NETWORK CONNECTIVITY METHODS AND SYSTEMS

BACKGROUND OF THE INVENTION

[0001] A computer network is a collection of computers and devices interconnected by communications channels that facilitate communications. A computer network may allow sharing of resources and information among interconnected devices. A network may include the Internet, an intranet, and the extranet.

[0002] A local area network (LAN) is typically a small network constrained to a small geographic area. A metropolitan area network (MAN) is typically a network constrained to metropolitan area, such as a city. A wide area network (WAN) is typically a network that covers a large geographic area. Wireless LANs are typically the wireless equivalents of LANs and WANs.

[0003] Networks may be interconnected to allow communication with a variety of different kinds of media, including twisted-pair copper wire cable, coaxial cable, optical fiber, power lines and various wireless technologies. A network may include routers and routing protocols.

SUMMARY OF THE INVENTION

[0004] In an aspect of the invention, there is provided a computer-implemented method for testing network connectivity for a network device comprising connecting to a network provider; pinging a first server having a static internet protocol (IP) address with the aid of the network provider; pinging a second server having a static uniform resource locator (URL) with the aid of the network provider; and determining whether to maintain connectivity to said network provider based on whether a response was received by said network device from said first server and/or whether a response was received by said network device from said second server, wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

[0004a] In an embodiment, determining whether to maintain connectivity to said network provider is based on whether a response was received by said network device from said first server and whether a response was received by said network device from said second server.

[0005] In some situations, said computer-implemented methods further comprise connecting to an another network provider based on at least one criterion selected from the group consisting of a bandwidth of the another network provider, cost to maintain connectivity to the another network provider, cost to transmit information with the aid of the another network provider, a download rate of the another network provider and an upload rate of the another network provider. In an embodiment, the at least one criterion is location-based, time based or bandwidth-based.

cost to transmit information with the aid of the network provider, the download rate and the upload rate. In an embodiment, the at least one criterion is location-based, time based or bandwidth-based.

[0014] In some situations, said computer-implemented methods further comprise connecting to another network provider based on at least one criterion selected from the group consisting of the bandwidth of the other network provider, cost to maintain connectivity to the other network provider, cost to transmit information with the aid of the other network provider, the download rate of the other network provider and the upload rate of the other network provider. In an embodiment, connectivity to the network provider is maintained upon comparison of a download rate or an upload rate to a predetermined limit. In an embodiment, the network device is selected from the group consisting a personal computer (PC), tablet PC, slate PC, server, mainframe and Smart phone.

[0015] In another aspect, there is provided a computer-implemented method for selecting a network provider for a network device comprise connecting to the network provider; pinging, with the aid of the network provider, a first server having a static internet protocol (IP) address and a second server having a static uniform resource locator (URL); and terminating a connection to said network provider based upon any one network termination condition selected from the group consisting of (a) a response was not received by the network device from said first server and/or said second server after said pinging, (b) a network bandwidth of another network provider is higher than a network bandwidth of said network provider, (c) a network cost of another network provider is lower than a network cost of said network provider, (d) network access provided by another network provider is more robust than network access provided by said network provider, (e) connectivity between the network device and another network provider is via wired connection and connectivity between the network device and said network provider is via wireless connection and (f) another network provider is in closer proximity to the network device than said network provider, wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

[0015a] In an embodiment, the connection to said network provider is terminated based upon at least any two network termination conditions selected from said group. In another embodiment, the connection to said network provider is terminated based upon at least any three network termination conditions selected from said group. In another embodiment, the computer-implemented method further comprises connecting to an another network provider. In another embodiment, connectivity between the network device and the first network provider is via a wired or wireless network access point. In another embodiment, the first and second servers are pinged simultaneously.

[0016] In another aspect, there is provided a method for establishing network connectivity for a network device comprise the steps of (a) connecting to a first network

provider; (b) pinging, with the aid of the first network provider, a first server and a second server; and (c) selecting a second network provider over said first network provider if said second network provider meets a criterion unmet by said first network provider, wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

[0016a] In an embodiment, said selecting is in response to said pinging. In another embodiment, said criterion is a location-based, time based or bandwidth-based criterion. In another embodiment, said first server has a static internet protocol (IP) address. In another embodiment, said second server has a static uniform resource locator (URL). In another embodiment, said criterion is selected from the group consisting of (a) whether a response was received by the network device from said first server and/or said second server after said pinging, (b) whether a network bandwidth of said second network provider is higher than a network bandwidth of said first network provider, (c) whether a network cost of said second network provider is lower than a network cost of said first network provider, (d) whether network access provided by said second network provider is more robust than network access provided by said first network provider, (e) whether connectivity between said network device and said second network provider is via wired connection and connectivity between said network device and said first network provider is via wireless connection, and (f) whether said second network provider is in closer proximity to the network device than said first network provider.

[0017] In some embodiments, computer-implemented method for establishing network connectivity for a network device comprise connecting to a first network provider; locating a second network provider, the second network provider having a higher ranked order of preference than the first network provider based on one or more predetermined network connectivity criteria; and connecting to the second network provider. In an embodiment, said locating comprises pinging a first server and a second server. In another embodiment, said first server has a static internet protocol (IP) address. In another embodiment, said second server has a static uniform resource locator (URL). In another embodiment, said one or more predetermined network connectivity criteria are selected from the group consisting of network bandwidth, network cost and proximity of the network device to a network provider. In another embodiment, said one or more predetermined network connectivity criteria are location-based, time based or bandwidth-based.

[0018] In some embodiments, one or more steps of the methods provided herein are performed with the aid of a processor. In an example, the network device is connected to the first network provider with the aid of a processor. In some embodiments, any of pinging, selecting and locating are performed with the aid of one or more processors, which may be located in network devices provided herein or remotely, such as in remote computer systems.

[0019] In another aspect of the invention, there is provided a system for establishing network connectivity for a network device comprising a network connectivity controller for locating network providers, the network connectivity controller having a processor for executing machine-readable code configured to: establish a connection to a network provider; ping a first server having a static internet protocol (IP) address with the aid of the network provider; ping a second server having a static uniform resource locator (URL) with the aid of the network provider; and determine whether to maintain connectivity to said network provider based on whether a response was received by said network device from said first server and/or whether a response was received by said network device from said second server. The system further comprises a graphical user interface (GUI) for displaying a list of network providers to a user, the list of network providers generated with the aid of one or more network connectivity criteria, wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

[0019a] In an embodiment, said one or more network connectivity criteria are selected from the group consisting of a bandwidth of another network provider, cost to maintain connectivity to another network provider, cost to transmit information with the aid of another network provider, a download rate of another network provider and an upload rate of another network provider. In another embodiment, said one or more network-connectivity criteria are location-based, time based or bandwidth-based. In another embodiment, said machine-readable code is configured to determine whether to maintain connectivity to said network provider based on whether a response was received by said network device from said first server and whether a response was received by said network device from said second server.

[0020] In ~~another aspect of the invention~~embodiments, computer-readable mediums comprise code implementing methods, the methods comprising establishing a connection to a network provider; pinging a first server having a static internet protocol (IP) address with the aid of the network provider; pinging a second server having a static uniform resource locator (URL) with the aid of the network provider; and determining whether to maintain connectivity to said network provider based on whether a response was received by said network device from said first server and/or whether a response was received by said network device from said second server. In some cases, the connection to the network provider is established with the aid of a processor.

[0021] In another aspect, a device is provided comprising: a plurality of network connectivity interfaces on one or more components in the device, wherein at least two of said network connectivity interfaces use different connectivity technologies; a programmable processor programmed to perform: a) a first network connectivity test using a first of said network connectivity interfaces to verify end-to-end connectivity between the device and another device on another network; b) a second network connectivity test using the second of said network connectivity interfaces to verify end-to-end connectivity between said device and

another device on another network; determining which network connection to maintain based on status of each of the network connectivity tests; wherein said network connectivity test is run at the beginning of network connectivity and periodically after network connection is established; and wherein the device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

[0021a] In another aspect, there is provided a computer-implemented method for testing network connectivity for a network device, comprising: connecting to a network provider; and determining whether to maintain connectivity to said network provider, wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

[0021b] In another aspect, there is provided a computer-implemented method for testing network connectivity for a network device, comprising: connecting to a network provider; and determining whether to switch to another network provider, wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

[0022] Optionally, the network connectivity test comprises pinging a first server having a static internet protocol (IP) address with a request sent from first of the network connectivity interfaces; pinging a second server having a static uniform resource locator (URL) with a request sent from the first of the network connectivity interfaces; and determining whether to maintain connectivity to said network provider based on whether a response was received by said network device from said first server and/or whether a response was received by said network device from said second server. This can be repeated with commands from the second of the network connectivity interfaces. The second of the network connectivity interfaces can run the same test or a different test not based on pinging. Optionally, the first connectivity test comprises running a command in a protocol in OSI layer three. Optionally, the first connectivity test comprises running a command in a protocol in OSI layer seven.

[0023] In one non-limiting example, a computer-implemented method is provided for testing network connectivity for a network device. In one embodiment, the method comprises connecting to a network provider through the use of at least one network connectivity interface on the network device; pinging a first server having a static internet protocol (IP) address with the aid of the network provider; pinging a second server having a static uniform resource locator (URL) with the aid of the network provider; and determining whether to establish network maintain connectivity to said with another network connectivity interface on the network device provider based on whether a response was received by said network device from said first server and/or whether a response was received by said network device from said second server, wherein

said network connectivity interface operates using a communication protocol different from a communication protocol of said another network connectivity interface.

[0024] It should be understood one or more of the following features may be adapted for use with one or more of the embodiments herein. For example, one embodiment of the method may have at least one of network connectivity interface and another network connectivity interface that is a non-cellular, wireless data interface while the other is a cellular data interface. Optionally, the method comprises establishing connectivity with said another network connectivity interface comprises connecting to an another network provider based on at least one criterion selected from the group consisting of a bandwidth of the another network provider, cost to maintain connectivity to the another network provider, cost to transmit information with the aid of the another network provider, a download rate of the another network provider and an upload rate of the another network provider. Optionally, at least one criterion is location-based,

CLAIMS

WHAT IS CLAIMED IS:

1. A computer-implemented method for testing network connectivity for a network device, comprising:

connecting to a network provider;

pinging a first server having a static internet protocol (IP) address with the aid of the network provider;

pinging a second server having a static uniform resource locator (URL) with the aid of the network provider; and

determining whether to maintain connectivity to said network provider based on whether a response was received by said network device from said first server and/or whether a response was received by said network device from said second server,

wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

2. The method of Claim 1, wherein determining whether to maintain connectivity to said network provider is based on whether a response was received by said network device from said first server and whether a response was received by said network device from said second server.

3. The method of Claim 1, further comprising connecting to ~~an~~ another network provider based on at least one criterion selected from the group consisting of a bandwidth of the another network provider, cost to maintain connectivity to the another network provider, cost to transmit information with the aid of the another network provider, a download rate of the another network provider and an upload rate of the another network provider.

4. The method of Claim 3, wherein the at least one criterion is location-based, time based or bandwidth-based.

5. The method of Claim 1, wherein pinging said first server comprises sending a ping packet to the first server.

6. The method of Claim 1, wherein pinging said second server comprises sending a ping packet to the second server.

7. The method of Claim 1, wherein connectivity to the network provider is maintained if the first server responds to the network device in response to said pinging the first server and/or the second server responds to the network device in response to said pinging the second server.

8. The method of Claim 1, further comprising connecting to another network provider if the first server does not respond to the network device in response to said pinging the first server and/or the second server does not respond to the network device in response to said pinging the second server.

9. The method of Claim 1, wherein the network provider is selected from the group consisting of a wireless router, Bluetooth router, wired router, cellular network router, radiofrequency (RF) device and optoelectronic device.

10. The method of Claim 1, further comprising:

connecting to an additional network provider;

pinging the first server with the aid of the additional network provider;

pinging the second server with the aid of the additional network provider; and

determining whether to maintain connectivity to the additional network provider based on whether a response was received by the network device from the first server and/or whether a response was received by the network device from the second server.

11. The method of Claim 10, wherein determining whether to maintain connectivity to the additional network provider is based on whether a response was received by the network device from the first server and whether a response was received by the network device from the second server.

12. The method of Claim 10, wherein connecting to said second network provider comprises terminating connectivity to said first network provider.

13. The method of Claim 1, wherein said network provider is selected from the group consisting of a wireless router, Bluetooth router, wired router, cellular network router, radiofrequency (RF) device and optoelectronic device.

14. The method of Claim 1, wherein the first and second servers are pinged simultaneously.

15. A computer-implemented method for selecting a network provider for a network device, comprising:

connecting to the network provider;

pinging, with the aid of the network provider, a first server having a static internet protocol (IP) address and a second server having a static uniform resource locator (URL); and

terminating a connection to said network provider based upon any one network termination condition selected from the group consisting of (a) a response was not received by the network device from said first server and/or said second server after said pinging, (b) a network bandwidth of another network provider is higher than a network bandwidth of said network provider, (c) a network cost of another network provider is lower than a network cost of said network provider, (d) network access provided by another network provider is more robust than network access provided by said network provider, (e) connectivity between the network device and another network provider is via wired connection and connectivity between the network device and said network provider is via wireless connection and (f) another network provider is in closer proximity to the network device than said network provider,

wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

16. The method of Claim 15, wherein the connection to said network provider is terminated based upon at least any two network termination conditions selected from said group.

17. The method of Claim 16, wherein the connection to said network provider is terminated based upon at least any three network termination conditions selected from said group.

18. The method of Claim 15, further comprising connecting to an another network provider.

19. The method of Claim 15, wherein connectivity between the network device and the first network provider is via a wired or wireless network access point.

20. The method of Claim 15, wherein the first and second servers are pinged simultaneously.

21. A method for establishing network connectivity for a network device, comprising the steps of:

(a) connecting to a first network provider;

(b) pinging, with the aid of the first network provider, a first server and a second server; and

(c) selecting a second network provider over said first network provider if said second network provider meets a criterion unmet by said first network provider,

wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

22. The method of Claim 21, wherein said selecting is in response to said pinging.

23. The method of Claim 21, wherein said criterion is a location-based, time based or bandwidth-based criterion.

24. The method of Claim 21, wherein said first server has a static internet protocol (IP) address.

25. The method of Claim 24, wherein said second server has a static uniform resource locator (URL).

26. The method of Claim 21, wherein said criterion is selected from the group consisting of (a) whether a response was received by the network device from said first server and/or said second server after said pinging, (b) whether a network bandwidth of said second network provider is higher than a network bandwidth of said first network provider, (c) whether a network cost of said second network provider is lower than a network cost of said first network provider, (d) whether network access provided by said second network provider is more robust than network access provided by said first network provider, (e) whether connectivity between said network device and said second network provider is via wired connection and connectivity between said network device and said first network provider is via wireless connection, and (f) whether said second network provider is in closer proximity to the network device than said first network provider.

27. A system for establishing network connectivity for a network device, comprising:

a) a network connectivity controller for locating network providers, the network connectivity controller having a processor for executing machine-readable code configured to:

establish a connection to a network provider;

ping a first server having a static internet protocol (IP) address with the aid of the network provider;

ping a second server having a static uniform resource locator (URL) with the aid of the network provider; and

determine whether to maintain connectivity to said network provider based on whether a response was received by said network device from said first server and/or whether a response was received by said network device from said second server; and

b) a graphical user interface for displaying a list of network providers to a user, the list of network providers generated with the aid of one or more network connectivity criteria,

wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

28. The system of Claim 27, wherein said one or more network connectivity criteria are selected from the group consisting of a bandwidth of another network provider, cost to maintain connectivity to another network provider, cost to transmit information with the aid of another network provider, a download rate of another network provider and an upload rate of another network provider.

29. The system of Claim 27, wherein said one or more network-connectivity criteria are location-based, time based or bandwidth-based.

30. The system of Claim 27, wherein said machine-readable code is configured to determine whether to maintain connectivity to said network provider based on whether a response was received by said network device from said first server and whether a response was received by said network device from said second server.

31. A device comprising:

a plurality of network connectivity interfaces on one or more components in the device, wherein at least two of said network connectivity interfaces use different connectivity technologies;

a programmable processor programmed to perform:

a) a first network connectivity test using a first of said network connectivity interfaces to verify end-to-end connectivity between the device and another device on another network;

b) a second network connectivity test using the second of said network connectivity interfaces to verify end-to-end connectivity between said device and another device on another network;

determining which network connection to maintain based on status of each of the network connectivity tests;

wherein said network connectivity test is run at the beginning of network connectivity and periodically after network connection is established; and wherein the device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

32. The device of claim 31 wherein the first connectivity test comprises running a command in a protocol in OSI layer three.

33. The device of claim 31 wherein the first connectivity test comprises running a command in a protocol in OSI layer seven.

34. A computer-implemented method for testing network connectivity for a network device, comprising:

connecting to a network provider; and

determining whether to maintain connectivity to said network provider,

wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.

35. A computer-implemented method for testing network connectivity for a network device, comprising:

connecting to a network provider; and

determining whether to switch to another network provider,

wherein the network device loads default rules and subsequently updates the rules with location-specific rules once network access has been established using the default rules.