

## WHAT IS CLAIMED IS:

1. A system, comprising:
  - a plurality of computing nodes located in multiple geographic regions that collectively provide virtual computing services to one or more clients, each of the computing nodes comprising at least one processor and a memory;
  - a plurality of virtualized computing resource instances, each executing on a respective one of the computing nodes within a data center in a respective one of the regions; and
  - a plurality of gateway components, wherein each of the gateway components is hosted on a respective one of the computing nodes at a point of presence location in a respective one of the regions;
- wherein one or more of the virtualized computing resource instances are configured to implement a management component of a virtual desktop service;
- wherein at least some of the plurality of gateway components and the management component of the virtual desktop service interoperate with each other within a virtual private cloud of the virtual desktop service;
- wherein one of the virtualized computing resource instances is configured to implement a virtual desktop instance on a computing node other than the computing nodes hosting the plurality of gateway components;
- wherein two or more of the plurality of gateway components are configured as network interfaces for communication between client devices and the virtual desktop service, wherein client devices communicate with the two or more gateway components over a public network;
- wherein in response to receiving a request from a client device to connect to the virtual desktop instance, the management component of the virtual desktop service is configured to establish a communication channel between the virtual desktop instance and one of the two or more of the gateway components for two-way communication of an interactive video stream between the client device and the virtual desktop instance, wherein the interactive video stream comprises a stream of pixels communicated to the client device through the one of the two or more of

the gateway components from the virtual desktop instance and a plurality of inputs that are communicated from the client device through the one of the two or more of the gateway components to the virtual desktop instance that represent user interactions with the virtual desktop instance.

2. The system of claim 1, wherein the one of the two or more of the gateway components and the virtualized computing resource instance on which the virtual desktop instance is executing are located in different ones of the regions.

3. The system of claim 1, wherein the management component of the virtual desktop service is further configured to determine, prior to establishing the communication channel, which of the two or more of the gateway components is to be used for two-way communication of the interactive video stream between the client device and the virtual desktop instance dependent, at least in part on the region in which the client device is located.

4. The system of claim 1, wherein the virtualized computing resource instance on which the virtual desktop instance is executing is one of multiple virtualized computing resource instances operating within a virtual private cloud of a client.

5. A method, comprising:

performing, by one or more computers:

receiving, from a client device, a request to begin a virtual desktop session on a virtual desktop instance, wherein the virtual desktop instance is hosted on one of a plurality of computing nodes that are located in multiple availability zones and that collectively implement a virtual desktop service;

establishing a communication channel between the virtual desktop instance and a gateway component, wherein the gateway component is one of a plurality of gateway components that are configured to provide communication interfaces between client devices and the virtual desktop service, wherein each of the plurality of gateway components is hosted on a respective

computing node other than the computing node hosting the virtual desktop instance, wherein the respective computing node hosting each of the plurality of gateway components is at a point of presence location in a respective one of the multiple availability zones, and wherein at least some of the plurality of gateway components interoperate with one or more other components of the virtual desktop service within a virtual private cloud of the virtual desktop service; and

beginning a virtual desktop session on the virtual desktop instance, wherein said beginning comprises initiating communication of an interactive video stream between the virtual desktop instance and the client device via the gateway component such that the client device communicates with the gateway component over a public network, wherein the interactive video stream comprises a stream of pixels communicated to the client device through the gateway component from the virtual desktop instance and a plurality of inputs that are communicated from the client device through the gateway component to the virtual desktop instance that represent user interactions with the virtual desktop instance.

6. The method of claim 5, wherein the virtual desktop instance is implemented by one of multiple virtualized computing resource instances operating within a virtual private cloud of a client on whose behalf the request is received from the client device.

7. The method of claim 5, wherein each of the plurality of gateway components is a multi-tenant gateway component that provides communication interfaces between client devices and the virtual desktop service on behalf of multiple clients.

8. The method of claim 5, further comprising, prior to said establishing:  
determining which of the plurality of gateway components is to be used to handle communication of the interactive video stream between the client device and the virtual desktop instance dependent, at least in part, on the proximity of the point

of presence location at which at least one of the plurality of gateway components is hosted to the client device.

9. The method of claim 8,  
wherein said determining is performed automatically by a management component of the virtual desktop service that is executing on a computing node in a data center located in an availability zone other than an availability zone in which the gateway component is located.
10. The method of claim 8,  
wherein said determining is performed by a client-side component of the virtual desktop service executing on the client device.
11. The method of claim 10, further comprising, prior to said determining:  
communicating information to the client-side component of the virtual desktop service identifying a set of two or more gateway components that are available to provide a communication interface between the client device and the virtual desktop service and identifying the point of presence locations in which they are hosted.
12. The method of claim 5,  
wherein said initiating communication of the interactive video stream between the virtual desktop instance and the client device via the gateway component comprises initiating communication of the interactive video stream from the virtual desktop instance to the gateway component over a stateless, datagram-based network protocol.
13. The method of claim 12, further comprising:  
converting, by a component on the public network, the interactive video stream from the stateless datagram-based protocol network protocol to a stateful network protocol;  
and

providing the converted interactive video stream to a logical endpoint on the client device.

14. The method of claim 5, wherein each of the at least some of plurality of gateway components is implemented by one or more virtualized computing resource instances executing within the virtual private cloud of the virtual desktop service.

15. The method of claim 5, wherein the gateway component operates within a virtual private cloud other than the virtual private cloud of the virtual desktop service, and wherein the other virtual private cloud is communicably coupled to the virtual private cloud of the virtual desktop service using a virtual private cloud peering mechanism.

16. The method of claim 5, wherein the interactive video stream further comprises one or more commands that are communicated to the client device from the virtual desktop instance and that represent instructions directing the client device to generate or render pixels for display by the client device.

17. A non-transitory computer-readable storage medium storing program instructions that when executed on one or more computers cause the one or more computers to perform:

configuring a virtualized computing resource instance to provide virtual desktop sessions on behalf of one or more clients, wherein the virtualized computing resource instance is hosted on one of a plurality of computing nodes that are located in multiple regions and that collectively provide virtual computing services;

receiving a request from a client to open a virtual desktop session on the virtualized computing resource instance;

determining which of a plurality of gateway components that are configured to provide network interfaces between clients and the virtual computing services is to be used to handle communication of an interactive video stream between the virtualized computing resource instance and the client, wherein each of the plurality of gateway components is hosted on a respective computing node other than the computing node hosting the virtualized computing resource instance,

wherein the respective computing node of each of the plurality of gateway components is at a point of presence location in a respective one of the regions, wherein at least some of the plurality of gateway components and one or more other components of the virtual computing services participate within a virtual private cloud, and wherein said determining is dependent, at least in part, on the region in which the client is located;

establishing a communication channel between the virtualized computing resource instance and the determined gateway component on behalf of the client.

18. The non-transitory computer-readable storage medium of claim 17, wherein when executed on the one or more computers, the program instructions cause the one or more computers to perform:

beginning a virtual desktop session on the virtualized computing resource instance, wherein said beginning comprises initiating communication of an interactive video stream between the virtualized computing resource and the client via the gateway component such that the client communicates with the gateway component over a public network, wherein the interactive video stream comprises a stream of pixels communicated to the client from the virtualized computing resource instance and a plurality of inputs that are communicated from the client to the virtualized computing resource instance that represent user interactions with the virtual desktop instance.

19. The non-transitory computer-readable storage medium of claim 17, wherein said determining which of a plurality of gateway components that are configured to provide network interfaces between clients and the virtual computing services is to be used to handle communication of an interactive video stream between the virtualized computing resource instance and the client comprises automatically identifying a gateway component that is hosted on a computing node at a point of presence location that is the point of presence location nearest the client.

20. The non-transitory computer-readable storage medium of claim 17, wherein said determining which of a plurality of gateway components that are configured to provide network interfaces between clients and the virtual computing services is to be used to handle communication of an interactive video stream between the virtualized computing resource instance and the client comprises selecting a gateway component that is hosted on a computing node at a point of presence location other than the point of presence location nearest the client dependent on a load-balancing policy or a priority policy for selecting a gateway component from among two or more of the plurality of gateway components that are hosted on one or more computing nodes at point of presence locations near the client.

21. The non-transitory computer-readable storage medium of claim 17, wherein when executed on the one or more computers, the program instructions cause the one or more computers to perform:

- automatically determining a set of two or more gateway components that are available to provide network interfaces between clients and the virtual computing services, and the point of presence locations at which they are hosted; and

- modifying the set of two or more gateway components that are available to provide network interfaces between clients and the virtual computing services dependent on one or more of: an increase or decrease in a workload experienced on one or more of the computing nodes on which the two or more gateway components are hosted, a loss of communication with one of the two or more gateway components, or a failure of a computing node on which one of the two or more gateway components is hosted.

22. The non-transitory computer-readable storage medium of claim 17, wherein when executed on the one or more computers, the program instructions cause the one or more computers to perform:

- determining, in response to detection of a failure or error condition, that a different one of the plurality of gateway components that are configured to provide network interfaces between clients and the virtual computing services is to be used to

handle communication of an interactive video stream between the virtualized computing resource instance and the client; and  
establishing a communication channel between the virtualized computing resource instance and the different gateway component on behalf of the client.