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Weber

(54) METHOD FOR USING COMMUNICATION CHANNEL ROUND-TRIP RESPONSE TIME FOR DIGITAL ASSET MANAGEMENT

(76) Inventor: **Joseph W. Weber**, Louisville, CO (US)

Correspondence Address:
PATTON BOGGS
1660 LINCOLN ST
SUITE 2050
DENVER, CO 80264 (US)

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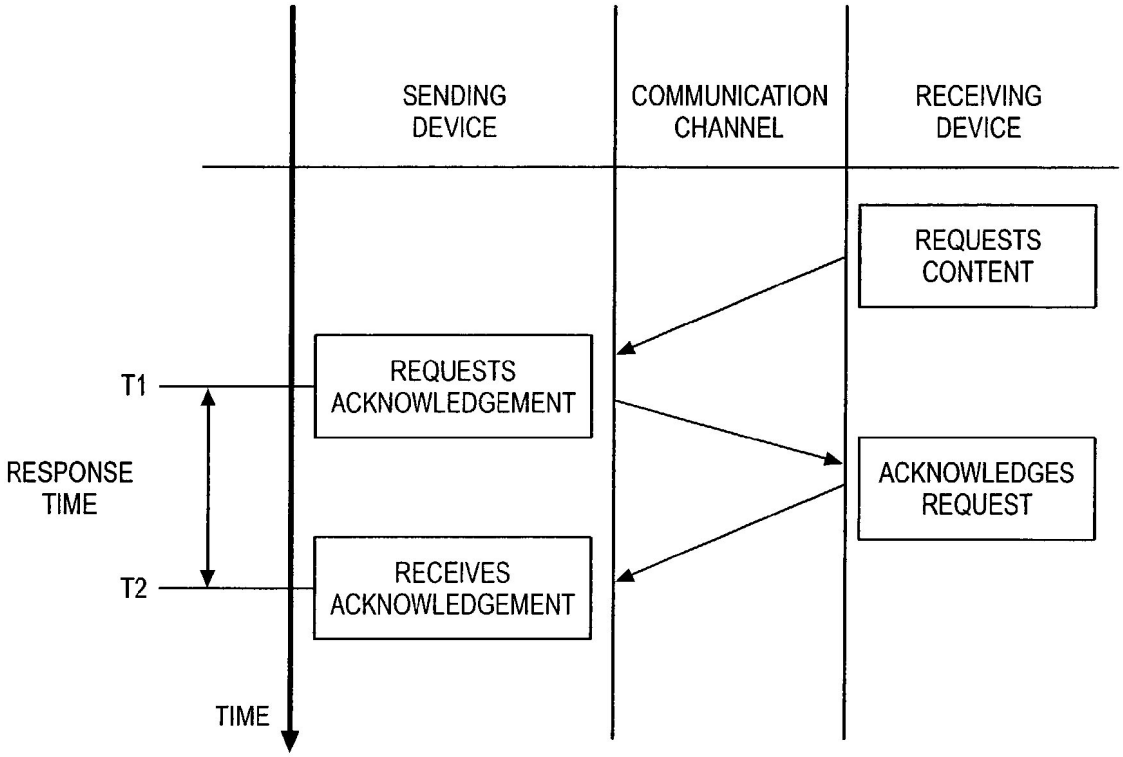
(57) ABSTRACT

The present method for using communication channel round-trip response time for digital asset management utilizes a predetermined distance between a sending device and a receiving device to prevent unauthorized receipt of digital content when the unauthorized receiving device is located beyond the predetermined distance. When the receiving device requests digital content from the sending device, the sending device replies with a request for an acknowledgement. The receiving device sends the requested acknowledgement. The time between sending the request for an acknowledgement and receipt of the acknowledgement is the actual round-trip response time. The actual round-trip response time is compared to a predetermined response time limit for the predetermined distance and if the actual response time is within the predetermined response time limit, the request for digital content is granted and if the actual round-trip response time is not within the predetermined response time limit, the request for digital content is denied.



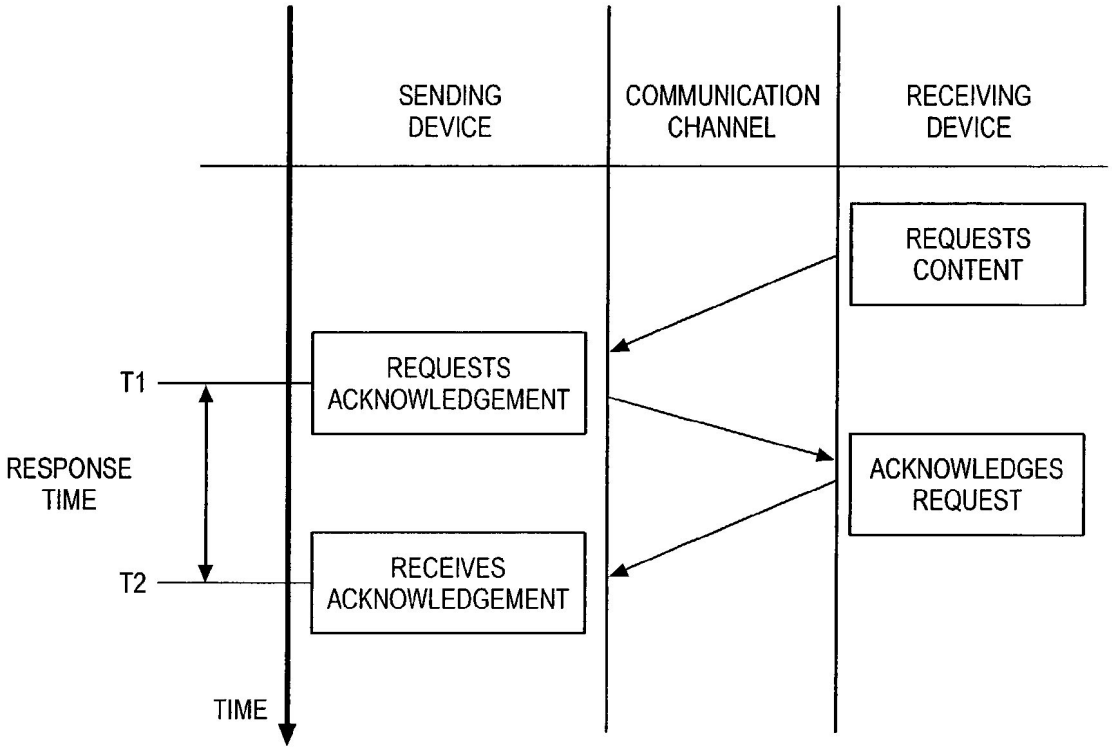

SENDING DEVICE
COMMUNICATION CHANNEL
RECEIVING DEVICE
REQUESTS CONTENT
REQUESTS ACKNOWLEDGEMENT
ACKNOWLEDGES REQUEST
RECEIVES ACKNOWLEDGEMENT
T1
T2
RESPONSE TIME
TIME

FIG. 1

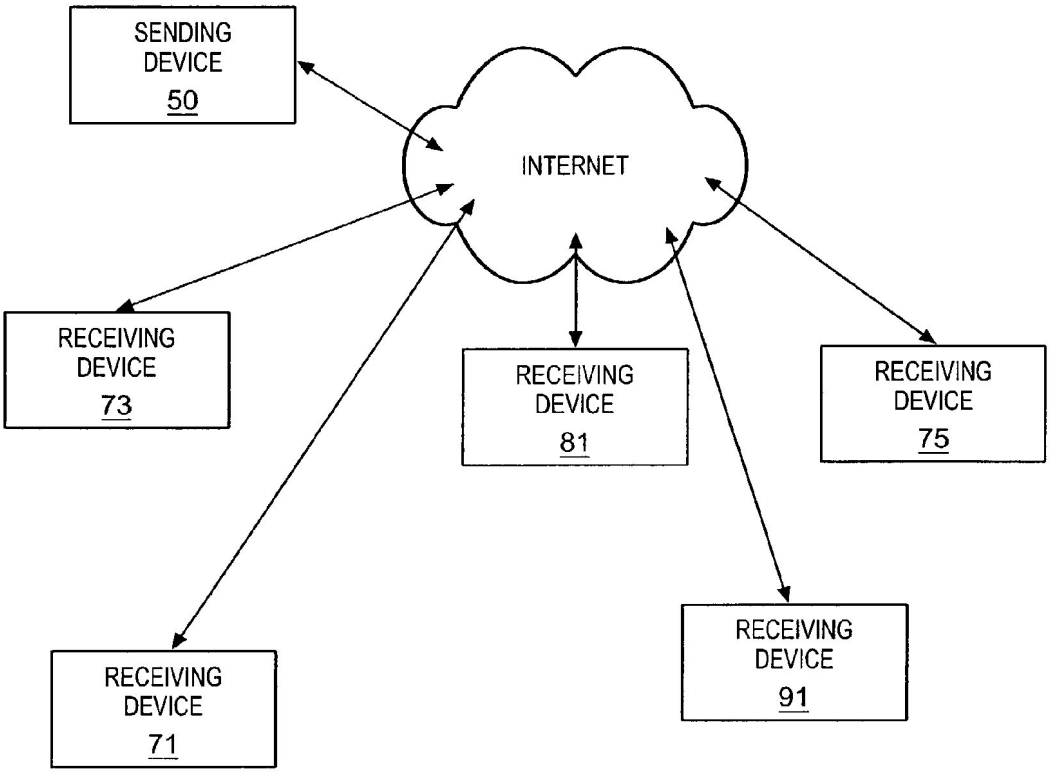

SENDING DEVICE 50
INTERNET
RECEIVING DEVICE 73
RECEIVING DEVICE 81
RECEIVING DEVICE 75
RECEIVING DEVICE 91
RECEIVING DEVICE 71

FIG. 2

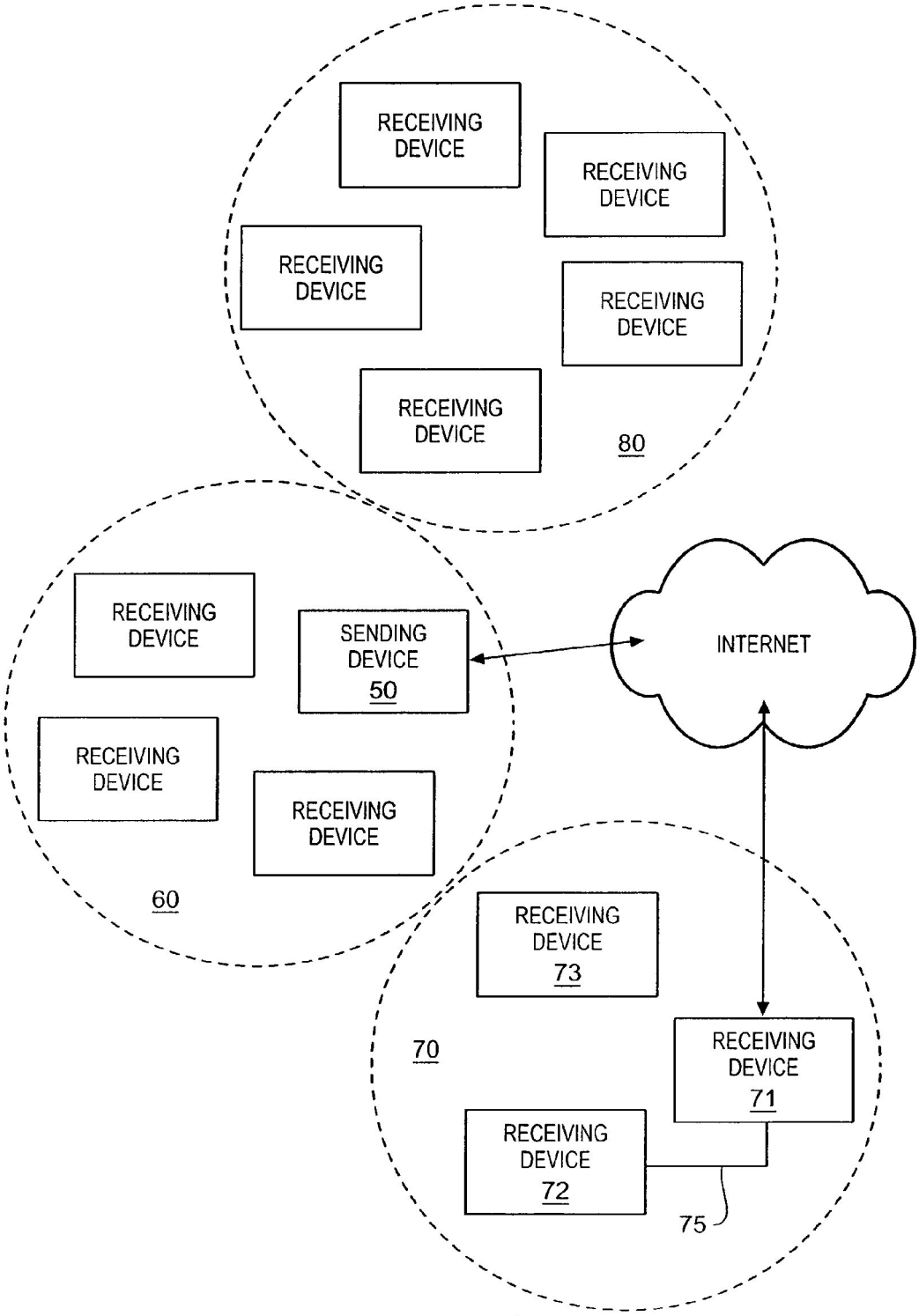

RECEIVING DEVICE
RECEIVING DEVICE
RECEIVING DEVICE
RECEIVING DEVICE
RECEIVING DEVICE
80
RECEIVING DEVICE
SENDING DEVICE 50
INTERNET
RECEIVING DEVICE
RECEIVING DEVICE
60
RECEIVING DEVICE 73
70
RECEIVING DEVICE 71
RECEIVING DEVICE 72
75

FIG. 3

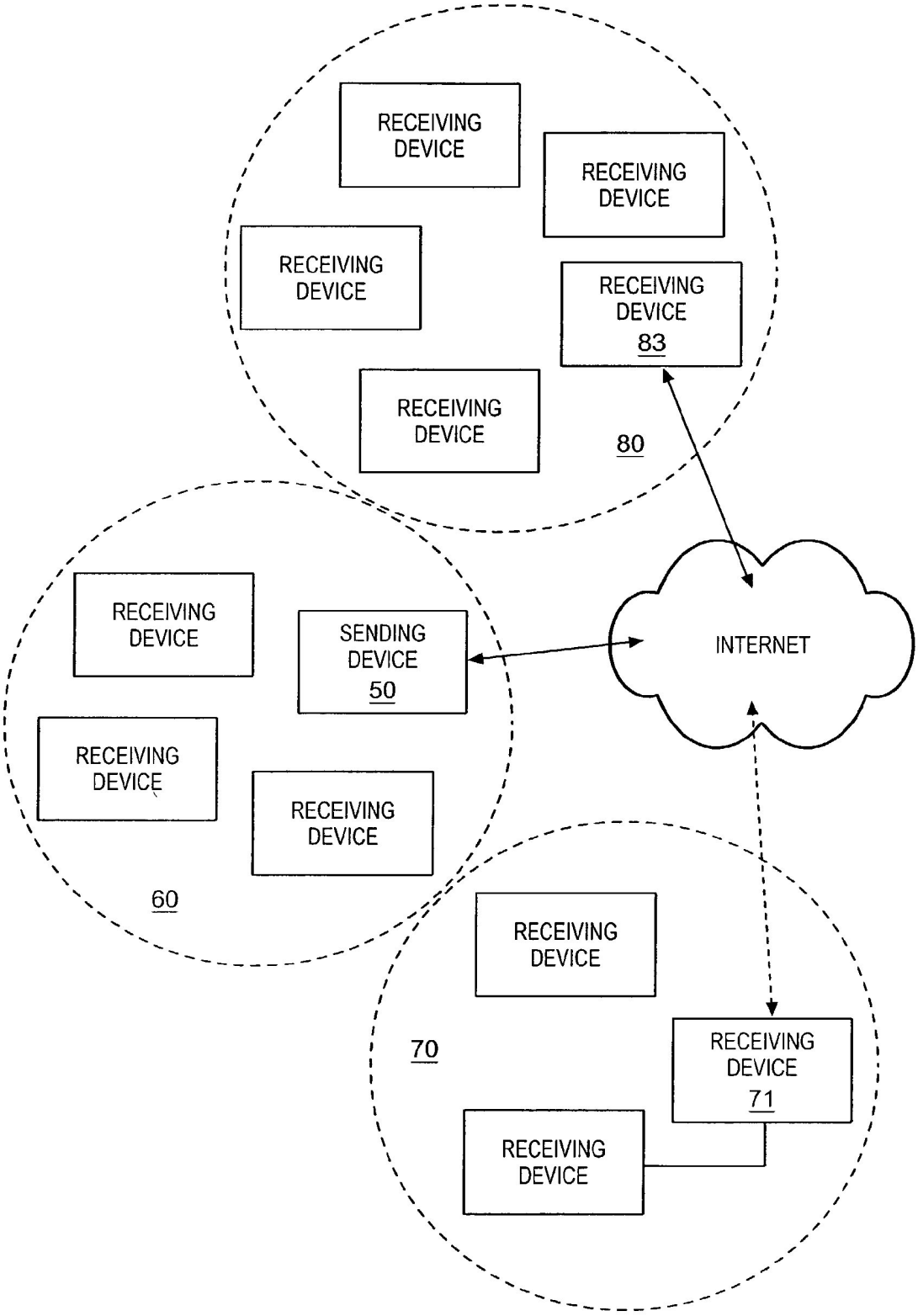
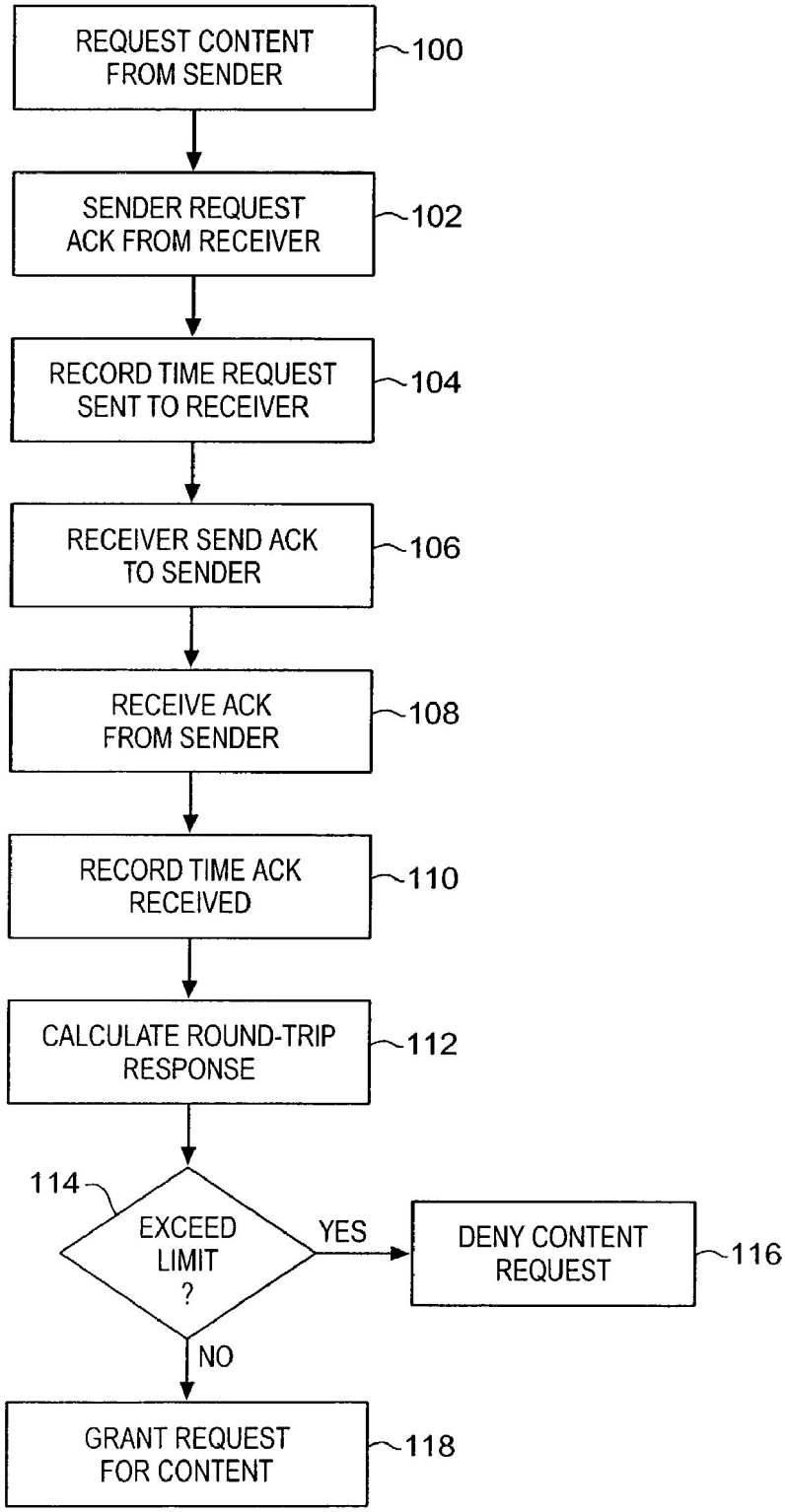

RECEIVING DEVICE
RECEIVING DEVICE
RECEIVING DEVICE
RECEIVING DEVICE
83
RECEIVING DEVICE
80
RECEIVING DEVICE
SENDING DEVICE
50
INTERNET
RECEIVING DEVICE
RECEIVING DEVICE
60
RECEIVING DEVICE
70
RECEIVING DEVICE
71
RECEIVING DEVICE

FIG. 4

FIG. 5


REQUEST CONTENT FROM SENDER
100
SENDER REQUEST ACK FROM RECEIVER
102
RECORD TIME REQUEST SENT TO RECEIVER
104
RECEIVER SEND ACK TO SENDER
106
RECEIVE ACK FROM SENDER
108
RECORD TIME ACK RECEIVED
110
CALCULATE ROUND-TRIP RESPONSE
112
114
EXCEED LIMIT ?
YES
DENY CONTENT REQUEST
116
NO
GRANT REQUEST FOR CONTENT
118

METHOD FOR USING COMMUNICATION CHANNEL ROUND-TRIP RESPONSE TIME FOR DIGITAL ASSET MANAGEMENT

FIELD OF THE INVENTION

[0001] This invention relates to digital communication and more specifically, to protecting digital content from unauthorized distribution outside of a geographic region.

PROBLEM

[0002] It is a problem in the field of digital communication to prevent unauthorized access to digital content sent from a sending device to a receiving device over an insecure communication channel while also providing digital content delivery upon request.

[0003] Often, the geographical area within which the digital content is distributed and available for receipt by receiving devices is known, for example, a single home, a secure building or a campus of buildings. When distributing the digital content over an insecure communication channel from the sending device to the receiving device within the geographical area, traditional digital rights management systems use digital authentication, such as shared secrets and key exchange, to verify that the receiver is authorized to receive the digital content. Examples include the PGP (Pretty Good Privacy), Kerberos, DTCP (Digital Transmission Content Protection) and HDCP (High-Bandwidth Digital Content Protection).

[0004] The insecure electronic communication channels are used to share part of those secrets to ensure to the sending device that it trusts the receiving device. The communication channel over which the digital content is transferred may be any electronic channel such as the electronic links using the Internet Protocol (IP). Many of the communication channels, including those using IP, do not include a method for determining whether the receiving device is located near or far away from the sending device. The receiving device may be a receiving device located anywhere on the global Internet.

[0005] A problem arises when the authentication method used by the sending device to authenticate the receiving device, is compromised. If an unauthorized receiving device acquires the shared secret or the exchanged key, the unauthorized receiving device may use the shared secret or the exchanged key to **13208.126** convince the sending device that the unauthorized receiving device is authorized to receive the digital content. Therefore, it is possible for the sending device to unknowingly send the digital content to an unauthorized receiving device located anywhere on the global Internet. Traditional digital authentication fails to provide an added layer of security wherein the sending device determines whether the authenticated receiving device is within a predetermined area and therefore authorized to receive the distributed digital content.

[0006] For this reason, a need exists for a method for preventing distribution of digital content from a sending device to a receiving device located outside of a predetermined area.

SOLUTION

[0007] The present method for using communication channel round-trip response time for digital asset management utilizes a predetermined distance between the sending device and the receiving device to prevent unauthorized receipt of the digital content when the unauthorized receiving device is located beyond the predetermined distance from the sending device. When the receiving device requests digital content from the sending device, the sending device replies to the receiving device with a request for an acknowledgement. In response to the request for an acknowledgement, the receiving device sends the requested acknowledgement to the sending device. The time between sending the request for an acknowledgement to the receiving device and receipt of the acknowledgement is the actual round-trip response time. The actual round-trip response time is compared to a predetermined response time limit and if the actual response time is within the predetermined response time limit, the request for digital content is granted and digital content is sent to the requesting receiving device. If the actual round-trip response time is not within the predetermined response time limit, the request for digital content is denied and digital content is not sent to the requesting receiving device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] **FIG. 1** is a diagram of the round-trip response time in accordance with the present method for using communication channel round-trip response time for digital asset management;

[0009] **FIG. 2** illustrates an example of receiving devices located a predetermined distance from the sending device in accordance with the present method for using communication channel round-trip response time for digital asset management;

[0010] **FIG. 3** illustrates an example of receiving devices located within defined geographical areas in accordance with the present method for using communication channel round-trip response time for digital asset management;

[0011] **FIG. 4** illustrates another example of receiving devices located within defined geographical areas in accordance with the present method for using communication channel round-trip response time for digital asset management; and

[0012] **FIG. 5** is a flow diagram illustrating the present method for using communication channel round-trip response time for digital asset management.

DETAILED DESCRIPTION

[0013] The present method for using communication channel round-trip response time for digital asset management summarized above and defined by the enumerated claims may be better understood by referring to the following detailed description, which should be read in conjunction with the accompanying drawings. This detailed description of the preferred embodiment is not intended to limit the enumerated claims, but to serve as a particular example thereof. In addition, the phraseology and terminology employed herein is for the purpose of description, and not of limitation.

[0014] Traditional digital rights management systems authenticate receiving devices based on shared secrets or exchanged keys. Examples of traditional digital rights management authentication methods include Pretty Good Pri-

vacy (PGP), Digital Transmission Content Protection (DTCP) and High-Bandwidth Digital Content Protection (HDCP) link-copy-protection systems. Insecure electronic communication channels are used to share part of those secrets to ensure to the sending device that it trusts the receiving device. However, electronic channels, such as the IP based Internet, allow the sending devices and the receiving devices to be located anywhere in the world. When the shared secret key is comprised, it is possible for unauthorized receiving devices to use the compromised secret key to convince the sending device that the unauthorized receiving device is authorized to receive the digital content.

[**0015**] The present method for using communication channel round-trip response time for digital asset management utilizes predetermined distance between the sending device and the receiving device to prevent unauthorized receipt of the digital content when the unauthorized receiving device is located beyond the predetermined distance from the sending device. Referring to **FIG. 1**, the receiving device requests digital content from the sending device. Upon receipt of the request for digital content, the sending device replies to the receiving device with a request for an acknowledgement. In response to the request for an acknowledgement, the receiving device sends the requested acknowledgement to the sending device. The time between sending the request for an acknowledgement to the receiving device and receipt of the acknowledgement is the round-trip response time. In other words, if the request for an acknowledgement is sent at time T**1** as shown in **FIG. 1**, and the acknowledgement is received by the sending device at T**2**, the round-trip response time is the difference between T**1** and T**2**.

[**0016**] In the example illustrated in **FIG. 2**, the receiving device **75** has a physical address representing the location of the receiving device **75**, and the physical address is known by the sending device **50**. Based on the known physical address, sending device **50** determines a distance between sending device **50** and receiving device **75** to further identify receiving device **75**. The predetermined distance between sending device **50** and receiving device **75** has a corresponding predetermined response time limit. By calculating the actual round-trip response time using the difference between T**1** and T**2**, and comparing the actual round-trip response time to the predetermined response time limit, sending device **50** is able to determine if receiving device **75** is located within the predetermined distance. If the receiving device is within the predetermined distance from sending device **50**, sending device **50** grants the requests for digital content. If the receiving device is not within the predetermined distance from sending device **50**, sending device **50** denies the requests for digital content. Using the physical location of receiving devices to determine whether or not the sending device trusts the receiving device limits the number of security breaches to those receiving devices located within the same distance from the sending device as the authorized receiving device **71**, such as receiving device **73** in this example. Receiving devices having a distance between the receiving device and the sending device that is greater than or less that the predefined distance, i.e. receiving devices **71**, **81** and **91**, would not have the ability to breach the added layer of security, and therefore would not received requested digital content even when the receiving device is authenticated using a compromised secrets.

[**0017**] In another embodiment, geographical areas are used in place of predetermined distances between the sending device and the receiving device. Referring to the example of receiving devices located within defined geographical areas illustrated in **FIG. 3, a** sending device **50** may send digital content to receiving devices in more than one geographical area. Each geographical area has a-predetermined round-trip response time corresponding to the geographical area. In this example, receiving devices within the predefined geographical areas **60**, **70** and **80** are assigned the predetermined response time limit corresponding to the geographical area in which they are located.

[**0018**] Referring to **FIG. 2** in conjunction with the flow diagram of **FIG. 5**, in step **100** sending device **50** located within geographical area **60** receives a request for digital content from receiving device **71** which is located within geographical area **70**. Upon receipt of the request for digital content, sending device **50** sends a request for acknowledgement in step **102** to receiving device **71**. Substantially simultaneously the sending device **50** records the time in step **104** at which the sending device sent the request for an acknowledgement to receiving device **71**. In response to receiving the request for an acknowledgement, in step **106** receiving device **71** sends the requested acknowledgement to sending device **50**. Substantially simultaneously to receiving the requested acknowledgement in step **108**, sending device **50** records the time at which sending device **50** receives the acknowledgement in step **110**.

[**0019**] Using the time recorded in step **104** for sending the request for an acknowledgement and the time recorded in step **110** corresponding to receiving the acknowledgement, the sending device calculates an actual round-trip response time in step **112**. The calculated actual round-trip response time is compared to predetermined response time limit for the geographical area in which receiving device **71** is located, geographical area **70** in this example. If the actual round-trip response time is within the predetermined response time limit in step **114**, the request for digital content is granted in step **118**. However, if the actual round-trip response time exceeds the predetermined response time limit in step **114** for geographical area **70**, the request for digital content is denied in step **116**. Use of the present method for using communication channel round-trip response time for digital asset management adds an additional layer of securing digital content distributed over insecure communication channels over and above the traditional Digital Rights Management (DRM) systems. Security breaches would be limited to receiving devices within predetermined geographical area **70**, i.e. receiving devices **72** and **73**. Receiving devices located within predetermined geographical areas **60** and **80** would not have the ability to breach the added layer of security.

[**0020**] In another example illustrated in **FIG. 4**, sending device **50** receives a request for digital content from receiving device **83**. In this example, receiving device **83** has previously comprised receiving device **71** and is using the secret or secret keys of receiving device **71** to convince sending device **50** that receiving device **83** is authorized to receive the requested digital content. Upon receipt of the request for digital content, sending device **50** sends a request for an acknowledgement from receiving device **83**. Upon receipt of the request for an acknowledgement, receiving device **83** sends an acknowledgement to sending device **50**.

As previously described, upon receipt of the acknowledgement, sending device **50** calculates an actual round-trip response time and compares the actual round-trip response time to the predetermined response time limit corresponding to receiving device **71**, geographical area **70** in this example. Since receiving device **83** is not within the geographical area **70** of the authorized receiving device **71**, the actual round-trip response time is not within the predetermined response limit for geographical area **70**, and the request for digital content is denied. Thus preventing unauthorized receiving device **83** from receiving the requested digital content.

[**0021**] As to alternative embodiments, those skilled in the art will appreciate that the present method for using communication channel round-trip response time for digital asset management may be implemented with alternative methods of determining a distance between the sending device and the receiving device. The geographical areas may be adjacent geographical areas as illustrated in **FIG. 2**, the geographical area may overlap, or may be a geographical area anywhere on the global Internet many miles from the sending device. The predetermined geographical areas have been illustrated as circular area but may be of any size and shape and may or may not be related to physical address characteristics such as area code or zip code. While the predetermined distance and the predetermined geographical areas have been described as having a predefined round-trip response time limit, alternative methods of comparing the actual round-trip response time to a threshold or a set of limits may be substituted.

[**0022**] It is apparent that there has been described method for using communication channel round-trip response time for digital asset management that fully satisfies the objects, aims, and advantages set forth above. While the method for using communication channel round-trip response time for digital asset management has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications, and/or variations can be devised by those skilled in the art in light of the foregoing description. Accordingly, this description is intended to embrace all such alternatives, modifications and variations as fall within the spirit and scope of the appended claims.

What is claimed is:

1. A method for preventing distribution of digital content to a receiving device located within a predetermined distance of a sending device, the method comprising the steps of:

at said sending device, receiving a request for digital content from said receiving device;

in response to receiving said request, requesting an acknowledgement from said receiving device;

in response to receiving said request for said acknowledgement, sending said acknowledgement to said sending device;

in response to receiving said acknowledgement at said sending device; determining an actual round-trip response time for said request for said acknowledgement; and

using said actual round-trip response time to determine if said receiving device is located within said predetermined distance of said sending device.

2. The method of claim 1 wherein the step of requesting an acknowledgement from said receiving device further comprises:

substantially simultaneously to requesting said acknowledgement, recording a first time representing when said request for said acknowledgement was sent.

3. The method of claim 2 wherein the step of receiving said acknowledgement further comprises:

substantially simultaneously to receiving said acknowledgement, recording a second time representing when said acknowledgement was received at said sending device.

4. The method of claim 3 wherein the step of determining a round-trip response time comprises:

comparing said first time and said second time to determine said actual round-trip response time.

5. The method of claim 1 wherein said step of using said round-trip response time further comprises:

comparing said actual round-trip response time to a predetermined response limit representing said predetermined distance, wherein if said actual round-trip response time is within said predetermined response limit, said request for digital content is granted and if said actual round-trip response time is not within said predetermined response level, denying said request for digital content.

6. A method for detecting a request for digital content from an unauthorized receiving device, the method comprising the steps of:

establishing a predetermined reference between a sending device and an authorized receiving device, said predetermined reference having a corresponding predetermined response time;

receiving said request for digital content at said sending device from said unauthorized receiving device;

in response to receiving said request for digital content, sending a request for an acknowledgement to said unauthorized receiving device;

in response to receiving said request for acknowledgement, sending said acknowledgement to said sending device;

in response to receiving said acknowledgement at said sending device, determining an actual round-trip response time; and

comparing said actual round-trip response time to said predetermined response time, wherein if said actual round-trip response time exceeds said predetermined round-trip response limit for said authorized receiving device, said unauthorized receiving device is not authorized to receive said digital content.

7. The detection method of claim 6 wherein the step of sending a request for an acknowledgement further comprises:

substantially simultaneously to requesting said acknowledgement, recording a time representing when said request for said acknowledgement was sent to said receiving device.

8. The detection method of claim 7 wherein the step of receiving said acknowledgement from said receiving device further comprises:

substantially simultaneously to receiving said acknowledgement, recording a receive time representing when said acknowledgement was received at said sending device.

9. The detection method of claim 7 wherein the step of determining an actual round-trip response time comprises:

calculating a difference between said send time and said receive time to determine said actual round-trip response time.

10. The detection method of claim 6 wherein the step of determining an actual round-trip response time comprises:

calculating a difference between sending said request for said acknowledgement from said sending device and receiving said acknowledgement at said sending device.

11. A method for preventing distribution of digital content from a source device to an unauthorized destination device located outside of a predetermined geographical area, the method comprising the steps of:

receiving a request from a destination device for said digital content from said source device;

in response to receiving said request for digital content, requesting an acknowledgement from said destination device;

substantially simultaneously to sending said request for said acknowledgement, recording a first time denoting the time that said request for acknowledge was sent to said destination device;

in response to receiving said acknowledgement request from said source device, sending an acknowledgement from said destination device to said source device;

receiving said acknowledge at said source device from said destination device;

substantially simultaneously to receiving said acknowledge at said source device, recoding a second time denoting the time that said acknowledgement from said destination device was received at said source device;

calculating a difference between said first time and said second time to determine a round-trip response time; and

comparing said round-trip response time to a predetermined response limit representing said predetermined geographical area, if said round-trip response time exceeds said predetermined response limit, denying said request for digital content and if said round-trip response time does not exceed said predetermined response limit, granting said request for said digital content.

* * * * *