CLAIMS

What is claimed:

1. A computer-implemented method for low-latency video game or application hosting and~~performing~~ video compression comprising:

generating control signals from a client device in response to an input device of the client device being actuated by the user as the user is playing the low latency video game or using the application;

transmitting the control signals from the client device to a first hosting service center over one or more networks including at least one public network;

executing a video game or application on a first server at the first hosting service center in response to the control signals received from the client device as the user plays the video game or uses the application;

generating video of the executed video game or application by the server, the video comprising a plurality of video frames;

encoding a plurality of video frames or portions thereof of the video stream to generate a low-latency encoded video stream~~according to a first encoding format~~;

transmitting the low-latency~~plurality of~~ encoded video stream to the ~~frames or portions to a~~ client device over the one or more networks including the at least one public network;

decoding and displaying the video on the client device;

wherein the operations of generating and transmitting the control signals, executing the video game or application, generating video, encoding the plurality of video frames, and transmitting the low-latency encoded video stream over the one or more networks to the client, and decoding and displaying the video on the client device are performed with a latency such that the user of the client device has the perception that the video game or application is responding instantly;

receiving feedback information from the client device, the feedback information usable to determine whether data contained in the video frames or portions has been successfully received and/or decoded;

modifying the encoding of the plurality of video frames or portions thereof in response to detecting that one or more video frames or portions thereof have not been successfully received and/or decoded~~receiving feedback information from the client device, the feedback information usable to determine whether data contained in the video frames or portions has been successfully received and/or decoded;~~

~~in response to detecting that one or more video frames or portions thereof have not been successfully received and/or decoded, determining a number of video frames or portions thereof which have not been successfully received and/or decoded and:~~

~~(1) if the number of video frames or portions thereof which have not been successfully received and/or decoded is above a specified threshold, then encoding a new video frame or portion thereof according to a second encoding format, the second encoding format comprising a format which is not dependent on previously-transmitted video frames or portions thereof; or~~

~~(2) if the number of video frames or portions thereof which have not been successfully received and/or decoded is below a specified threshold, then encoding a new video frame or portion thereof according to the first encoding format, the new video frame encoded to be dependent on a last known successfully received video frame or portion thereof; and~~

~~transmitting the new video frame or portion thereof to the client device~~.

2. The method as in claim 1 further comprising:

determining latency associated with communicating with the client device; and

(1) if the latency is above a specified threshold, then encoding a new video frame or portion thereof according to a second encoding format, the second encoding format comprising a format which is not dependent on previously-transmitted video frames or portions thereof; or

(2) if the latency is below a specified threshold, then encoding a new video frame or portion thereof according to the first encoding format, the new video frame encoded to be dependent on a last known successfully received video frame or portion thereof.

3. The method as in claim 2 wherein the frames or portions thereof comprise P-frames or P-tiles, respectively, when encoded according to the first encoding format and wherein the frames or portions thereof encoded comprise I-frames or I-tiles, respectively, when encoded according to the second encoding format.

4. The method as in claim 1 wherein modifying the encoding of the plurality of video frames or portions thereof~~feedback information~~ comprises:

(1) if the number of video~~an indication that the~~ frames or portions thereof which have not ~~have~~ been successfully received and/or decoded is above a specified threshold, then encoding a new video frame or portion thereof according to a second encoding format, the second encoding format comprising a format which is not dependent on previously-transmitted video frames or portions thereof; or

(2) if the number of video frames or portions thereof which have not been successfully received and/or decoded is below a specified threshold, then encoding a new video frame or portion thereof according to the first encoding format, the new video frame encoded to be dependent on a last known successfully received video frame or portion thereof; and

transmitting the new video frame or portion thereof to~~at~~ the client device.

5. The method as in claim 1 wherein the feedback information comprises an indication that the frames or portions thereof have not been successfully received and/or decoded at the client device.

6. The method as in claim 1 wherein the video frames comprise images of a video game being played at the client device.

7. The method as in claim 1 further comprising:

decoding the encoded video frames or portion thereof at the client device; and

displaying images associated with each of the video frames or portions thereof on a display on the client device.

8. A system low-latency video game or application hosting and video compression comprising a memory for storing program code and a processor for processing the program code to perform the operations of:

generating control signals from a client device in response to an input device of the client device being actuated by the user as the user is playing the low latency video game or using the application;

transmitting the control signals from the client device to a first hosting service center over one or more networks including at least one public network;

executing a video game or application on a first server at the first hosting service center in response to the control signals received from the client device as the user plays the video game or uses the application;

generating video of the executed video game or application by the server, the video comprising a plurality of video frames;

encoding a plurality of video frames or portions thereof of the video stream to generate a low-latency encoded video streamaccording to a first encoding format;

transmitting the low-latency plurality of encoded video streamframes or portions to thea client device over the one or more networks including the at least one public networkclient device;

decoding and displaying the video on the client device;

wherein the operations of generating and transmitting the control signals, executing the video game or application, generating video, encoding the plurality of video frames, and transmitting the low-latency encoded video stream over the one or more networks to the client, and decoding and displaying the video on the client device are performed with a latency such that the user of the client device has the perception that the video game or application is responding instantly;

receiving feedback information from the client device, the feedback information usable to determine whether data contained in the video frames or portions has been successfully received and/or decoded;

modifying the encoding of the plurality of video frames or portions thereof in response to detecting that one or more video frames or portions thereof have not been

successfully received and/or decodedin response to detecting that one or more video frames or portions thereof have not been successfully received and/or decoded, determining a number of video frames or portions thereof which have not been successfully received and/or decoded and:

(1) if the number of video frames or portions thereof which have not been successfully received and/or decoded is above a specified threshold, then encoding a new video frame or portion thereof according to a second encoding format, the second encoding format comprising a format which is not dependent on previously-transmitted video frames or portions thereof; or

(2) if the number of video frames or portions thereof which have not been successfully received and/or decoded is below a specified threshold, then encoding a new video frame or portion thereof according to the first encoding format, the new video frame encoded to be dependent on a last known successfully received video frame or portion thereof; and

transmitting the new video frame or portion thereof to the client device.

9. The system as in claim 8 wherein the processor processes the program code to determine latency associated with communicating with the client device; and

(1) if the latency is above a specified threshold, then encoding a new video frame or portion thereof according to a second encoding format, the second encoding format comprising a format which is not dependent on previously-transmitted video frames or portions thereof; or

(2) if the latency is below a specified threshold, then encoding a new video frame or portion thereof according to the first encoding format, the new video frame encoded to be dependent on a last known successfully received video frame or portion thereof.

10. The system as in claim 9 wherein the frames or portions thereof comprise P-frames or P-tiles, respectively, when encoded according to the first encoding format and wherein the frames or portions thereof encoded comprise I-frames or I-tiles, respectively, when encoded according to the second encoding format.

11. The system as in claim 8 wherein modifying the encoding of the plurality of videothe feedback information comprises an indication that the frames or portions thereof comprises:

(1) if the number of video frames or portions thereof which have not been successfully received and/or decoded is above a specified threshold, then encoding a new video frame or portion thereof according to a second encoding format, the second encoding format comprising a format which is not dependent on previously-transmitted video frames or portions thereof; or

(2) if the number of video frames or portions thereof which have not been successfully received and/or decoded is below a specified threshold, then encoding a new video frame or portion thereof according to the first encoding format, the new video frame encoded to be dependent on a last known successfully received video frame or portion thereof; and

transmitting the new video frame or portion thereof to the client devicehave been successfully received and/or decoded at the client device.

12. The system as in claim 8 wherein the feedback information comprises an indication that the frames or portions thereof have not been successfully received and/or decoded at the client device.

13. The system as in claim 8 wherein the video frames comprise images of a video game being played at the client device.

14. The system as in claim 8 comprising additional program code to cause the processor to perform the operations of:

decoding the encoded video frames or portion thereof at the client device; and

displaying images associated with each of the video frames or portions thereof on a display on the client device.

15. A non-transitory machine-readable medium low-latency video game or application hosting and video compression having program code stored thereon which, when executed by a machine, causes the machine to perform the operations of:

generating control signals from a client device in response to an input device of the client device being actuated by the user as the user is playing the low latency video game or using the application;

transmitting the control signals from the client device to a first hosting service center over one or more networks including at least one public network;

executing a video game or application on a first server at the first hosting service center in response to the control signals received from the client device as the user plays the video game or uses the application;

generating video of the executed video game or application by the server, the video comprising a plurality of video frames;

encoding a plurality of video frames or portions thereof of the video stream to generate a low-latency encoded video streamaccording to a first encoding format;

transmitting the low-latencyplurality of encoded video stream to the client device over the one or more networks including the at least one public networkframes or portions to a client device;

decoding and displaying the video on the client device;

wherein the operations of generating and transmitting the control signals, executing the video game or application, generating video, encoding the plurality of video frames, and transmitting the low-latency encoded video stream over the one or more networks to the client, and decoding and displaying the video on the client device are performed with a latency such that the user of the client device has the perception that the video game or application is responding instantly;

receiving feedback information from the client device, the feedback information usable to determine whether data contained in the video frames or portions has been successfully received and/or decoded;

modifying the encoding of the plurality of video frames or portions thereof in response to detecting that one or more video frames or portions thereof have not been successfully received and/or decodedreceiving feedback information from the client

~~device, the feedback information usable to determine whether data contained in the video frames or portions has been successfully received and/or decoded;~~

~~in response to detecting that one or more video frames or portions thereof have not been successfully received and/or decoded, determining a number of video frames or portions thereof which have not been successfully received and/or decoded and:~~

~~(1) if the number of video frames or portions thereof which have not been successfully received and/or decoded is above a specified threshold, then encoding a new video frame or portion thereof according to a second encoding format, the second encoding format comprising a format which is not dependent on previously-transmitted video frames or portions thereof; or~~

~~(2) if the number of video frames or portions thereof which have not been successfully received and/or decoded is below a specified threshold, then encoding a new video frame or portion thereof according to the first encoding format, the new video frame encoded to be dependent on a last known successfully received video frame or portion thereof; and~~

~~transmitting the new video frame or portion thereof to the client device~~.

16. The machine-readable medium as in claim 15 further comprising program code to determine latency associated with communicating with the client device; and

(1) if the latency is above a specified threshold, then encoding a new video frame or portion thereof according to a second encoding format, the second encoding format comprising a format which is not dependent on previously-transmitted video frames or portions thereof; or

(2) if the latency is below a specified threshold, then encoding a new video frame or portion thereof according to the first encoding format, the new video frame encoded to be dependent on a last known successfully received video frame or portion thereof.

17. The machine-readable medium as in claim 16 wherein the frames or portions thereof comprise P-frames or P-tiles, respectively, when encoded according to the first

encoding format and wherein the frames or portions thereof encoded comprise I-frames or I-tiles, respectively, when encoded according to the second encoding format.

18. The machine-readable medium as in claim 15 wherein modifying the encoding of the plurality of video frames or portions thereof comprises:

(1) if the number of video frames or portions thereof which have not been successfully received and/or decoded is above a specified threshold, then encoding a new video frame or portion thereof according to a second encoding format, the second encoding format comprising a format which is not dependent on previously-transmitted video frames or portions thereof; or

(2) if the number of video frames or portions thereof which have not been successfully received and/or decoded is below a specified threshold, then encoding a new video frame or portion thereof according to the first encoding format, the new video frame encoded to be dependent on a last known successfully received video frame or portion thereof; and

transmitting the new video frame or portion thereof to the client device~~the feedback information comprises an indication that the frames or portions thereof have been successfully received and/or decoded at the client device~~.

19. The machine-readable medium as in claim 15 wherein the feedback information comprises an indication that the frames or portions thereof have not been successfully received and/or decoded at the client device.

20. The machine-readable medium as in claim 15 wherein the video frames comprise images of a video game being played at the client device.

21. The machine-readable medium as in claim 15 comprising additional program code to cause the machine to perform the operations of:

decoding the encoded video frames or portion thereof at the client device; and

displaying images associated with each of the video frames or portions thereof on a display on the client device.