## Amended Set of Claims

1. A method of outputting encoded video data, the method comprising:

assembling encoded video data into a fragment of a video file, the fragment comprising a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related coded video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the hierarchically related coded video pictures each correspond to a common hierarchical layer;

receiving a request in accordance with a streaming protocol, wherein the request specifies at least one of the sub-track fragments; and

in response to the request, outputting the hierarchically related coded video pictures of the at least one of the plurality of sub-track fragments.

2. The method of claim 1, wherein the request comprises a hypertext transfer protocol (HTTP) partial GET request that specifies a byte range corresponding to the at least one of the plurality of sub-track fragments.

3. The method of claim 1, further comprising signaling reordering information that indicates how to reorder the coded video pictures of more than one of the sub-track fragments into a decoding order.

4. The method of claim 3, wherein signaling reordering information comprises:

producing a reassembler object that references a sample comprising a coded video picture of a first one of the plurality of sub-track fragments; and

storing the reassembler object in a second one of the plurality of sub-track fragments.

5. The method of claim 4, wherein producing the reassembler object comprises producing the reassembler object to include an index value for the first one of the plurality of sub-track fragments and a position value that indicates a position of the sample in the first one of the plurality of sub-track fragments.



ition: 20.09.2012 00:11:48 - 20.09.2012 00:20:43. This page 11 of AMENDED SHEET 2012 00:15:15
Received at the EPO on Sep 20, 2012 00:20:43. Page 11 of 30

6. The method of claim 3,

wherein signaling reordering information comprises signaling, for each sub-track fragment, a sub-track fragment identifier and a number of pictures in the sub-track fragment, the method further comprising:

arranging the sub-track fragments such that the sub-track fragments follow a fixed pattern.

7. The method of claim 1, further comprising producing a sub-track fragment header that specifies a byte range for at least one of the plurality of sub-track fragments.

8. The method of claim 7, further comprising outputting the sub-track fragment header before outputting the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments.

9. The method of claim 1, further comprising defining, in an initialization segment of a media file including the sub-track fragments, at least one operation point corresponding to a subset of the plurality of sub-track fragments.

10. An apparatus for outputting encoded video data, the apparatus comprising;

an interface configured to output data according to a streaming protocol; and

a control unit configured to assemble encoded video data into a fragment comprising a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the hierarchically related video pictures each correspond to a common hierarchical layer, receive a request in accordance with the streaming protocol, wherein the request specifies at least one of the plurality of sub-track fragments, and, in response to the request, cause the interface to output the hierarchically related video pictures of the at least one of the sub-track fragments.

11. The apparatus of claim 10, wherein the request comprises a hypertext transfer protocol (HTTP) partial GET request that specifies a byte range corresponding to the at least one of the plurality of sub-track fragments.



ation: 20.09.2012 00:11:48 - 20.09.2012 00:20:43. This page 12 of AMENDED SHEET 2012 00:15:33
Received at the EPO on Sep 20, 2012 00:20:43. Page 12 of 30

12. The apparatus of claim 10, wherein the control unit is further configured to produce a reassembler object that references a sample of a first one of the plurality of sub-track fragments, and store the reassembler object in a second one of the plurality of sub-track fragments.

13. The apparatus of claim 12, wherein the control unit is configured to produce the reassembler object to include an index value for the first one of the plurality of sub-track fragments and a position value that indicates a position of the sample in the first one of the plurality of sub-track fragments.

14. The apparatus of claim 10, wherein the control unit is configured to produce a sub-track fragment header that specifies a byte range for at least one of the plurality of sub-track fragments.

15. The apparatus of claim 14, wherein the control unit is configured to output the sub-track fragment header before outputting the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments.

16. The apparatus of claim 10, wherein the control unit is configured to define, in an initialization segment of a media file including the sub-track fragments, at least one operation point corresponding to a subset of the plurality of sub-track fragments.

17. The apparatus of claim 10, wherein the apparatus comprises at least one of:
an integrated circuit;
a microprocessor; and
a wireless communication device that includes the control unit.



ion: 20.09.2012 00:11:48 - 20.09.2012 00:20:43. This page 13 of AMENDED SHEET 2012 00:15:49
eceived at the EPO on Sep 20, 2012 00:20:43. Page 13 of 30

18. An apparatus for outputting encoded video data, the apparatus comprising:

means for assembling encoded video data into a fragment comprising a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the plurality of hierarchically related video pictures each correspond to a common hierarchical layer;

means for receiving a request in accordance with a streaming protocol, wherein the request specifies at least one of the plurality of sub-track fragments; and

means for outputting the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments in response to the request.

19. The apparatus of claim 18, wherein the request comprises a hypertext transfer protocol (HTTP) partial GET request that specifies a byte range corresponding to the at least one of the plurality of sub-track fragments.

20. The apparatus of claim 18, further comprising:

means for producing a reassembler object that references a sample of a first one of the plurality of sub-track fragments; and

means for storing the reassembler object in a second one of the plurality of sub-track fragments.

21. The apparatus of claim 20, wherein the means for producing the reassembler object comprises means for producing the reassembler object to include an index value for the first one of the plurality of sub-track fragments and a position value that indicates a position of the sample in the first one of the plurality of sub-track fragments.

22. The apparatus of claim 18, further comprising means for producing a sub-track fragment header that specifies a byte range for at least one of the plurality of sub-track fragments.

23. The apparatus of claim 22, further comprising means for outputting the sub-track fragment header before outputting the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments.



ation 20.09.2012 00:11:48 - 20.09.2012 00:20:43. This page 14 of AMENDED SHEET 2012 00:16:07
Received at the EPO on Sep 20, 2012 00:20:43. Page 14 of 30

24. The apparatus of claim 18, further comprising means for defining, in an initialization segment of a media file including the sub-track fragments, at least one operation point corresponding to a subset of the plurality of sub-track fragments.

25. A computer program product comprising a computer-readable storage medium having stored thereon instructions that, when executed, cause a processor of a source device for outputting encoded video data to:

assemble encoded video data into a fragment comprising a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the plurality of hierarchically related video pictures each correspond to a common hierarchical layer;

receive a request in accordance with a streaming protocol, wherein the request specifies at least one of the plurality of sub-track fragments; and

in response to the request, output the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments.

26. The computer program product of claim 25, wherein the request comprises a hypertext transfer protocol (HTTP) partial GET request that specifies a byte range corresponding to the at least one of the plurality of sub-track fragments.

27. The computer program product of claim 25, further comprising instructions to:

produce a reassembler object that references a sample of a first one of the plurality of sub-track fragments; and

store the reassembler object in a second one of the plurality of sub-track fragments.

28. The computer program product of claim 27, wherein the instructions to produce the reassembler object comprise instructions to produce the reassembler object to include an index value for the first one of the plurality of sub-track fragments and a position value that indicates a position of the sample in the first one of the plurality of sub-track fragments.



ation: 20.09.2012 00:11:48 - 20.09.2012 00:20:43. This page 15 of AMENDED SHEET 2012 00:16:26
Received at the EPO on Sep 20, 2012 00:20:43. Page 15 of 30

29. The computer program product of claim 25, further comprising instructions to produce a sub-track fragment header that specifies a byte range for at least one of the plurality of sub-track fragments.

30. The computer program product of claim 29, further comprising instructions to output the sub-track fragment header before outputting the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments.

31. The computer program product of claim 25, further comprising instructions to define, in an initialization segment of a media file including the sub-track fragments, at least one operation point corresponding to a subset of the plurality of sub-track fragments.

32. A method of receiving encoded video data, the method comprising:

receiving information from a source device that describes hierarchical layers of video data for a movie fragment of a video file;

determining a subset of the hierarchical layers of video data to request;

for each of the hierarchical layers of the subset, sending no more than one request to the source device to retrieve all of the video data of the movie fragment at the hierarchical layers of the subset;

receiving the video data of the determined subset of the hierarchical layers ; and

decoding and displaying the received video data.

33. The method of claim 32, wherein the information that describes the hierarchical layers comprises a sub-track fragment header that specifies, for each of the hierarchical layers, a byte range in the movie fragment of the video data corresponding to the hierarchical level.



ation: 20.09.2012 00:11:48 - 20.09.2012 00:20:43. This page 16 of AMENDED SHEET 2012 00:16:42
Received at the EPO on Sep 20, 2012 00:20:43. Page 16 of 30

34. The method of claim 32, wherein the received video data comprises a first sub-track fragment for a first hierarchical level and a second sub-track fragment for a second hierarchical level, wherein the first sub-track fragment includes a plurality of video pictures, and wherein the second sub-track fragment includes a reassembler object that references one of the plurality of video pictures of the first sub-track fragment, the method further comprising:

arranging a sequence of video pictures from the first sub-track fragment and the second sub-track fragment in decoding order using the reassembler object.

35. The method of claim 32, wherein the information that describes the hierarchical layers comprises an initialization segment of a media file including the video data, wherein the initialization segment defines an operation point corresponding to the subset of the hierarchical layers, and wherein determining the subset comprises selecting the operation point.

36. An apparatus for receiving encoded video data, the apparatus comprising:

an interface configured to receive information from a source device that describes hierarchical layers of video data for a movie fragment of a video file; and

a control unit configured to determine a subset of the hierarchical layers of video data to request, wherein, for each of the hierarchical layers of the subset, the control unit is configured to send no more than one request to the source device to retrieve all of the video data of the movie fragment at the hierarchical layers of the subset,

wherein the interface is configured to receive the video data of the determined subset of the hierarchical layers in response to the requests.

37. The apparatus of claim 36, wherein the information that describes the hierarchical layers comprises a sub-track fragment header that specifies, for each of the hierarchical layers, a byte range in the movie fragment of the video data corresponding to the hierarchical level.



ration: 20.09.2012 00:11:48 - 20.09.2012 00:20:43. This page 17 of AMENDED SHEET 2012 00:17:00
Received at the EPO on Sep 20, 2012 00:20:43. Page 17 of 30

38. The apparatus of claim 36, wherein the received video data comprises a first sub-track fragment for a first hierarchical level and a second sub-track fragment for a second hierarchical level, wherein the first sub-track fragment includes a plurality of video pictures, and wherein the second sub-track fragment includes a reassembler object that references one of the plurality of video pictures of the first sub-track fragment, and wherein the control unit is configured to arrange a sequence of video pictures from the first sub-track fragment and the second sub-track fragment in decoding order using the reassembler object.

39. The apparatus of claim 36, wherein the information that describes the hierarchical layers comprises an initialization segment of a media file including the video data, wherein the initialization segment defines an operation point corresponding to the subset of the hierarchical layers, and wherein to determine the subset, the control unit is configured to select the operation point.

40. The apparatus of claim 36, wherein the apparatus comprises at least one of:
an integrated circuit;
a microprocessor; and
a wireless communication device that includes the control unit.

41. An apparatus for receiving encoded video data, the apparatus comprising:
means for receiving information from a source device that describes hierarchical layers of video data for a movie fragment of a video file;
means for determining a subset of the hierarchical layers of video data to request;
means for sending, for each of the hierarchical layers of the subset, no more than one request to the source device to retrieve all of the video data of the movie fragment at the hierarchical layers of the subset;
means for receiving the video data of the determined subset of the hierarchical layers ; and
means for decoding and displaying the received video data.



ation: 20.09.2012 00:11:48 - 20.09.2012 00:20:43. This page 18 of AMENDED SHEET 2012 00:17:17
Received at the EPO on Sep 20, 2012 00:20:43. Page 18 of 30

42. The apparatus of claim 41, wherein the information that describes the hierarchical layers comprises a sub-track fragment header that specifies, for each of the hierarchical layers, a byte range in the movie fragment of the video data corresponding to the hierarchical level.

43. The apparatus of claim 41, wherein the received video data comprises a first sub-track fragment for a first hierarchical level and a second sub-track fragment for a second hierarchical level, wherein the first sub-track fragment includes a plurality of video pictures, and wherein the second sub-track fragment includes a reassembler object that references one of the plurality of video pictures of the first sub-track fragment, the apparatus further comprising:

means for arranging a sequence of video pictures from the first sub-track fragment and the second sub-track fragment in decoding order using the reassembler object.

44. The apparatus of claim 41, wherein the information that describes the hierarchical layers comprises an initialization segment of a media file including the video data, wherein the initialization segment defines an operation point corresponding to the subset of the hierarchical layers, and wherein the means for determining the subset comprises means for selecting the operation point.

45. A computer program product comprising a computer-readable storage medium having stored thereon instructions that, when executed, cause a processor of a device for receiving encoded video data to:

receive information from a source device that describes hierarchical layers of video data for a movie fragment of a video file;

determine a subset of the hierarchical layers of video data to request;

for each of the hierarchical layers of the subset, send no more than one request to the source device to retrieve all of the video data of the movie fragment at the hierarchical layers of the subset;

receive the video data of the determined subset of the hierarchical layers ; and

decode and display the received video data.



ation: 20.09.2012 00:11:48 - 20.09.2012 00:20:43. This page 19 of AMENDED SHEET 2012 00:17:35
Received at the EPO on Sep 20, 2012 00:20:43. Page 19 of 30

46. The computer program product of claim 45, wherein the information that describes the hierarchical layers comprises a sub-track fragment header that specifies, for each of the hierarchical layers, a byte range in the movie fragment of the video data corresponding to the hierarchical level.

47. The computer program product of claim 45, wherein the received video data comprises a first sub-track fragment for a first hierarchical level and a second sub-track fragment for a second hierarchical level, wherein the first sub-track fragment includes a plurality of video pictures, and wherein the second sub-track fragment includes a reassembler object that references one of the plurality of video pictures of the first sub-track fragment, the computer-readable storage medium further comprising instructions to:

arrange a sequence of video pictures from the first sub-track fragment and the second sub-track fragment in decoding order using the reassembler object.

48. The computer program product of claim 45, wherein the information that describes the hierarchical layers comprises an initialization segment of a media file including the video data, wherein the initialization segment defines an operation point corresponding to the subset of the hierarchical layers, and wherein the instructions to determine the subset comprise instructions to select the operation point.



tion: 20.09.2012 00:11:48 - 20.09.2012 00:20:43. This page 20 of AMENDED SHEET .2012 00:17:51
Received at the EPO on Sep 20, 2012 00:20:43. Page 20 of 30

## CLAIMS

**1**. A method of outputting encoded video data, the method comprising:

assembling encoded video data into a fragment of a video file, the fragment comprising a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related coded video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the hierarchically related coded video pictures of each of the sub-track fragments correspond to a common hierarchical layer for the corresponding sub-track fragment;

receiving a request in accordance with a streaming protocol, wherein the request specifies at least one of the sub-track fragments; and

in response to the request, outputting the hierarchically related coded video pictures of the at least one of the plurality of sub-track fragments.

**2**. The method of claim **1**, further comprising signaling reordering information that indicates how to reorder the coded video pictures of more than one of the sub-track fragments into a decoding order.

**3**. The method of claim **2**, wherein signaling reordering information comprises:

producing a reassembler object that references a coded video picture of a first one of the plurality of sub-track fragments; and

storing the reassembler object in a second one of the plurality of sub-track fragments.

**4**. The method of claim **3**, wherein producing the reassembler object comprises producing the reassembler object to include an index value for the first one of the plurality of sub-track fragments and a position value that indicates a position of the sample in the first one of the plurality of sub-track fragments.

**5**. The method of claim **2**,

wherein signaling reordering information comprises signaling, for each sub-track fragment, a sub-track fragment identifier and a number of pictures in the sub-track fragment, the method further comprising:

arranging the sub-track fragments such that the sub-track fragments follow a fixed pattern.

**6**. The method of claim **1**, wherein the video file is associated with a distinct uniform resource locator (URL).

**7**. The method of claim **6**, wherein receiving the request comprises receiving an HTTP partial GET request that specifies the URL of the video file and a byte range corresponding to the at least one of the plurality of sub-track fragments.

**8**. The method of claim **6**, wherein the plurality of sub-track fragments comprise a first sub-track fragment, a second sub-track fragment, and a third sub-track fragment, wherein the first sub-track fragment includes a first set of hierarchically related coded video pictures at a first layer of a hierarchy,

wherein the second sub-track fragment includes a second set of hierarchically related coded video pictures at a second layer of the hierarchy greater than the first layer, and wherein the third sub-track fragment includes a third set of hierarchically related coded video pictures at a third layer of the hierarchy greater than the first layer and the second layer, wherein receiving the request comprises receiving an HTTP partial GET request that specifies the URL of the video file and a byte range corresponding to the first sub-track fragment and the second sub-track fragment, and wherein outputting comprises outputting the first set of hierarchically related coded video pictures at the first layer of the hierarchy and outputting the second set of hierarchically related coded video pictures at the second layer of the hierarchy without outputting the third set of hierarchically related coded video pictures at the third layer of the hierarchy.

**9**. The method of claim **1**, wherein the video file comprises a first video file of a plurality of video files of media content, the first file corresponding to a first temporal section of the media content, the method further comprising assembling encoded video data for the media content into the plurality of video files, each of the video files corresponding to a respective temporal section of the media content.

**10**. The method of claim **9**, wherein each of the video files is associated with a distinct uniform resource locator (URL), such that the URL for the first video file is different than a URL of a second video file of the plurality of video files, the second video file being different than the first video file.

**11**. The method of claim **9**, wherein the fragment of the first video file corresponds to a sub-temporal section of the first temporal section to which the first video file corresponds.

**12**. The method of claim **1**, further comprising producing a sub-track fragment header that specifies a byte range for at least one of the plurality of sub-track fragments.

**13**. The method of claim **12**, further comprising outputting the sub-track fragment header before outputting the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments.

**14**. The method of claim **1**, wherein the request comprises a hypertext transfer protocol (HTTP) partial GET request that specifies a byte range corresponding to the at least one of the plurality of sub-track fragments.

**15**. The method of claim **1**, further comprising defining, in an initialization fragment of a media file including the sub-track fragments, at least one operation point corresponding to a subset of the plurality of sub-track fragments.

**16**. An apparatus for outputting encoded video data, the apparatus comprising:

an interface configured to output data according to a streaming protocol; and

a control unit configured to assemble encoded video data into a fragment of a video file, the fragment comprising a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the hierarchically related video pictures of each of the sub-track fragments correspond to a common hierarchical layer for the corresponding sub-track fragment, receive a request in accordance with the streaming protocol, wherein the request specifies at least one of the plurality of sub-track fragments, and, in response to the request, cause the interface to output the hierarchically related video pictures of the at least one of the sub-track fragments.

**17**. The apparatus of claim **16**, wherein the control unit is further configured to produce a reassembler object that references a sample of a first one of the plurality of sub-track fragments, and store the reassembler object in a second one of the plurality of sub-track fragments.

**18**. The apparatus of claim **17**, wherein the control unit is configured to produce the reassembler object to include an index value for the first one of the plurality of sub-track fragments and a position value that indicates a position of the sample in the first one of the plurality of sub-track fragments.

**19**. The apparatus of claim **16**, wherein the control unit is configured to produce a sub-track fragment header that specifies a byte range for at least one of the plurality of sub-track fragments.

**20**. The apparatus of claim **19**, wherein the control unit is configured to output the sub-track fragment header before outputting the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments.

**21**. The apparatus of claim **16**, wherein the request comprises a hypertext transfer protocol (HTTP) partial GET request that specifies a byte range corresponding to the at least one of the plurality of sub-track fragments.

**22**. The apparatus of claim **16**, wherein the control unit is configured to define, in an initialization segment of a media file including the sub-track fragments, at least one operation point corresponding to a subset of the plurality of sub-track fragments.

**23**. The apparatus of claim **16**, wherein the apparatus comprises at least one of:

an integrated circuit;

a microprocessor; and

a wireless communication device that includes the control unit.

**24**. An apparatus for outputting encoded video data, the apparatus comprising:

means for assembling encoded video data into a fragment of a video file, the fragment comprising a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the plurality of hierarchically related video pictures of each of the sub-track fragments correspond to a common hierarchical layer for the corresponding sub-track fragment;

means for receiving a request in accordance with a streaming protocol, wherein the request specifies at least one of the plurality of sub-track fragments; and

means for outputting the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments in response to the request.

**25**. The apparatus of claim **24**, further comprising:

means for producing a reassembler object that references a sample of a first one of the plurality of sub-track fragments; and

means for storing the reassembler object in a second one of the plurality of sub-track fragments.

**26**. The apparatus of claim **25**, wherein the means for producing the reassembler object comprises means for producing the reassembler object to include an index value for the first one of the plurality of sub-track fragments and a position value that indicates a position of the sample in the first one of the plurality of sub-track fragments.

**27**. The apparatus of claim **24**, further comprising means for producing a sub-track fragment header that specifies a byte range for at least one of the plurality of sub-track fragments.

**28**. The apparatus of claim **27**, further comprising means for outputting the sub-track fragment header before outputting the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments.

**29**. The apparatus of claim **24**, wherein the request comprises a hypertext transfer protocol (HTTP) partial GET request that specifies a byte range corresponding to the at least one of the plurality of sub-track fragments.

**30**. The apparatus of claim **24**, further comprising means for defining, in an initialization segment of a media file including the sub-track fragments, at least one operation point corresponding to a subset of the plurality of sub-track fragments.

**31**. A computer program product comprising a computer-readable storage medium having stored thereon instructions that, when executed, cause a processor of a source device for outputting encoded video data to:

assemble encoded video data into a fragment of a video file, the fragment comprising a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the plurality of hierarchically related video pictures of each of the sub-track fragments correspond to a common hierarchical layer for the corresponding sub-track fragment;

receive a request in accordance with a streaming protocol, wherein the request specifies at least one of the plurality of sub-track fragments; and

in response to the request, output the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments.

**32**. The computer program product of claim **31**, further comprising instructions to:

produce a reassembler object that references a sample of a first one of the plurality of sub-track fragments; and

store the reassembler object in a second one of the plurality of sub-track fragments.

**33**. The computer program product of claim **32**, wherein the instructions to produce the reassembler object comprise instructions to produce the reassembler object to include an index value for the first one of the plurality of sub-track fragments and a position value that indicates a position of the sample in the first one of the plurality of sub-track fragments.

**34**. The computer program product of claim **31**, further comprising instructions to produce a sub-track fragment header that specifies a byte range for at least one of the plurality of sub-track fragments.

**35**. The computer program product of claim **34**, further comprising instructions to output the sub-track fragment header before outputting the plurality of hierarchically related video pictures of the at least one of the plurality of sub-track fragments.

**36**. The computer program product of claim **31**, wherein the request comprises a hypertext transfer protocol (HTTP) partial GET request that specifies a byte range corresponding to the at least one of the plurality of sub-track fragments.

**37**. The computer program product of claim **31**, further comprising instructions to define, in an initialization segment of a media file including the sub-track fragments, at least one operation point corresponding to a subset of the plurality of sub-track fragments.

**38**. A method of receiving encoded video data, the method comprising:

receiving information from a source device that describes hierarchical layers of video data for a movie fragment of a video file, wherein the fragment comprises a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related coded video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the hierarchically related coded video pictures of each of the sub-track fragments correspond to a common hierarchical layer for the corresponding sub-track fragment;

determining a subset of the hierarchical layers of video data to request;

for each of the hierarchical layers of the subset, sending no more than one request, in accordance with a streaming protocol, to the source device to retrieve all of the video data of the movie fragment at the hierarchical layers of the subset;

receiving the video data of the determined subset of the hierarchical layers; and

decoding and displaying the received video data.

**39**. The method of claim **38**, wherein the information that describes the hierarchical layers comprises a sub-track fragment header that specifies, for each of the hierarchical layers, a byte range in the movie fragment of the video data corresponding to the hierarchical layer.

**40**. The method of claim **38**, wherein the received video data comprises a first sub-track fragment for a first hierarchical layer and a second sub-track fragment for a second hierarchical layer, wherein the first sub-track fragment includes a plurality of video pictures, and wherein the second sub-track fragment includes a reassembler object that references one of

the plurality of video pictures of the first sub-track fragment, the method further comprising:

arranging a sequence of video pictures from the first sub-track fragment and the second sub-track fragment in decoding order using the reassembler object.

**41**. The method of claim **38**, wherein the information that describes the hierarchical layers comprises an initialization segment of a media file including the video data, wherein the movie box defines an operation point corresponding to the subset of the hierarchical layers, and wherein determining the subset comprises selecting the operation point.

**42**. An apparatus for receiving encoded video data, the apparatus comprising:

an interface configured to receive information from a source device that describes hierarchical layers of video data for a movie fragment of a video file, wherein the fragment comprises a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related coded video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the hierarchically related coded video pictures of each of the sub-track fragments correspond to a common hierarchical layer for the corresponding sub-track fragment; and

a control unit configured to determine a subset of the hierarchical layers of video data to request, wherein, for each of the hierarchical layers of the subset, the control unit is configured to send no more than one request, in accordance with a streaming protocol, to the source device to retrieve all of the video data of the movie fragment at the hierarchical layer,

wherein the interface is configured to receive the video data of the determined subset of the hierarchical layers in response to the requests.

**43**. The apparatus of claim **42**, wherein the information that describes the hierarchical layers comprises a sub-track fragment header that specifies, for each of the hierarchical layers, a byte range in the movie fragment of the video data corresponding to the hierarchical layer.

**44**. The apparatus of claim **42**, wherein the received video data comprises a first sub-track fragment for a first hierarchical layer and a second sub-track fragment for a second hierarchical layer, wherein the first sub-track fragment includes a plurality of video pictures, and wherein the second sub-track fragment includes a reassembler object that references one of the plurality of video pictures of the first sub-track fragment, and wherein the control unit is configured to arrange a sequence of video pictures from the first sub-track fragment and the second sub-track fragment in decoding order using the reassembler object.

**45**. The apparatus of claim **42**, wherein the information that describes the hierarchical layers comprises an initialization segment of a media file including the video data, wherein the movie box defines an operation point corresponding to the subset of the hierarchical layers, and wherein to determine the subset, the control unit is configured to select the operation point.

**46**. The apparatus of claim **42**, wherein the apparatus comprises at least one of:

an integrated circuit;

a microprocessor; and

a wireless communication device that includes the control unit.

**47**. An apparatus for receiving encoded video data, the apparatus comprising:

means for receiving information from a source device that describes hierarchical layers of video data for a movie fragment of a video file, wherein the fragment comprises a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related coded video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the hierarchically related coded video pictures of each of the sub-track fragments correspond to a common hierarchical layer for the corresponding sub-track fragment;

means for determining a subset of the hierarchical layers of video data to request;

means for sending, for each of the hierarchical layers of the subset, no more than one request, in accordance with a streaming protocol, to the source device to retrieve all of the video data of the movie fragment at the hierarchical layer;

means for receiving the video data of the determined subset of the hierarchical layers; and

means for decoding and displaying the received video data.

**48**. The apparatus of claim **47**, wherein the information that describes the hierarchical layers comprises a sub-track fragment header that specifies, for each of the hierarchical layers, a byte range in the movie fragment of the video data corresponding to the hierarchical layer.

**49**. The apparatus of claim **47**, wherein the received video data comprises a first sub-track fragment for a first hierarchical layer and a second sub-track fragment for a second hierarchical layer, wherein the first sub-track fragment includes a plurality of video pictures, and wherein the second sub-track fragment includes a reassembler object that references one of the plurality of video pictures of the first sub-track fragment, the apparatus further comprising:

means for arranging a sequence of video pictures from the first sub-track fragment and the second sub-track fragment in decoding order using the reassembler object.

**50**. The apparatus of claim **47**, wherein the information that describes the hierarchical layers comprises an initialization segment of a media file including the video data, wherein the movie box defines an operation point corresponding to the subset of the hierarchical layers, and wherein the means for determining the subset comprises means for selecting the operation point.

**51**. A computer program product comprising a computer-readable storage medium having stored thereon instructions that, when executed, cause a processor of a device for receiving encoded video data to:

receive information from a source device that describes hierarchical layers of video data for a movie fragment of a video file, wherein the fragment comprises a plurality of sub-track fragments, each of the sub-track fragments comprising a plurality of hierarchically related coded video pictures of the encoded video data arranged continuously in decoding order within the respective sub-track fragment, wherein the hierarchically related coded video pictures of each of the sub-track fragments correspond to a common hierarchical layer for the corresponding sub-track fragment;

determine a subset of the hierarchical layers of video data to request;

for each of the hierarchical layers of the subset, send no more than one request, in accordance with a streaming protocol, to the source device to retrieve all of the video data of the movie fragment at the hierarchical layer;

receive the video data of the determined subset of the hierarchical layers; and

decode and display the received video data.

**52**. The computer program product of claim **51**, wherein the information that describes the hierarchical layers comprises a sub-track fragment header that specifies, for each of the hierarchical layers, a byte range in the movie fragment of the video data corresponding to the hierarchical layer.

**53**. The computer program product of claim **51**, wherein the received video data comprises a first sub-track fragment for a first hierarchical layer and a second sub-track fragment for a second hierarchical layer, wherein the first sub-track fragment includes a plurality of video pictures, and wherein the second sub-track fragment includes a reassembler object that references one of the plurality of video pictures of the first sub-track fragment, the computer-readable storage medium further comprising instructions to:

arrange a sequence of video pictures from the first sub-track fragment and the second sub-track fragment in decoding order using the reassembler object.

**54**. The computer program product of claim **51**, wherein the information that describes the hierarchical layers comprises an initialization segment of a media file including the video data, wherein the movie box defines an operation point corresponding to the subset of the hierarchical layers, and wherein the instructions to determine the subset comprise instructions to select the operation point.