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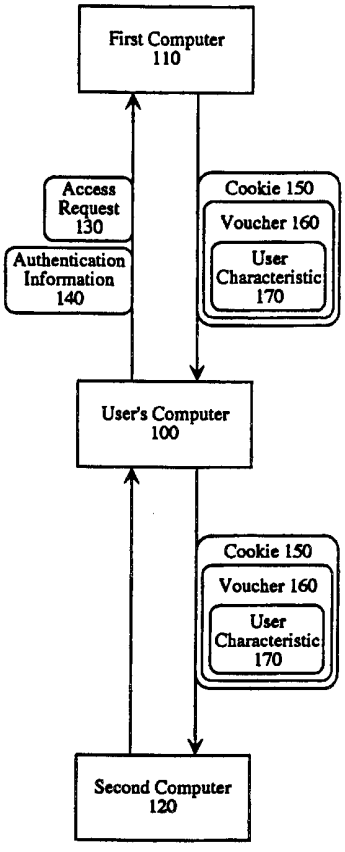
(54) Title: METHOD AND SYSTEM FOR AUTHENTICATION AND SINGLE SIGN ON USING CRYPTOGRAPHICALLY ASSURED COOKIES IN A DISTRIBUTED COMPUTER ENVIRONMENT

(57) Abstract

Cryptographically assured data structures are created to enable a single sign on and/or authentication method for securely transferring user authentication information from a first computer to a second computer to allow the user to seamlessly interact with the second computer without necessarily re-authenticating himself thereto. Thus, if a second computer trusts the methods used by a first computer to authenticate a user, then the second computer can use a cryptographically assured cookie created by the first computer to authenticate the user, without requiring the user to perform an explicit authentication step at the second computer. More particularly, a cryptographically assured cookie is made by creating a cryptographically assured voucher of a user characteristic at the first computer, and embedding the voucher into a cookie for transmission to the user's computer and hence to the second computer.



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METHOD AND SYSTEM FOR AUTHENTICATION AND SINGLE SIGN ON USING CRYPTOGRAPHICALLY ASSURED COOKIES IN A DISTRIBUTED COMPUTER ENVIRONMENT

1. FIELD OF THE INVENTION

The present invention relates to securely transferring user authentication information from a first computer to one or more other computers to allow the user to interact with the other computers without necessarily having to explicitly identify himself thereto. More particularly, the present invention includes the use of cryptographically assured cookies in a distributed computer environment.

2. BACKGROUND OF THE INVENTION

The widespread proliferation of links among networked computers allows users to effortlessly navigate from one computer to another. For example, in the Internet environment, users can obtain publicly available information by following links from any computer to any other computer, in an anonymous fashion, without previously knowing of, being known to, or having an account on, the other computer. However, to access certain secure areas of a business's web site, or to carry out an electronic transaction (e.g., a purchase), the user must typically be known to and/or have an account on, that web site. Today, the user must perform a separate sign on and/or authentication process with each such web site, i.e., the fact that the user has authenticated himself to a first site can not be easily transferred to an unrelated second site.

The data structures known as "cookies" have conventionally served as a general mechanism by which server computers can store and retrieve information on a client computer. For example, a conventional cookie allows a server computer to customize its web site for a particular client computer by reading the preferences information stored in a conventional cookie in the client computer. Typically, the server computer would be a computer running a business's web site and the client computer would be a user's computer running a web-browser program. Conventional cookies are also used to authenticate registered users of a particular web site without requiring them to sign in

again every time they access that same web site. Additional information regarding conventional cookies can be found at http://www.illuminatus.com/cookie.fcgi.

However, conventional cookies can not be used for transferring authentication from one site to another site for two reasons. First, the degree of security provided by conventional cookie authentication is inadequate for many types of transactions, even in the single site (same site) case. For example, banks offering on-line banking services on the Internet often require sophisticated security measures for the storage of highly confidential information that are not contemplated by conventional cookies.

Second:

> **A browser will not give up it's cookie data to any server except the one that set it.** If your browser went around spewing all it's cookies to every site you hit this would be a security risk and would make cookies worthless. (emphasis in the original -- see http://www.illuminatus.com/cookie.fcgi)

Therefore, the conventional mechanism of cookies does not allow for transferring authentication. Instead, the user must perform a separate authentication process with each business web site, even if the user has already gone through a reliable, secure authentication process at a previous business web site. This multiple sign on process is redundant, inefficient, and cumbersome for the user. As the amount of business being done on the Internet increases, or as specialization leads to the outsourcing to third parties of certain parts of an electronic transaction such as bill payment, this multiple sign on process will become increasingly cumbersome for the user.

All of the foregoing shows that there is a need to develop methods and systems for securely transferring user authentication information from a first computer to a second computer to allow the user to seamlessly interact with the second computer without necessarily re-authenticating himself thereto.

SUMMARY OF THE INVENTION

The present invention overcomes the limitations and disadvantages of the prior art by providing a method for securely transferring user authentication information from a first computer to a second computer to allow the user to seamlessly interact with the second computer without necessarily re-authenticating himself thereto. Cryptographically assured data structures are created to enable a single sign on and/or authentication method. Thus, if a second computer trusts the methods used by a first computer to authenticate a user, then the second computer can use a cryptographically assured cookie created by the first computer to authenticate the user, without requiring the user to perform an explicit authentication step at the second computer.

This system has numerous advantageous over the prior art. The user does not necessarily have to go through an explicit authentication step at each business web site (although, for added security, such could also be used). In addition, the user does not necessarily have to remember authentication information such as user names and user passwords for each business web site. The transfer of user authentication information can be done easily, seamlessly, and securely, thus facilitating transactions in which the user either does not know the second computer, or would be inconvenienced by having to separately authenticate himself thereto. The first and second computers could be, without limitation, virtually any type of content service provider on the Internet.

In an exemplary embodiment of the invention particularly well suited to Internet applications, a cryptographically assured cookie is made by creating a cryptographically assured voucher at the first computer, and embedding the voucher into a cookie for transmission to the user's computer and hence to the second computer. Although conventional cookies and cryptography are both known in the prior art, the combination of these two components to create a new type of cryptographically assured cookie is not known or suggested by the prior art. Indeed, the prior art teaches away from cookies as used in the present invention.

For example, as discussed in the Background, the prior art teaches away from the present invention by prohibiting cookies created by one server (i.e., a first computer) from being disclosed to or read by another server (i.e., a second computer). More particularly, the prior art teaches that this would create a security risk and make cookies worthless.

These prior art teachings concerning conventional cookies are diametrically opposed to the present invention, which teaches how to have cookies created by one computer be read by other computers without creating a security risk.

The foregoing and other embodiments and aspects of the present invention will become apparent to those skilled in the art in view of the subsequent detailed description of the invention taken together with the appended claims and the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic illustrating an exemplary system allowing authentication and single sign on using cryptographically assured cookies.

FIG. **2** is a flow chart illustrating an exemplary method for authentication and single sign on using cryptographically assured cookies.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates an exemplary system for authentication and single sign on in which a user (at user computer **100**) known to a first computer **110** but not to a second computer **120** can, via a single sign on to the first computer **110**, be authenticated thereby to the second computer **120** via the mechanism of a cryptographically assured cookie. As used herein, the term computer refers to any device that processes information using an integrated circuit chip, including without limitation mainframe computers, desktop computers, portable computers, embedded computers, and hand-held computers.

Referring now to FIG. 2, at step **200**, the user transmits an access request **130** from the user's computer **100** to the first computer **110**. The user also sends authentication information **140** to the first computer **110**, which the first computer **110** uses to authenticate the user at step **210**. Depending on the extent of the previous relationship (if any) between the user and first computer **110**, and the desired level of security, such authentication information could encompass a wide range of possibilities, ranging from simple passwords all the way to so-called digital certificates.

In any event, once the first computer **110** authenticates the user, such authentication may be transferred to the second computer **120** as follows. The first computer **110** uses a

data structure for passing the authentication to the second computer **120**. In an exemplary embodiment particularly well suited for Internet applications, the data structure could be a cryptographically assured cookie **150** that is made by creating a cryptographically assured voucher **160** at the first computer **110**, and embedding the voucher **160** into the cookie **150** for transmission to the user's computer **100** and hence to the second computer **120**.

More particularly, after having authenticated the user, at step **220** the first computer **110** either: (a) embeds a user characteristic **170** in an existing cookie; or (b) creates a new cookie containing user characteristic **170**. User characteristics **170** could include virtually any data that first computer **110** wishes to send to the second computer **120** based on the first computer's authentication of the user and/or to facilitate the second computer's authentication of the user. Thus, without limitation, user characteristic **170** may include information such as the user's network identity, domain, password, account number, and session preferences.

In an exemplary embodiment, at step **230**, the first computer **110** cryptographically assures all or part of user characteristic **170** to create a digital voucher **160** that is placed in the cookie **150** and, at step **240**, transmits the cookie **150** to the user's computer **100**. The cryptographic assurance can be provided by any of a number of well-known asymmetric or symmetric encryption protocols such as RSA or DES or combinations thereof. For example, if asymmetric cryptography is used, the first computer **110** could encrypt or digitally sign the user characteristic **170** (or the digital voucher **160**) using the first computer's private key. A second computer **120** having the corresponding public key could then decrypt the encryption (or signature) to verify or authenticate the user characteristic **170**.

The second computer **120** could already have the first computer's public key (e.g., from a prior transaction) or could obtain it via any of a number of standard techniques including but not limited to: (a) via an off-line key exchange; (b) from a commonly known trusted third party, or (c) via the first computer's digital certificate. These and other standard techniques for secure key exchange, as well as details of the aforementioned protocols, are well known to those skilled in the art and need not be described in detail here.

The digital voucher **160** may optionally include such information as the user's identity at the second computer **120**, the domain identity of the first computer **110**, the

creation time for the digital voucher **160**, an expiration time for the digital voucher **160**, information for synchronizing the time outs of the first computer **110** and the second computer **120**, instructions to return the user to the first computer **110** when communication with the second computer **120** ends, instructions to send the user to another computer when communication with the second computer **120** ends, and any other characteristic of the voucher and/or the communication.

The expiration time for the digital voucher **160** can be set to a relatively small increment from the time the voucher was created to increase the security of the system. The system security increases as the time increment decreases. The security of the system can also be increased by having the second computer **120** check the validity of the time that the cookie **150** was created, the validity of the expiration time, and/or that the time on the second computer **120** has not reached the expiration time specified in the voucher **160**. In general, but especially for small time increments, it is advantageous to synchronize the times at the first and second computers. The Internet standard time synchronization protocol NTP can be used to synchronize the time of the first computer **110** and the second computer **120**.

At step **250**, the user's computer **100** receives the cookie **150** and at step **260**, sends at least a portion of the cookie **150**, including the digital voucher **160**, to the second computer **120**. Alternatively, the first computer **110** can cause the user's computer **100** to automatically be redirected to the second computer **120**. For example, if a user is viewing a bank's web site and requests to pay his bills, the first computer **110** could redirect the user to a third-party bill presentment/payment web site. In an Internet environment, this could be accomplished by the first computer **110** sending the user's web browser an HTTP header refresh command that redirects the user's web browser to the second computer's web site. This and other techniques for other network environments are well known to, and will be appreciated by, those skilled in the art. In addition, the first computer **110** can send information about data, services, or virtually any other aspect of the first computer **110** that the user is permitted to access. For example, the bill presentment/payment web site could be instructed to display brand information or advertising about a bank's web site.

At step **270**, the second computer **120** accesses the cookie, extracts the digital voucher **160** created by the first computer **110**, and authenticates the digital voucher. At step **280**, the second computer **120** extracts the user characteristic **170** from the digital

voucher **160**, thus authenticating the user without necessarily requiring the user to expressly identify himself to, and/or access, the second computer **120**.

As described previously, in the prior art there is no sharing of cookie data created by a first computer with a second computer that did not place the cookie on the user's computer **100**. Such sharing can be achieved by having the first computer **110** and the second computer **120** share a domain. For example, if the first computer **110** was a bank web site and the second computer **120** was a third-party bill payment/presentment web site, then these two computers could share a domain by having respective web site addresses www.bank.com and bills.bank.com, with the cookie domain set to bank.com. In other words, the third-party bill site dynamically mimics or aliases the bank's domain (e.g., via the domain name system (DNS) infrastructure).

The foregoing system is particularly useful when the second computer **120** is unknown to the user. In the exemplary Internet environment, the second computer **120** could be a web site link on a web page of the first computer **110**. For example, the web site link could be a third-party back office site performing bill presentment/payment services in connection with a merchant's sales interface on the first computer **110**. Of course, there is no requirement that the second computer **120** be unknown to the user, as the invention may be used any time it is desirable or convenient that the user be able to access a second computer **120** without having to expressly identify himself thereto. Furthermore, such identification can be for security reasons (e.g., a customer accessing his bank or some other financial services at second computer **120** via an Internet portal at the first computer **110**) or otherwise (e.g., the first computer **110** has a contract to share user identities and other marketing data with a partner of the second computer **120**).

In some cases, business or other considerations may allow user authentication and/or further transactions at the second computer **120** only when the user has been previously registered or enrolled at the second computer **120**. One way to accomplish this registration is to have the first computer **110** send a list of its users to the second computer **120** for automatic enrollment. The user registration could include the user's network identity and the domain identity of the first computer **110**. Another way to accomplish this registration is to have the user register directly with the second computer **120**.

In general, it will be appreciated that there could be virtually any relationship between first computer **110** and second computer **120**, ranging from collocation and/or co-

ownership to virtual anonymity (except that second computer **120** must be able to authenticate first computer **110** in order to use the first computer's cryptographic assurance, if any, of the digital voucher).

After authenticating the user, the second computer **120** may perform virtually any other act based on the user characteristic **170** at step **290**. For example, if the second computer **120** provides bill presentment/payment services, then after authenticating the user the second computer **120** might retrieve the user's bill information and send a bill page to the user's browser for display. Other than the new web address, the user might be unaware that he has been redirected to a different web site and that the web pages he is viewing are coming from a different server.

As noted above, cryptographic assurance can be provided by any of a number of well-known asymmetric or symmetric encryption protocols. The use of a combination of asymmetric and symmetric encryption protocols is one alternative that is particularly advantageous for overall system speed. In particular, asymmetric encryption could be used to transfer a shared symmetric key between the first computer **110** and the second computer **120**. For example, the first computer **110** could encrypt or digitally sign the shared key using public key cryptography. A second computer **120** having the corresponding key could then decrypt the encryption (or signature) to obtain the shared key. The first computer **110** could then use the shared key to symmetrically encrypt the user characteristic **170** in the digital voucher **160**, while the second computer **120** would use the shared key to decrypt the encrypted digital voucher **160**.

For this alternative, the use of a shared key to encrypt and decrypt the digital voucher **160** is advantageous because symmetric encryption and decryption can be done much faster than asymmetric encryption and decryption. Asymmetric encryption is only used here to securely transmit the shared key from the first computer **110** to the second computer **120**. The shared key could be transmitted from the first computer **110** to the second computer **120** by placing the asymmetrically encrypted shared key in a cookie that is sent to the user's computer **100** and is then redirected or resent to the second computer **120**. This communication process also uses a cryptographically assured cookie to send information from the first computer **110** to the second computer **120**, but here the information being sent is the shared key rather than the user characteristic **170**. The user characteristic **170** would then be sent via a separate user characteristic cookie **150** of the

type described earlier. Alternatively, the user characteristic and the shared key can be part of a single combined cookie.

Prior to the present invention, direct communication between a first computer and a second computer, rather than indirect communication via a third computer (e.g., a user's computer) with a cookie, was used to transmit a shared key from the first computer to the second computer.

The foregoing describes a new method for transmitting a shared key from a first computer to a second computer, but those skilled in the art will recognize that many other alternatives are possible. For example, the shared key could be generated and sent by the second computer **120**, or could be mutually generated by both the first and second computers using a key exchange protocol. These and other methods for sharing keys between two computers are well known in the art (see, e.g., Applied Cryptography by Bruce Schneir) and need not be described in detail here.

The following can further improve the speed and security of this combined asymmetric/symmetric method for cryptographic assurance. The speed of the system can be enhanced by using the shared key (sent from the first computer **110** to the second computer **120** via, e.g., a cryptographically assured cookie) to authenticate additional users. In other words, the shared key received via a cryptographically assured cookie for one user could be used to decrypt other users' digital vouchers as well. Such reuse of the shared key can eliminate multiple executions of the slower asymmetric decryption protocol when the first computer **110** will be authenticating many users to the second computer **120**. Shared key reuse can be implemented in many ways. For example, the first computer **110** could monitor/record the previous transmission of the shared key and simply not resend the key if it had already been sent. Alternatively, the second computer **120** could monitor/record the previous transmission of the shared key and simply not decrypt a (redundant) received shared key if it had already been decrypted. Another alternative could include signaling within the cookie (which includes either no shared key, a redundant shared key, or a new shared key) via some sort of identifier, which could be the absence of a shared key, the retransmission of the shared key, the inclusion of a new shared key, or even some form of non-key identifier. A hash could be used to allow quick comparisons with previous transmissions.

The security of the shared key method could be enhanced if the shared key had an expiration date/time, so that, for example, the first computer **110** would have to send a new asymmetrically encrypted shared key after a certain (e.g., relatively short) time interval to users who were going to be redirected to the same second computer **120**. The interval would reflect a balance between speed and security for the system. Yet another measure, applicable to both the asymmetric and the combined asymmetric/symmetric methods, increases the security of the communications among any combination of the user's computer **100**, the first computer **110**, and the second computer **120** (including, without limitation, during transmitting step **240**, receiving step **250**, and sending step **260**) by utilizing the Secure Sockets Protocol (SSL) or other secure networking protocols, all of which are well known in the art.

The various embodiments described above should be considered as merely illustrative of the present invention and not in limitation thereof. They are not intended to be exhaustive or to limit the invention to the forms disclosed. Those skilled in the art will readily appreciate that still other variations and modifications may be practiced without departing from the general spirit of the invention set forth herein. Therefore, it is intended that the present invention be defined by the claims which follow:

CLAIMS

What is claimed is:

1. A method for transferable authentication, by which a user accessing a first computer can be authenticated to a second computer remote from said first computer, without necessarily requiring the user to explicitly identify himself to said second computer, comprising the steps of:

a) at a user's computer, accessing a first computer;

b) authenticating said user to said first computer;

c) receiving from said first computer a cookie including said first computer's digital voucher of a user characteristic, said voucher being cryptographically assured by said first computer; and

d) sending at least a portion of said cookie, including said voucher, to a second computer configured to:

(1) authenticate said voucher without necessarily requiring said user to explicitly identify himself to said second computer;

(2) extract said user characteristic from said voucher; and

(3) perform an action based on said user characteristic.

2. The method of claim 1 wherein

a) prior to said receiving step said user characteristic has been encrypted by said first computer using a session key confidential to said first computer and said second computer but unknown to said user;

b) said session key having been cryptographically assured using an asymmetric key of at least one of said first computer and said second computers; and

c) further comprising the step of transmitting said cryptographically assured session key to said second computer via said user computer.

3. A method for transferable authentication, by which a user accessing a first computer can be authenticated to a second computer remote from said first computer,

without necessarily requiring the user to explicitly identify himself to said second computer, comprising the steps of:

a) at a first computer, receiving an access request from a user;

b) receiving authentication information from said user;

c) creating a cookie containing a user characteristic;

d) cryptographically assuring said cookie with a digital voucher of said user characteristic; and

e) sending said cookie to said user's computer to be at least partially forwarded to a second computer that can:

(1) authenticate said voucher;

(2) extract said user characteristic from said voucher; and

(3) perform an action based on said user characteristic.

4. The method of claim 3, wherein said first computer and said second computer are not collocated.

5. The method of claim 3, wherein said first computer and said second computer have different owners.

6. The method of claim 3, wherein said first computer and said second computer share a common domain.

7. The method of claim 3, wherein said voucher includes an expiration time.

8. The method of claim 3, wherein said voucher includes an instruction to send said user to another computer after communication with said second computer.

9. The method of claim 3, wherein said voucher includes an instruction to return said user to said first computer after communication with said second computer.

10. The method of claim 3, wherein said first computer and said second computer have synchronized timeouts.

11. The method of claim 3, wherein said user characteristic comprises the user's network identity.

12. The method of claim 3, wherein said user characteristic comprises the user's session preferences.

13. The method of claim 3, wherein said user computer includes a web browser.

14. The method of claim 3, wherein at least one of said first and second computers is a web site.

15. The method of claim 14, wherein said first computer is a web site of a content service provider.

16. The method of claim 14, wherein said second computer is a web site for electronic bill presentment and payment.

17. The method of claim 3, wherein said cryptographic assurance includes RSA cryptography.

18. The method of claim 3, wherein said cryptographic assurance includes encryption of said user characteristic under a symmetric key shared between said first computer and said second computer.

19. The method of claim 18, further comprising exchanging between said first computer and said second computer via a cookie on said user's computer a cryptographic assurance of said symmetric key under an asymmetric key of at least one of said first computer or said second computer.

20. The method of claim 3 wherein

a) prior to said sending step said user characteristic has been encrypted by said first computer using a session key confidential to said first computer and said second computer but unknown to said user;

b) said session key having been cryptographically assured using an asymmetric key of at least one of said first computer and said second computers; and

c) further comprising the step of transmitting said cryptographically assured session key to said second computer via said user computer.

21. A method for transferable authentication, by which a user accessing a first computer can be authenticated to a second computer remote from said first computer, without necessarily requiring the user to explicitly identify himself to said second computer, comprising the steps of:

a) at a second computer, receiving at least a portion of a cookie from a user wherein said cookie was:

(1) created by a first computer,

(2) sent to the user, and

(3) cryptographically assured with a digital voucher of a user characteristic created by said first computer;

b) authenticating said digital voucher created by said first computer;

c) extracting said user characteristic from said voucher; and

d) performing an action based on said user characteristic.

22. The method of claim 21, wherein said first computer and said second computer are not collocated.

23. The method of claim 21, wherein said first computer and said second computer have different owners.

24. The method of claim 21, wherein said first computer and said second computer share a common domain.

25. The method of claim 21, wherein said voucher includes an expiration time.

26. The method of claim 21, wherein said voucher includes an instruction to send said user to another computer after communication with said second computer.

27. The method of claim 21, wherein said voucher includes an instruction to return said user to said first computer after communication with said second computer.

28. The method of claim 21, wherein said first computer and said second computer have synchronized timeouts.

29. The method of claim 21, wherein said user characteristic comprises the user's network identity.

30. The method of claim 21, wherein said user characteristic comprises the user's session preferences.

31. The method of claim 21, wherein said user computer includes a web browser.

32. The method of claim 21, wherein at least one of said first and second computers is a web site.

33. The method of claim 32, wherein said first computer is a web site of a content service provider.

34. The method of claim 32, wherein said second computer is a web site for electronic bill presentment and payment.

35. The method of claim 21, wherein said cryptographic assurance includes RSA cryptography.

36. The method of claim 21, wherein said cryptographic assurance includes encryption of said user characteristic under a symmetric key shared between said first computer and said second computer.

37. The method of claim 36, further comprising exchanging between said first computer and said second computer via a cookie on said user's computer a cryptographic assurance of said symmetric key under an asymmetric key of at least one of said first computer or said second computer.

38. The method of claim 21 wherein

a) prior to said receiving step said user characteristic has been encrypted by said first computer using a session key confidential to said first computer and said second computer but unknown to said user;

b) said session key having been cryptographically assured using an asymmetric key of at least one of said first computer and said second computers; and

c) further comprising the step of transmitting said cryptographically assured session key to said second computer via said user.

39. A method for transferable authentication, by which a user accessing a first computer can be authenticated to a second computer remote from said first computer, without necessarily requiring the user to explicitly identify himself to said second computer, comprising the steps of:

a) transmitting an access request from a user's computer to a first computer;

b) authenticating said user to said first computer;

c) creating a cookie containing a user characteristic at said first computer;

d) cryptographically assuring said cookie with a digital voucher of said user characteristic at said first computer;

e) transmitting said cookie to said user's computer;

f) receiving from said first computer a cookie including said first computer's digital voucher of a user characteristic, said voucher being cryptographically assured by said first computer;

g) sending at least a portion of said cookie, including said voucher, to a second computer;

h) authenticating said digital voucher created by said first computer at said second computer;

i) extracting said user characteristic from said voucher at said second computer; and

j) performing an action based on said user characteristic.

40. A system for transferable authentication, by which a user accessing a first computer can be authenticated to a second computer remote from said first computer, without necessarily requiring the user to explicitly identify himself to said second computer, comprising:

a) means for transmitting an access request from a user's computer to a first computer;

b) means for authenticating said user to said first computer;

c) means for creating a cookie containing a user characteristic at said first computer;

d) means for cryptographically assuring said cookie with a digital voucher of said user characteristic at said first computer;

e) means for transmitting said cookie to said user's computer;

f) means for receiving from said first computer a cookie including said first computer's digital voucher of a user characteristic, said voucher being cryptographically assured by said first computer;

g) means for sending at least a portion of said cookie, including said voucher, to a second computer;

h) means for authenticating said digital voucher created by said first computer at said second computer

i) means for extracting said user characteristic from said voucher at said second computer; and

j) means for performing an action based on said user characteristic.

41. A data structure for transferable authentication, by which a user accessing a first computer can be authenticated to a second computer remote from said first computer, without necessarily requiring the user to explicitly identify himself to said second computer, comprising:

a) a digital voucher

(1) containing a user characteristic available to said first computer; and

(2) cryptographically assured by said first computer;

b) said digital voucher embedded in a cookie configured to be transmitted from said first computer to a user's computer and then at least partially forwarded to second computer configured to:

(1) authenticate said voucher without requiring said user to explicitly identify himself to said second computer;

(2) extract said user characteristic from said voucher; and

(3) perform an action based on said user characteristic.

42. The data structure of claim 41 wherein

a) said user characteristic has been encrypted by said first computer using a session key confidential to said first computer and said second computer but unknown to said user; and

b) said session key has been cryptographically assured using an asymmetric key of at least one of said first computer and said second computers.

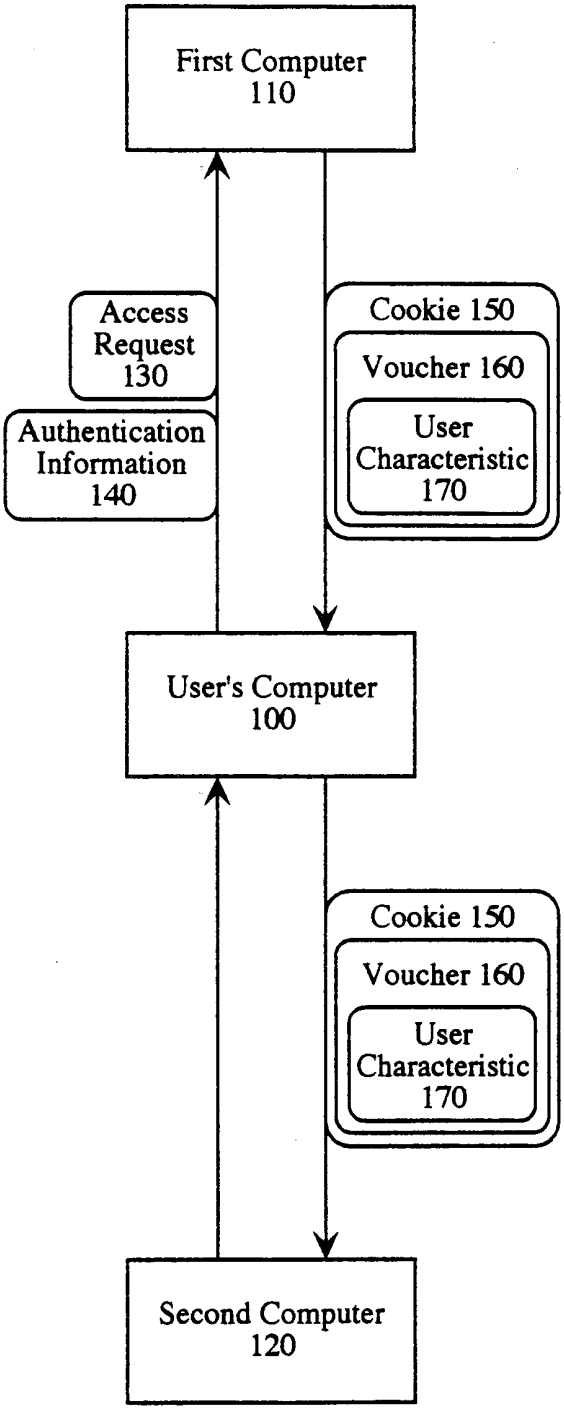
First Computer
110
Access
Request
130
Authentication
Information
140
Cookie 150
Voucher 160
User
Characteristic
170
User's Computer
100
Cookie 150
Voucher 160
User
Characteristic
170
Second Computer
120

FIG. 1

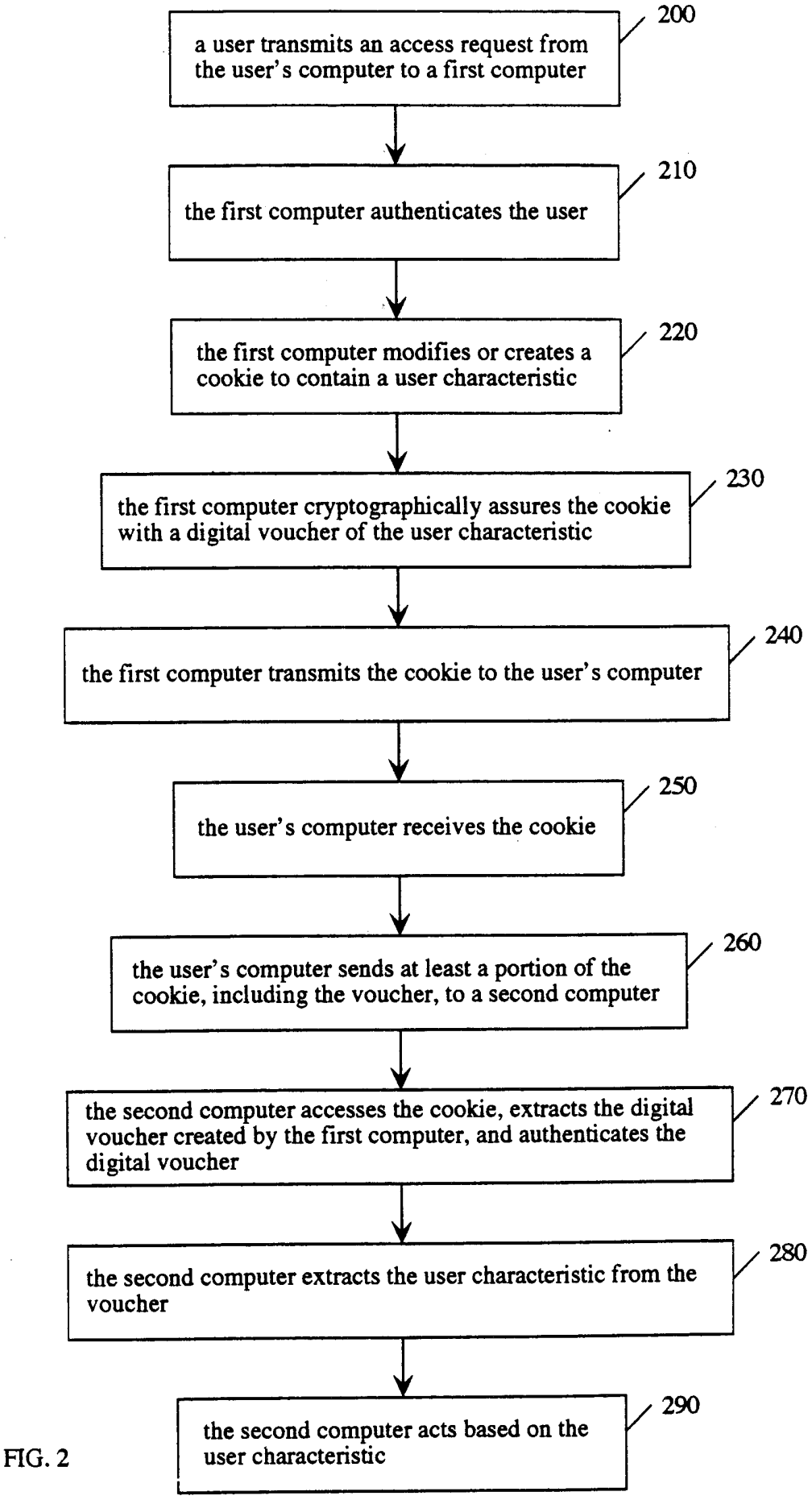
a user transmits an access request from the user's computer to a first computer
200
the first computer authenticates the user
210
the first computer modifies or creates a cookie to contain a user characteristic
220
the first computer cryptographically assures the cookie with a digital voucher of the user characteristic
230
the first computer transmits the cookie to the user's computer
240
the user's computer receives the cookie
250
the user's computer sends at least a portion of the cookie, including the voucher, to a second computer
260
the second computer accesses the cookie, extracts the digital voucher created by the first computer, and authenticates the digital voucher
270
the second computer extracts the user characteristic from the voucher
280
the second computer acts based on the user characteristic
290

FIG. 2