CLAIMS

What is claimed is:

1. A computer-implemented method for providing logical networking functionality for computer networks, the method comprising:

receiving configuration information for a first virtual computer network that includes multiple computing nodes arranged via a specified network topology, the multiple computing nodes each having a distinct virtual network address for the first virtual computer network, the configuration information indicating one or more specified networking devices that interconnect the multiple computing nodes and that are each associated with one or more of the multiple computing nodes; and

under control of one or more configured computing systems, automatically providing the first virtual computer network in accordance with the received configuration information by overlaying the first virtual computer network on a distinct substrate network and by emulating the specified network topology for multiple communications between the multiple computing nodes without physically implementing the specified network topology, the multiple communications each being sent from a sending one of the multiple computing nodes to one or more of the multiple computing nodes that are each a destination computing node for the communication, each communication including a virtual network address corresponding to the one or more destination computing nodes and including a virtual hardware address associated with one of the specified networking devices that is an initial intermediate destination of the communication, the emulating of the specified network topology including, for each of the multiple communications:

identifying the one or more destination computing nodes based on the virtual network address included in the communication; and

for each of the one or more destination computing nodes,

forwarding the communication over the substrate network to a location of the destination computing node;

modifying the communication to include information corresponding to the communication having been forwarded via

the specified network topology from the sending computing node to the destination computing node by the specified networking device whose associated virtual hardware address is included in the communication; and

providing the modified communication to the destination computing node.

2. The method of claim 1 wherein the specified network topology includes multiple logical sub-networks of the first virtual computer network that each include a distinct subset of the multiple computing nodes, and wherein the one or more specified networking devices include multiple logical router devices that are each associated with one of the multiple logical sub-networks.

3. The method of claim 2 wherein the emulating of the specified network topology is performed for communications that are sent between sending computing nodes and destination computing nodes that are part of distinct logical sub-networks.

4. The method of claim 1 wherein the emulating of the specified network topology includes logically representing the one or more physical networking devices with one or more logical networking devices, and emulating functionality of the one or more logical networking devices in forwarding the multiple communications via the specified network topology.

5. The method of claim 1 wherein the modifying of each of one or more of the multiple communications to include information corresponding to the communication having been forwarded by a specified networking device to a destination computing node includes replacing in the communication the virtual hardware address associated with the specified networking device with a distinct virtual hardware address corresponding to the destination computing node for the communication and includes modifying a header of the communication to reflect occurrence of a network forwarding hop.

6. The method of claim 5 wherein the providing of the first virtual computer network in accordance with the received configuration information includes:

tracking virtual hardware addresses for the first virtual computer network for each of the multiple computing nodes and each of the specified networking devices;

tracking for each of the multiple computing nodes a local one of the specified networking devices in the specified network topology; and

for each of multiple requests from the multiple computing nodes for information that would be provided by the local specified networking device of the requesting computing node that made the request, responding to the request in such a manner as to emulate functionality of the local specified networking device of the requesting computing node that made the request.

7. The method of claim 1 wherein the one or more specified networking devices include multiple logical networking devices, wherein the forwarding of each of one or more of the multiple communications via the specified network topology includes two or more of the multiple logical networking devices that would forward the communication, and wherein the modifying of each of the one or more communications to include information corresponding to the communication having been forwarded by a specified networking device to a destination computing node includes replacing in the communication the virtual hardware address associated with the specified networking device with a distinct virtual hardware address corresponding to the destination computing node for the communication and includes modifying a header of the communication to reflect occurrence of a quantity of multiple network forwarding hops corresponding to a quantity of the two or more logical networking devices that would forward the communication via the specified network topology.

8. The method of claim 1 wherein the providing of the first virtual computer network further includes managing multiple other communications between the multiple computing nodes, the multiple other communications each being sent from a sending one of the multiple computing nodes to a destination one of the multiple computing nodes and including the virtual network address for the destination computing node and including a virtual hardware address associated with the destination computing node, the managing of each of the multiple other communications including forwarding

the other communication over the substrate network to the location of the destination computing node and providing the other communication to the destination computing node without modification to include information corresponding to the communication having been forwarded via the specified network topology.

9. The method of claim 1 wherein the substrate network is a physical network that includes multiple interconnected physical networking devices, wherein each of the multiple computing nodes has an associated substrate network address that corresponds to a location of the computing node in the substrate network address and that is distinct from the virtual network address for the computing node, and wherein the forwarding of each of the multiple communications over the substrate network to the location of a destination computing node includes sending the communication to one of the physical networking devices of the substrate network so that the one physical networking device uses the substrate network address for the destination computing node to route the communication to the location of the destination computing node in the substrate network.

10. The method of claim 1 wherein the configuration information for the first virtual computer network is received from a user on whose behalf the first virtual computer network is provided.

11. A system structured to provide logical networking functionality for computer networks, comprising:

one or more processors of one or more computing systems; and

one or more communication manager modules that are each configured to, when executed by at least one of the one or more processors, provide logical networking functionality for a first virtual computer network that is implemented using one or more intermediate networks, the one or more intermediate networks including multiple physical networking devices that physically interconnect multiple computing nodes of the first virtual computer network, each of the multiple computing nodes having an associated first virtual network address for the first virtual computer network and having a distinct associated second network address that corresponds to

the one or more intermediate networks, the providing of the logical networking functionality including:

obtaining configuration information regarding one or more specified logical networking devices of the first virtual computer network that logically interconnect the multiple computing nodes and that are distinct from the physical networking devices of the one or more intermediate networks; and

automatically managing multiple communications sent between the multiple computing nodes so as to implement functionality of the specified logical networking devices, the managing of each of the multiple communications including using the second network address of a destination computing node for the communication to forward the communication via at least one of the physical networking devices of the one or more intermediate networks to the destination computing node, the managing of each of the multiple communications further including modifying the communication to include information emulating forwarding of the communication by one or more of the specified logical networking devices that logically interconnect the multiple computing nodes.

12. The system of claim 11 wherein the one or more intermediate networks are a substrate network on which the first virtual computer network is overlaid, wherein the associated second network addresses of the multiple computing nodes are substrate network addresses that correspond to locations of the multiple computing nodes in the substrate network, wherein the one or more specified logical networking devices include multiple specified logical networking devices that are each associated with a subset of the multiple computing nodes, wherein the configuration information further specifies a logical network topology of the first virtual computer network that includes the multiple logical networking devices, and wherein the providing of the logical networking functionality includes emulating functionality that would be provided by the multiple specified logical networking devices if the multiple specified logical networking devices were physically implemented and used to forward the communications from sending computing nodes to destination computing nodes.

13. The system of claim 12 wherein each of the multiple computing nodes and each of the one or more specified logical networking devices further has a distinct virtual hardware address for the first virtual computer network, wherein each of the multiple communications further includes a virtual hardware address for an initial intended destination of the communication, wherein the modifying of each of the multiple communications further includes determining one of the specified logical networking devices to which the virtual hardware address included in the communication corresponds and adding information to the communication that would have been added by the determined logical networking device when forwarding the communication, and wherein the one or more communication manager modules are part of an overlay network manager system that provides the first virtual computer network and that automatically manages the providing of the logical networking functionality for the first virtual computer network.

14. The system of claim 11 wherein the one or more communication manager modules include multiple communication manager modules that each manage communications sent from an associated group of a subset of the multiple computing nodes, wherein the one or more computing systems include multiple computing systems that execute the multiple communication manager modules, and wherein the system further comprises the multiple computing systems, one or more of the multiple computing systems each hosting multiple virtual machines that each provide one of the multiple computing nodes and executing one of the communication manager modules as part of a virtual machine manager module for the computing system, such that the computing nodes provided by the hosted virtual machines of the computing system are the associated group of computing nodes for the executing communication manager module.

15. The system of claim 11 wherein the one or more communication manager modules each consists of a means for providing logical networking functionality for the first virtual computer network by:

obtaining configuration information regarding one or more specified logical networking devices of the first virtual computer network that logically interconnect the multiple computing nodes and that are distinct from

the physical networking devices of the one or more intermediate networks; and

automatically managing multiple communications sent between the multiple computing nodes so as to implement functionality of the specified logical networking devices, the managing of each of the multiple communications including using the second network address of a destination computing node for the communication to forward the communication via at least one of the physical networking devices of the one or more intermediate networks to the destination computing node, the managing of each of the multiple communications further including modifying the communication to include information emulating forwarding of the communication by one or more of the specified logical networking devices that logically interconnect the multiple computing nodes.

CLAIMS

1. A computer-implemented method comprising:

receiving configuration information for a virtual computer network that includes multiple computing nodes and one or more logical router devices; and

managing, by one or more configured computing systems, one or more communications sent between the multiple computing nodes in a manner that emulates functionality of the one or more logical router devices, the managing of each of the communications including:

forwarding the communication over an underlying computer network to a location of a destination computing node for the communication;

modifying the communication to include information from emulated actions of at least one of the one or more logical router devices; and

providing the modified communication to the destination computing node for the communication.

2. The method of claim 1 wherein the configuration information indicates a logical network topology for the multiple computing nodes that is specified by a user on whose behalf the virtual computer network is provided, the logical network topology including the one or more logical router devices.

3. The method of claim 2 wherein the managing of the one or more communications in a manner that emulates functionality of the one or more logical router devices includes emulating the functionality of the one or more logical router devices without implementing any physical router devices to represent the one or more logical router devices.

4. The method of claim 2 wherein the logical network topology includes multiple logical sub-networks of the virtual computer network that each includes a distinct subset of the multiple computing nodes, and includes multiple logical router devices that are each associated with one of the multiple logical sub-networks.

5. The method of claim 2 further comprising providing the virtual computer network in accordance with the received configuration information by:

overlaying the virtual computer network on the underlying computer network;

tracking virtual hardware addresses for the virtual computer network for each of the multiple computing nodes and each of the one or more logical router devices; and

tracking, for each of the multiple computing nodes, one of the logical router devices that is associated with the computing node in the logical network topology.

6. The method of claim 1 further comprising managing a further communication between the multiple computing nodes without emulating functionality of the one or more logical router devices, the managing of the further communication including forwarding the further communication over the underlying computer network to a location of an indicated destination computing node for the further communication and including providing the further communication to the indicated destination computing node without modifying the further communication to include information corresponding to emulated actions of any of the one or more logical router devices.

7. The method of claim 1 wherein the underlying computer network is a substrate computer network on which the virtual computer network is overlaid, wherein each of the one or more communications is sent to a destination virtual network address associated with the destination computing node for the communication, and wherein the forwarding of each communication over the

underlying computer network includes using a destination substrate network address that is associated with the destination computing node for the communication and that corresponds to the location of that destination computing node in the substrate network.

8. The method of claim 7 wherein one of the one or more communications further includes a virtual hardware address associated with one of the logical router devices, and wherein the modifying of the one communication to include information from the emulated actions of the at least one logical router devices includes adding information to the one communication that the one logical router device associated with the virtual hardware address would have added to the one communication if the one logical router device was physically implemented and had forwarded the one communication.

9. The method of claim 8 wherein the modifying of the one communication includes replacing the virtual hardware address in the one communication with a distinct virtual hardware address corresponding to the destination computing node for the one communication.

10. The method of claim 8 wherein the modifying of the one communication includes modifying a header of the one communication to reflect occurrence of a network forwarding hop.

11. A computer system comprising:

one or more processors;

a first means for receiving configuration information for a virtual computer network that includes multiple computing nodes and one or more logical router devices; and

a second means for managing one or more communications sent between the multiple computing nodes in a manner that emulates functionality of the one or more logical router devices, the managing of each of the communications including:

forwarding the communication over an underlying computer network to a location of a destination computing node for the communication;

modifying the communication to include information from emulated actions of at least one of the one or more logical router devices; and

providing the modified communication to the destination computing node.

12. The computer system of claim 11 wherein the configuration information indicates a logical network topology for the multiple computing nodes that is specified by a user on whose behalf the virtual computer network is provided, the logical network topology including the one or more logical router devices.

13. The computer system of claim 11 wherein the underlying computer network is a substrate computer network on which the virtual computer network is overlaid, wherein each of the one or more communications is sent to a destination virtual network address associated with the destination computing node for the communication, and wherein the forwarding of each communication over the underlying computer network includes using a destination substrate network address that is associated with the destination computing node for the communication and that corresponds to the location of that destination computing node in the substrate network.

14. The computer system of claim 13 wherein one of the one or more communications further includes a virtual hardware address associated with one of the logical router devices, and wherein the modifying of the one communication to include information from the emulated actions of the at least one logical router devices includes adding information to the one communication that the one logical router device associated with the virtual hardware address would have added to the one communication if the one logical router device was physically implemented and had forwarded the one communication.

15. The computer system of claim 14 wherein the modifying of the one communication further includes replacing the virtual hardware address with a distinct virtual hardware address corresponding to the destination computing node for the one communication and includes modifying a header of the one communication to reflect occurrence of a network forwarding hop.