505**

The Content Usage Control Layer **505** permits the specification and enforcement of the conditions or restrictions imposed on the use of Content **113** use at the End-User Device(s) **109**. The conditions may specify the number of plays allowed for the Content **113**, whether or not a secondary copy of the Content **113** is allowed, the number of secondary copies, and whether or not the Content **113** may be copied to an external portable device. The Content Provider(s) **101** sets the allowable Usage Conditions **517** and transmits them to the Electronic Digital Content Store(s) **103** in a SC (see the License Control Layer **501** section). The Electronic Digital Content Store(s) **103** can add to or narrow the Usage Conditions **517** as long as it doesn't invalidate the original conditions set by the Content Provider(s) **101**. The Electronic Digital Content Store(s) **103** then transmits all Store Usage Conditions **519** (in a SC) to the End-User Device(s) **109** and the Clearinghouse(s) **105**. The Clearinghouse(s) **105** perform Usage Conditions Validation **521** before authorizing the Content **113** release to an End-User Device(s) **109**.

The enforcement of the content Usage Conditions **517** is performed by the Content Usage Control Layer **505** in the End-User Device(s) **109**. First, upon reception of the Content **113** copy from the Content Identification Layer **503** in the End-User Device(s) **109** marks the Content **113** with a Copy/Play Code **523** representing the initial copy/play permission. Second, the Player Application **195** cryptographically scrambles the Content **113** before storing it in the End-User Device(s) **109**. The Player Application **195** generates a scrambling key for each Content item, and the key is encrypted and hidden in the End-User Device(s) **109**. Then, every time the End-User Device(s) **109** accesses the Content **113** for copy or play, the End-User Device(s) **109** verifies the copy/play code before allowing the de-scrambling of the Content **113** and the execution of the play or copy. The End-User Device(s) **109** also appropriately updates the copy/play code in the original copy of the Content **113** and on any new secondary copy. The copy/play coding is performed on Content **113** that has been compressed. That is, there is no need to decompress the Content **113** before the embedding of the copy/play code.

The End-User Device(s) **109** uses a License Watermark **527** to embed the copy/play code within the Content **113**. Only the End-User Player Application **195** that is knowledgeable of the embedding algorithm and the associated scrambling key is able to read or modify the embedded data. The data is invisible or inaudible to a human observer; that is, the data introduces no perceivable degradation to the Content **113**. Since the watermark survives several steps of content processing, data compression, D-to-A and A-to-D conversion, and signal degradation introduced by normal content handling, the watermark stays with the Content **113** in any representation form, including analog representation.

3. Content Identification Layer **503**

As part of the Content Identification Layer **503**, the Content Provider(s) **101** also uses a License Watermark **527** to embed data in the Content **113** such as to the content identifier, content owner and other information, such as publication date and geographic distribution region. This watermark is referred to here as the Copyright Watermark **529**. Upon reception, the End-User Device(s) **109** watermarks the copy of the Content **113** with the content purchaser's name and the Transaction ID **535** (see the License Control Layer **501** section below), and with other information such as date of license and Usage Conditions **517**. This watermark is referred to here as the license watermark. Any copy of Content **113**, obtained in an authorized manner or not, and subject to audio processing that preserves the content quality, carries the copyright and license watermarks. The Content Identification Layer **503** deters piracy.

4. License Control Layer **501**

The License Control Layer **501** protects the Content **113** against unauthorized interception and ensures that the Content is only released on an individual basis to an End-User(s) that has properly licensed End-User Device(s) **109** and successfully completes a license purchase transaction with an authorized Electronic Digital Content Store(s) **103**. The License Control Layer **501** protects the Content **113** by double Encryption **531**. The Content **113** is encrypted using an encryption symmetric key generated by the Content Provider(s) **101**, and the symmetric key is encrypted using the public key **621** of the Clearinghouse(s). Only the Clearinghouse(s) **105** can initially recover the symmetric key.

License control is designed with the Clearinghouse(s) **105** as the "trusted party". Before releasing permission for the License Request **537**, (i.e. the Symmetric Key **623** for the Content **113** to an End-User Device(s) **109**), the Clearinghouse(s) **105** verifies that the Transaction **541** and the License Authorization **543** are complete and authentic, that the Electronic Digital Content Store(s) **103** has authorization from the Secure Digital Content Electronic Distribution System **100** for the sale of electronic Content **113**, and that the End-User(s) has a properly licensed application. Audit/Reporting **545** allows the generation of reports and the sharing of licensing transaction information with other authorized parties in the Secure Electronic Digital Content Distribution System **100**.

License control is implemented through SC Processing **533**. SC(s) are used to distribute encrypted Content **113** and information among the system operation components (more about the SC(s) detailed structure sections below). A SC is cryptographic carrier of information that uses cryptographic encryption, digital signatures and digital certificates to provide protection against unauthorized interception and modification of the electronic information or Content **113**. It also allows for the authenticity verification of the electronic data.

License control requires that the Content Provider(s) **101**, the Electronic Digital Content Store(s) **103**, and the Clearinghouse(s) **105** have bona-fide cryptographic digital certificates from reputable Certificate Authorities that are used to authenticate those components. The End-User Device(s) **109** are not required to have digital certificates.

C. Content Distribution and Licensing Control

FIG. **6** is a block diagram illustrating an overview of the Content Distribution and Licensing Control as it applies to the License Control Layer of FIG. **5**. The figure depicts the case in which the Electronic Digital Content Store(s) **103**, End-User Device(s) **109** and the Clearinghouse(s) **105** are interconnected via the Internet, and unicast (point-to-point) transmission is used among those components. The communication between the Content Provider(s) **101** and the Electronic Digital Content Store(s) **103** could also be over the Internet or other network. It is assumed that the Content-purchase commercial transaction between the End-User Device(s) **109** and the Electronic Digital Content Store(s) **103** is based on standard Internet Web protocols. As part of the Web-based interaction, the End-User(s) makes the selection of the Content **113** to purchase, provides personal and financial information, and agrees to the conditions of purchase. The Electronic Digital Content Store(s) **103** could obtain payment authorization from an acquirer institution using a protocol such as SET.

It is also assumed in FIG. **6** that the Electronic Digital Content Store(s) **103** has downloaded the End-User Player Application **195** to an End-User Device(s) **109** based on standard Web protocols. The architecture requires that the Electronic Digital Content Store(s) **103** assigns a unique application ID to the downloaded Player Application **195** and that the End-User Device(s) **109** stores it for later application license verification (see below).

The overall licensing flow starts at the Content Provider (s) **101**. The Content Provider(s) **101** encrypts the Content **113** using an encryption symmetric key locally generated, and encrypts the Symmetric Key **623** using the Clearinghouse's **105** public key **621**. The Content Provider(s) **101** creates a Content SC(s) **630** around the encrypted Content **113**, and a Metadata SC(s) **620** around the encrypted Symmetric Key **623**, Store Usage Conditions **519**, and other Content **113** associated information. There is one Metadata SC(s) **620** and one Content SC(s) **630** for every Content **113** object. The Metadata SC(s) **620** also carries the Store Usage Conditions **519** associated with the Content Usage Control Layer **505**.

The Content Provider(s) **101** distributes the Metadata SC(s) **620** to one or more Electronic Digital Content Store(s) **103** (step **601**) and the Content SC(s) **630** to one or more Content Hosting Sites (step **602**). Each Electronic Digital Content Store(s) **103**, in turn creates an Offer SC(s) **641**. The Offer SC(s) **641** typically carries much of the same information as the Metadata SC(s) **620**, including the Digital Signature **624** of the Content Provider(s) **101** and the Certificate (not shown of the Content Provider(s) **101**. As mentioned above, the Electronic Digital Content Store(s) **103** can add to or narrow the Store Usage Conditions **519** (handled by the Control Usage Control Layer) initially defined by the Content Provider(s) **101**. Optionally, the Content SC(s) **630** and/or the Metadata SC(s) **620** is signed with a Digital Signature **624** ofthe Content Provider(s) **101**.

After the completion of the Content-purchase transaction between the End-User Device(s) **109** and the Electronic Digital Content Store(s) **103** (step **603**), the Electronic Digital Content Store(s) **103** creates and transfers to the End-User Device(s) **109** a Transaction SC(s) **640** (step **604**). The Transaction SC(s) **640** includes a unique Transaction ID **535**, the purchaser's name (i.e. End-User(s)') (not shown), the Public Key **661** ofthe End-User Device(s) **109**, and the Offer SC(s) **641** associated with the purchased Content **113**. Transaction Data **642** in FIG. **6** represents both the Transaction ID **535** and the End-User(s) name (not shown). The Transaction Data **642** is encrypted with the Public Key **621** of the Clearinghouse(s) **105**. Optionally, the Transaction SC(s) **640** is signed with a Digital Signature **643** of the Electronic Digital Content Store(s) **103**.

Upon reception of the Transaction SC(s) **640** (and the Offer SC(s) **641** included in it), the End-User Player Application **195** running on End-User Device(s) **109** solicits license authorization from the Clearinghouse(s) **105** by means of an Order SC(s) **650** (step **605**). The Order SC(s) **650** includes the encrypted Symmetric Key **623** and Store Usage Conditions **519** from the Offer SC(s) **641**, the encrypted Transaction Data **642** from the Transaction SC(s) **640**, and the encrypted Application ID **551** from the End-User Device(s) **109**. In another embodiment, the Order SC(s) **650** is signed with a Digital Signature **652** of the End-User Device(s) **109**.

Upon reception of the Order SC(s) **650** from the End-User Device(s) **109**, the Clearinghouse(s) **105** verifies:

1. that the Electronic Digital Content Store(s) **103** has authorization from the Secure Digital Content Electronic Distribution System **100** (exists in the Database **160** of the Clearinghouse(s) **105**);
2. that the Order SC(s) **650** has not been altered;
3. that the Transaction Data **642** and Symmetric Key **623** are complete and authentic;
4. that the electronic Store Usage Conditions **519** purchased by the End-User Device(s) **109** are consistent with those Usage Conditions **517** set by the Content Provider(s) **101**; and
5. that the Application ID **551** has a valid structure and that it was provided by an authorized Electronic Digital Content Store(s) **103**.

If the verifications are successful, the Clearinghouse(s) **105** decrypts the Symmetric Key **623** and the Transaction Data **642** and builds and transfers the License SC(s) **660** to the End-User Device(s) **109** (step **606**). The License SC(s) **660** carries the Symmetric Key **623** and the Transaction Data **642**, both encrypted using the Public Key **661** of the End-User Device(s) **109**. If any verification is not successful, the Clearinghouse(s) **105** denies the license to the End-User Device(s) **109** and informs the End-User Device(s) **109**. The Clearinghouse(s) **105** also immediately informs the Electronic Digital Content Store(s) **103** of this verification failure. In an alternate embodiment, the Clearinghouse(s) **105** signs the License SC(s) **660** with its Digital Signature **663**.

After receiving the License SC(s) **660**, the End-User Device(s) **109** decrypts the Symmetric Key **623** and the Transaction Data **642** previously received from the Clearinghouse(s) **105** and requests the Content SC(s) **630** (step **607**) from a Content Hosting Site(s) **111**. Upon arrival of the Content SC(s) **630** (step **608**), the End-User Device(s) **109** decrypts the Content **113** using the Symmetric Key **623** (step **609**), and passes the Content **113** and the Transaction Data **642** to the other layers for license watermarking, copy/play coding, scrambling, and fuirther Content **113** processing as described previously for FIG. **5**.

Finally, the Clearinghouse(s) **105** on a periodic basis transmits summary transaction reports to the Content Provider(s) **101** and the Electronic Digital Content Store(s) **103** for auditing and tracking purposes (step **610**).

V. SECURE CONTAINER STRUCTURE

A. General Structure

A Secure Container (SC) is a structure that consists of several parts which together define a unit of Content **113** or a portion of a transaction, and which also define related

information such as Usage Conditions, metadata, and encryption methods. SC(s) are designed in such a way that the integrity, completeness, and authenticity of the information can be verified. Some of the information in SC(s) may be encrypted so that it can only be accessed after proper authorization has been obtained.

SC(s) include at least one bill of materials (BOM) part which has records of information about the SC(s) and about each of the parts included in the SC(s). A message digest is calculated, using a hashing algorithm such as MD-5, for each part and then included in the BOM record for the part. The digests of the parts are concatenated together and another digest is computed from them and then encrypted using the private key of the entity creating the SC(s) to create a digital signature. Parties receiving the SC(s) can use the digital signature to verify all of the digests and thus validate the integrity and completeness of the SC(s) and all of its parts.

The following information may be included as records in the BOM along with the records for each part. The SC(s) type determines which records need to be included:

SC(s) version

SC(s) ID

Type of SC(s) (e.g. Offer, Order, Transaction, Content, Metadata or promotional and License.)

Publisher of the SC(s)

Date that the SC(s) was created

Expiration date of the SC(s)

Clearinghouse(s) URL

Description of the digest algorithm used for the included parts (default is MD-5)

Description of the algorithm used for the digital signature encryption (default is RSA)

Digital signature (encrypted digest of all of the concatenated digests of the included parts)

SC(s) may include more than one BOM. For example, an Offer SC(s) **641** consists of the original Metadata SC(s) **620** parts, including its BOM, as well as additional information added by the Electronic Digital Content Store(s) **103** and a new BOM. A record for the Metadata SC(s) **620** BOM is included in the Offer SC(s) **641** BOM. This record includes a digest for the Metadata SC(s) **620** BOM which can be used to validate its integrity and therefore, the integrity of the parts included from the Metadata SC(s) **620** can also be validated using the part digest values stored in Metadata SC(s) **620** BOM. None of the parts from the Metadata SC(s) **620** have records in the new BOM that was created for the Offer SC(s) **641**. Only parts added by the Electronic Digital Content Store(s) **103** and the Metadata SC(s) **620** BOM have records in the new BOM.

SC(s) may also include a Key Description part. Key Description parts include records that contain the following information about encrypted parts in the SC(s):

The name of the encrypted part.

The name to use for the part when it is decrypted.

The encryption algorithm used to encrypt the part.

Either a Key Identifier to indicate the public encryption key that was used to encrypt the part or an encrypted symmetric key that, when decrypted, is used to decrypt the encrypted part.

The encryption algorithm used to encrypt the symmetric key. This field is only present when the record in the Key Description part includes an encrypted symmetric key that was used to encrypt the encrypted part.

A Key Identifier of the public encryption key that was used to encrypt the symmetric key. This field is only present when the record in the Key Description part includes an encrypted symmetric key and the encryption algorithm identifier of the symmetric key that was used to encrypt the encrypted part.

If the SC(s) does not contain any encrypted parts, then there is no Key Description part.

B. Rights Management Language Syntax and Semantics

The Rights Management Language consists of parameters that can be assigned values to define restrictions on the use of the Content **113** by an End-User(s) after the Content **113** purchase. The restrictions on the use of the Content **113** is the Usage Conditions **517**. Each Content Provider(s) **101** specifies the Usage Conditions **517** for each of its Content **113** items. Electronic Digital Content Store(s) **103** interpret the Usage Conditions **517** in Metadata SC(s) **620** and use the information to provide different options or Store Usage Conditions **519** to the End-User(s) for purchase of Content **113**. After an End-User(s) has selected a Content **113** item for purchase, the End-User Device(s) **109** requests authorization for the Content **113** based on Store Usage Conditions **519**. Before the Clearinghouse(s) **105** sends a License SC(s) **660** to the End-User(s), the Clearinghouse(s) **105** verifies that the Store Usage Conditions **519** being requested are in agreement with the allowable Usage Conditions **517** that were specified by the Content Provider(s) **101** in the Metadata SC(s) **620**.

When an End-User Device(s) **109** receives the Content **113** that was purchased, the Store Usage Conditions **519** are encoded into that Content **113** using the Watermarking Tool. The End-User Player Application **195** running on End-User Device(s) **109** insures that the Store Usage Conditions **519** that were encoded into the Content **113** are enforced.

The following are examples of Store Usage Conditions **519** for an embodiment where the Content **113** is music:

Song is recordable.

Song can be played n number of times.

C. Overview of Secure Container Flow and Processing

Metadata SC(s) **620** are built by Content Provider(s) **101** and are used to define Content **113** items such as songs. The Content **113** itself is not included in these SC(s) because the size of the Content **113** is typically too large for Electronic Digital Content Store(s) **103** and End-User(s) to efficiently download the containers just for the purpose of accessing the descriptive metadata. Instead, the SC(s) includes an external URL (Uniform Resource Locators) to point to the Content **113**. The SC(s) also includes metadata that provides descriptive information about the Content **113** and any other associated data, such as for music, the CD cover art and/or digital audio clips in the case of song Content **113**.

Electronic Digital Content Store(s) **103** download the Metadata SC(s) **620**, for which they are authorized, and build Offer SC(s) **641**. In short, an Offer SC(s) **641** consists of some of the parts and the BOM from the Metadata SC(s) **620** along with additional information included by the Electronic Digital Content Store(s) **103**. A new BOM for the Offer SC(s) **641** is created when the Offer SC(s) **641** is built. Electronic Digital Content Store(s) **103** also use the Metadata SC(s) **620** by extracting metadata information from them to build HTML pages on their web sites that present descriptions of Content **113** to End-User(s), usually so they can purchase the Content **113**.

The information in the Offer SC(s) **641** that is added by the Electronic Digital Content Store(s) **103** is typically to narrow the selection of Usage Conditions **517** that are specified in the Metadata SC(s) **620**. An Offer SC(s) **641** template in the Metadata SC(s) **620** indicates which information can be overridden by the Electronic Digital Content Store(s) **103** in the Offer SC(s) **641** and what, if any, additional information is required by the Electronic Digital Content Store(s) **103** and what parts are retained in the embedded Metadata SC(s) **620**.

Offer SC(s) **641** are included in a Transaction SC(s) **640** when an End-User(s) decides to purchase Content **113** from an Electronic Digital Content Store(s) **103**. The Electronic Digital Content Store(s) **103** builds a Transaction SC(s) **640** and includes Offer SC(s) **641** for each Content **113** item being purchased and transmits it to the End-User Device(s) **109**. The End-User Device(s) **109** receives the Transaction SC(s) **640** and validates the integrity of the Transaction SC(s) **640** and the included Offer SC(s) **641**.

An Order SC(s) **650** is built by the End-User Device(s) **109** for each Content **113** item being purchased. Information is included from the Offer SC(s) **641**, from the Transaction SC(s) **640**, and from the configuration files of the End-User Device(s) **109**. Order SC(s) **650** are sent to the Clearinghouse(s) **105** one at a time. The Clearinghouse(s) **105** URL where the Order SC(s) **650** is included as one of the records in the BOM for the Metadata SC(s) **620** and included again in the Offer SC(s) **641**.

The Clearinghouse(s) **105** validates and processes Order SC(s) **650** to provide the End-User Device(s) **109** with everything that is required to a License Watermark **527** and access purchased Content **113**. One of the functions of the Clearinghouse(s) **105** is to decrypt the Symmetric Keys **623** that are needed to decrypt the watermarking instructions from the Offer SC(s) **641** and the Content **113** from the Content SC(s) **630**. An encrypted Symmetric Key **623** record actually contains more than the actual encrypted Symmetric Key **623**. Before executing the encryption, the Content Provider(s) **101** appends its name to the actual Symmetric Key **623**. Having the Content Provider(s)' **101** name encrypted together with the Symmetric Key **623** provides security against a pirate Content Provider(s) **101** that has built its own Metadata SC(s) **620** and Content SC(s) **630** from legal SC(s). The Clearinghouse(s) **105** verifies that the name of the Content Provider(s) **101** encrypted together with the Symmetric Keys **623** matches the name of the Content Provider(s) **101** in the SC(s) certificate.

If there are any changes required to be made to the watermarking instructions by the Clearinghouse(s) **105**, then the Clearinghouse(s) **105** decrypts the Symmetric Key **623** and then modifies the watermarking instructions and encrypts them again using a new Symmetric Key **623**. The Symmetric Key **623** is then re-encrypted using the Public Key **661** of the End-User Device(s) **109**. The Clearinghouse (s) **105** also decrypts the other Symmetric Keys **623** in the SC(s) and encrypts them again with the Public Key **661** of the End-User Device(s) **109**. The Clearinghouse(s) **105** builds a License SC(s) **660** that includes the newly encrypted Symmetric Keys **623** and updated watermarking instructions and sends it to the End-User Device(s) **109** in response to the Order SC(s) **650**. If the processing of the Order SC(s) **650** does not complete successfully, then the Clearinghouse(s) **105** returns to the End-User Device(s) **109** an HTML page reporting the failure of the authorization process.

A License SC(s) **660** provides an End-User Device(s) **109** with everything that is needed to access a Content **113** item. The End-User Device(s) **109** requests the appropriate Content SC(s) **630** from the Content Hosting Site(s) **111**. Content SC(s) **630** are built by Content Provider(s) **101** and include encrypted Content **113** and metadata parts. The End-User Player Application **195** uses the Symmetric Keys **623** from the License SC(s) **660** to decrypt the Content **113**, metadata, and watermarking instructions. The watermarking instructions are then implemented into the Content **113** and the Content **113** is scrambled and stored on the End-User Device(s) **109**.

D. Metadata Secure Container **620** Format

The following table shows the parts that are included in a Metadata SC(s) **620**. Each box in the Parts column is a separate object included in the SC(s) along with the BOM (with the exception of part names that are surrounded by [ ] characters). The BOM contains a record for each part included in the SC(s). The Part Exists column indicates whether the part itself is actually included in the SC(s) and the Digest column indicates whether a message digest is computed for the part. Some parts may not be propagated when a SC(s) is included in other SC(s) (as determined by the associated template), although the entire original BOM is propagated. This is done because the entire BOM is required by the Clearinghouse(s) **105** to verify the digital signature in the original SC(s).

The Key Description Part columns of the following table define the records that are included in the Key Description part of the SC(s). Records in the Key Description part define information about the encryption keys and algorithms that were used to encrypt parts within the SC(s) or parts within another SC(s). Each record includes the encrypted part name and, if necessary, a URL that points to another SC(s) that includes the encrypted part. The Result Name column defines the name that is assigned to the part after it is decrypted. The Encrypt Alg column defines the encryption algorithm that was used to encrypt the part. The Key Id/Enc Key column defines either an identification of the encryption key that was used to encrypt the part or a base64 encoding of the encrypted Symmetric Key **623** bitstring that was used to encrypt the part. The Sym Key Alg column is an optional parameter that defines the encryption algorithm that was used to encrypt the Symmetric Key **623** when the previous column is an encrypted Symmetric Key **623**. The Sym Key ID column is an identification of the encryption key that was used to encrypt the Symmetric Key **623** when the Key Id/Enc Key column is an encrypted Symmetric Key **623**.

	BOM		Key Description Part				
Parts	Part Exists	Digest	Result Name	Encrypt Alg	Key Id/Enc Key	Sym Key Alg	Sym Key ID
[Content URL]			Output Part	RC4	Enc Sym Key	RSA	CH Pub Key
[Metadata URL]			Output Part	RC4	Enc Sym Key	RSA	CH Pub Key
	SC Version						
	SC ID						
	SC Type						
	SC Publisher						
	Date						
	Expiration Date						
	Clearinghouse(s) URL						
	Digest Algorithm ID						
	Digital Signature Alg ID						

-continued

	BOM		Key Description Part				
Parts	Part Exists	Digest	Result Name	Encrypt Alg	Key Id/Enc Key	Sym Key Alg	Sym Key ID
Content ID	Yes	Yes					
Metadata	Yes	Yes					
Usage Conditions	Yes	Yes					
SC Templates	Yes	Yes					
Watermarking Instructions	Yes	Yes	Output Part	RC4	Enc Sym Key	RSA	CH Pub Key
Key Description Part	Yes	Yes					
Clearinghouse(s) Certificate(s)	Yes	No					
Certificate(s)	Yes	No					
	Digital Signature						

The following describes the terms that are used in the above Metadata SC(s) table:

[Content URL]—A parameter in a record in the Key Description part. This is a URL that points to the encrypted Content **113** in the Content SC(s) **630** that is associated with this Metadata SC(s) **620**. The Metadata SC(s) **620** itself does not contain the encrypted Content **113**.

[Metadata URL]—A parameter in a record in the Key Description part. This is a URL that points to the encrypted metadata in the Content SC(s) **630** that is associated with this Metadata SC(s) **620**. The Metadata SC(s) **620** itself does not contain the encrypted metadata.

Content ID—A part that defines a unique ID assigned to a Content **113** item. There is more than one Content ID included in this part if the Metadata SC(s) **620** references more than one Content **113** item.

Metadata—Parts that contain information related to a Content **113** item such as the artist name and CD cover art in the case of a song. There may be multiple metadata parts, some of which may be encrypted. The internal structure of the metadata parts is dependent on the type of metadata contained therein.

Usage Conditions—A part that contains information that describes usage options, rules, and restrictions to be imposed on an End-User(s) for use of the Content **113**.

SC(s) Templates—Parts that define templates that describe the required and optional information for building the Offer, Order, and License SC(s) **660**.

Watermarking Instructions—A part that contains the encrypted instructions and parameters for implementing watermarking in the Content **113**. The watermarking instructions may be modified by the Clearinghouse (s) **105** and returned back to the End-User Device(s) **109** within the License SC(s) **660**. There is a record in the Key Description part that defines the encryption algorithm that was used to encrypt the watermarking instructions, the output part name to use when the watermarking instructions are decrypted, a base64 encoding of the encrypted Symmetric Key **623** bitstring that is was used to encrypt the watermarking instructions, the encryption algorithm that was used to encrypt the Symmetric Key **623**, and the identification of the public key that is required to decrypt the Symmetric Key **623**.

Clearinghouse(s) Certificate(s)—A certificate from a certification authority or from the Clearinghouse(s) **105** that contains the signed Public Key **621** of the Clearinghouse(s) **105**. There may be more than one certificate, in which case a hierarchical level structure is used with the highest level certificate containing the public key to open the next lowest level certificate is reached which contains the Public Key **621** of the Clearinghouse(s) **105**.

Certificate(s)—A certificate from a certification authority or from the Clearinghouse(s) **105** that contains the signed Public Key **621** of the entity that created the SC(s). There may be more than one certificate, in which case a hierarchical level structure is used with the highest level certificate containing the public key to open the next level certificate, and so on, until the lowest level certificate is reached which contains the public key of the SC(s) creator.

SC Version—A version number assigned to the SC(s) by the SC Packer Tool.

SC ID—A unique ID assigned to the SC(s) by the entity that created the SC(s).

SC Type—Indicates the type of SC(s) (e.g. Metadata, Offer, Order, etc.)

SC Publisher—Indicates the entity that created the SC(s).

Creation Date—Date that the SC(s) was created.

Expiration Date—Date the SC(s) expires and is no longer valid.

Clearinghouse(s) URL—Address of the Clearinghouse(s) **105** that the End-User Player Application **195** should interact with to obtain the proper authorization to access the Content **113**.

Digest Algorithm ID—An identifier of the algorithm used to compute the digests of the parts.

Digital Signature Alg ID—An identifier of the algorithm used to encrypt the digest of the concatenated part digests. This encrypted value is the digital signature.

Digital Signature—A digest of the concatenated part digests encrypted with the public key of the entity that created the SC(s).

Output Part—The name to assign to the output part when an encrypted part is decrypted.

RSA and RC4—Default encryption algorithms used to encrypt the Symmetric Keys **623** and data parts.

Enc Sym Key—A base64 encoding of an encrypted key bitstring that, when decrypted, is used to decrypt a SC(s) part.

CH Pub Key—An identifier that indicates that the Clearinghouse's **105** Public Key **621** was used to encrypt the data.

E. Offer Secure Container **641** Format

The following table shows the parts that are included in the Offer SC(s) **641**. The parts, with the exception of some of the metadata parts, and BOM from the Metadata SC(s) **620** are also included in the Offer SC(s) **641**.

Parts	BOM		Key Description Part				
	Part Exists	Digest	Result Name	Encrypt Alg	Key ID/Enc Key	Sym Key Alg	Sym Key ID
			Metadata SC Parts				
[Content URL]			Output Part	RC4	Enc Sym Key	RSA	CH Pub Key
[Metadata URL]			Output Part	RC4	Enc Sym Key	RSA	CH Pub Key
	SC Version						
	SC ID						
	SC Type						
	SC Publisher						
	Date						
	Expiration Date						
	Clearinghouse(s) URL						
	Digest Algorithm ID						
	Digital Signature Alg ID						
Content ID	Yes	Yes					
Metadata	Some	Yes					
Usage Conditions	Yes	Yes					
SC Templates	Yes	Yes					
Watermarking Instructions	Yes	Yes	Output Part	RC4	Enc Sym Key	RSA	CH Pub Key
Key Description Part	Yes	Yes					
Clearinghouse(s) Certificate(s)	Yes	No					
Certificate(s)	Yes	No					
	Digital Signature						
			Offer SC Parts				
	SC Version						
	SC ID						
	SC Type						
	SC Publisher						
	Date						
	Expiration Date						
	Digest Algorithm ID						
	Digital Signature Alg ID						
Metadata SC BOM	Yes	Yes					
Additional and Overridden Fields	Yes	Yes					
Electronic Digital Content Store(s) Certificate	Yes	No					
Certificate(s)	Yes	No					
	Digital Signature						

The following describes the terms that are used in the above Offer SC(s) **641** that were not previously described for another SC(s):

Metadata SC(s) BOM—The BOM from the original Metadata SC(s) **620**. The record in the Offer SC(s) **641** BOM includes the digest of the Metadata SC(s) **620** BOM.

Additional and Overridden Fields—Usage conditions information that was overridden by the Electronic Digital Content Store(s) **103**. This information is validated by the Clearinghouse(s) **105**, by means of the received SC(s) templates, to make sure that anything that the Electronic Digital Content Store(s) **103** overrides is within the scope of its authorization.

Electronic Digital Content Store(s) Certificate—A certificate provided to the Electronic Digital Content Store(s) **103** by the Clearinghouse(s) **105** and signed by the Clearinghouse(s) **105** using its private key. This certificate is used by the End-User Player Application **195** to verify that the Electronic Digital Content Store(s) **103** is a valid distributor of Content **113**. The End-User Player Application **195** and Clearinghouse(s) **105** can verify that the Electronic Digital Content Store(s) **103** is an authorized distributor by decrypting the certificate's signature with the Clearinghouse's **105** Public Key **621**. The End-User Player Application **195** keeps a local copy of the Clearinghouse's **105** Public Key **621** that it receives as part of its initialization during installation.

F. Transaction Secure Container **640** Format

The following table shows the parts that are included in the Transaction SC(s) **640** as well as its BOM and Key Description parts.

Parts	BOM		Key Description Part				
	Part Exists	Digest	Result Name	Encrypt Alg	Key ID/Enc Key	Sym Key Alg	Sym Key ID
	SC Version						
	SC ID						
	SC Type						
	SC Publisher						
	Date						

-continued

	BOM		Key Description Part				
Parts	Part Exists	Digest	Result Name	Encrypt Alg	Key ID/Enc Key	Sym Key Alg	Sym Key ID
	Expiration Date						
	Digest Algorithm ID						
	Digital Signature Alg ID						
Transaction ID	Yes	Yes	Output Part	RSA	CH Pub Key		
End-User(s) ID	Yes	Yes	Output Part	RSA	CH Pub Key		
End-User(s)' Public Key	Yes	Yes					
Offer SC(s)	Yes	No					
Offer SC(s) BOMS	Yes	Yes					
Selections of Content Use	Yes	Yes					
HTML to Display	Yes	Yes					
Key Description Past	Yes	Yes					
Electronic Digital Content Store(s) Certificate	Yes	No					
	Digital Signature						

The following describes the terms that are used in the above Transaction SC(s) **640** that were not previously described for another SC(s):

Transaction ID **535**—An ID assigned by the Electronic Digital Content Store(s) **103** to uniquely identify the transaction.

End-User(s) ID—An identification of the End-User(s) obtained by the Electronic Digital Content Store(s) **103** at the time the End-User(s) makes the buying selection and provides the credit card information.

End-User(s)' Public Key—The End-User(s)' Public Key **661** that is used by the Clearinghouse(s) **105** to re-encrypt the Symmetric Keys **623**. The End-User(s)' Public Key **661** is transmitted to the Electronic Digital Content Store(s) **103** during the purchase transaction.

Offer SC(s)—Offer SC(s) **641** for the Content **113** items that were purchased. The Offer SC(s) do not have digests computed because each container can be validated individually.

Offer SC(s) BOMs—BOM parts of the Offer SC(s) **641** that are included as parts in the Transaction SC(s) **640**. The Transaction SC(s) **640** BOM has a record for each of the Offer SC(s) **641** BOM parts. The record includes a digest of the BOM part and a parameter that identifies the name of the Offer SC(s) **641** part that is associated with this Offer SC(s) **641** BOM part. After each Offer SC(s) **641** is unpacked by the packer, a digest is computed for its BOM and compared with the digest of its associated Offer SC(s) **641** BOM record in the Transaction SC(s) **640**. If the digests match, then the BOMs are identical and the appropriate Offer SC(s) **641** was really included in the Transaction SC(s) **640**. If the digest do not match, then the SC(s) is not valid.

Selections of Content Use—An array of Usage Conditions for each Content **113** item being purchased by the End-User(s). There is an entry for each Offer SC(s) **641**.

HTML to Display—One or more HTML pages that the End-User Player Application **195** displays in the Internet browser window upon receipt of the Transaction SC(s) **640** or during the interaction between the End-User Device(s) **109** and the Clearinghouse(s) **105**.

When the End-User Device(s) **109** receives a Transaction SC(s) **640**, the following steps may be performed to verify the integrity and authenticity of the SC(s):

1. Verify the integrity of the Electronic Digital Content Store(s) **103** certificate using the Public Key **621** of the Clearinghouse(s) **105**. The Public Key **621** of the Clearinghouse(s) **105** was stored at the End-User Device(s) **109** after it was received as part of the initialization of the End-User Player Application **195** during its installation process.
2. Verify the Digital Signature **643** of the SC(s) using the public key from the Electronic Digital Content Store(s) **103** certificate.
3. Verify the hashes of the SC(s) parts.
4. Verify the integrity and authenticity of each Offer SC(s) **641** included in the Transaction SC(s) **640**.
5. Compute the hashes of BOMs from each Offer SC(s) **641** and compare them against the hashes of the Offer SC(s) **641** BOMs that are included as parts in the Transaction SC(s) **640**.

G. Order Secure Container **650** Format

The following table shows the parts that are included in the Order SC(s) **650** as well as its BOM and Key Description parts. These parts either provide information to the Clearinghouse(s) **105** for decryption and verification purposes or is validated by the Clearinghouse(s) **105**. The parts and BOM from the Offer SC(s) **641** are also included in the Order SC(s) **650**. The Some string in the Part Exists column of the Metadata SC(s) BOM indicates that the some of those parts are not included in the Order SC(s) **650**. The BOM from the Metadata SC(s) **620** is also included without any change so that the Clearinghouse(s) **105** can validate the integrity of the Metadata SC(s) **620** and its parts.

	BOM		Key Description Part				
Parts	Part Exists	Digest	Result Name	Encrypt Alg	Key ID/Enc Key	Sym Key Alg	Sym Key ID
			Metadata SC(s) Parts				
[Content URL]			Output Part	RC4	Enc Sym Key	RSA	CH Pub Key
[Metadata URL]			Output Part	RC4	Enc Sym Key	RSA	CH Pub Key
	SC(s) Version						
	SC(s) ID						
	SC(s) Type						
	SC(s) Publisher						
	Date						
	Expiration Date						
	Clearinghouse(s) URL						
	Digest Algorithm ID						
	Digital Signature Alg ID						
Content ID	Yes	Yes					
Metadata	Some	Yes					
Usage Conditions	Yes	Yes					
SC(s) Templates	Yes	Yes					
Watermarking Instructions	Yes	Yes	Output Part	RC4	Enc Sym Key	RSA	CH Pub Key
Key Description Part	Yes	Yes					
Clearinghouse(s) Certificate(s)	Yes	No					
Certificate(s)	Yes	No					
	Digital Signature						
			Offer SC(s) Parts				
	SC(s) Version						
	SC(s) ID						
	SC(s) Type						
	SC(s) Publisher						
	Date						
	Expiration Date						
	Digest Algorithm ID						
	Digital Signature Alg ID						
Metadata SC(s) BOM	Yes	Yes					
Additional and Overridden Fields	Yes	Yes					
Electronic Digital Content Store(s) Certificate	Yes	No					
Certificate(s)	Yes	No					
	Digital Signature						
			Transaction SC(s) Parts				
	SC(s) Version						
	SC(s) ID						
	SC(s) Type						
	SC(s) Publisher						
	Date						
	Expiration Date						
	Digest Algorithm						
	Digital Signature Alg ID						
Transaction ID	Yes	Yes	Output Part	RSA	CH Pub Key		
End-User(s) ID	Yes	Yes	Output Part	RSA	CH Pub Key		
End-User(s)' Public Key	Yes	Yes					
Offer SC(s)	One Offer SC(s)	No					
Offer SC(s) BOMs	One BOM	Yes					
Selections of Content Use	Yes	Yes					
HTML to Display in Browser Wdw	Yes	Yes					
Key Description Part	Yes	Yes					
Electronic Digital Content Store(s) Certificate	Yes	No					
	Digital Signature						
			Order SC(s) Parts				
	SC(s) Version						
	SC(s) ID						
	SC(s) Type						
	SC(s) Publisher						
	Date						
	Expiration Date						
	Digest Algorithm ID						
	Digital Signature Alg ID						
Offer SC(s) BOM	Yes	Yes					
Transaction SC(s) BOM	Yes	Yes					
Encrypted Credit Card Info	Yes	Yes	Output Part	RSA	CH Pub Key		

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Parts	BOM		Key Description Part				
	Part Exists	Digest	Result Name	Encrypt Alg	Key ID/Enc Key	Sym Key Alg	Sym Key ID
Key Description Part	Yes	Yes					
	Digital Signature						

The following describes the terms that are used in the above Order SC(s) **650** that were not previously described for another SC(s):

Transaction SC(s) BOM—The BOM in the original Transaction SC(s) **640**. The record in the Order SC(s) **650** BOM includes the digest of the Transaction SC(s) **640** BOM.

Encrypted Credit Card Info.—Optional encrypted information from the End-User(s) that is used to charge the purchase to a credit card or debit card. This information is required when the Electronic Digital Content Store(s) **103** that created the Offer SC(s) **641** does not handle the customer billing, in which case the Clearinghouse(s) **105** may handle the billing.

H. License Secure Container **660** Format

The following table shows the parts that are included in the License SC(s) **660** as well as its BOM. As shown in the Key Description part, the Symmetric Keys **623** that are required for decrypting the watermarking instructions, Content **113**, and Content **113** metadata have been re-encrypted by the Clearinghouse(s) **105** using the End-User(s)' Public Key **661**. When the End-User Device(s) **109** receives the License SC(s) **660** it decrypts the Symmetric Keys **623** and use them to access the encrypted parts from the License SC(s) **660** and the Content SC(s) **630**.

Parts	BOM		Key Description Part				
	Part Exists	Digest	Result Name	Encrypt Alg	Key ID/Enc Key	Sym Key Alg	Sym Key ID
[Content URL]			Output Part	RC4	Enc Sym Key	RSA	EU Pub Key
[Metadata URL]			Output Part	RC4	Enc Sym Key	RSA	EU Pub Key
	SC(s) Version						
	SC(s) ID						
	SC(s) Type						
	SC(s) Publisher						
	Date						
	Expiration Date						
	Digest Algorithm ID						
	Digital Signature Alg ID						
Content ID	Yes	Yes					
Order SC(s) ID	Yes	Yes					
Watermarking Instructions	Yes	Yes	Output Part	RC4	Enc Sym Key	RSA	EU Pub Key
Key Description Part	Yes	Yes					
Certificate(s)	Yes	No					
	Digital Signature						

The following describes the terms that are used in the above License SC(s) **660** that were not previously described for another SC(s):

EU Pub Key—An identifier that indicates that the End-User(s)' Public Key **661** was used to encrypt the data.

Order SC(s) **650** ID—The SC(s) ID taken from the Order SC(s) **650** BOM.

Certificate Revocation List—An optional list of certificate IDs which were previously issued and signed by the Clearinghouse(s) **105**, but are no longer considered to be valid. Any SC(s) that have a signature which can be verified by a certificate that is included in the revocation list are invalid SC(s). The End-User Player Application **195** stores a copy of the Clearinghouse's **105** certificate revocation list on the End-User Device(s) **109**. Whenever a revocation list is received, the End-User Player Application **195** replaces its local copy if the new one is more up to date. Revocation lists includes a version number or a time stamp (or both) in order to determine which list is the most recent.

I. Content Secure Container Format

The following table shows the parts that are included in the Content SC(s) **630** as well as the BOM:

Parts	BOM	
	Part Exists	Digest
	SC(s) Version	
	SC(s) ID	
	SC(s) Type	
	SC(s) Publisher	
	Date	
	Expiration Date	

-continued

Parts	BOM	
	Part Exists	Digest
	Clearinghouse(s) 105 URL	
	Digest Algorithm ID	
	Digital Signature Alg ID	
Content ID	Yes	Yes
Encrypted Content	Yes	Yes
Encrypted Metadata	Yes	Yes

-continued

Parts	BOM Part Exists	BOM Digest
Metadata	Yes	Yes
Certificate(s)	Yes	No
	Digital Signature	

The following describes the terms used in the above Content SC(s) **630** that were not previously described for another SC(s):

Encrypted Content—Content **113** that was encrypted by a Content Provider(s) **101** using a Symmetric Key **623**.

Encrypted Metadata—Metadata associated with the Content **113** that was encrypted by a Content Provider(s) **101** using a Symmetric Key **623**. The Symmetric Key **623** is typically the same one that was used to encrypt the Content **113**.

There is no Key Description part included in the Content SC(s) **630** since the keys required to decrypt the encrypted parts are in the License SC(s) **660** that is built at the Clearinghouse(s) **105**.

VI. SECURE CONTAINER PACKING AND UNPACKING

A. Overview

The SC(s) Packer is a 32-bit Windows' DLL with an external API (Application Programming Interface) that can be called in either a multiple or single step process to create a SC(s) with all of the specified parts. The SC(s) Packer **151**, **152**, **153** variety of hardware platforms supporting Windows' DLL at the Content Provider(s) **101**, Clearinghouse(s) **105**, Electronic Digital Content Store(s) **103** and other sites requiring SC(s) Packing. A BOM and, if necessary, a Key Description part are created and included in the SC(s). A set of packer APIs allows the caller to specify the information required to generate the records in the BOM and Key Description parts and to include parts in the SC(s). Encryption of parts and Symmetric Keys **623** as well as computing the digests and the digital signature is also be performed by the packer. Encryption and digest algorithms that are supported by the packer are included in the packer code or they are called through an external interface.

The interface to the packer for building a SC(s) is done by an API that accepts the following parameters as input:

A pointer to a buffer of concatenated structures. Each structure in the buffer is a command to the packer with the information that is required to execute the command. Packer commands include adding a part to the SC(s) with an associated BOM record, adding a record to the BOM, and adding records to the Key Description part.

A value indicating the number of concatenated structures contained in the above described buffer.

Name and location of the BOM part.

A value with each bit being a defined flag or a reserved flag for future use. The following flags are currently defined:

Indication as to whether all of the parts of the SC(s) should be bundled together into a single file after all of the structures in the buffer have been processed. Bundling the parts into a single object is the last step that is performed when building a SC(s).

Indication as to whether the digital signature is omitted from the BOM part. If this flag is not set, then the digital signature is computed right before the SC(s) is bundled into a single object.

Either the packer or the entity calling the packer can use a SC(s) template to build a SC(s). SC(s) templates have information that define parts and records that are required in the SC(s) that is being built. Templates can also define encryption methods and key references to use for encrypting Symmetric Keys **623** and encrypted parts.

The packer has an API that is used to unpack a SC(s). Unpacking a SC(s) is the process of taking a SC(s) and separating it into its individual parts. The packer can then be called to decrypt any of the encrypted parts that were unpacked from the SC(s).

B. Bill of Materials (BOM) Part

The BOM part is created by the packer when a SC(s) is being built. The BOM is a text file that contains records of information about the SC(s) and about the parts that are included in the SC(s). Each record in the BOM is on a single line with a new line indicating the start of a new record. The BOM usually includes digests for each part and a digital signature that can be used to validate the authenticity and integrity of the SC(s).

The record types within a BOM are as follows:

IP An IP record contains a set of Name=Value pairs pertaining to the SC(s). The following Names are reserved for specific properties of SC(s):

V major.minor.fix

The V property specifies the version of the SC(s). This is the version number of the SC(s) specification that the SC(s) was created under. The string that follows should be of the form major.minor.fix, where major, minor, and fix are the major release number, minor release number, and fix level, respectively.

ID value

The ID property is a unique value that is assigned to this specific SC(s) by the entity that is creating this SC(s). The format of the value is defined in a later version of this document.

T value

The T property specifies the type of the SC(s), which should be one of:

ORD—An Order SC(s) **650**.
OFF—An Offer SC(s) **641**.
LIC—A License SC(s).
TRA—A Transaction SC(s) **640**.
MET—A Metadata SC(s) **620**.
CON—A Content SC(s) **630**.

A value

The A property identifies the author or publisher of the SC(s). Author/publisher identities should be unambiguous and/or registered with the Clearinghouse(s) **105**.

D value

The D property identifies the date, and optionally, the time that the SC(s) was created. The value should be of the form yyyy/mm/dd[@hh:mm[:ss[.fsec]][(TZ)]] representing year/month/day@hour:minute:second.decimal-fraction-of-second (time-zone). Optional parts of the value are enclosed in [ ] characters.

E value

The E property identifies the date, and optionally, the time that the SC(s) expires. The value should be the same form used in the D property that was previously defined. The expiration date/time should be compared, whenever possible, with the date/time at the Clearinghouse(s) **105**.

CCURL value

The CCURL property identifies the URL of the Clearinghouse(s) **105**. The value should be of the form of a valid external URL.

H value

The H property identifies the algorithm that was used to calculate the message digests for the parts included in the SC(s). An example digest algorithm is MD5.

D A D record is a data or part entry record that contains information that identifies the type of part, the name of the part, the (optional) digest of the part, and an (optional) indication that the part is not included in the SC(s). A - sign immediately after the type identifier is used to indicate that the part is not included in the SC(s). The following are reserved types of data or part records:

K[-] part_name [digest]

Specifies the Key Description part.

W[-] part_name [digest]

Specifies the watermarking instructions part.

C[-] part_name [digest]

Specifies the certificate(s) used to validate the digital signature.

T[-] part_name [digest]

Specifies the Usage Conditions part.

YF[-] part_name [digest]

Specifies the Template part for the Offer SC(s) **641**.

YO[-] part_name [digest]

Specifies the Template part for the Order SC(s) **650**.

YL[-] part_name [digest]

Specifies the Template part for the License SC(s) **660**.

ID[-] part_name [digest]

Specifies the ID(s) of the Content **113** of the item(s) of Content **113** being referenced.

CH[-] part_name [digest]

Specifies the Clearinghouse(s) **105** certificate part.

SP[-] part_name [digest]

Specifies the Electronic Digital Content Store(s) **103** certificate part.

B[-] partname [digest]

Specifies a BOM part for another SC(s) that has its parts or a subset of its parts included in this SC(s).

BP[-] part_name sc_part_name [digest]

Specifies a BOM part for another SC(s) that is included as a single part in this SC(s). The sc_part_name parameter is the name of the SC(s) part that is included in this SC(s) and that this BOM part defines. A BOM that is identical to this one is also included in the SC(s) that is defined by the sc_part_name parameter.

D[-] part_name [digest]

Specifies a data (or metadata) part.

S An S record is a signature record the is used to define the digital signature of the SC(s). The digital signature is specified as follows:

S key_identifier signature_string signature_algorithm

The S record contains the key_identifier to indicate the encryption key of the signature, the signature_string, which is the base64 encoding of the digital signature bitstring, and the signature algorithm that was used to encrypt the digest to create the digital signature.

C. Key Description Part

The Key Description part is created by the packer to provide information about encryption keys that are needed for decryption of SC(s) encrypted parts. The encrypted parts may be included in the SC(s) being built or may be in other SC(s) which are referred to by the SC(s) being built. The Key Description part is a text file that contains records of information about the encryption keys and the parts for which the encryption keys are used. Each record in the Key Description part is on a single line with a new line indicating the start of a new record.

The following record type is used within a Key Description part and is defined as follows:

K encrypted_part_name; result_part_name; part_encryption_algorithm_identifier; public_key_dentifier_or_encrypted_key comprising [key_encryption_algorithm_identifier and key_public_key_dentifier].

A K record specifies an encrypted part that may be included in this SC(s) or may be included in another SC(s) that is referred to by this record. The encrypted_part_name is either the name of a part in this SC(s) or a URL pointing to the name of the encrypted part in another SC(s). The result_part_-name is the name that is given to the decrypted part. The part_encryption_algorithm_identifier indicates the encryption algorithm that was used to encrypt the part. The public_key_identifier_or_encrypted_key is either an identifier of the key that was used to encrypt the part or a base64 encoding of the encrypted Symmetric Key **623** bitstring that was used to encrypt the part.

The key_encryption_algorithm_identifier and the key_public_key_identifier are only specified when the public key_identifier_or_encrypted_key is an encrypted Symmetric Key **623**. In this case the key_encryption_algorithm_identifier indicates the encryption algorithm that was used to encrypt the Symmetric Key **623** and the key_public_key_identifier indicates the encryption key that was used to encrypt the Symmetric Key **623**.

VII. CLEARINGHOUSE(S) 105

A. Overview

The Clearinghouse(s) **105** is responsible for the rights management functions of the Secure Digital Content Electronic Distribution System **100**. Clearinghouse(s) **105** functions include enablement of Electronic Digital Content Store (s) **103**, verification of rights to Content **113**, integrity and authenticity validation of the buying transaction and related information, distribution of Content encryption keys or Symmetric Keys **623** to End-User Device(s) **109**, tracking the distribution of those keys, and reporting of transaction summaries to Electronic Digital Content Store(s) **103** and Content Provider(s) **101**. Content encryption keys are used by End-User Device(s) **109** to unlock Content **113** for which they have obtained rights, typically by a purchase transaction from an authorized Electronic Digital Content Store(s) **103**. Before a Content encryption key is sent to an End-User Device(s) **109**, the Clearinghouse(s) **105** goes through a verification process to validate the authenticity of the entity that is selling the Content **113** and the rights that the End-User Device(s) **109** has to the Content **113**. This is called the SC Analysis Tool **185**. In some configurations the Clearinghouse(s) **105** may also handle the financial settlement of Content **113** purchases by co-locating a system at the Clearinghouse(s) **105** that performs the Electronic Digital Content Store(s) **103** functions of credit card authorization and billing. The Clearinghouse(s) **105** uses OEM packages such as ICVerify and Taxware to handle the credit card processing and local sales taxes.

Electronic Digital Content Store(s) Embodiment

An Electronic Digital Content Store(s) **103** that wants to participate as a seller of Content **113** in the Secure Digital Content Electronic Distribution System **100** makes a request

to one or more of the Digital Content Provider(s) **101** that provide Content **113** to the Secure Digital Content Electronic Distribution System **100**. There is no definitive process for making the request so long as the two parties come to an agreement. After the digital content label such as a Music Label e.g. Sony, Time-Warner, etc. decides to allow the Electronic Digital Content Store(s) **103** to sell its Content **113**, the Clearinghouse(s) **105** is contacted, usually via E-mail, with a request that the Electronic Digital Content Store(s) **103** be added to the Secure Digital Content Electronic Distribution System **100**. The digital content label provides the name of the Electronic Digital Content Store(s) **103** and any other information that may be required for the Clearinghouse(s) **105** to create a digital certificate for the Electronic Digital Content Store(s) **103**. The digital certificate is sent to the digital content label in a secure fashion, and then forwarded by the digital content label to the Electronic Digital Content Store(s) **103**. The Clearinghouse (s) **105** maintains a database of digital certificates that it has assigned. Each certificate includes a version number, a unique serial number, the signing algorithm, the name of the issuer (e.g., the name of Clearinghouse(s) **105**), a range of dates for which the certificate is considered to be valid, the name Electronic Digital Content Store(s) **103**, the public key of the Electronic Digital Content Store(s) **103**, and a hash code of all of the other information signed using the private key of the Clearinghouse(s) **105**. Entities that have the Public Key **621** of the Clearinghouse(s) **105** can validate the certificate and then be assured that a SC(s) with a signature that can be validated using the public key from the certificate is a valid SC(s).

After the Electronic Digital Content Store(s) **103** has received its digital certificate that was created by the Clearinghouse(s) **105** and the necessary tools for processing the SC(s) from the digital content label, it can begin offering Content **113** that can be purchased by End-User(s). The Electronic Digital Content Store(s) **103** includes its certificate in the Offer SC(s) **641** and the Transaction SC(s) **640** and signs the SC(s) using its Digital Signature **643**. The End-User Device(s) **109** verifies that the Electronic Digital Content Store(s) **103** is a valid distributor of Content **113** on the Secure Digital Content Electronic Distribution System **100** by first checking the digital certificate revocation list and then using the Public Key **621** of the Clearinghouse(s) **105** to verify the information in the digital certificate for the Electronic Digital Content Store(s) **103**. A digital certificate revocation list is maintained by the Clearinghouse(s) **105**. The revocation list is included as one of the parts in every License SC(s) **660** that is created by the Clearinghouse(s) **105**. End-User Device(s) **109** keep a copy of the revocation list on the End-User Device(s) **109** so they can use it as part of the Electronic Digital Content Store(s) **103** digital certificate validation. Whenever the End-User Device(s) **109** receives a License SC(s) **660** it determines whether a new revocation list is included and if so, the local revocation list on the End-User Device(s) **109** is updated.

B. Rights Management Processing

Order SC(s) Analysis

The Clearinghouse(s) **105** receives an Order SC(s) **650** from an End-User(s) after the End-User(s) has received the Transaction SC(s) **640**, which include the Offer SC(s) **641**, from the Electronic Digital Content Store(s) **103**. The Order SC(s) **650** consists of parts that contain information relative to the Content **113** and its use, information about the Electronic Digital Content Store(s) **103** that is selling the Content **113**, and information about the End-User(s) that is purchasing the Content **113**. Before the Clearinghouse(s) **105** begins processing the information in the Order SC(s) **650**, it first performs some processing to insure that the SC(s) is in fact valid and the data it contains has not been corrupted in any way.

Validation

The Clearinghouse(s) **105** begins the validation of Order SC(s) **650** by verifying the digital signatures, then the Clearinghouse(s) **105** verifies the integrity of the Order SC(s) **650** parts. To validate the digital signature, first the Clearinghouse(s) **105** decrypts the Contents **631** of the signature itself using the Public Key **661** of End-User Device(s) **109** included in the Order SC(s) **650**. Then, the Clearinghouse(s) **105** calculates the digest of the concatenated part digests of the Order SC(s) **650** and compares it with the digital signature's decrypted Content **113**. If the two values match, the digital signature is valid. To verify the integrity of each part, the Clearinghouse(s) **105** computes the digest of the part and compares it to the digest value in the BOM. The Clearinghouse(s) **105** follows the same process to verify the digital signatures and part integrity for the Metadata and Offer SC(s) **641** parts included within the Order SC(s) **650**.

The process of verification of the Transaction and Offer SC(s) **641** digital signatures also indirectly verifies that the Electronic Digital Content Store(s) **103** is authorized by the Secure Digital Content Electronic Distribution System **100**. This is based on the fact that the Clearinghouse(s) **105** is the issuer of the certificates. The Clearinghouse(s) **105** would be able to successfully verify the digital signatures of the Transaction SC(s) **640** and Offer SC(s) **641** using the public key from the Electronic Digital Content Store(s) **103**, only if the entity signing the SC(s) has ownership of the associated private key. Only the Electronic Digital Content Store (s) **103** has ownership of the private key. Notice that the Clearinghouse(s) **105** does not need to have a local database of the Electronic Digital Content Store(s) **103**.

Then, the Store Usage Conditions **519** of the Content **113** which the End-User(s) is purchasing are validated by the Clearinghouse(s) **105** to insure that they fall within the restrictions that were set in the Metadata SC(s) **620**. Recall that the Metadata SC(s) **620** is included within the Order SC(s) **650**.

Key Processing

Processing of the encrypted Symmetric Keys **623** and of the watermarking instructions is done by the Clearinghouse (s) **105** after authenticity and the integrity check of the Order SC(s) **650**, the validation of the Electronic Digital Content Store(s) **103**, and the validation of the Store Usage Conditions **519** have been completed successfully. The Metadata SC(s) **620** portion of the Order SC(s) **650** typically has two Symmetric Keys **623** located in the Key Description part that were encrypted using the Public Key **621** of the Clearinghouse(s) **105**. Encryption of the Symmetric Keys **623** is done by the Content Provider(s) **101** when the Metadata SC(s) **620** was created.

One Symmetric Key **623** is used for decrypting the watermarking instructions and the other for decrypting the Content **113** and any encrypted metadata. The watermarking instructions are included within the Metadata SC(s) **620** portion in the Order SC(s) **650**. The Content **113** and encrypted metadata are in the Content SC(s) **630** at a Content Hosting Site(s) **111**. The URL and part names of the encrypted Content **113** and metadata parts, within the Content SC(s) **630**, are included in the Key Description part of the Metadata SC(s) **620** portion of the Order SC(s) **650**. The Clearinghouse(s) **105** uses its private key to decrypt the Symmetric Keys **623** and then encrypts each of them using

the Public Key **661** of the End-User Device(s) **109**. The Public Key **661** of the End-User Device(s) **109** is retrieved from the Order SC(s) **650**. The new encrypted Symmetric Keys **623** is included in the Key Description part of the License SC(s) **660** that the Clearinghouse(s) **105** returns to the End-User Device(s) **109**.

During the time of processing the Symmetric Keys **623**, the Clearinghouse(s) **105** may want to make modifications to the watermarking instructions. If this is the case, then after the Clearinghouse(s) **105** decrypts the Symmetric Keys **623**, the watermarking instructions is modified and re-encrypted. The new watermarking instructions is included as one of the parts within the License SC(s) **660** that gets returned to the End-User Device(s) **109**.

Returning a Result

If all of the processing of the Order SC(s) **650** is successful, then the Clearinghouse(s) **105** returns a License SC(s) **660** to the End-User Device(s) **109**. The End-User Device(s) **109** uses the License SC(s) **660** information to download the Content SC(s) **630** and access the encrypted Content **113** and metadata. The watermarking instructions are also executed by the End-User Device(s) **109**.

If the Clearinghouse(s) **105** is not able to successfully process the Order SC(s) **650**, then an HTML page is returned to the End-User Device(s) **109** and displayed in an Internet browser window. The HTML page indicates the reason that the Clearinghouse(s) **105** was unable to process the transaction.

C. Country Specific Parameters

Optionally, the Clearinghouse(s) **105** uses the domain name of the End-User Device(s) **109** and, whenever possible, the credit card billing address to determine the country location of the End-User(s). If there are any restrictions for the sale of Content **113** in the country where the End-User(s) resides, then the Clearinghouse(s) **105** insures that the transaction being processed is not violating any of those restrictions before transmitting License SC(s) **660** to the End-User Device(s) **109**. The Electronic Digital Content Store(s) **103** is also expected to participate in managing the distribution of Content **113** to various countries by performing the same checks as the Clearinghouse(s) **105**. The Clearinghouse(s) **105** does whatever checking that it can in case the Electronic Digital Content Store(s) **103** is ignoring the country specific rules set by the Content Provider(s) **101**.

D. Audit Logs and Tracking

The Clearinghouse(s) **105** maintains a Audit Logs **150** of information for each operation that is performed during Content **113** purchase transactions and report request transactions. The information can be used for a variety of purposes such as audits of the Secure Digital Content Electronic Distribution System **100**, generation of reports, and data mining.

The Clearinghouse(s) **105** also maintains account balances in Billing Subsystem **182** for the Electronic Digital Content Store(s) **103**. Pricing structures for the Electronic Digital Content Store(s) **103** is provided to the Clearinghouse(s) **105** by the digital content labels. This information can include things like current specials, volume discounts, and account deficit limits that need to be imposed on the Electronic Digital Content Store(s) **103**. The Clearinghouse(s) **105** uses the pricing information to track the balances of the Electronic Digital Content Store(s) **103** and insure that they do not exceed their deficit limits set by the Content Provider(s) **101**.

The following operations are typically logged by the Clearinghouse(s) **105**:

End-User Device(s) **109** requests for License SC(s) **660**

Credit card authorization number when the Clearinghouse (s) **105** handles the billing

Dispersement of License SC(s) **660** to End-User Device (s) **109**

Requests for reports

Notification from the End-User(s) that the Content SC(s) **630** and License SC(s) **660** were received and validated

The following information is typically logged by the Clearinghouse(s) **105** for a License SC(s) **660**:

Date and time of the request

Date and time of the purchase transaction

Content ID of the item being purchased

Identification of the Content Provider(s) **101**

Store Usage Conditions **519**

Watermarking instruction modifications

Transaction ID **535** that was added by the Electronic Digital Content Store(s) **103**

Identification of the Electronic Digital Content Store(s) **103**

Identification of the End-User Device(s) **109**

End-User(s) credit card information (if the Clearinghouse (s) **105** is handling the billing)

The following information is typically logged by the Clearinghouse(s) **105** for an End-User's credit card validation:

Date and time of the request

Amount charged to the credit card

Content ID of the item being purchased

Transaction ID **535** that was added by the Electronic Digital Content Store(s) **103**

Identification of the Electronic Digital Content Store(s) **103**

Identification of the End-User(s)

End-User(s) credit card information

Authorization number received from the clearer of the credit card

The following information is typically logged by the Clearinghouse(s) **105** when a License SC(s) **660** is sent to an End-User Device(s) **109**:

Date and time of the request

Content ID of the item being purchased

Identification of Content Provider(s) **101**

Usage Conditions **517**

Transaction ID **535** that was added by the Electronic Digital Content Store(s) **103**

Identification of the Electronic Digital Content Store(s) **103**

Identification of the End-User(s)

The following information is typically logged when a report request is made:

Date and time of the request

Date and time the report was sent out

Type of report being requested

Parameters used to generate the report

Identifier of the entity requesting the report

E. Reporting of Results

Reports are generated by the Clearinghouse(s) **105** using the information that the Clearinghouse(s) **105** logged during End-User(s) purchase transactions. Content Provider(s) **101** and Electronic Digital Content Store(s) **103** can request transaction reports from the Clearinghouse(s) **105** via a

Payment Verification Interface **183** so they can reconcile their own transaction databases with the information logged by the Clearinghouse(s) **105**. The Clearinghouse(s) **105** can also provide periodic reports to the Content Provider(s) **101** and Electronic Digital Content Store(s) **103**.

The Clearinghouse(s) **105** defines a secure electronic interface which allows Content Provider(s) **101** and Electronic Digital Content Store(s) **103** to request and receive reports. The Report Request SC(s) includes a certificate that was assigned by the Clearinghouse(s) **105** to the entity initiating the request. The Clearinghouse(s) **105** uses the certificate and the SC's digital signature to verify that the request originated from an authorized entity. The request also includes parameters, such as time duration, that define the scope of the report. The Clearinghouse(s) **105** validates the request parameters to insure that requesters can only receive information for which they are permitted have.

If the Clearinghouse(s) **105** determines that the Report Request SC(s) is authentic and valid, then the Clearinghouse (s) **105** generates a report and pack it into a Report SC(s) to be sent to the entity that initiated the request. Some reports may be automatically generated at defined time intervals and stored at the Clearinghouse(s) **105** so they can be immediately sent when a request is received. The format of the data included in the report is defined in a later version of this document.

F. Billing and Payment Verification

Billing of Content **113** can be handled either by the Clearinghouse(s) **105** or by the Electronic Digital Content Store(s) **103**. In the case where the Clearinghouse(s) **105** handles the billing of the electronic Content **113**, the Electronic Digital Content Store(s) **103** separates the End-User (s)' order into electronic goods and, if applicable, physical goods. The Electronic Digital Content Store(s) **103** then, notifies the Clearinghouse(s) **105** of the transaction, including the End-User(s)' billing information, and the total amount that needs to be authorized. The Clearinghouse(s) **105** authorizes the End-User(s)' credit card and returns a notification back to the Electronic Digital Content Store(s) **103**. At the same time the Clearinghouse(s) **105** is authorizing the End-User(s)' credit card, the Electronic Digital Content Store(s) **103** can charge the End-User(s)' credit card for any physical goods that are being purchased. After each electronic item is downloaded by the End-User Device(s) **109**, the Clearinghouse(s) **105** is notified so the End-User(s)' credit card can be charged. This occurs as the last step by the End-User Device(s) **109** before the Content **113** is enabled for use at the End-User Device(s) **109**.

In the case where the Electronic Digital Content Store(s) **103** handles the billing of the electronic Content **113**, the Clearinghouse(s) **105** is not notified about the transaction until the End-User Device(s) **109** sends the Order SC(s) **650** to the Clearinghouse(s) **105**. The Clearinghouse(s) **105** is still notified by the End-User Device(s) **109** after each electronic item is downloaded. When the Clearinghouse(s) **105** is notified it sends a notification to the Electronic Digital Content Store(s) **103** so that the Electronic Digital Content Store(s) **103** can charge the End-User(s)' credit card.

G. Retransmissions

The Secure Digital Content Electronic Distribution System **100** provides the ability to handle retransmissions of Content **113**. This is typically performed by a Customer Service Interface **184**. Electronic Digital Content Store(s) **103** provides a user interface that the End-User(s) can step through in order to initiate a retransmission. The End-User (s) goes to the Electronic Digital Content Store(s) **103** site where the Content **113** item was purchased in order to request a retransmission of the Content **113**.

Retransmissions of Content **113** are done when an End-User(s) requests a new copy of a previously purchased Content **113** item because the Content **113** could not be downloaded or the Content **113** that was downloaded is not usable. The Electronic Digital Content Store(s) **103** determines whether the End-User(s) is entitled to do a retransmission of the Content **113**. If the End-User(s) is entitled to a retransmission, then the Electronic Digital Content Store (s) **103** builds a Transaction SC(s) **640** that includes the Offer SC(s) **641** of the Content **113** item(s) being retransmitted. The Transaction SC(s) **640** is sent to the End-User Device(s) **109** and the identical steps as for a purchase transaction are performed by the End-User(s). If the End-User Device(s) **109** has a scrambled key(s) in the key library for the Content **113** item(s) undergoing retransmission, then the Transaction SC(s) **640** includes information that instructs the End-User Device(s) **109** to delete the scrambled key(s).

In the case where the Clearinghouse(s) **105** handles the financial settlement of Content **113** purchases, the Electronic Digital Content Store(s) **103** includes a flag in the Transaction SC(s) **640** that is carried forward to the Clearinghouse (s) **105** in the Order SC(s) **650**. The Clearinghouse(s) **105** interprets the flag in the Order SC(s) **650** and proceed with the transaction without charging the End-User(s) for the purchase of the Content **113**.

VIII. CONTENT PROVIDER

A. Overview

The Content Provider(s) **101** in the Secure Digital Content Electronic Distribution System **100** is the digital content label or the entity who owns the rights to the Content **113**. The role of the Content Provider(s) **101** is to prepare the Content **113** for distribution and make information about the Content **113** available to Electronic Digital Content Store(s) **103** or retailers of the downloadable electronic versions of the Content **113**. To provide the utmost security and rights control to the Content Provider(s) **101**, a series of tools are provided to enable the Content Provider(s) **101** to prepare and securely package their Content **113** into SC(s) at their premises so that the Content **113** is secure when it leaves the Content Provider(s)' **101** domain and never exposed or accessible by unauthorized parties. This allows Content **113** to be freely distributed throughout a non-secure network, such as the Internet, without fear of exposure to hackers or unauthorized parties.

The end goal of the tools for the Content Provider(s) **101** is to prepare and package a Content **113** such as a song or series of songs into Content SC(s) **630** and to package information describing the song, approved uses of the song (content Usage Conditions **517**), and promotional information for the song into a Metadata SC(s) **620**. To accomplish this, the following set of tools are provided:

- Work Flow Manager **154**—Schedules processing activities and manages the required synchronization of processes.
- Content Processing Tool **155**—A collection of tools to control Content **113** file preparation including Watermarking, Encoding (for an audio example any required equalization, dynamic range adjustment, or re-sampling and compression), Quality Assurance, and Encryption.
- Metadata Assimilation and Entry Tool **161**—A collection of tools used to gather Content **113** description information from the Database **160** of the Content Provider (s) and/or third party database and/or via operator interaction and provides means for specifying content Usage Conditions **517**.

SC(s) Packer Tool **152**—Packages all Content **113** and information and calls the SC(s) Packer to pack into SC(s).

Content Dispersement Tool (not shown)—Disperses SC(s) to designated distribution centers, such as Content Hosting Site(s) **111**.

Content Promotions Web Site **156**—Disperses Metadata SC(s) **620** and optionally additional promotional material to authorized Electronic Digital Content Store(s) **103**.

B. Work Flow Manager **154**

The purpose of this tool is to schedule, track, and manage Content **113** processing activities. This application is presented via a web browser interface to enable multi-user access as well as allowing scheduling of Content **113** and status checking from remote locations within the Intranet or extranet of the Content Provider(s) **101**. This design also allows for collaborative processing where multiple individuals can be working on multiple pieces of Content **113** in parallel and different individuals can be assigned specific responsibilities and these individuals can be spread throughout the world.

The following diagram summarizes the Content **113** processing functions provided by the tools described in this section. The Work Flow Manager **154** is responsible for feeding jobs to these processes and directing jobs to the next required process upon completion of its current process. This is accomplished through a series of Application Programming Interfaces (APIs) which each processing tool calls to:

retrieve the next job to process

indicate successful completion of a process

indicate unsuccessful completion of a process and reason for the failure

provide interim status of a process (to allow initiation of processes that require only partial completion of a dependent process)

add comments to a product which are made available to the designated processes

The Work Flow Manager **154** also has a user interface, an example Work Flow Manager User Interface **700** is illustrated in FIG. **7** which provides the following functions:

a configuration panel to allow specification of default values and conditions to be assigned and performed during various stages of processing

customization of the work flow rules and automated processing flows

job scheduling

status queries and reports

add comments or instructions for a job associated to one or more processes

job management (i.e. suspend, release, remove, change priority (order of processing))

Each process has a queue associated with it managed by the Work Flow Manager **154**. All processes requesting jobs from the Work Flow Manager **154** results in the Work Flow Manager **154** either suspending the process (tool) in a wait state if there are no jobs currently in its associated queue or returning to the process all information about the job needed to perform its respective process. If a process is suspended in a wait state, it resumes processing when a job is placed on its queue by the Work Flow Manager **154**.

The Work Flow Manager **154** also manages the flow or order of processing based on a set of defined rules. These rules can be customized by the Content Provider(s) **101** if it has special processing requirements or configures specific defaults rules. When a process reports completion of its assigned task, it notifies the Work Flow Manager **154** of this status and the Work Flow Manager **154** next decides what queue the job gets placed on next based on the defined rules.

Comments indicating special handling instructions or notices may also be attached to the product at any of the processing steps via either the programming API or manually through the Work Flow Manager User Interface **700**.

Turning now to FIG. **8** is a block diagram of the major processes of the Work Flow Manager **154** corresponding to FIG. **7**. The following sections summarize each process and describes the information or action required by each process.

1. Products Awaiting Action/Information Process **801**

Jobs are placed on specific processes queues once all information required by that process is available and the job has already successfully completed all dependent processing. A special queue exists in the Work Flow Manager **154** which is used to hold jobs that are not currently available for processing due to missing information or a failure that prevent further processing. These jobs are placed in the Products Awaiting Action/Information Process **801** queue. Each job in this queue has associated status to indicate the action or information it is waiting on, the last process that worked on this job, and the next process(es) this job is queued to once the missing information is provided or the required action is successfully completed.

Completion of any process causes the Work Flow Manager **154** to check this queue and determine if any job in this queue was awaiting the completion of this process (action) or information provided by this process. If so, that job is queued to the appropriate process queue.

2. New Content Request Process **802**

The Content Provider(s) **101** determines those products (for example, a product may be a song or a collection of songs) it wishes to sell and deliver electronically. The initial function of the Work Flow Manager **154** is to enable an operator to identify these products and to place them on the queue of the New Content Request Process **802**. The Content Provider(s) **101** may specify through configuration options, what information is prompted for on the product selection interface. Enough information is entered to uniquely identify the product. Optionally, additional fields may be included to request manual entry of the information required to initiate the audio processing phase in parallel with the metadata acquisition. If not provided manually, this information can optionally be retrieved from default configuration settings or from the Database **160** of the Content Provider(s), obtained in the first stage of Metadata Processing as in Automatic Metadata Acquisition Process **803**. The makeup and capabilities of the Content **113** in the Database **160** of the Content Provider(s) determines the Content selection process.

If the required information needed to perform a query to the Database **160** of the Content Provider(s) **101** is specified, the job is enabled to be queued to the Automatic Metadata Acquisition Process **803**. In a music embodiment, to properly schedule the product for audio processing, the product's genre and the desired compression levels are specified as well as the audio PCM or WAV filename(s). This information may be entered as part of the product selection process or selected via a customized query interface or Web browser function. Specification of this information enables the product to be scheduled for content processing.

The product selection user interface provides an option enabling the operator to specify whether the product can be released for processing or whether it are held pending

further information entry. If held, the job is added to the queue of the New Content Request Process **802** awaiting further action to complete data entry and/or release the product for processing. Once the product is released, the Work Flow Manager **154** evaluates the information specified and determines which processes the job is ready to be passed to.

If adequate information is provided to enable an automated query to the Database **160** of the Content Provider(s)' **101**, the job is queued for Automatic Metadata Acquisition Process **803**. If the database mapping table has not been configured for the Automatic Metadata Acquisition Process **803**, the job is queued for Manual Metadata Entry Process **804** (see Automatic Metadata Acquisition Process **803** section for details on the Database Mapping Table).

If the required general information for audio processing and the specific information required for watermarking is specified, the job is queued for Watermarking Process **808** (the first phase of content processing). If any of the required information is missing when the job is released, the job is queued to the queue of the Products Awaiting Action/Information Process **801** along with status indicating the information that is missing.

If the status indicates that the filename of the Content **113**, for example where the Content **113** is audio and the PCM or WAV file is missing, this may indicate that a capture (or digital extraction from digital media) is required. The audio processing functions require that the song files be accessible via a standard file system interface. If the songs are located on external media or a file system that is not directly accessible to the audio processing tools, the files are first be copied to an accessible file system. If the songs are in digital format but on CD or Digital Tape, they are extracted to a file system accessible to the audio processing tools. Once the files are accessible, the Work Flow Manager User Interface **700** is used to specify or select the path and filename for the job so that it can be released to the watermarking process, assuming all other information required for watermarking has also been specified.

3. Automatic Metadata Acquisition Process **803**

The Automatic Metadata Acquisition Process **803** performs a series of queries to the Database **160** of the Content Provider(s) **101** in an attempt to obtain as much of the product information as possible in an automated fashion. The Automatic Metadata Acquisition Process **803** requires the following information prior to allowing items to be placed on its queue:

- database mapping table with adequate information to generate queries to the Database **160** of the Content Provider(s) **101**
- product information required to perform queries
- adequate product information to uniquely define product

An automated query is performed to the Database **160** of the Content Provider(s) **101** to obtain the information necessary to process this Content **113**. For example, if the Content **113** is a music, the information needed to perform this query could be the song and album name or may be an ISRC or a specific song ID as defined by the Content Provider(s) **101**. Of the information to be obtained, some is specified as required (see the section on Automatic Metadata Acquisition Process **803** for details). If all required information is obtained, the job is next queued for Usage Conditions Process **805**. If any required information is missing, the song is queued for Manual Metadata Entry Process **804**. If any jobs in the Products Awaiting Action/Information Process **801** queue are waiting for any of the information obtained in this step, the jobs status is updated to indicate that it is no longer waiting for this information. If that job no longer has any outstanding requirements, it is queued to the next defined queue.

4. Manual Metadata Entry Process **804**

The Manual Metadata Entry Process **804** provides a means for an operator to enter missing information. It has no dependencies. Once all required information is specified, the job is queued for Usage Conditions Process **805**.

5. Usage Conditions Process **805**

The Usage Conditions Process **805** allows specification of product uses and restrictions. The Usage Conditions Process **805** may require some metadata. Upon completion of Usage Conditions specifications, the job is eligible to be queued for Metadata SC(s) Creation Process **807** unless the Supervised Release Process **806** option has been requested or is configured as the default in the Work Flow Manager **154** rules. In that case, the job is queued for Supervised Release Process **806**. Before queuing to Metadata SC(s) Creation Process **807**, the Work Flow Manager **154** will first assure that all dependencies for that process have been met (see below). If not, the job is queued to the Products Awaiting Action/Information Process **801**.

6. Supervised Release Process **806**

The Supervised Release Process **806** allows a quality check and validation of information specified for the digital content product. It does not have any dependencies. Comments previously attached to the job at any stage of the processing for this product can be reviewed by the Supervisor and appropriate action taken. After reviewing all information and comments, the Supervisor has the following options:

- approve release and queue the product for Metadata SC(s) Creation Process **807**
- modify and/or add information and queue the product for Metadata SC(s) Creation Process **807**
- add comments to the job and re-queue for Manual Metadata Entry Process **804**
- add comments and queue the job to the queue for Products Awaiting Action/Information Process **801**

7. Metadata SC(s) Creation Process **807**

The Metadata SC(s) Creation Process **807** gathers together all the information collected above as well as other information required for the Metadata SC(s) **620** and calls the SC(s) Packer Process to create the Metadata SC(s) **620**. This tool requires the following as input:

- the required metadata
- the usage conditions
- the encryption keys generated by the encryption stage of all quality levels for this product

This last dependency requires that the associated audio objects completed the audio processing phase before the Metadata SC(s) **620** can be created. Upon completion of the Metadata SC(s) Creation Process **807**, the job is queued to either the queue for Final Quality Assurance Process **813** or Content Dispersement Process **814** based on defined work flow rules.

8. Watermarking Process **808**

The Watermarking Process **808** adds copyright and other information to the Content **113**. For an embodiment where the Content **113** is a song, this tool requires the following as input:

- song filename(s) (multiple filenames if album)
- watermarking instructions
- watermarking parameters (information to be included in the watermark)

Upon completion of the Watermarking Process **808**, the job is queued for Preprocessing and Compression Process **809** if its required input is available or otherwise queued to the Products Awaiting Action/Information Process **801**.

9. Preprocessing and Compression Process **809**

The Preprocessing and Compression Process **809** encodes the Content **113** to the specified compression level performing any required preprocessing first. Queuing a job to this queue actually create multiple queue entries. A job is created for each compression level of the product desired. The encoding processes can be performed in parallel on multiple systems. This tool requires the following input:

watermarked content filename(s) (multiple filenames if Content **113** is an album)

quality levels for product (could be preconfigured)

compression algorithm (could be preconfigured)

product genre (if required by preprocessor)

Upon completion of the encoding process, the jobs are queued to the Content Quality Control Process **810** if configured by the work flow rules. If not, the jobs are queued for Encryption Process **811**.

Third party providers of encoding tools do not provide a method to display the percentage of the Content **113**, such as audio, that has been processed. In addition, the third party providers of these tools do not provide a method to indicate the amount of Content **113** that has been encoded as a percentage of the entire selection of Content **113** selected. Turning now to FIG. **11** there is shown a flow diagram **1100** of a method to determine the encoding rate of Digital Content for the Content Preprocessing and Compression tool of FIG. **8**. The method begins with the selection of the desired encoding algorithm and a bit rate, step **1101**. Next, a query is made to determine if this algorithm and encoding rate has a previously calculated rate factor, step **1102**. The rate factor is the factor used to determine the rate of compression for a specific encoding algorithm and a specific bit rate. If no previously calculated rate factor is stored, a sample of the Content **113** is encoded for a predetermined amount of time. The predetermined period of time in the preferred embodiment is a few seconds. This rate of encoding for a predetermined period of time is used to calculate a new rate factor R_{NEW}. Calculating a new rate factor R_{NEW} knowing the amount of time and the amount of Content **113** encoded is R_{NEW}=(length of Digital Content encoded)/(amount of time), step **1108**. The Content **113** is encoded and the encoding rate is displayed using the previously calculate rate factor R_{NEW}, step **1109**. This encoding rate factor R_{NEW} is then stored, step **1107**, for future use for this encoding algorithm and encoding bit rate. If the selected algorithm has a previously calculated rate factor R_{STORED}, step **1103**. The Content **113** is encoded and the progression displayed using the previously calculated rate factor R_{STORED}, step **1104**. In the meantime, a current rate factor, $R_{current}$ is calculated for this selected algorithm and bit rate, step **1105**. This current rate factor $R_{current}$ is used to update the stored rate factor R_{NEW}=AVERAGE OF (R_{STORED}+$R_{CURRENT}$), step **1106**. The iterative update of the rate factor enables the determination of the encoding rate to become more and more accurate with each subsequent use for a particular encoding algorithm and bit rate. The new rate R_{NEW} is then stored for future use, step **1107**. Along with the current encoding rate, the display of the percentage of the total Content **113** can be displayed as a progression bar based on the encoding rate and the total length of the file for the Content **113**.

It should be understood that this process like any of the other processes described on the Work Flow Manager **154** can run on a variety of hardware and software platforms. This method may be practiced on any computer readable medium, including but not limited to floppy diskettes, CD ROMS and removable hard disk drives (not shown).

10. Content Quality Control Process **810**

The Content Quality Control Process **810** is similar in function to the Supervised Release Process **806**. It is an optional step allowing someone to validate the quality of the content processing performed thus far. This has no dependencies other than completion of the Watermarking Process **808** and the encoding portion of the Preprocessing and Compression Process **809**. Upon completion of the Content Quality Control Process **810** the following options are available:

the jobs can be released and queued for Encryption Process **811**.

comments can be attached and one or more of the jobs re-queued for Preprocessing and Compression Process **809**.

The last option requires that the unencoded watermarked version of the song file remain available until after Content Quality Control Process **810**.

11. Encryption Process **811**

The Encryption Process **811** Process calls the appropriate Secure Digital Content Electronic Distribution Rights Management function to encrypt each of the watermarked/encoded song files. This process has no dependencies other than completion of all other audio processing. Upon completion of the Encryption Process **811** process, the jobs is queued for Content SC(s) Creation Process **812**.

12. Content SC(s) Creation Process **812**

The Content SC(s) Creation Process **812** Process may require some metadata files to be included in the Content SC(s) **630**. If files other than the Content **113** are required, the files are gathered and the SC(s) Packer Process is called to create a Content SC(s) **630** for each compression level of the Content **113** (e.g. a song) created. Upon completion of the Content SC(s) Creation Process **812**, the song is queued to either the Final Quality Assurance Process **813** or Content Dispersement Process **814** queue based on defined work flow rules.

13. Final Quality Assurance Process **813**

Final Quality Assurance Process **813** is an optional step that allows a cross reference check between the associated Metadata and Content SC(s) **630** to verify that they match up correctly and that all information and Content **113** contained therein are correct. Upon completion of Final Quality Assurance Process **813**, the jobs are queued for Content Dispersement Process **814**. If a problem is found, the job in most cases has to be re-queued to the failing stage. Rework at this stage is much more costly since the product has to go through re-encryption and repacking in addition to the reprocessing required to correct the problem. It is highly recommended that the prior assurance stages be used to assure the quality of the Content **113** and accuracy and completeness of the information.

14. Content Dispersement Process **814**

The Content Dispersement Process **814** Process is responsible for transferring the SC(s) to the appropriate hosting sites. After the successful transfer of the SC(s), the job completion status is logged and the job is deleted from the queue. If a problem occurs in transferring the SC(s), after a defined number of retries, the job is queued to the queue for the Products Awaiting Action/Information Process **801** along with the error encountered.

15. Work Flow Rules

The Work Flow Rules for FIG. **8** operate in three major systems as follows:

A: Work Flow Manager Tool **154**
1. New Content Request Process **802**
2. Products Awaiting Action/Information Process **801**
3. Final Quality Assurance Process **813**
4. Content Dispersement (and Notification) Process **814**
B: Metadata Assimilation and Entry Tool **161**
1. Automatic Metadata Acquisition Process **803**
2. Manual Metadata Entry Process **804**
3. Supervised Release Process **806**
4. Metadata SC(s) Creation Process **807**
C: Content Processing Tool **155**
1. Watermarking Process **808** (requires copyright data)
2. Preprocessing and Compression Process **809**
3. Content Quality Control Process **810**
4. Encryption Process **811**
5. Content SC(s) Creation Process **812**

Work Flow

The Content **113** selection operator inputs a new product and it starts out queued onto A1 (New Content Request Process **802**).

A1: When the Content **113** selection operator releases it to the Work Flow Manager Tool **154**, then it gets queued onto B1 (the Automatic Metadata Acquisition Process **803**).

A2: coming from step B1 (the Automatic Metadata Acquisition Process **803**),
or step B2 (Manual Metadata Entry Process **804**),
or step B3 (Supervised Release Process **806**)
on its way to step B4 (the Metadata SC(s) Creation Process **807**)
[needs the encryption keys].
coming from step B4 (the Metadata SC(s) Creation Process **807**)
on its way to either step A3 (the Final Quality Assurance Process **813**) or step A4
(the Content Dispersement Process **814**)
[needs the Content SC(s) **630**].
coming from step C1 (the Watermarking Process **808**)
on its way to step C2 (the Preprocessing and Compression Process **809**)
[needs the metadata for Preprocessing and Compression Process **809**].
coming from step C4 (the Encryption Process **811**)
on its way to step C5 (the Content SC(s) Creation Process **812**)
[needs the metadata for Content SC(s) **630** Packing].
coming from step C5 (the Content SC(s) Creation Process **812**)
on its way to either step A3 (the Final Quality Assurance Process **813**) or step A4
(the Content Dispersement Process **814**)
[needs the Metadata SC(s) **620**].

A3: After step A3 (the Final Quality Assurance Process **813**),
place onto queue B2 (Manual Metadata Entry Process **804**),
or place onto queue B3 (Supervised Release Process **806**),
or place into queue as required by the quality assurance operator.

A4: After step A4 (Content Dispersement Process **814**), the Work Flow Manager Tool **154** is done for this product.

B1: After step B1 (the Automatic Metadata Acquisition Process **803**),
if the metadata needed for step C1 (the Watermarking Process **808**) is present, then place an entry representing this product onto queue C1.
(do the following logic also)
if either 1—any required metadata is missing, or 2—there are comments directed to the manual metadata providers, then also place the product onto queue B2 (Manual Metadata Entry Process **804**),
else if supervised release was requested for this product, then place the product onto queue B3 (Supervised Release Process **806**).
else if the product has all the information from the Content Processing Tool **155** for all of the requested quality levels, then place the product onto queue B4 (the Metadata SC(s) Creation Process **807**),
else flag the product as needs the encryption keys and place the product onto queue A2 (Products Awaiting Action/Information Process **801**).

B2: During step B2 (Manual Metadata Entry Process **804**),
if step C1 (the Watermarking Process **808**) has not been done and the metadata needed for step C1 is present, then place an entry representing this product onto queue C1.
(do the following logic also)
if metadata needed for step C2 (the Preprocessing and Compression Process **809**) just been provided, then
(do the following logic also)
if all the metadata that can be gathered by the Metadata Assimilation and Entry Tool **161** is present, then
if supervised release was requested for this product, then place the product onto queue B3 (Supervised Release Process **806**)
else
if all the information from step C4 (the Encryption Process **811**) of the Content Processing Tool **155** is present, then place this product onto queue B4 (the Metadata SC(s) Creation Process **807**)
else flag the product as needs the encryption keys and place this product onto queue A2 (Products Awaiting Action/Information Process **801**).
else
if the metadata provider requested a forced supervised release, then place the product onto queue B3 (Supervised Release Process **806**)
else do nothing (keep the product on queue B2 (Manual Metadata Entry Process **804**)).

B3: During step B3 (Supervised Release Process **806**),
if this operator is sending the product back to step B2 (Manual Metadata Entry Process **804**), then place the product on queue B2.
else if this operator released the product, then
if all the information from step C4 (the Encryption Process **811**) of the Content Processing Tool **155** is present, then place this product onto queue B4 (the Metadata SC(s) Creation Process)
else flag the product as needs the encryption keys and place this product onto queue A2 (Products Awaiting Action/Information Process **801**).
else the product remains on queue B3 (Supervised Release Process **806**).

B4: After step B4 (the Metadata SC(s) Creation Process **807**),
flag the product Metadata has been packed.
if all the (product/quality level) tuples have been packed, then
if the Content Provider(s)' **101** configuration specifies Quality Assure the SC(s), then place this product onto queue A3 (the Final Quality Assurance Process **813**)

else place this product onto queue A4 (the Content Dispersement Process **814**).

else flag the product as needs the Content **113** SC(s) and place this product onto queue A2 (Products Awaiting Action/Information Process **801**).

C1: After step C1 (the Watermarking Process **808**),

if the metadata needed for step C2 (the Preprocessing and Compression Process **809**) is present, then create an entry for each (product/quality level) tuple and place them onto queue C2,

else flag the product as needs the metadata for Preprocessing/Compression and place this product onto queue A2 (Products Awaiting Action/Information Process **801**).

C2: After step C2 (the Preprocessing and Compression Process **809**),

if the Content Provider(s)' **101** configuration specifies Content Quality Control Process **810**, then place this (product/quality level) tuple onto queue C3 (the Content Quality Control Process **810**),

else place this (product/quality level) tuple onto queue C4 (the Encryption Process **811**).

C3: After step C3 (the Content Quality Control Process **810**), then place this (product/quality level) tuple onto queue C4 (the Encryption Process **811**).

C4: After step C4 (the Encryption Process **811**),

provide the needed information (i.e., the Symmetric Key **623** generated by the Process and used to encipher the Content **113**) to the Metadata Assimilation and Entry Tool **161**.

if all the metadata that's required for the Content SC(s) **630** is present, then place this (product/quality level) tuple onto queue C5 (the Content SC(s) Creation Process **812**),

else flag the product as needs the metadata for Content SC(s) **630** Packing and place this (product/quality level) tuple onto A2 (Products Awaiting Action/Information Process **801**).

C5: After step C5 (the Content SC(s) Creation Process **812**),

flag the quality level the Content **113** at this quality level has been packed.

if all the (product/quality level) tuples have been packed, then

if the product is flagged Metadata has been packed, then

if the Content Provider(s)' **101** configuration specifies Quality Assure the SC(s), then place this product onto queue A3 (the Final Quality Assurance Process **813**)

else place this product onto queue A4 (the Content Dispersement Process **814**)

else flag the product as needs the Metadata SC(s) **620** and place this product onto queue A2 (Products Awaiting Action/Information Process **801**).

else (all the (product/quality level) tuples have not been packed) do nothing (another (product/quality level) tuple triggers an action).

C. Metadata Assimilation and Entry Tool

Metadata consists of the data describing the Content **113** for example in music, title of the recording, artist, author/composer, producer and length of recording. The following description is based upon Content **113** being music but it should be understood by those skilled in the art that other content types e.g., video, programs, multimedia, movies, and equivalent, are within the true scope and meaning of the present invention.

This Subsystem brings together the data the Content Provider(s) **101** provides to the Electronic Digital Content Store(s) **103** to help promote the sale of the product (e.g., for music, sample clips by this artist, history of this artist, list of albums on which this recording appears, genres associated with this artist and/or product), the data the Content Provider (s) **101** provides to the End-User(s) with the purchased product (e.g., artist, producer, album cover, track length), and the different purchase options (the Usage Conditions **517**) the Content Provider(s) **101** wants to offer the End-User(s). The data is packaged into a Metadata SC(s) **620** and made available to the Electronic Digital Content Store(s) **103**. To accomplish this, the following tools are provided:

Automatic Metadata Acquisition Tool

Manual Metadata Entry Tool

Usage Conditions Tool

Supervised Release Tool

These tools enable Content Provider(s) **101** to implement the processes described above for Work Flow Manager **154**. Tools described here are a toolkit based on Java in the preferred embodiment but other programming languages such as C/C++, Assembler and equivalent can be used.

1. Automatic Metadata Acquisition Tool

The Automatic Metadata Acquisition Tool provides a user the ability to implement the Automatic Metadata Acquisition Process **803** described above. The Automatic Metadata Acquisition Tool is used to access the Database **160** of the Content Provider(s) **101** and to retrieve as much data as possible without operator assistance. Configuration methods are available to automate this process. The Content Provider (s) **101** can tailor the default metadata template to identify the types of data this Content Provider(s) **101** wants to provide to End-User(s) (e.g., composer, producer, sidemen, track length) and the types of promotional data the Content Provider(s) **101** provides to the Electronic Digital Content Store(s) **103** (e.g., for a music example, sample clips by this artist, a history of this artist, the list of albums on which this recording appears, genres associated with this artist). The default metadata template includes data fields which are required by the End-User Device(s) **109**, data fields which can be optionally provided to the End-User Device(s) **109** and a sample set of data fields, targeted to the Electronic Digital Content Store(s) **103**, that promote the artist, album, and/or single.

To extract the template data fields from the Database **160** of the Content Provider(s) **101** the Automatic Metadata Acquisition Tool uses a table that maps the type of data (e.g., composer, producer, a biography of the artist) to the location within the database where the data can be found. Each of the Content Provider(s) **101** help specify that mapping table for their environment.

The Automatic Metadata Acquisition Tool uses a metadata template of the Content Provider(s) **101** and mapping table to acquire whatever data is available from the Databases **160** of the Content Provider(s) **101**. The status of each product is updated with the result of the Automatic Metadata Acquisition Process **803**. A product which is missing any required data is queued for Manual Metadata Entry Process **804**, otherwise it is available for packing into a Metadata SC(s) **620**.

2. Manual Metadata Entry Tool

The Manual Metadata Entry Tool provides a user the ability to implement the Manual Metadata Entry Process **804** described above. The Manual Metadata Entry Tool allows any properly authorized operator to provide the missing data. If the operator determines that the missing data is unavailable, the operator can attach a comment to the

product and request supervised release. The Content Provider(s) **101** may require, for quality assurance reasons, that the product undergo supervised release. Once all the required data is present, and if supervised release has not been requested, then the product is available for packing into a Metadata SC(s) **620**.

3. Usage Conditions Tool

The Usage Conditions Tool provides a user the ability to implement the Usage Conditions Process **805** described above. The process of offering Content **113** for sale or rent (limited use), using electronic delivery, involves a series of business decisions. The Content Provider(s) **101** decides at which compression level(s) the Content **113** is made available. Then for each compressed encoded version of the Content **113**, one or more usage conditions are specified.

The Content Provider(s) **101** may decide to test the North American market's acceptance to the re-release of the children's song by a popular children's vocalist during the fourth quarter 1997. The test will make the song available in two different compression encoding versions: 384 Kbps and 56 Kbps. The 384 Kbps version can be bought (and one copy made onto MiniDisc) or rented (for two weeks), while the 56 Kbps version can only be bought (and no copies made). The watermarking instructions is the same for any purchase/rental, and the Content Provider(s) **101** wants the Clearinghouse(s) **105** to count every copy made. This would create Usage Conditions as follows:

	Usage Condition 1	Usage Condition 2	Usage Condition 3
compressed encoded version	384 Kbps	384 Kbs	56 Kbps
type of user	private consumer	private consumer	private consumer
type of transaction	purchase	rental	purchase
availability dates	1 Oct 1997–31 Dec 1997	1 Oct 1997–31 Dec 1997	1 Oct 1997–31 Dec 1997
countries	USA and Canada	USA and Canada	USA and Canada
watermarking	std.	std.	std.
notifying events	copy action	none	none
number of copies	1	0	0
onto what media	MiniDisc	not applicable	not applicable
term of rental	not applicable	14 days	not applicable
price	Price 1	Price 2	Price 3

Each usage condition defmes the rights of the End-User(s), and any restrictions on the End-User(s), with regard to the use of the Content **113**.

As part of Content Processing Tool **155**, a set of usage conditions (End-User(s) rights and restrictions) is attached to the product.

A usage condition defines:

1. the compression encoded version of the Content **113** to which this usage condition applies.
2. the type of user covered by this usage condition (e.g., business, private consumer)
3. whether this usage condition allows for the purchase or the rental of the Content **113**.
   For a rental transaction:
   the measurement unit which is used to limit the term of the rental (e.g., days, plays).
   the number of the above units after which the Content **113** will no longer play.
   For a purchase transaction:
   the number of playable copies the End-User(s) is allowed to make.
   onto what kinds of media can he/she make those copies (e.g., CD-Recordable (CD-R), MiniDisc, Personal Computer).
4. the period of time during which the purchase/rental transaction is allowed to occur (i.e., an End-User(s) can purchase/rent under the terms of this usage condition only after the beginning availability date and before the last date of availability).
5. the countries from which an End-User(s) can transact this purchase (or rental).
6. the price of the purchase/rental transaction under this usage condition
7. the watermarking parameters.
8. the types of events which require notification of the Clearinghouse(s) **105**.

An Example of a Set of Usage Conditions

4. Parts of the Metadata SC(s) **620**

Below are some of the kinds of data that the Metadata Assimilation and Entry Tool **161** gathers for inclusion into the Metadata SC(s) **620**. An attempt has been made to group the data into SC(s) parts by function and destination.

product ID	[src:content provider;] [dest: everybody;]
licensor label company	[dest: EMS; end-user;]
licensee label company	[dest: EMS; end-user;]
source (publisher) of this object (sublicensee label company)	[dest: everybody;]
type of object (i.e., a single object or an array of objects)	
object ID	[dest: everybody;]

International Standard Recording Code (ISRC)

International Standard Digital Content Number (ISMN)

usage conditions (src: content provider; dest: EMS, end-user, Clearinghouse(s) 105)
purchased usage conditions (src: EMS; dest: end-user, Clearinghouse(s) 105)
the set of usage conditions (consumer restrictions and rights) for the use of the object (sound recording)
an individual entry in the array of usage conditions
the compression encoded version of the Content 113 to which this usage condition applies
whether this usage condition allows for the purchase or the rental of the Content 113
for a rental transaction:
the measurement unit which is used to limit the term of the rental (e.g., days, plays).
the number of the above units after which the Content 113 will no longer play.
for a purchase transaction:
the number of playable copies the End-User(s) is allowed to make.
onto what kinds of media can (s)he make those copies (e.g., CD-Recordable (CD-R), MiniDisc, personal computer).
the period of time during which the purchase/rental transaction is allowed to occur (i.e., an End-User(s) can purchase/rent under the terms of this usage condition <u>only</u> after the beginning availabilty date <u>and</u> before the last date of availability)
a pointer to the countries from which an End-User(s) can transact this purchase (or rental)
the price of the purchase/rental transaction under this usage condition
a pointer to the encrypted watermarking instructions and parameters
a pointer to the types of events which require notification of the Clearinghouse(s) 105

purchase data (encrypted; optional info; src: EMS; dest: end-user, Clearinghouse(s) 105)
purchase date
purchase price
bill to name and address
consumer name and address
country of the consumer (best guess)
metadata 1 (src: content provider; dest: EMS, end-user)
an array of {
copyright information
for the composition
for the sound recording
title of song
principal artist(s)
}
a pointer to {
the artwork (e.g., album cover);
the format of the artwork (e.g., GIF, JPEG);
}
optional info:
an array of additional information {
composer
publisher
producer
sidemen
date of recording
date of release
lyrics
track name (description) / track length
list of albums on which this recording appears
genre(s)
}
metadata 2 (src: content provider; dest: EMS)
an array of structures, each representing different quality levels of the same sound recording {
the sound recording;
the quality level of the sound recording;
the size (in bytes) of the (probably compressed) sound recording;
}
metadata 3 (src: content provider; dest: EMS, end-user)
optional info:
promotional material:
a pointer to artist promotion material {
a URL to the artist's web site;
background description(s) of the artist(s);
artist-related interviews (along with format of the interview (e.g., text, audio,

-continued

```
        video));
        reviews (along with format of the reviews (e.g., text, audio, video));
        sample clips (and its format and compression level);
        recent and upcoming conceits/appearances/events - their dates and locations;
    }
    a pointer to album promotion material {
        sample clip (and its format and compression level);
        background description(s) of the producer, and/or the composer, and/or the
            movie/play/cast, and/or the making of the album, etc.;
        non-artist-related interviews (along with format of the interview (e.g., text,
            audio, video));
        reviews (along with format of the reviews (e.g., text, audio, video));
        genre(s);
    }
    single promotions:
        sample clip (and its format and compression level)
        background description(s) of the producer, and/or the composer, and/or the
            movie/play/cast, and/or the making of the single, etc.
        reviews (along with format of the reviews (e.g., text, audio, video))
```

5. Supervised Release Tool

Supervised Release Tool provides a user the ability to implement the Supervised Release Process **806** described above. An individual designated by the Content Provider(s) **101** as having supervised release authority, may call up a product awaiting supervised release (i.e., a product on the queue of the Supervised Release Process **806**), examine its Contents **113** and its accompanying comments, and either

- approve its Contents **113** and release the product for packing into a Metadata SC(s) **620**, or
- make any necessary corrections and release the product for packing into a Metadata SC(s) **620** or
- add a comment specifying the corrective action to take and resubmit the product to the Manual Metadata Entry Process **704**

In another embodiment, after the creation of the SC(s), there is another optional quality assurance step where the Content **113** of the SC(s) can be opened and examined for completeness and accuracy, and, at that time, final approval can be given or denied for the product's release to the retail channel.

D. Content Processing Tool

The Content Processing Tool **155** is actually a collection of software tools which are used to process the digital content file to create watermarked, encoded, and encrypted copies of the content. The tools makes use of industry standard digital content processing tools to allow pluggable replacement of watermarking, encoding and encryption technologies as they evolve. If the selected industry tool can be loaded via a command line system call interface and passed parameters or provides a toolkit wherein functions can be called via a DLL interface, the content processing can be automated to some degree. A front end application to each tool queries the appropriate queue in the Content Processing Tool **155** for the next available job, retrieves the required files and parameters and then loads the industry standard content processing tool to perform the required function. Upon completion of the task, manual update to the queue may be required if the tool does not report terminating status.

1. Watermarking Tool

The Watermarking Tool provides a user the ability to implement the Watermarking Process **808** as described above. This tool applies copyright information of the Content **113** owner to the song file using audio Watermarking technology. The actual information to be written out is determined by the Content Provider(s) **101** and the specific watermarking technology selected. This information is available to the front end Watermarking Tool so that it can properly pass this information to the watermarking function. This imposes a synchronization requirement on the Metadata Assimilation and Entry Tool **161** to assure that it has acquired this information prior to, for example, allowing the song's audio file to be processed. This song will not be available for audio processing until the watermarking information has been obtained.

The watermark is applied as the first step in audio processing since it is common to all encodings of the song created. As long as the watermark can survive the encoding technology, the watermarking process need only occur once per song.

Various watermarking technologies are known and commercially available. The front end Watermarking Tool though is capable of supporting a variety of industry Watermarking Tools.

2. Preprocessing and Compression Tool

The Preprocessing and Compression Tool provides a user the ability to implement the Preprocessing and Compression Process **809** as described above. Audio encoding involves two processes. Encoding is basically the application of a lossy compression algorithm against, for a music content example, a PCM audio stream. The encoder can usually be tuned to generate various playback bit stream rates based on the level of audio quality required. Higher quality results in larger file sizes and since the file sizes can become quite large for high quality Content **113**, download times for high quality Content **113** can become lengthy and sometimes prohibitive on standard 28,800 bps modems.

The Content Provider(s) **101** may, therefore, choose to offer a variety of digital content qualities for download to appease both the impatient and low bandwidth customers who don't want to wait hours for a download and the audiophile or high bandwidth customers who either only buys high quality Content **113** or has a higher speed connection.

Compression algorithms vary in their techniques to generate lower bit rate reproductions of Content **113**. The techniques vary both by algorithm (i.e. MPEG, AC3, ATRAC) and by levels of compression. To achieve higher levels of compression, typically the data is re-sampled at lower sampling rates prior to being delivered to the compression algorithm. To allow for more efficient compression with less loss of fidelity or to prevent drastic dropout of some frequency ranges, the digital content may sometimes

require adjustments to equalization levels of certain frequencies or adjustments to the dynamic range of the recording. The content preprocessing requirements are directly related to the compression algorithm and the level of compression required. In some cases, the style of Content **113** (e.g. musical genre) can be successfully used as a base for determining preprocessing requirements since songs from the same genre typically have similar dynamic ranges. With some compression tools, these preprocessing functions are part of the encoding process. With others, the desired preprocessing is performed prior to the compression.

Besides the downloadable audio file for sale, each song also has a Low Bit Rate (LBR) encoded clip to allow the song to be sampled via a LBR streaming protocol. This LBR encoding is also the responsibility of the Content Processing Tool **155**. This clip is either provided by the Content Provider(s) **101** as a separate PCM file or as parameters of offset and length.

As with watermarking, it is hoped that the encoding tools can be loaded via a DLL or command line system call interface and passed all the required parameters for preprocessing and compression. The front end Encoding Tool may have a synchronization requirement with the Metadata Assimilation and Entry Tool **161**, for example if the content is music, and if it is determined that the song's genre is acquired from the Database **160** of the Content Provider(s) prior to performing any audio preprocessing. This depends on the encoding tools selected and how indeterminate the genre for the song is. If the Content Provider(s) **101** varies the choice of encoded quality levels per song, this information is also be provided prior to the encoding step and agrees with the metadata being generated by the Metadata Assimilation and Entry Tool **161**.

A variety of high quality encoding algorithms and tools are known today. The front end Encoding Tool though is capable of supporting a variety of industry encoding tools.

Turning now to FIG. **12** is shown a flow diagram of one embodiment for the Automatic Metadata Acquisition Tool of FIG. **8** according to the present invention. The process starts with reading an identifier from the media the Content Provider(s) **101** is examining. One example of content in an audio CD embodiment. In an audio CD embodiment, the following codes may be available Universal Price Code (UPC), International Standard Recording Code (ISRC), International Standard Digital Content Number (ISMN). This identifier is read in the appropriate player for the content, for example an audio CD Player for audio CD, DVD player for DVD movie, DAT recorder for DAT recording and equivalent, step **1201**. Next this Identifier is used to index a Database **160** for the Content Provider(s) **101**, step **1202**. Some or all of the information required by the Work Flow Manager Process as described in FIG. **8** is retrieved in Database **160** and any other related sources, step **1203**. This information can include the Content **113** and the metadata related to it. In step **1204**, the additional information retrieved is used to start the Work Flow Manager **154** for creating electronic Content **113**. It should be understood, that several selections of media, such as several audio CDS, can be queued up so as to enable the Automatic Metadata Acquisition Tool to create a series of Content **113** for electronic distribution. For example, all the Content **113** could be created from a series of CDs or even selected tracks from one or more CDs examined by the Content Provider(s) **101**.

In an alternate embodiment, the preprocessing parameters can be retrieve from the Database **160** of the Content Provider(s) automatically. Referring now to FIG. **13** is a flow diagram of a method to automatically set the Preprocessing and Compression parameters of the Preprocessing and Compression Tool of FIG. **8** according to the present invention. In this embodiment the Content **113** is music. In step **1301**, music (Content **113**) is selected to be encoded in Content Processing Tool **155**. The genre of the music selected is determined, step **1302**. This can be entered manually or by using other meta data available, such as the additional data retrieved from the process described in FIG. **12**. The audio compression level and audio compression algorithms selected are than examined, step **1303**. Next, a lookup is made by genre, compression settings and compression algorithms of what compression parameters should be used in the Preprocessing and Compression Process **809**, **1304**.

3. Content Quality Control Tool

The Content Quality Control Tool provides a user the ability to implement the Content Quality Control Process **810** as described above. This is an optional Content Processing Tool and provides an opportunity for a quality control technician to review the encoded and watermarked content files and approve or reject the content files based on quality judgments. He can re-encode the content making manual preprocessing adjustments until the quality is adequate or can flag the song for reprocessing and attach a note describing the problem.

This process step can be configured by the Content Provider(s) **101** as an optional or required step of the content processing work flow. An additional optional Final Quality Assurance Process **813** step is provided after packaging of all the SC(s) for this content (e.g. each SC(s) for songs on a CD) at which time the quality of the content encoding can be tested but catching a problem early prior to encryption and packaging allows for more efficient content processing. It is, therefore, highly desirable that the content quality be assured at this step as opposed to waiting until final completion of all processing.

4. Encryption Tool

The Encryption Tool provides a user the ability to implement the Encryption Process **811** as described above. Content encryption is the final step of the Content Processing Tool **155**. Each of the versions of the content that were created by the Encoding Tool is now encrypted. The encryption tool is a function of the SC(s) Packer. The SC(s) Packer is called to encrypt the song and returns the generated encryption key used. This key is later passed into the SC(s) Packer for use in creation of the Metadata SC(s) **620**.

E. Content SC(s) Creation Tool

Once all metadata has been gathered the Content SC(s) Creation Tool groups the metadata into categories based on their intended use. These groups of metadata are written into files to be passed in to the SC(s) Packer Tool as Metadata parts for the Metadata SC(s) **620**. Each part (file) has unique processing requirements. Once the associated songs have been processed and encrypted and the target destination (URL of Content Hosting Site(s) **111**) has been determined, the Content SC(s) **630** for the Content **113** are ready to be created. The Content **113** which have completed processing and have met all the requirements described above, are queued for packing in the packer queue of the Work Flow Manager **154**.

The Content SC(s) Creation Tool now retrieves all the required files created by the previous steps of the Metadata Assimilation and Entry Tool **161** and calls the SC(s) Packer functions to create the Metadata SC(s) **620** and Content SC(s) **630**. This process creates a single Metadata SC(s) **620** and multiple Content SC(s) **630** for each song. For example, if the content is music, each of the audio files created during

audio processing for the various quality levels of the full song is packed into separate Content SC(s) **630**. The audio file created for the sample clip is passed as a metadata file to be included in the Metadata SC(s) **620**.

F. Final Quality Assurance Tool

The Final Quality Assurance Tool provides a user the ability to implement the Final Quality Assurance Process **813** as described above. Once all the SC(s) have been built for a content file, the content is available for a final quality assurance check. Quality assurance can be performed at various stages of the Content **113** preparation process. The Content Provider(s) **101** can choose to perform quality assurance as each major step is completed to prevent excessive rework later or may choose to wait until all audio preparation processes are complete and perform quality assurance on everything at once. If the latter is chosen, quality assurance is performed at this point upon completion of the creation of the SC(s). This tool allows each SC(s) for the song to be opened, examined, and the audio played.

Any problem discovered, even minor text changes requires that the SC(s) be rebuilt due to internal security features of SC(s). To avoid unnecessary re-processing time, it is highly recommended that the interim quality assurance steps be utilized to assure accuracy of the metadata and that this specific quality assurance step be reserved for validating appropriate cross references between the SC(s) associated with this song. If problems are found, the assurer can enter a problem description to be attached to the song and have it re-queued to the appropriate processing queue for reprocessing. Status is updated appropriately in the Work Flow Manager **154** to indicate the status of all related components of the song. If no problems are discovered, the Content **113** is marked or flagged as ready for release.

G. Content Dispersement Tool

The Content Dispersement Tool provides a user the ability to implement the Content Dispersement Process **814** as described above. Once the Content **113** has been approved for release, the SC(s) for the Content **113** are placed in the queue of the Content Dispersement Process. The Content Dispersement Tool monitors the queue and performs immediate transfer of the SC(s) files or batch transfer of a group of SC(s) files based on the configuration settings provided by the Content Provider(s) **101**. The Content Provider(s) **101** can also optionally configure the Content Dispersement Tool to automatically hold all SC(s) in this queue until they are manually flagged for release. This allows the Content Provider(s) **101** to prepare content in advance of their scheduled release date and hold them until they wish to release them e.g., a new song, movie or game. The SC(s) can also control access to Content **113** based on a defined release date so there is no requirement for the Content Provider(s) **101** to actually hold up delivery of the SC(s) but this manual release option can still be used for this purpose or used to manage network bandwidth required to transfer these large files.

When flagged for release, the Content SC(s) **630** for the Content **113** are transferred via FTP to the designated Content Hosting Site(s) **111**. The Metadata SC(s) **620** is transferred via FTP to the Content Promotions Web Site **156**. Here the SC(s) are staged to a new Content **113** directory until they can be processed and integrated into the Content Promotions Web Site **156**.

H. Content Promotions Web Site

To most effectively disperse information on what the Content Provider(s) **101** is making available for sale via digital download, and to get the necessary files to the Electronic Digital Content Store(s) **103** to enable it to make this Content **113** available for download to its customers, each Content Provider(s) **101** should have a secure web site housing this information. This is similar to the method used today by some Content Provider(s) **101** to make promotional content available to their retailers and others with a need for this information. In the case where this type of service already exists, an additional section can be added to the web site where Electronic Digital Content Store(s) **103** can go to see a list of the content available for sale via download.

The Content Provider(s) **101** has complete control over the design and layout of this site or can choose to use a turnkey web server solution provided as part of the toolkit for Secure Digital Content Electronic Distribution System **100**. To implement their own design for this service, the Content Provider(s) **101** need only provide links to the Metadata SC(s) **620** for Electronic Digital Content Store(s) **103** who access their site. This is accomplished using the toolkit for the Secure Digital Content Electronic Distribution System **100**. The selection process and what information is shown is the discretion of the Content Provider(s) **101**.

Metadata SC(s) **620** received into a new content directory via FTP from the Content Dispersement Tool is processed by the Content Promotions Web Site **156**. These containers can be opened with the SC(s) Preview Tool to display or extract information from the container. This information can then be used to update HTML Web pages and/or add information to a searchable database maintained by this service. The SC(s) Preview Tool is actually a subset of the Content Acquisition Tool used by the Electronic Digital Content Store(s) **103** to open and process Metadata SC(s) **620**. See the Content Acquisition Tool section for more details. The Metadata SC(s) **620** file should then be moved to a permanent directory maintained by the Content Promotions Web Site **156**.

Once the Metadata SC(s) **620** has been integrated into the Content Promotions Web Site **156**, its availability is publicized. The Content Provider(s) **101** can send a notification to all subscribing Electronic Digital Content Store(s) **103** as each new Metadata SC(s) **620** is added to the site or can perform a single notification daily (or any defined periodicity) of all Metadata SC(s) **620** added that day (or period). This notification is performed via a standard HTTP exchange with the Electronic Digital Content Store(s) **103** Web Server by sending a defined CGI string containing parameters referencing the Metadata SC(s) **620** added. This message is handled by the Notification Interface Module of the Electronic Digital Content Store(s) **103** which is described later.

I. Content Hosting

The Entertainment Industry produces thousands of content titles, such as CDS, movies and games every year, adding to the tens of thousands of content titles that are currently available. The Secure Digital Content Electronic Distribution System **100** is designed to support all of the content titles available in stores today.

The numbers of content titles that the Secure Digital Content Electronic Distribution System **100** may eventually download to customers on a daily basis is in the thousands or tens of thousands. For a large number of titles, this requires a large amount of bandwidth. The computer disk space and bandwidth needs call for a distributed, scalable implementation with multiple Content Hosting Site(s) **111**. The system also supports customers all over the world. This requires overseas sites to speed delivery to the global customers.

Content hosting on the Secure Digital Content Electronic Distribution System **100** is designed to allow the Content Provider(s) **101** to either host their own Content **113** or share a common facility or a set of facilities.

Content hosting on the Secure Digital Content Electronic Distribution System **100** consists of multiple Content Hosting Site(s) **111** that collectively contain all of the Content **113** offered by the Secure Digital Content Electronic Distribution System **100** and several Secondary Content Sites (not shown) that contain the current hot hits offered by the Content Provider(s) **101**. The number of Content Hosting Site(s) **111** changes depending on the number of End-User(s) using the system. The Secondary Content sites host a limited number of songs, but they will represent a large percentage of the bandwidth used on the system. The secondary sites are brought on line as the volume on the primary sites increases to the point of maximum capacity. The secondary sites can be located close to Network Access Points (NAPs) which helps speed up download times. They may also be placed in different geographic areas around the world to speed up download times.

Should the Content Provider(s) **101** choose to host all of their Content **113** in their own system, they can act as a single Content Hosting Site **111** with or without additional Secondary Content Sites. This allows them to build their own scalable distributed system. In another embodiment, Electronic Digital Content Store(s) **103** can also act as Content Hosting Site(s) **111** for certain Content **113**. This embodiment requires a special financial agreement between the Electronic Digital Content Store(s) **103** and the Content Provider(s) **101**.

1. Content Hosting Sites

Content **113** is added to the Content Hosting Site(s) **111** via FTP by the Content Disbursement Tool described in the Content Provider(s) Section of this specification. The Metadata SC(s) **620** created by the Content Provider(s) **101** contain a field that indicates the URL locating the Content SC(s) **630** for this Content **113**. This URL corresponds to a Content Hosting Site(s) **111**. Electronic Digital Content Store(s) **103** can override this URL if allowed by the Content Provider(s) **101** in the Offer SC(s) **641**. The End-User Device(s) **109** communicates to this Content Hosting Site(s) **111** when it wants to download the Content SC(s) **630**.

The End-User Device(s) **109** initiates the request for a Content SC(s) **630** by sending the License SC(s) **660** to the Content Hosting Site(s) **111**. This is the same License SC(s) **660** returned by the Clearinghouse(s) **105**. The Digital Signature of the License SC(s) **660** can be verified to determine if it is a valid License SC(s) **660**. If it is a valid License SC(s) **660** either the download is initiated, or the download request may be redirected to another Content Hosting Site(s) **111**.

2. Content Hosting Site(s) **111** provided by the Secure Digital Content Electronic Distribution System **100**

For the Secure Digital Content Electronic Distribution System **100** the decision of which site should be used to download the Content **113** is made by the primary content site that received the initial request for a Content SC(s) **630**. This site uses the following information to make this decision:

- Are there secondary content sites that host the Content **113** requested? (The majority of Content **113** offered by the Secure Digital Content Electronic Distribution System **100** is only located at primary sites);
- Where is the End-User Device(s) **109** geographically located? (This information can be obtained from the End-User Device(s) **109** when the request is initiated at the End-User Device(s) **109**, this is passed up to the Clearinghouse(s) **105** in the Order SC(s) **650**;
- Is the appropriate secondary site up and operational? (Sometimes the secondary sites may be off-line);
- What is the load of the secondary sites? (In some cases where a secondary site is swamped with activity another site that is less busy may be selected.

Before transmitting the Content SC(s) **630** to the End-User Device(s) **109**, analysis and verifications are performed on the End-User's request. A database is kept of all of the License SC IDs that have been used to download Content **113**. This database can be checked to ensure that the End-User Device(s) **109** only makes one request for each piece of Content **113** purchased. This prevents malicious users from repeatedly accessing the Content Hosting Site(s) **111** in hopes of slowing down the Content Hosting Site(s) **111** and prevents unauthorized download of the Content SC(s) **630**.

The promotion and demotion of Content **113** to the Secondary Content sites is done periodically based on customer demand for the individual pieces of Content **113**.

Content Hosting Router

The Content Hosting Router (not shown) resides in the Content Hosting Site(s) **111** and receives all requests from End-User(s) wanting to download Content **113**. It performs validation checks on the End-User(s) request to ensure they indeed bought the Content **113**. A database is maintained on the status of the Secondary Content Sites that includes what Content **113** is on them and there current status. This current status includes the amount of activity on the sites and whether a site is down for maintenance.

The only interface to the Content Hosting Router is the License SC(s) **660** that is sent by the End-User Device(s) **109** when Content **113** is required to be downloaded. The License SC(s) **660** includes information that indicates the user is allowed to download the Content **113**.

Secondary Content Sites

The Secondary Content Sites (not shown) host the popular Content **113** of the Secure Digital Content Distribution System **100**. These sites are geographically dispersed across the world and are located near Network Access Points (NAPs) to improve download times. These sites are added to the system as demand on the primary Content Hosting Site(s) **111** nears maximum capacity.

IX. ELECTRONIC DIGITAL CONTENT STORE (S)

A. Overview—Support for Multiple Electronic Digital Content Store(s) **103**

Electronic Digital Content Store(s) **103** are essentially the retailers. They are the entities who market the Content **113** to be distributed to the customer. For distribution of Content **113**, this would include Digital Content Retailing Web Sites, Digital Content Retail Stores, or any business who wishes to get involved in marketing electronic Content **113** to consumers. These businesses can market the sale of electronic Content **113** only or can choose to just add the sale of electronic goods to whatever other merchandise they currently offer for sale. Introduction of downloadable electronic goods into the service offering of the Electronic Digital Content Store(s) **103** is accomplished via a set of tools developed for the Electronic Digital Content Store(s) **103** as part of the Secure Digital Content Electronic Distribution System **100**.

These tools are used by the Electronic Digital Content Store(s) **103** to:

- acquire the Metadata SC(s) **620** packaged by the Content Provider(s) **101**
- extract Content **113** from these SC(s) to be used as input to building their service offering
- create Offer SC(s) **641** describing the downloadable Content **113** they are offering for sale

handle the acknowledgment of the sale and initiation of the download by creating and sending Transaction SC(s) **640** to the End-User Device(s) **109**

manage a transaction log of sales of downloadable Content **113** and the status of each download

handle status notifications and transaction authentication requests

perform account reconciliation

The tools are designed to allow flexibility in how the Electronic Digital Content Store(s) **103** wishes to integrate sale of downloadable electronic Content **113** into its service. The tools can be used in such a way as to request that all financial settlements for downloadable Content **113** purchased be handled by the Clearinghouse(s) **105** although this is not required. These tools also enable Electronic Digital Content Store(s) **103** to completely service their customers and handle the financial transactions themselves, including providing promotions and special offers. The tools enable the Electronic Digital Content Store(s) **103** to quickly integrate the sale of downloadable Content **113** into its existing services. In addition, the Electronic Digital Content Store(s) **103** is not required to host the downloadable Content **113** and does not have to manage its dispersement. This function is performed by the Content Hosting Site(s) **111** selected by the Content Provider(s) **101**.

Electronic Digital Content Store(s) **103** are not limited to Web based service offerings. The tools provided are used by all Electronic Digital Content Store(s) **103** wishing to sell downloadable electronic Content **113** regardless of the transmission infrastructure or delivery mode used to deliver this Content **113** to End-User(s). Broadcast services offered over satellite and cable infrastructures is also use these same tools to acquire, package, and track electronic Content **113** sales. The presentation of electronic merchandise for sale and the method in which these offers are delivered to the End-User (s) is the main variant between the broadcast based service offering and the point-to-point interactive web service type offering.

B. Point-to-Point Electronic Digital Content Distribution Service

Point-to-Point primarily means a one-to-one interactive service between the Electronic Digital Content Store(s) **103** and the End-User Device(s) **109**. This typically represents an Internet web based service provided via telephone or cable modem connection. Networks other than the Internet are supported in this model as well, as long as they conform to the Web Server/Client Browser model. FIG. **9** is a block diagram illustrating the major tools, components and processes of an Electronic Digital Content Store(s) **103**.

1. Integration Requirements

The Secure Digital Content Electronic Distribution System **100** is used not only create new online businesses but provides a method for existing businesses to integrate the sale of downloadable electronic Content **113** to their current inventory. The suite of tools provided to the Electronic Digital Content Store(s) **103** simplify this integration effort. The Content Acquisition Tool **171** and SC(s) Packer Tool **153** provides a method for the Electronic Digital Content Store(s) **103** to acquire information from the participating Content Provider(s) **101** on what they have available for sale and to create the files required to reference these downloadable objects as items in their own inventory. This process is batch driven and can be largely automated and is executed only to integrate new Content **113** into the site.

The tools for the Secure Digital Content Electronic Distribution have been designed to allow integration of sale of electronic downloadable Content **113** into typical implementations of web based Electronic Digital Content Store(s) **103** (i.e. Columbia House online, Digital Content Boulevard, @Tower) and equivalent with minimal change to their current Content **113** retailing paradigm. Several methods of integration are possible and in the preferred embodiment, the Electronic Digital Content Store(s) **103** provides support for all product searches, previews, selections (shopping cart), and purchases. Each Electronic Digital Content Store (s) **103** establishes customer loyalty with its customers and continues to offer its own incentives and market its products as it does today. In the Secure Digital Content Electronic Distribution System **100**, it would simply need to indicate which products in its inventory are also available for electronic download and allow its customers to select the electronic download option when making a purchase selection. In another embodiment, the customer's shopping cart could contain a mixture of electronic (Content **113**) and physical media selections. After the customer checks out, and the Electronic Digital Content Store(s) **103** has completed the financial settlement and logged or notified its shipping and handling functions to process the physical merchandise purchased, the commerce handling function of the Electronic Digital Content Store(s) **103** then calls the Transaction Processor Module **175** to handle all electronic downloads. It simply passes the required information and all processing from that point on is handled by the toolset for the Secure Digital Content Electronic Distribution System **100**. In another embodiment, other methods of transaction handling are also possible using tools for the Secure Digital Content Electronic Distribution System **100** to handle the financial settlement should the Electronic Digital Content Store(s) **103** wish to sell downloadable merchandise only or to segregate the financial settlement of physical and downloadable merchandise.

To handle the downloading of merchandise, the Electronic Digital Content Store(s) **103** is given a Product ID (not shown) for each downloadable product that it acquires from the Content Promotions Web Site **156** for the Content Provider(s) **101**. This Product ID is associated to a customer's purchase selection to the downloadable product. The Product ID is what the Electronic Digital Content Store(s) **103** passes to the Transaction Processor Module **175** to identify the product that the user has purchased. The SC(s) (Offer SC(s) **641**) that were created to describe the products, are isolated from the Electronic Digital Content Store(s) **103** and kept in an Offer Database **181** in an effort to simplify management of these objects and make their existence transparent to the Electronic Digital Content Store(s) **103**.

The Transaction Processor Module **175** and other additional functions are provided as web server side executables (i.e. CGI and NSAPI, ISAPI callable functions). These fuinctions handle run time processing for End-User(s) interactions and optional interactions with the Clearinghouse(s) **105**. These functions interact with the web server's commerce services to create and download to the End-User Device(s) **109** the files necessary to initiate the Content **113** download process. They also handle optional interactions to provide authorizations and accept notifications of completion of activities.

An Accounting Reconciliation Tool **179** is also provided to assist the Electronic Digital Content Store(s) **103** in contacting the Clearinghouse(s) **105** to reconcile accounts based on its own and the transaction logs of the Clearinghouse(s) **105**.

2. Content Acquisition Tool **171**

The Content Acquisition Tool **171** is responsible for interfacing with the Content Promotions Web Site **156** to

preview and download Metadata SC(s) **620**. Since the Content Promotions site is a standard web site, a web browser is used by the Electronic Digital Content Store(s) **103** to navigate this site. The navigation features varies based on the site design of the Content Provider(s) **101**. Some sites may provide extensive search capabilities with many screens of promotional information. Others may have a simple browser interface with lists of titles, performers or new releases to select from. All sites include the selection of Metadata SC(s) **620** containing all the promotional and descriptive information of a song or album.

Viewing Metadata

The Content Acquisition Tool **171** is a web browser helper application which launches whenever a Metadata SC(s) **620** link is selected at the Content Promotions Web Site **156**. Selection of the SC(s) causes it to be downloaded to the Electronic Digital Content Store(s) **103**, and launch the helper application. The Content Acquisition Tool **171** opens the Metadata SC(s) **620** and display the non-encrypted information contained therein. Displayed information includes Extracted Metadata **173**, for a music example, the graphic image(s) associated with the song and the information describing the song, a preview clip of the song can also be listened to if included in the Metadata SC(s) **620**. In an example where the Content **113** is music, promotional information about the song, the album it is from, and the artist is also shown if provided by the Content Provider(s) **101**. This information is displayed as a series of linked HTML pages in the browser window. Purchasable Content **113** such as the song and the lyrics and whatever other metadata the Content Provider(s) **101** wishes to protect, is not accessible to the Retail Content Web Site **180**.

In another embodiment, the Content Provider(s) **101** provides optional promotional content for a fee. In this embodiment such promotional content is encrypted in the Metadata SC(s) **620**. Financial settlement to open this data can be handled via the Clearinghouse(s) **105** with the account for the Electronic Digital Content Store(s) **103** being charged the designated fee.

Extracting Metadata

Besides the preview capabilities, this tool provides two additional features: metadata extraction and preparation of an Offer SC(s) **641**. Selection of the metadata extraction option prompts the Electronic Digital Content Store(s) **103** to enter the path and filenames to where the metadata is to be stored. Binary metadata such as graphics and the audio preview clip is stored as separate files. Text metadata is stored in an ASCII delimited text file which the Retail Content Web Site **180** can then import into its database. A table describing the layout of the ASCII delimited file is also be created in a separate TOC file. Additional options is available to allow extraction into other National Language Support (NLS) supported formats.

One important piece of information provided in the extracted data is the Product ID. This Product ID is what the commerce handling function for the Electronic Digital Content Store(s) **103** needs to identify to the Transaction Processor Module **175** (for more information refer to Transaction Processing section), the Content **113** that the user has purchased. The Transaction Processor Module **175** uses this Product ID to properly retrieve the appropriate Offer SC(s) **641** from the Offer Database **181** for subsequent download to the End-User Device(s) **109**. The Electronic Digital Content Store(s) **103** has full control over how it presents the offer of downloadable Content **113** on its site. It only needs to retain a cross reference of the Content **113** being offered to this Product ID to properly interface with the tools for the Secure Digital Content Electronic Distribution System **100**. Providing this information here, allows the Electronic Digital Content Store(s) **103** to integrate this product or Content **113** into its inventory and sales pages (database) in parallel with the Offer SC(s) **641** creation process since both processes uses the same Product ID to reference the product. This is described further below.

Offer SC(s) Creation Packer **153**

The Electronic Digital Content Store(s) **103** is required to create an Offer SC(s) **641** describing the downloadable Content **113** that is for sale. Most of the information that goes into the Offer SC(s) **641** is derived from the Metadata SC(s) **620**. The Content Acquisition Tool **171** creates the Offer SC(s) **641** by:

- removing parts from the Metadata SC(s) **620** that are not required to be included in the Offer SC(s) **641** as defined by the Offer SC(s) Template in the Metadata SC(s) **620**
- adding additional required parts as defined by defaults specified by the configuration options in this tool for the Electronic Digital Content Store(s) **103**
- prompting for additional required inputs or selections as defined by the Offer SC(s) Template in the Metadata SC(s) **620**
- calling the SC(s) Packer **153** to pack this information into the SC(s) format

Metadata to be displayed by the Player Application **195** (further described later) on the End-User Device(s) **109** is kept in the Metadata SC(s) **620**. Other promotional metadata that was only used by the Electronic Digital Content Store(s) **103** as input to his web service database is removed from the Metadata SC(s) **620**. Rights management information provided by the Content Provider(s) **101**, such as watermarking instructions, encrypted Symmetric Keys **623**, and Usage Conditions **517** defining the permitted uses of the object, are also retained.

This stripped down Metadata SC(s) **620** is then included in the Offer SC(s) **641**. The Electronic Digital Content Store(s) **103** also attaches its own Usage Conditions called Store Usage Conditions **519** or purchase options to the Offer SC(s) **641**. This can be accomplished interactively or automatically through a set of defaults. If configured to be processed interactively, the Electronic Digital Content Store (s) **103** is prompted with the set of permitted object Usage Conditions **517** as defined by the Content Provider(s) **101**. He then selects the option(s) he wishes to offer to his customers. These now become the new Usage Conditions or Store Usage Conditions **519**. To process automatically, the Electronic Digital Content Store(s) **103** configures a set of default purchase options to be offered for all Content **113**. These default options are automatically checked against the permitted Usage Conditions **517** defined by the Content Provider(s) **101** and is set in the Offer SC(s) **641** if there are no discrepancies.

Once the Offer SC(s) **641** is created, it is stored in an Offer Database **181** and is indexed with the Product ID pre-assigned in the Metadata SC(s) **620**. This Product ID is used later by the Electronic Digital Content Store(s) **103** to identify the downloadable Content **113** being purchased by a customer when interfacing with the Offer Database **181** to retrieve the Offer SC(s) **641** for packaging and transmittal to the End-User(s). See the Transaction Processor Module **175** section for more details.

In another embodiment, the Electronic Digital Content Store(s) **103** hosts the Content SC(s) **641** at his site. This embodiment requires changes to the Offer SC(s) **641** such as the replacement of the URL of the Content Hosting Site(s) **111** with the URL of the Electronic Digital Content Store(s) **103**.

3. Transaction Processing Module **175**

Electronic Digital Content Store(s) **103** directs billing to Clearinghouse(s) **105**. There are two basic modes for processing End-User(s) purchase requests for downloadable Content **113**. If the Electronic Digital Content Store(s) **103** does not wish to handle the financial settlement of the purchase and has no special promotions or incentives governing the sale of the merchandise and does not use a shopping cart metaphor for batching the purchase requests, it may opt to provide links on its Content **113** download pages directly to the Offer SC(s) **641** files. These Offer SC(s) **641** would have to have been built with retail pricing information included in the metadata. Also included in the Offer SC(s) **641** is a special HTML offer page presenting the purchase options with terms and conditions of the sale. This page is built from a template created when the Offer SC(s) **641** was built. When the End-User(s) clicks on the direct link to the Offer SC(s) **641**, the Offer SC(s) **641** is downloaded to the browser End-User Device(s) **109** launching a helper application which opens the container and present the offer page included in the Offer SC(s) **641**. This page contains a form to collect customer information including credit card information and purchase option selection. The form then gets submitted directly to the Clearinghouse(s) **105** for financial settlement and processing. Optionally, this form may contain the fields needed to use the End-User(s)' credit information or industry standard local transaction handler.

An embodiment where the Electronic Digital Content Store(s) **103** handles billing is now described. The more typical mode of handling purchase requests is to allow the Electronic Digital Content Store(s) **103** to process the financial settlement and then submit the download authorization to the End-User(s). This method allows the Electronic Digital Content Store(s) **103** to integrate sale of downloadable Content **113** with other merchandise offered for sale at his site, allows batch processing of purchase requests with only one consolidated charge to the customer (via a shopping cart metaphor) instead of individual charges for each download request, and allows the Electronic Digital Content Store(s) **103** to directly track his customers buying patterns and offer special promotions and club options. In this environment, the offer of downloadable Content **113** is included in his shopping pages which get added to a shopping cart when selected by the End-User(s) and get processed and financially settled as is done in the Electronic Digital Content Store(s)' **103** current shopping model. Once the financial settlement is completed, the commerce handling process of the Electronic Digital Content Store(s) **100** then calls the Transaction Processor Module **175** to complete the transaction.

Transaction Processor Module **175**

The role of the Transaction Processor Module **175** is to put together the information needed by the End-User Device (s) **109** to initiate and process the download of the Content **113** purchased. This information is packaged into a Transaction SC(s) **640** which is sent back to the End-User Device(s) **109** by the Web Server as the response to the purchase submission. The Transaction Processor Module **175** requires three pieces of information from the commerce handling process of the Electronic Digital Content Store(s) **103**: the Product IDs for the Content **113** purchased, Transaction Data **642**, and an HTML page acknowledging the purchase settlement.

The Product ID is the value provided to the Electronic Digital Content Store(s) **103** in the Metadata SC(s) **620** associated to the Content **113** just sold. This Product ID is used to retrieve the associated Offer SC(s) **641** from the Offer Database **181**.

The Transaction Data **642** is a structure of information provided by the transaction processing function of the Electronic Digital Content Store(s) **103** which is later used to correlate the Clearinghouse(s) **105** processing with the financial settlement transaction performed by the Electronic Digital Content Store(s) **103** and to provide user identity information to be included in the watermark of the Content **113** downloaded to the End-User Device(s) **109**. When the Clearinghouse(s) **105** receives a valid Order SC(s) **650**, it logs a transaction indicating the Content **113** that was sold, which Electronic Digital Content Store(s) **103** sold it and the associated Transaction Data **642** including the End-User's Name and a Transaction ID **535**. The Transaction ID **535** provides a reference to the financial settlement transaction. This information is later returned by the Clearinghouse(s) **105** to the Electronic Digital Content Store(s) **103** for use in reconciling its accounts with the billing statements received from the Content Provider(s) **101** (or his agent). The Clearinghouse Transaction Log **178** can be used by the Content Provider(s) **101** to determine what Content **113** of his has been sold and enables him to create a bill to each Electronic Digital Content Store(s) **103** for royalties owed him. Other electronic means besides billing can alternatively be used to settle accounts between the Content Provider(s) **101** and Electronic Digital Content Store(s) **103**.

The information provided in the Transaction SC(s) **640** and the security and integrity of the Transaction SC(s) **640** provide sufficient authenticity to the Clearinghouse(s) **105** that the purchase transaction is valid and thus no further validation is required prior to the logging of this sale by the Clearinghouse(s) **105**. The Electronic Digital Content Store (s) **103**, however, has the option to request authentication before its accounts are charged (trnsaction logged at the Clearinghouse(s) **105** indicating to the Content Provider(s) **101** that this Electronic Digital Content Store(s) **103** has collected money for the sale of this Content **113**). This request for authentication/notification is indicated by a flag in the Transaction Data **642**. In this scenario, the Clearinghouse(s) **105** contacts the Electronic Digital Content Store(s) **103** and receive authorization from the Electronic Digital Content Store(s) **103** before the charge to his account and the release of the encryption Key **623**. The Transaction ID **535** is passed to the Electronic Digital Content Store(s) **103** from the Clearinghouse(s) **105** as part of this authentication request to enable the Electronic Digital Content Store(s) **103** to associate this request to a prior transaction performed with the End-User(s). This Transaction ID **535** can be any unique value the Electronic Digital Content Store(s) **103** wishes to use and is solely for its benefit.

The Transaction Data **642** also contains a customer name. This name can be from the user name field of the purchase form filled out by the user when making his purchase, or from information logged previously during some user registration process with the Electronic Digital Content Store(s) **103**, or the official name obtained from credit card information associated with the card used in this transaction. This name is later included in the License Watermark **527**.

The Transaction Data **642** also contains the Store Usage Conditions **519** purchased by the End-User(s). This information is included in the License Watermark **527** and used by the End-User Device(s) **109** in Copy and Play Control.

The final parameter required by the Transaction Processor Module **175** is the HTML page acknowledging the purchase settlement. The purpose of this is to allow the Electronic Digital Content Store(s) **103** to respond to the End-User(s) with an acknowledgment of the financial settlement and

whatever other information he wishes to include in the response. This HTML page is included in the Transaction SC(s) **640** and is displayed in the browser window of the End-User Device(s) **109** when the Transaction SC(s) **640** is received and processed.

The Transaction SC(s) **640** is the HTTP response to the End-User(s) from the Electronic Digital Content Store(s) **103** after processing the purchase submission. Sending a SC(s) as the direct HTTP response forces the automatic loading on the End-User Device(s) **109** of a SC(s) Processor Helper Application thus allowing automatic completion of the transaction without depending on further End-User(s) initiated actions. This process is described in more detail in the End-User Device(s) **109** and Player Application **195** section later.

When the Transaction Processor Module **175** is called with the required parameters, it builds a Transaction SC(s) **640** containing the Transaction Data **642**, the transaction acknowledgment HTML page, other required security features of the SC(s), and retrieves and imbeds the Offer SC(s) **641** associated with the purchase. It also logs information about this transaction for later use by the Notification Interface Module **176** and the Account Reconciliation Tool **179**.

4. Notification Interface Module **176**

The Notification Interface Module **176** is a Web Server side executable routine (CGI or function callable by NSAPI, ISAPI or equivalent). It handles optional requests and notifications from the Clearinghouse(s) **105**, the End-User Device(s) **109**, the Content Hosting Site(s) **111**, and the Content Provider(s) **101**. The events that the Electronic Digital Content Store(s) **103** can optionally request notification for are:

Notification from the Clearinghouse(s) **105** that the End-User Device(s) **109** requesting an encryption Key **623** and the Clearinghouse(s) **105** is releasing the encryption Key **623** for the specified Content **113**. This notification can optionally be configured to require authentication from the Electronic Digital Content Store(s) **103** prior to the encryption Key **623** being sent to the End-User Device(s) **109**.

Notification from the Content Hosting Site(s) **111** that the Content SC(s) **630** has been sent to the End-User Device(s) **109**.

Notification from the End-User Device(s) **109** that the Content SC(s) **630** and the License SC(s) **660** have been received and successfully used to process the Content **113** or was found to be corrupt.

Notification from the Content Provider(s) **101** that new Content **113** has been placed in the Content Promotions Web Site **156**.

None of these notifications are a required step in the Secure Digital Content Electronic Distribution System flows **100** but are provided as options to allow the Electronic Digital Content Store(s) **103** the opportunity to close its records on the satisfaction of completion of the sale. It also provides information that may be needed to handle customer service requests by letting the Electronic Digital Content Store(s) **103** know what functions have transpired since financial settlement of the transaction or what errors occurred during an attempt to complete the sale.

Frequency of notification of new Content **113** available at the Content Promotions Web Site **156** is determined by the Content Provider(s) **101**. Notification may be provided as each new Metadata SC(s) **620** is added or just daily with all new Metadata SC(s) **620** added that day.

All of these notifications result in entries being made to the Transaction Log **178**. If the Electronic Digital Content Store(s) **103** wishes to perform his own processing on these notifications, he can intercept the CGI call, perform his unique function and then optionally pass the request on to the Notification Interface Module **176**.

5. Account Reconciliation Tool **179**

This Account Reconciliation Tool **179** contacts the Clearinghouse(s) **105** to compare the Transaction Log **178** with the log of the Clearinghouse(s) **105**. This is an optional process which is available to help the Electronic Digital Content Store(s) **103** feel comfortable with the accounting for the Secure Digital Content Electronic Distribution System **100**.

In another embodiment, this tool can be updated to provide electronic fumds transfers for automated periodic payments to the Content Provider(s) **101** and the Clearinghouse(s) **105**. It can also be designed to automatically process payments upon reception of an electronic bill from the Clearinghouse(s) **105** after reconciling the bill against the Transaction Log **178**.

C. Broadcast Electronic Digital Content Distribution Service

Broadcast primarily refers to a one to many transmission method where there is no personal interaction between the End-User Device(s) **109** and the Electronic Digital Content Store(s) **103** to customize on-demand viewing and listening. This is typically provided over a digital satellite or cable infrastructure where the Content **113** is preprogrammed so that all End-User Device(s) **109** receive the same stream.

A hybrid model can also be defined such that an Electronic Digital Content Store(s) **103** provides a digital content service organized in such a way that it can offer both a web distribution interface via an Internet connection as well as a higher bandwidth satellite or cable distribution interface via a broadcast service, with a great deal of commonality to the site design. If the IRD backchannel serial interface were connected to the web, and the IRD supported web navigation, the End-User(s) could navigate the digital content service in the usual way via the backchannel Internet interface, previewing and selecting Content **113** to purchase. The user can select high quality downloadable Content **113**, purchase these selections, and receive the required License SC(s) **660** all via an Internet connection and then request delivery of the Content **113** (Content SC(s) **630**) over the higher bandwidth broadcast interface. The Web service can indicate which Content **113** would be available for download in this manner based on the broadcast schedule or could build the broadcast streams based totally on purchased Content **113**. This method would allow a Web based digital content service to contract with a broadcast facility to deliver high quality Content **113** to users equipped with the proper equipment making a limited number of specific Content **113** (e.g. songs or CDS) available daily in this manner and the entire catalog available for download in lower quality via the web interface.

Other broadcast models can be designed where there is no web interface to the End-User Device(s) **109**. In this model, promotional content is packaged in specially formatted digital streams for broadcast delivery to the End-User Device(s) **109** (i.e. IRD) where special processing is performed to decode the streams and present the End-User(s) with the promotional content from which purchase selections can be made.

The actual purchase selections would still be initiated via backchannel communications from the End-User Device(s) **109** to the Clearinghouse(s) **105** and would utilize SC(s) to perform all data exchange. The toolset provided to the Electronic Digital Content Store(s) **103** has been architected and developed in such a way that most of the tools apply to

both a point-to-point Internet service offering as well as a broadcast satellite or cable offering. The tools used by a Digital Content Web Site Electronic Digital Content Store(s) **103** to acquire and manage Content **113** as well as prepare SC(s) is also used by a satellite based Electronic Digital Content Store(s) **103** to manage and prepare Content **113** for distribution on a broadcast infrastructure. The SC(s) distributed over a Web service are the same as those distributed over a broadcast service.

X. END-USER DEVICE(S) 109

The applications in the End-User Device(s) **109** for the Secure Digital Content Electronic Distribution System **100** perform two main functions: first the SC(s) processing and copy control; and second playback of encrypted Content **113**. Whether the End-User Device(s) **109** is a Personal Computer or a specialized electronic consumer device, it has to be capable of performing these base functions. The End-User Device(s) **109** also provides a variety of additional features and functions like creating play lists, managing the digital content library, displaying information and images during content playback, and recording to external media devices. These functions varies based on the service these applications are supporting and the type of device the applications are designed for.

A. Overview

Referring now to FIG. **10**, shown is the major components and processes an End-User Device(s) **109** Functional Flow. The applications designed to support a PC based web interface Content **113** service consists of two executable software applications: the SC(s) Processor **192** and the Player Application **195**. The SC(s) Processor **192** is an executable application which is configured as a Helper Application into the End-User(s) Web Browser **191** to handle SC(s) File/MIME Types. This application is launched by the Browser whenever SC(s) are received from the Electronic Digital Content Store(s) **103**, the Clearinghouse (s) **105**, and the Content Hosting Site(s) **111**. It is responsible for performing all required processing of the SC(s) and eventually adding Content **113** to the Digital Content Library **196** of the End-User(s).

The Player Application **195** is a stand alone executable application which the End-User(s) loads to perform Content **113** in his Digital Content Library **196**, manage his Digital Content Library **196** and create copies of the Content **113** if permitted. Java, C/C++ or any equivalent software.

The searching and browsing of Content **113** information, previewing of, for example, song clips, and selecting songs for purchase is all handled via the End-User(s) Web Browser **191**. Electronic Digital Content Store(s) **103** provides the shopping experience in the same way that is offered today by many Content **113** retailing web sites. The difference to the End-User(s) over today's web based Content **113** shopping is that they may now select downloadable Content **113** objects to be added to their shopping cart. If the Electronic Digital Content Store(s) **103** has other merchandise available for sale in addition to the downloadable objects, the End-User(s) may have a combination of physical and electronic downloadable merchandise in his shopping cart. The Secure Digital Content Electronic Distribution End-User Device(s) **109** are not involved until after the End-User(s) checks out and submits his fmal purchase authorization to the Electronic Digital Content Store(s) **103**. Prior to this point, all interaction is between the Web Server for the Electronic Digital Content Store(s) **103** and the Browser **191** on the End-User Device(s) **109**. This includes preview of sample Digital Content clips. Digital Content clips are not packaged into SC(s) but instead are integrated into the web service of the Electronic Digital Content Store(s) **103** as downloadable files or fed from a streaming server. The format of the Content **113** clip is not dictated by the system architecture.

B. Application Installation

The Player Application **195** and the Helper Application **1981** are packaged into a self installing executable program which is available for download from many web sites. The Clearinghouse(s) **105** acts as a central location which hosts the master download page at a public web site. It contains links to the locations from which the installation package can be downloaded. The installation package is available at all Content Hosting Site(s) **111** to provide geographic dispersal of the download requests. Each participating Electronic Digital Content Store(s) **103** can also make the package available for download from their site or may just provide a link to the master download page at the public web site of the Clearinghouse(s) **105**.

Any End-User(s) wishing to purchase downloadable Content **113** downloads and install this package. The installation is self contained in this downloadable package. It unpacks and installs both the Helper Application **198** and the Player Application **195** and also configure the Helper Application **198** to the installed Web Browser(s).

As part of the installation, a Public/Private Key **661** pair is created for the End-User Device(s) **109** for use in processing Order and License SC(s) **660**. A random Symmetric Key (Secret User Key) is also generated for use in protecting song encryption keys in the License Database **197**. The Secret User Key (not shown) is protected by breaking the key into multiple parts and storing pieces of the key in multiple locations throughout the End-User(s)' computer. This area of the code is protected with Tamper Resistant Software technology so as not to divulge how the key is segmented and where it is stored. Preventing access to this key by even the End-User(s) helps to prevent piracy or sharing of the Content **113** with other computers. See the SC(s) Processor **192** section for more details on how these keys are used.

Tamper-resistant software technology is a method to deter unauthorized entry into a computer software application by a hacker. Typically a hacker wants to understand and/or modify the software to remove the restrictions on the usage. In practicality, no computer program exists that cannot be hacked; that is why tamper-resistant software is not called "tamper-proof". But the amount of effort required to hack a tamper-resistance protect application usually deters most hackers because the effort is not worth the possible gain. Here the effort would be to gain access to a key to one piece of Content **113**, perhaps a single song on a CD.

One type of tamper-resistant software technology is from IBM. One product this code was introduced is in the IBM ThinkPad 770 laptop computer. Here, the tamper-resistant software was used to protect the DVD movie player in the computer. Digital Content Provider(s) such as Hollywood studios, concerned about the advent of digital movies and the ease with perfect copies can be made, have insisted that movies on DVD disc(s) contain copy protection mechanisms. IBM's tamper-resistant software made it difficult to circumvent these copy protection mechanisms. This is a very typical application for tamper-resistant software; the software is used to enforce rules on the usage of some protected type of Content **113**.

IBM's tamper-resistant software puts several types of obstacles in the path of the attacker. First, it contains techniques to defeat, or at least reduce the effectiveness of,

the standard software tools that the hacker uses: debuggers and disassemblers. Second it contains self-integrity checking, so that single modifications, or even small handfuls of modifications, will be detected and cause incorrect operation. Finally, it contains obfuscations to mislead hackers regarding its true operation. The latter technique is largely ad hoc, but the first two build upon well-known tools in cryptography: encryption and digital signatures.

C. Secure Container Processor **192**

When the End-User(s) submits the final purchase authorization to the Electronic Digital Content Store(s) **103** for the merchandise he has collected in his shopping cart, his Web Browser remains active waiting for a response from the Web Server. The Web Server at the Electronic Digital Content Store(s) **103** processes the purchase and performs the financial settlement and then returns a Transaction SC(s) **640** to the End-User Device(s) **109**. The SC(s) Processor **192** (Helper Application **198**) is launched by the Web Browser to process the SC(s) mime type associated with the Transaction SC(s) **640**. FIG. **14** is an example of user interface screens of the Player Application **195** downloading content to a local library as described in FIG. **11** according to the present invention.

The SC(s) Processor **192** opens the Transaction SC(s) **640** and extract the Response HTML page and Offer SC(s) **641** contained within. The Response HTML page is displayed in the Browser window acknowledging the End-User(s)' purchase. The Offer SC(s) **641** are then opened and the Content **113** (e.g. song or album) names along with the projected download times are extracted from them, step **1401**. A new window is then displayed with this information and the End-User(s) is presented with options to schedule the download(s) of the Content **113** (e.g. for music, songs or entire albums), step **1402**. The End-User(s) can select immediate download or can schedule the download to occur at a later time. If a later time is selected, the download schedule information is saved in a log and the download is initiated at the scheduled time if the End-User Device(s) **109** is powered on at that time. If the computer is not active at the scheduled download time or the communication link is not active, the End-User(s) is prompted to reschedule the download when the computer is next powered up.

When the scheduled download time occurs or if immediate download was requested, the SC(s) Processor **192** creates Order SC(s) **650** from information in the Transaction SC(s) **640**, Offer SC(s) **641**, and the Public Key **661** of the End-User(s) generated at install time. This Order SC(s) **650** is sent via HTTP request through the Browser to the Clearinghouse(s) **105**. When the Clearinghouse(s) **105** returns the License SC(s) **660**, the Helper Application **198** is re-invoked to process the License SC(s) **660**. The License SC(s) **660** is then opened and the URL of the Content Hosting Site(s) **111** is extracted from the referenced Order SC(s) **650**. The License SC(s) **660** is then sent to the specified Content Hosting Site **111**, via http request through the Browser, requesting download of the Content SC(s) **630**. When the Content SC(s) **630** comes back to the Browser, the Helper Application **198** is re-invoked again. The SC(s) Processor **192** displays the name of the Content **113** being downloaded along with a download progress indicator and an estimated time to completion.

As the Content **113** is being received by the SC(s) Processor **192**, it loads the Content **113** data into memory buffers for decryption. The size of the buffers depends on the requirements of the encryption algorithm and watermarking technology **193** and is the minimum size possible to reduce the amount of unencrypted Content **113** exposed to hacker code. As a buffer is filled, it is decrypted using the Key **623** (corresponding to the Public Key **661**) of the End-User(s) extracted from the License SC(s) **660**, which itself is first decrypted using the Private Key. The decrypted buffer is then passed to the watermarking function.

The watermarking **193** extracts the watermarking instructions from the License SC(s) **660** and decrypt the instructions using the Private Key of the End-User(s). The watermarking data is then be extracted from the License SC(s) **660** which includes transaction information such as the purchaser's name as registered with the Electronic Digital Content Store(s) **103** from which this Content **113** was purchased or derived from the credit card registration information if the Electronic Digital Content Store(s) **103** does not provide a registration function. Also included in the watermark is the purchase date and the Transaction ID **535** assigned by the Electronic Digital Content Store(s) **103** to reference the specific records logged for this transaction. The Store Usage Conditions **519** are also included to be used by the Copy Control of the Player Application **195**. The watermarking instructions determines which specific content buffers the watermark is written to.

The Watermarking **193** is protected with Tamper Resistant Code technology so as not to divulge the watermarking instructions thus preventing a hacker from discovering the location and technique of the watermark. This prevents removal or modification of the watermark by a hacker.

After inscribing any required watermark to this content buffer, the buffer is passed to the scrambling function for Re-Encryption **194**. A processor efficient secure encryption algorithm such as IBM's SEAL encryption technology is used to re-encrypt the Content **113** using a random Symmetric Key. Once the download and Decryption and Re-Encryption **194** process is complete, the encryption Key **623** used by the Content Provider(s) **101** to originally encrypt the Content **113** is now destroyed and the new SEAL key is itself encrypted using the Secret User Key created and hidden at installation time. This new encrypted Seal Key is now stored in the License Database **107**.

The Decryption and Re-Encryption **194** process is another area of the code that is protected with Tamper Resistant Code technology so as not to divulge the original Content **113** encryption key, the new SEAL key, the Secret User Key, and where the Secret User Key segments are stored and how the key is segmented.

The process of Decryption and Re-Encryption **194** serves two purposes. Storing the Content **113** encrypted with an algorithm like SEAL enables faster than real-time decryption and requires much less processor utilization to perform the decryption than does a more industry standard type algorithm like DES. This enables the Player Application **195** to perform a real-time concurrent decryption-decode-playback of the Content **113** without the need to first decrypt the entire file for the Content **113** prior to decode and playback. The efficiency of the SEAL algorithm and a highly efficient decode algorithm such as IBM's implementation of the AC3 algorithm, allows not only concurrent operation (streaming playback from the encrypted file) but also allows this process to occur on a much lower powered system processor. Thus this application can be supported on a End-User Device(s) **109** as low end as a 60 MHz Pentium system and perhaps lower. Separating the encryption format in which the Content **113** is fmally stored from the original encryption format, allows for greater flexibility in the selection of the original content encryption algorithm. Thus use of widely accepted and proven industry standard algorithms can be used thus further enhancing Digital Content Industry

acceptance of the Secure Digital Content Electronic Distribution System **100**.

The second purpose of this Decryption and Re-Encryption **194** process is to remove the requirement that the original master encryption Key **623**, used by the Content Provider(s) **101** to encrypt this Content **113**, be stored on every End-User Device(s) **109** which has licensed this Content **113**. The encrypted master Key **623**, as part of the License SC(s) **660**, is only cached on the hard disk of the End-User Device(s) **109** for a very short time and is in the clear only in memory and for a very short time. During this execution phase, the Key **623** is protected via Tamper Resistant Code technology. Not having to retain this Key **623** in any form on the End-User Device(s) **109** once this Decryption and Re-Encryption **194** phase has completed, greatly lessens the possibility of piracy from hackers.

Once the song has been re-encrypted, it is stored in the Digital Content Library **196**. All metadata required for use by the Player Application **195**, is extracted from the associated Offer SC(s) **641** and also stored in the Digital Content Library **196**, step **1403**. Any parts of the metadata which are encrypted, such as the song lyrics, are decrypted and re-encrypted in the same manner as described above for the other content. The same SEAL key used to encrypt the Content **113** is used for any associated metadata needing to be encrypted.

D. The Player Application **195**

1. Overview

The Secure Digital Content Electronic Distribution Player Application **195** (referred to here as the Player Application **195**) is analogous to both a CD, DVD or other Digital Content player and to a CD, DVD, or other digital content storage management system. At its simplest, it performs Content **113**, such as playing songs or videos. At another level, it provides the End-User(s) a tool for managing his/her Digital Content Library **196**. And just as importantly, it provides for editing and playing of collections of content, such as songs, (referred to here as Play-lists).

The Player Application **195** is assembled from a collection of components that may be individually selected and customized to the requirements of the Content Provider(s) **101** and Electronic Digital Content Store(s) **103**. A generic version of the player is described, but customization is possible.

Referring now to FIG. **15** there is shown a block diagram of the major components and processes of the Player Application **195** running on End-User Device(s) **109** of FIG. **10**.

There are several component-sets that make up the subsystems of the Player Object Manager **1501**:

1. End-User Interface Components **1509**
2. Copy/Play Management Components **1504**
3. Decryption **1505**, Decompression **1506** and Playback Components **1507**
4. Data Management **1502** and Library Access Components **1503**
5. Inter-application Communication Components **1508**
6. Other miscellaneous (Installation, etc) Components

Components from within each of these sets may be selected, based on the requirements of:

- the platform (Windows, Unix, or equivalent)
- communications protocols (network, cable, etc)
- Content Provider(s) **101** or Electronic Digital Content Store(s) **103**
- Hardware (CD, DVD, etc)
- Clearinghouse(s) **105** technology and more.

The sections below detail the various component sets. The final section details how these components are put together in the generic player, and discusses how the components can be customized.

2. End-User Interface Components **1509**

Components from this set combine to provide the on-screen manifestation of the Player Application **195**. Note that the design establishes no definitive layout of these components. One such layout is provided in the generic player. Based on requirements from Content Provider(s) **101** and/or Electronic Digital Content Store(s) and other requirements, alternate layouts are possible.

This set is grouped into subgroups, starting with the components used to present End-User Display **1510** and handle controls called End-User Controls **1511** used for such low-level functions as audio playback, and presentation of metadata. Next, the End-User Display Component **1510** is further divided by special function groupings (Play-list, Digital Content Library), and then object-container components used for grouping and placing of those lower-level components.

Within the component listings below, any reference to creating CDs or copying of Content **113** to a CD or other recordable medium only applies to the case where the Player Application **195** has such functionality enabled. Also note that the term CD in that context is a generic one, that can also represent various other external recording devices, such as MiniDisc or DVD.

FIG. **16** is an example user interface screens of the Player Application **195** of FIG. **15** according to the present invention. Function for the End-User Controls **1511** include (corresponding screens of an End-User Interface are shown **1601–1605**):

Controls for performing the Content **113**:

- Play/Stop button
- Play button
- Stop button
- Pause button
- Skip forward button
- Skip backward button
- Volume control
- Track position control/display
- Audio channel volume level display and more.

Controls for the displaying metadata associated with the Content **113**

- Cover Picture button
- Cover Picture object
- Artist Picture button
- Artist Picture object
- Track List button
- Track List Information object
- Track List Selector object (click to play)
- Track Name object
- Track Information object
- Track Lyrics button
- Track Lyrics object
- Track Artist Name object
- Track Credits button
- Track Credits object
- CD Name object
- CD Credits button
- CD Credits object
- Generic (Configurable) Metadata button
- Generic Metadata object and more.

Function for the End-User Display **1510** include (corresponding screens of an End-User Interface are shown **1601–1605**):

Play-list of display container
Play-list Management button
Play-list Management window
Digital Content search button
Digital Content search Definition object
Digital Content search Submit button
Digital Content search Results object
Copy Selected Search Result Item To Play-list button
Play-list object (editable)
Play-list Save button
Play-list Play button
Play-list Pause button
Play-list Restart button
Create CD from Play-list button and more.
Display of Digital Content Library **196**
Digital content library button
Digital content librarian window
Digital content categories button
Digital content categories object
By-artist button
By-genre button
By-label button
By-category button
Delete button
Add-to-Play-list button
Copy to CD button
Song List object
Song List display container and more
Containers and Misc.
Player window container
Audio controls container
Metadata controls container
Metadata display container
Toolbar container object
Sample button
Download button
Purchase button
Record button
Player Name object
Label/Provider/Store Advertisement object
Label/Provider/Store URL button
Artist URL Button and more

3. Copy/Play Management Components **1504**

These components handle set up of encryption keys, Watermark processing, Copy management, etc. Interfaces also exist for communication with the Clearinghouse(s) **105**, transmission of purchase requests, etc, for special services such as pay per listen or cases where each access to the Content **113** is accounted for (if such finctionality is adopted). Currently, though, the Clearinghouse(s) **105** functions has been previously taken care of by the SC(s) Processor **192** Application when the Digital Content was acquired from the Electronic Digital Content Store(s) **103**.

4. Decryption **1505**, Decompression **1506** and Playback Components **1506**

These components use the keys acquired by the Copy/Play Management components to unlock the audio data acquired from the Data Management and Library Access components, apply the appropriate decompression to prepare it for playback, and use system audio services to play it.

5. Data Management **1502** and Library Access Components **1503**

These components are used to store and retrieve song data on various storage devices on the End-User(s)' system, as well as handle requests for information about the stored songs.

6. Inter-application Communication Components **1508**

These components are used for coordination between the Secure Digital Content Electronic Distribution Player and other applications (e.g., Browser, helper-app and/or plug-in, etc) that may invoke the Player Application **195**, or that the Player Application **195** needs to use when carrying out its functions. For example, when a URL control is activated, it invokes the appropriate browser and instruct it to load the appropriate page.

7. Other Miscellaneous Components

Individual components that don't fall into the categories above (e.g., Installation) are grouped here.

8. The Generic Player

In this section the combining of the components above into a version of the Player Application **195** is discussed. This is just one of many different examples possible, since the Player Application **195** is designed for customization by being based on software objects.

The Player Object Manager **1501** is a software framework holding all the other components together. As discussed in the sections above, the blocks below the Player Object Manager **1501** in this diagram are required for any player, but may be replaced by specialized versions depending on such things as form of encryption or scrambling being used, types of audio compression, access methods for the Content **113** library, and more.

Above the Player Object Manager **1501** are Variable Objects **1512**, which are mostly derived from the metadata associated with the Content **113** being played or searched. These Variable Objects are made available to the End-User Device(s) **109** by way of the End-User Display **1510** and received input from the End-User Controls **1511**. All objects are configurable, and the layouts of all containers are customizable. These objects may be implemented in C/C++, Java or any equivalent object oriented language.

Using the Player Application **195**

The following embodiment is for an example where the Player Application **195** running on End-User Device(s) **109** is an audio player where Content **113** is music. It should be understood to those skilled in the art that other types of Content **113** can be supported by the Player Application **195**. A typical audio enthusiast has a library of CDS holding songs. All of these are available within the Secure Digital Content Electronic Distribution System **100**. The set of songs that have been purchased from Electronic Digital Content Store(s) **103** are stored within a Digital Content Library **196** on his or her system. The groupings of songs that are analogous to physical CDS are stored as Play-lists. In some cases a Play-list exactly emulates a CD (e.g., all tracks of a commercially available CD has been purchased from an Electronic Digital Content Store(s) **103** as an on-line version of the CD and is defined by a Play-list equivalent to that of the CD). But most Play-lists is put together by End-User(s) to group songs they have stored in the Digital Content Libraries on their systems. However for the purposes of the ensuing discussions, an example of a custom made music CD is used when the term a Play-list is mentioned.

When the End-User(s) starts the Player Application **195** explicitly, rather than having it start up via invocation from the SC(s) Processor **192** Application, it pre-loads to the last Play-list that was accessed. If no Play-lists exist in the Digital Content Library **196**, the Play-list editor is started automatically (unless the user has turned off this feature via a preference setting). See The Play-list, below for further details.

The Player Application **195** may also be invoked with a specific song as an argument, in which case it immediately enters Song-play mode. Optionally, the song may be prepared for play but await action by the End-User(s) before proceeding. See Song Play, below for more on this situation.

The Play-list (corresponding screen of an End-User Interface **1603**):

When the End-User(s) has invoked the Play-list function, these are the available functions:

Open Play-list

Digital Content Librarian is invoked to display a list of stored Play-lists for selection. Also see Digital Content Librarian below for more info.

Edit Play-list

Invokes the Play-list Editor (see below), primed with the current Play-list if one has been loaded already. Otherwise the editor creates an empty Play-list to start with.

Run Play-list

Songs are played one at a time starting with the selected song (or the beginning of the play-list, if no song is selected). Options set in the Play-list Editor affect the sequencing of the playback. However there is controls available here to override those options for this play of the Play-list.

Play song

Only the selected song from the Play-list is played. See Song Play below for more info.

Play-list Info

Display information about the Play-list.

Song Info

Display information about the selected song within the Play-list.

Visit web site

Load web site associated with this Play-list into browser.

Librarian

Open the Digital Content Librarian window. Also see Digital Content Librarian below for more info.

The Play-list Editor (corresponding screen of an End-User Interface **1603**):

When invoking the Play-list editor, these are the End-User(s)' options:

View/Load/Delete Play-lists

Digital Content Librarian is invoked to display a list of stored Play-lists for selection of one to load or delete. Also see Digital Content Librarian below for more info.

Save Play-list

Current version of Play-list is saved in the Digital Content Library **196**.

Delete Song

Currently selected song is deleted from Play-list.

Add Song

Digital Content Librarian is invoked in song-search mode, for selection of song to add to the Play-list. Also see Digital Content Librarian below for more info.

Set Song Information

Display and allow changes to information about the selected song within the play-list. This information is stored within the Play-list, and does not alter information about the song stored within the Digital Content Library **196**. These things can be changed:

Displayed Song Title

End-User(s) notes about the song

Lead-in delay on playing the song

Follow-on delay after playing the song

Start-point within song when playing

End-point within song when playing

Weighting for random mode

Volume adjustment for this song and more. Set Play-list attributes: Display and allow changes to the attributes of this Play-list.

These attributes may be set:

Play-list title

Play-list mode (random, sequential, etc)

Repeat mode splay once, restart when done, etc)

End-User(s) notes about this Play-list Librarian (corresponding screen of an End-User Interface **1601**):

Open the Digital Content Librarian window. Also see Digital Content Librarian below for more info.

Song Play

When a song has been prepared for play, either by invoking the Player Application **195** with the song as an argument or by selecting a song for play from a Play-list or within the Digital Content Librarian, these are the End-User (s)' options: (corresponding screen of an End-User Interface **1601**):

Play

Pause

Stop

Skip Backward

Skip Forward

Adjust Volume

Adjust Track Position

View Lyrics

View Credits

View CD Cover

View Artist Picture

View Track Information

View other metadata

Visit web site

Play-list

Librarian and more.

Digital Content Librarian

The Digital Content Librarian can be invoked implicitly when selecting songs or Play-lists (see above) or may be opened in its own window for management of the Song Library on the End-User(s)' system. In that case, these are the End-User(s)' options:

Working with songs:

Sort All by Artist, Category, Label, other

Select Songs by Artist, Category, Label, other

Add selected songs to Current Play-list

Copy Song to CD (if enabled)

Delete Song

Add Song to Category and more.

Work with Play-lists:

Sort by Name

Sort by Category

Search by Keyword

Search by Included Song Title

Load Selected Play-list

Rename Play-list

Delete Play-list

Create CD from Selected Play-list (if enabled) and more.

Although a specific embodiment of the invention has been disclosed, it will be understood by those having skill in the art that changes can be made to this specific embodiment without departing from the spirit and scope of the invention. The scope of the invention is not to be restricted, therefore, to the specific embodiment, and it is intended that the appended claims cover any and all such applications, modifications, and embodiments within the scope of the present invention.

What is claimed is:

1. A method of securely providing data to a user's system, said method comprising the steps of:

encrypting the data using a first encrypting key;

encrypting a first decrypting key using a second encrypting key;

transferring the encrypted data, which has been encrypted with the first encrypting key, to the user's system;

transferring the encrypted first decrypting key, which has been encrypted with the second encrypting key, to the user's system;

transferring the encrypted first decrypting key, which has been encrypted with the second encrypting key, to a clearing house that possesses a second decrypting key;

decrypting the first decrypting key using the second decrypting key; and

transferring the decrypted first decrypting key to the user's system.

2. The method as defined in claim **1**, wherein the step of transferring the decrypted first decrypting key includes the sub-steps of:

re-encrypting the first decrypting key using a third encrypting key;

transferring the decrypted and re-encrypted first decrypting key to the user's system; and

decrypting the re-encrypted first decrypting key using a third decrypting key.

3. The method as defined in claim **1**, wherein the first encrypting key and the first decrypting key are symmetric keys.

4. The method as defined in claim **3**, wherein the second encrypting key is a public key of the clearinghouse and the second decrypting key is a corresponding private key of the clearinghouse.

5. The method as defined in claim **4**, wherein the step of transferring the decrypted first decrypting key includes the sub-steps of:

re-encrypting the first decrypting key using a third encrypting key, the third encrypting key being a public key of the user;

transferring the decrypted and re-encrypted first decrypting key to the user's system; and

decrypting the re-encrypted first decrypting key using a third decrypting key, the third decrypting key being a corresponding private key of the user.

6. The method as defined in claim **1**, wherein the step of transferring the encrypted first decrypting key to the user's system is performed by an electronic merchant and includes the sub-steps of:

initiating a purchase of the data or a license for the data from the electronic merchant; and

sending the encrypted first decrypting key and purchase transaction data to the user's system.

7. The method as defined in claim **6**,

wherein the step of transferring the encrypted first decrypting key to the user's system further includes the sub-step of charging the user for the data or the license, and

the step of decrypting the first decrypting key is performed by the clearinghouse and includes the sub-steps of:

verifying that the user has paid for the data or the license; and

decrypting the first decrypting key using the second decrypting key.

8. The method as defined in claim **6**, wherein the step of decrypting the first decrypting key is performed by the clearinghouse and includes the sub-steps of:

charging the user for the data or the license; and

decrypting the first decrypting key using the second decrypting key.

9. The method as defined in claim **1**, further comprising the step of decrypting the data using the first decrypting key.

10. The method as defined in claim **1**, wherein the data includes music data.

11. A method of securely providing data to a user's system, the data being encrypted so as to only be decryptable by a data decrypting key, the data decrypting key being encrypted using a first public key, and the encrypted data being accessible to the user's system, said method comprising the steps of:

transferring the encrypted data decrypting key to a clearing house that possesses a first private key, which corresponds to the first public key;

decrypting the data decrypting key using the first private key;

re-encrypting the data decrypting key using a second public key;

transferring the re-encrypted data decrypting key to the user's system, the user's system possessing a second private key, which corresponds to the second public key; and

decrypting the re-encrypted data decrypting key using the second private key.

12. The method as defined in claim **11**, wherein the step of transferring the encrypted data decrypting key to a clearing house includes the sub-steps of:

transferring the encrypted data decrypting key to the user's system; and

subsequently transferring the encrypted data decrypting key from the user's system to the clearing house.

13. The method as defined in claim **12**, wherein the sub-step of transferring the encrypted data decrypting key to the user's system is performed by an electronic merchant and includes the sub-steps of:

initiating a purchase of the data or a license for the data from the electronic merchant; and

sending the encrypted data decrypting key and purchase transaction data to the user's system.

14. The method as defined in claim 13,

wherein the sub-step of transferring the encrypted data decrypting key to the user's system further includes the sub-step of charging the user for the data or the license, and

the step of decrypting the data decrypting key is performed by the clearinghouse and includes the sub-steps of:

verifying that the user has paid for the data or the license; and

decrypting the data decrypting key using the first private key.

15. The method as defined in claim 13, wherein the step of decrypting the data decrypting key is performed by the clearinghouse and includes the sub-steps of:

charging the user for the data or the license; and

decrypting the data decrypting key using the first private key.

16. The method as defined in claim 11, further comprising the step of decrypting the encrypted data using the data decrypting key.

17. A method of operating a clearinghouse to provide integrity in a channel of commerce that includes a provider, a distributor, and a purchaser, the provider producing data and encrypting the data so as to only be decryptable by a data decrypting key, the encrypted data being accessible to the purchaser, said method comprising the steps of:

encrypting the data decrypting key using a public key of the clearinghouse;

sending the encrypted data decrypting key from the provider to the distributor;

when the purchaser desires to purchase the data or a license to use the data, sending the encrypted data decrypting key from the distributor to the purchaser;

sending the encrypted data decrypting key from the purchaser to the clearing house;

decrypting the data decrypting key using a private key of the clearinghouse and re-encrypting the data decrypting key using a public key of the purchaser; and

sending the re-encrypted data decrypting key from the clearinghouse to the purchaser.

18. The method as defined in claim 17,

wherein the distributor charges the user a fee before sending the encrypted data decrypting key to the purchaser, and

the clearinghouse verifies that the user has paid the fee before sending the re-encrypted data decrypting key to the purchaser.

19. The method as defined in claim 17, wherein the clearinghouse charges the user a fee before sending the re-encrypted data decrypting key to the purchaser.

20. The method as defined in claim 17, further comprising the steps of:

decrypting the re-encrypted data decrypting key using the private key of the purchaser; and

decrypting the encrypted data using the data decrypting key.

21. A system for securely providing data to a user's system, the system comprising:

a content system;

a first public key;

a first private key; which corresponds to the first public key;

a data encrypting key;

a data de-encrypting key for de-encrypting data encrypted using the data encrypting key;

first data encryption means for encrypting data so as to be decryptable only by a data decrypting key;

second data encryption means, using the first public key, for encrypting the decrypting key;

a clearing house;

first transferring means for transferring the data decrypting key which has been encrypted to the clearing house, wherein the clearinghouse possesses the first private key;

first decrypting means for decrypting the data decrypting key using the first private key;

a second public key;

a second private key; which corresponds to the second public key;

re-encryption means for re-encrypting the data decrypting key using the second public key;

second transferring means for transferring the re-encrypted data decrypting key to the user's system, wherein the user's system possesses the second private key; and

second decrypting means for decrypting the re-encrypted data decrypting key using the second private key.

22. The system as defined in claim 21, wherein the first transferring means further comprises:

a third transfer means for transferring the encrypted data decrypting key to the user's system; and

a fourth transfer means for subsequently transferring the encrypted data decrypting key from the user's system to the clearinghouse.

23. The system as defined in claim 22, wherein the third transfer means is performed by an electronic merchant and further comprises:

initiating means for initiating a purchase of the data or a license for the data from the electronic merchant; and

sending means for sending the encrypted data decrypting key and purchase transaction data to the user's system.

24. The system as defined in claim 23, wherein the sending means further comprises:

charging means for charging the user for the data or the license; and

wherein the first decrypting means is performed by the clearinghouse and further comprises:

verifying means for verifying that the user has paid for the data or the license; and

third decrypting means for decrypting the data decrypting key using the first private key.

25. The system as defined in claim 23, wherein the first decrypting means is performed by the clearinghouse and further comprises:

charging means for charging the user for the data or the license; and

fourth decrypting means for decrypting the data decrypting key using the first private key.

26. The system in claim 21, further comprises:

data decrypting key decrypting means for decrypting the encrypted data using the data decrypting key.

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