IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

NOKIA TECHNOLOGIES OY, **Plaintiff,** **v.** **PARAMOUNT SKYDANCE CORPORATION, PARAMOUNT GLOBAL, and PARAMOUNT STREAMING SERVICES, INC.,** **Defendants.**	**Civil Action No. 1:25-cv-01054-UNA** **JURY TRIAL DEMANDED**

ORIGINAL COMPLAINT

Plaintiff Nokia Technologies Oy ("Nokia," or "Plaintiff") files this Original Complaint against Paramount Skydance Corporation, Paramount Global, and Paramount Streaming Services, Inc. ("Paramount" or "Defendants") and alleges as follows:

NATURE OF THE ACTION

1. Nokia is a leading innovator in video coding technology with one of the strongest video patent portfolios in the world. Nokia's patented inventions allow video to be efficiently and reliably transmitted and received over communications networks, such as internet or cellular networks, with high quality and dramatically lower bandwidth requirements, and minimize the amount of data it takes to send, receive, and store these videos.

2. Nokia's patent portfolio includes claims related to video decoding and encoding. As opposed to decoding, encoding video generally refers to compressing or reducing the size of raw video files so that they are suitable for storage and transmission over different media (e.g., over the internet or cellular networks) and are suitable for playback on devices that may have different capabilities (e.g., a mobile device, TV, or a computer).

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3. The "Accused Services" are backend processes, including for example transcoding and encoding, for the purpose of providing videos to users and user authentication processes wherein such processes infringe one or more method claims in Nokia's Asserted Patents (as defined below).

4. Paramount currently benefits and has benefitted from Nokia's innovations, which—among other things—enable Paramount's Accused Services to encode and deliver high-quality video more efficiently and effectively. Nokia's patented technology is important to Paramount's business. Nokia's patented technology benefits Paramount's ad-supported and subscription offerings, including but not limited to Paramount+, Pluto TV, and BET+.

5. Though other companies have recognized and validated the strength of Nokia's video patent portfolio by taking licenses to Nokia's portfolio, Paramount is using Nokia's patented technology without a license. Nokia brings this lawsuit to end Paramount's unlicensed use of Nokia's patented technology.

PARTIES

6. Plaintiff Nokia Technologies Oy is a foreign corporation organized under the laws of Finland, with its principal place of business at Karakaari 7, FIN-02610, Espoo, Finland. Plaintiff is a wholly owned subsidiary of Nokia Corporation ("Nokia Corp.") and the sole owner by assignment of all right, title, and interest in U.S. Patent Nos. 7,532,808; 6,950,469; 8,175,148; 8,050,321; 7,289,674; 6,968,005; 7,082,450; 6,711,211; 8,005,145; 9,800,891; 6,856,701; 8,107,744; and 8,776,204 (the "Asserted Patents").

7. On information and belief, Paramount Skydance Corporation is a corporation organized under the laws of the State of Delaware.

8. On information and belief, Paramount Skydance Corporation has its principal place of business at 5555 Melrose Avenue, Los Angeles, California, 90038.

9. On information and belief, Paramount Global is a corporation organized under the laws of the State of Delaware.

10. On information and belief, Paramount Global has its principal place of business at 1515 Broadway, New York, New York 10036.

11. On information and belief, Paramount Streaming Services, Inc. is a corporation organized under the laws of the State of Delaware.

12. On information and belief, Paramount Streaming Services, Inc. has its principal place of business at 235 Second Street, San Francisco, California.

JURISDICTION AND VENUE

13. This Court has exclusive subject matter jurisdiction over the patent infringement claims in this case under 28 U.S.C. §§ 1331 and 1338.

14. This Court has original subject matter jurisdiction over Count XIV (Declaratory Judgment of no RAND Obligation/Violation) under 28 U.S.C. § 1332(a)(2), as the parties are completely diverse and the amount in controversy exceeds $75,000. An actual controversy over Count XIV exists between the parties to this case.

15. The Court also has supplemental jurisdiction over all claims other than the patent infringement claims in this case under 28 U.S.C. § 1367(a), including over Count XIV (Declaratory Judgment of no RAND Obligation/Violation).

16. This Court has general personal jurisdiction over Paramount Skydance Corporation by virtue of Paramount Skydance Corporation's incorporation in Delaware. Paramount Skydance Corporation has appointed a registered agent for service of process: Corporation Service Company, 251 Little Falls Drive, Wilmington, Delaware 19808.

17. This Court has general personal jurisdiction over Paramount Global by virtue of Paramount Global's incorporation in Delaware. Paramount Global has appointed a registered agent

for service of process: Corporation Service Company, 251 Little Falls Drive, Wilmington, Delaware 19808.

18. This Court has general personal jurisdiction over Paramount Streaming Services, Inc. by virtue of its incorporation in Delaware. Paramount Streaming Services, Inc. has appointed a registered agent for service of process: Corporation Service Company, 251 Little Falls Drive, Wilmington, Delaware 19808.

19. This Court has specific personal jurisdiction over Defendants because they have, directly and/or through agents and/or intermediaries, committed acts and continue to commit acts of patent infringement, including within Delaware, giving rise to this action and have established minimum contacts with Delaware such that the exercise of jurisdiction would not offend traditional notions of fair play and substantial justice.

20. Defendants, directly and/or indirectly through agents and intermediaries, have committed and continue to commit acts of infringement, including, on information and belief, in Delaware and this District. Defendants, among other things, use the infringing Accused Services to place one or more encoded video bitstreams into the stream of commerce over the internet with the knowledge and/or understanding that such Accused Services were being utilized for the purpose of offering services and videos in Delaware.

21. On information and belief, Defendants regularly conduct and have conducted business in Delaware, including in this District, and purposefully avail themselves of the privileges of conducting business in Delaware and this District. On information and belief, Defendants, and/or their agents and/or intermediaries, make, use, import, offer for sale, sell, and/or advertise their products and affiliated services in Delaware and this District, sufficient to give rise to jurisdiction.

22. On information and belief, Defendants derive and have derived substantial revenue from the Accused Services within Delaware, and/or expect or should reasonably expect their actions to have consequences in Delaware.

23. Defendants' infringing activity has led to foreseeable harm and injury to Nokia.

24. Venue is proper under 28 U.S.C. § 1391 and 28 U.S.C. § 1400(b). As set forth above, Paramount has committed acts of infringement in this District and has a regular and established place of business in this District, and Paramount is incorporated in this District.

I. NOKIA'S INVESTMENT IN VIDEO CODING TECHNOLOGY AND RESULTING PATENT CLAIMS

25. Nokia has consistently been one of the major contributors to wireless communication, audio, and video standards and technologies that enable many features that are commonplace and expected of today's consumer electronics and services.

26. Over the past several years, video has become the main form of internet traffic, coinciding with, for example, the rise in popularity of internet and social media apps and streaming services. In 2022, for example, video was estimated to be 82% of global consumer internet traffic.

27. Nokia Corp., together with its wholly owned subsidiaries, has cumulatively invested billions of dollars in research and development relating to mobile communications and video coding technologies and, because of this commitment, currently owns more than 20,000 patents worldwide. These include many patents with encoding patent claims that, while not essential to the H.264 and H.265 Standards (defined below), are implemented by companies such as Paramount due to the efficiencies they bring to non-standardized encoding processes.

II. THE ITU'S COMMON PATENT POLICY

28. The ITU was formed in 1865 at the International Telegraph Convention and, in 1947, it became a specialized agency of the United Nations, responsible for issues that concern

information and communication technologies. The ITU handles a variety of matters and thus is organized into various sectors. One of the sectors is Telecommunication Standardization or "ITU-T." The mission of ITU-T is to ensure efficient and timely production of standards related to the field of telecommunications. The standards developed by ITU-T are referred to as "Recommendations."

29. Within ITU-T, members come together and propose technological solutions for inclusion in the draft Recommendations. The ITU and the International Standards Organization ("ISO") jointly published a standard referred to as "H.264," "MPEG-4 part 10," or "Advanced Video Coding" (the "H.264 Standard"). The H.264 Standard development process was initiated by Video Coding Experts Group ("VCEG") and finalized by the Joint Video Team ("JVT"), which was a collaborative effort between VCEG and the Moving Picture Experts Group ("MPEG").

30. Following publication of the H.264 Standard, the Joint Collaborative Team on Video Coding ("JCT-VC") began work on the H.265 Standard. The H.265 Standard, which is also known as "MPEG-H Part 2" or "High Efficiency Video Coding," represents the next step for video quality and coding efficiency after the widely successful H.264 Standard.

31. The contributions that are ultimately included in a Recommendation may be covered by one or more patent claims, so the ITU developed the Common Patent Policy.

32. The ITU published Guidelines for Implementation of the Common Patent Policy (the "Guidelines"). The Guidelines explain that the Common Patent Policy "was drafted in its operative part as a checklist, covering the three different cases which may arise if a Recommendation | Deliverable requires licenses for Patents to be practiced or implemented, fully or partly." [*"Guidelines for Implementation of the Common Patent Policy for ITU-*

T/ITURIISOIIEC," ITU, Rev. 4 (Dec. 16, 2022) https://www.itu.int/itudoc/itu-t/patents/policy/guide.pdf].

33. The Common Patent Policy states:

> 2. If a Recommendation | Deliverable is developed and such information as referred to in paragraph 1 has been disclosed, three different situations may arise:
>
> 2.1 The patent holder is willing to negotiate licences free of charge with other parties on a non-discriminatory basis on reasonable terms and conditions. Such negotiations are left to the parties concerned and are performed outside ITU-T/ITU-R/ISO/IEC.
>
> 2.2 The patent holder is willing to negotiate licences with other parties on a non-discriminatory basis on reasonable terms and conditions. Such negotiations are left to the parties concerned and are performed outside ITU-T/ITU-R/ISO/IEC.
>
> 2.3 The patent holder is not willing to comply with the provisions of either paragraph 2.1 or paragraph 2.2; in such case, the Recommendation | Deliverable shall not include provisions depending on the patent.
>
> 3. Whatever case applies (2.1, 2.2 or 2.3), the patent holder has to provide a written statement to be filed at ITU-TSB, ITU-BR or the offices of the CEOs of ISO or IEC, respectively, using the appropriate "Patent Statement and Licensing Declaration" form. This statement must not include additional provisions, conditions, or any other exclusion clauses in excess of what is provided for each case in the corresponding boxes of the form.

[*"Common Patent Policy for ITU-TIITU-RIISOIIEC,"* ITU (2022), https://www.itu.int/en/ITU-T/ipr/Pages/policy.aspx].

34. The Guidelines define the term "Patent" to be "those claims contained in and identified by patents, utility models and other similar statutory rights based on inventions (including applications for any of these) solely to the extent that any such claims are essential to the implementation of a Recommendation | Deliverable. Essential patents are patents that would be required to implement a specific Recommendation | Deliverable." [*"Guidelines for Implementation of the Common Patent Policy for ITU-T/ITURIISOIIEC,"* ITU, Rev. 4 (Dec. 16, 2022) https://www.itu.int/itudoc/itu-t/patents/policy/guide.pdf]. The definition of "Patent"

provided by the Guidelines is mirrored in the Patent Statement and Licensing Declaration Form that is completed by patent holders who may have patent claims essential to the H.264 or H.265 Standards. The Patent Statement and Licensing Declaration Form states that identifying specific patents on the form is optional (i.e., not required).

35. The ITU's Common Patent Policy thus deems "essential" only patent claims that are required to implement a specific Recommendation.

36. The H.264 Recommendation specifies the implementation of decoders and specifically defines the "decoding process" as "[t]he process specified in this Recommendation | International Standard that reads a *bitstream* and derives *decoded pictures* from it." It does not, however, specify the implementation of encoders.

37. The H.264 Recommendation defines "encoding process" as "[a] process, not specified in this Recommendation | International Standard, that produces a *bitstream* conforming to this Recommendation | International Standard."

38. Similarly, the H.265 Recommendation only specifies the implementation of decoders. *See* Recommendation ITU-T H.265 (defining (i) "decoding process" as "[t]he process specified in this Specification that reads a *bitstream* and derives *decoded pictures* from it" and (ii) "encoding process" as "[a] process not specified in this Specification that produces a *bitstream* conforming to this Specification.").

39. Nokia has committed that it is prepared to grant licenses for decoding according to the H.264 and H.265 Standards to any patent claims essential to the H.264 and H.265 Standards on reasonable and non-discriminatory (RAND) terms and conditions as set forth in the ITU Common Patent Policy. Consistent with the ITU Common Patent Policy, Nokia timely notified standard setting participants that Nokia may obtain patents on its contributions, including by

submitting Patent Statement and Licensing Declarations to the ITU in which Nokia declares in good faith that it is prepared to grant licenses to the essential claims of the relevant patents on RAND terms and conditions.

40. Under the terms of the ITU's Common Patent Policy and Nokia's declarations, Nokia's encoding patent claims are not "essential" to the H.264 and/or H.265 Standards. Accordingly, as tribunals have recognized, Nokia's patent claims covering encoding processes are not "essential" to the H.264 and/or H.265 Standards and are thus not RAND encumbered.

III. NOKIA'S NEGOTIATIONS WITH PARAMOUNT

41. Nokia first informed Paramount of Nokia's extensive portfolio of patents relevant to multimedia technologies in an email dated September 29, 2022.

42. Since its September 29, 2022 email, Nokia has been negotiating with Paramount in good faith.

43. On December 7, 2022, Nokia gave Paramount notice that Paramount used and needed to take a license to the 7,532,808; 6,950,469; 8,175,148; 8,050,321; 7,289,674; 6,968,005; 7,082,450; 6,711,211; 8,005,145; 9,800,891; 6,856,701; and 8,107,744 patents.

44. On November 23, 2024, Nokia gave Paramount notice that Paramount used and needed to take a license to the 8,776,204 patent.

45. Nokia repeatedly told Paramount that Nokia's encoding patent claims are not essential to the H.264 and/or H.265 Standards and are thus not RAND encumbered or otherwise governed by the ITU's Common Patent Policy. Despite Nokia's repeated statements, Paramount did not concede this point or otherwise agree.

46. On information and belief, Paramount disagrees that Nokia's encoding patent claims are not RAND encumbered or otherwise governed by the ITU's Common Patent Policy.

47. Despite Nokia's good faith efforts to negotiate, the parties have been unable to reach agreement. Paramount has profited from infringing Nokia's patents but has paid no royalties.

48. Paramount's continued and past unauthorized use of Nokia's patents has prompted Nokia to seek the relief sought by this Complaint.

IV. NOKIA ASSERTED PATENTS

49. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287(a) at least because the asserted method claims do not require marking and/or there is nothing to mark.

A. U.S. Patent No. 7,532,808

50. Nokia owns by assignment the entire right, title, and interest in and to U.S. Patent No. 7,532,808 (the "'808 Patent"). The '808 Patent, entitled "Method for Coding Motion in a Video Sequence" issued on May 12, 2009, to inventor Jani Lainema. Nokia owns all rights to the '808 Patent necessary to bring this action. The '808 Patent issued from U.S. Patent Application No. 10/390,549, filed on March 14, 2003, and claims priority to U.S. Provisional Application No. 60/365,072, filed on March 15, 2002. A true and correct copy of the '808 Patent is attached as Exhibit 1 and incorporated by reference herein.

51. The '808 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the '808 Patent is directed to novel and unconventional improvements to motion-compensated prediction in the field of digital video coding. The '808 Patent provides improvements over prior motion compensated prediction and video compression techniques that result in substantial benefits to motion prediction, video compression, video quality, and video playback.

52. A digital video sequence is a sequence of still images with "the illusion of motion being created by displaying consecutive images of the sequence one after the other at a relatively

fast rate." '808 Patent at 1:15-19. These still images are referred to as frames. "Each frame of an uncompressed digital video sequence comprises an array of image pixels." *Id*. at 1:32-33. Frames in commonly used video formats may have millions of pixels.

53. The '808 Patent describes that video frames in a given digital video sequence may contain various forms of redundancy. *Id.* at 2:36-46. "Temporal redundancy" refers to the fact that "objects appearing in one frame of a sequence are likely to appear in subsequent frames." *Id*.

54. As the '808 Patent explains, "motion-compensated prediction" can take advantage of temporal redundancy to "predict" the image content of some frames from "one or more other frames in the sequence, known as 'reference frames.'" *Id.* at 3:15-18. Predictions can be achieved by tracking the motion of objects or regions of an image between a given frame and one or more reference frames. *Id.* at 3:18-23.

55. Prior to the '808 Patent, some motion-compensated prediction techniques involved assigning "coding modes" to "macroblocks" (a region of 16x16 image pixels in the original image). *See id*. at 1:64-2:6. One such coding mode was referred to as "SKIP" mode. SKIP mode was assigned to macroblocks that could be copied from a reference frame without using or considering motion-compensated prediction. *Id.* at 10:64-67.

56. As explained in the '808 Patent, "it is necessary for a corresponding video decoder to be aware of that coding mode in order for it to correctly decode the received information relating to the macroblock in question." *Id.* at 11:20-24. "Therefore, an indication of the coding mode assigned to each macroblock is provided in the video bit-stream." *Id.* at 11:24-27. The indication can be transmitted using a variable length codeword, where "the shortest codeword is used to represent the coding mode that is statistically most likely to occur." *Id.* at 11:27-32. At the time

of the ’808 Patent (during development of what would become the H.264 Standard), SKIP mode was assumed to be the most frequently occurring mode.

57. However, SKIP mode could not effectively address problems with certain types of redundancy within video sequences—for example, global and regional motion, such as might occur when phenomena like panning or zooming are present in a video sequence. *Id*. at 12:41-47. For example, redundancies may occur in a video sequence when footage is captured by a video camera moving horizontally from a fixed position or when translational motion occurs, such as when an object translates across a stationary background. Prior motion-compensated prediction techniques could not efficiently or effectively handle these scenarios. For example, in the prior H.263+ video coding standard, this global motion scenario was addressed by using a highly complex global motion compensation technique that required the decoder to rely on additional information. *Id*. at 12:48-13:30. This prior solution was computationally intensive and less efficient. *Id*.

58. The ’808 Patent overcame these technical challenges in the prior systems by inventing an improved skip coding mode. The ’808 Patent’s improved skip coding mode can address certain scenarios with motion (and/or without motion) without the need for additional motion data. For example, the ’808 Patent teaches that the skip coding mode is associated with either a zero (non-active) motion vector or a non-zero (active motion vector), where the decision is made by analyzing the motion of other macroblocks or sub-blocks in a region surrounding the macroblock to be coded. *Id.* at 14:23-32. Therefore, for example, “SKIP mode [skip coding mode] macroblocks can adapt to the motion in the region surrounding them, enabling global or regional motion to [be] taken account of in an efficient manner.” *Id*. at 14:48-51.

59. For example, an encoder can assign skip coding mode to a given macroblock and include such an indication in the bitstream. For a skip coded macroblock, an encoder need only encode an indication of skip coding mode and no further motion vector information. The encoder can form a prediction with the improved skip coding mode. These unconventional solutions allow an encoder to, for example, more efficiently encode video sequences with a reduced amount of information. Because the '808 Patent inventions use the surrounding macroblocks or sub-blocks to determine how the skip coding mode will operate for a given image segment, there is no need for the video encoder to use additional information to encode certain types of motion (or no motion). *Id*. at 14:52-64.

60. The novel solution of the '808 Patent, including the aforementioned aspects, was not well-understood, routine, or conventional, nor was it simply comprised of well-understood, routine, and conventional activities previously known to the industry. Indeed, the '808 Patent specifies an entirely new and improved coding mode.

61. The '808 Patent therefore provides specific technological improvements to the functionality and capabilities of video coding technology that, for example, "not only provides an improvement in coding efficiency in the presence of global motion . . . but also enables regional motion to be represented in an efficient manner." *Id*. at 14:14-22.

62. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the '808 Patent at least because the asserted claims of the '808 Patent are all method claims that do not require marking and/or there is nothing to mark.

B. U.S. Patent No. 6,950,469

63. On September 27, 2005, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 6,950,469 (the "'469 Patent"), entitled "Method for Sub-Pixel Value Interpolation," to inventors Marta Karczewicz and Antti Olli Hallapuro. Nokia owns all rights to

the '469 Patent necessary to bring this action. The '469 Patent issued from U.S. Patent Application No. 09/954,608, filed on September 17, 2001. A true and correct copy of the '469 Patent is attached hereto as Exhibit 2 and incorporated herein by reference.

64. The '469 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the '469 Patent is directed to novel and unconventional improvements to motion-compensated prediction in the field of digital video coding. The '469 Patent provides improvements over prior motion compensated prediction and video compression techniques that result in substantial benefits to motion prediction, video compression, video quality, and video playback.

65. A digital video sequence is a sequence of still images with "the illusion of motion being created by displaying consecutive images of the sequence one after the other at a relatively fast frame rate." '469 Patent at 1:10-15. Consecutive images (or frames) often tend to be only slightly different from one another because, for example, the background is stationary or only changes slowly. *Id.* at 1:18-25. Thus, there is often a "considerable amount of redundant information" between consecutive images. *Id.* at 1:15-18. The '469 Patent describes one form of redundancy as "temporal redundancy." To reduce temporal redundancy "the content of some (often many) frames in a video sequence is 'predicted' from other frames in the sequence by tracing the motion of objects or regions of an image between frames." *Id.* at 2:61-65. A "prediction frame" is created by generating prediction pixels from a reference frame according to motion information, which describes the relationship between pixels in the current frame and their corresponding prediction pixels in the reference frame. *Id.* at 3:53-58. The difference between the current frame being coded and the predicted frame is referred to as the prediction error frame. *Id.* at 3:49-64.

66. A video encoder can therefore represent a current frame in a more compact way by representing the frame in terms of the motion information required to form its prediction frame and the prediction error frame. *Id.* at 3:64-4:3. Thus, the "operating principle of video coders using motion compensation is to minimize the amount of information in a prediction error frame." *Id.* at 3:38-42.

67. However, as the '469 Patent explains, when using motion compensated prediction, full pixel resolution is generally not sufficiently accurate to model real life motion, which has arbitrary precision. *Id.* at 6:24-35. Therefore, sub-pixel resolution is used. *Id.* at 6:35-41. Allowing motion vectors to have sub-pixel resolution adds to the complexity and burden of the encoding and decoding operations that must be performed, in part, because the sub-pixel values must be interpolated from full resolution pixels. *Id.* at 6:35-45, 7:23-26.

68. One problem with sub-pixel value interpolation is maintaining prediction accuracy while also limiting computational complexity and memory usage. For example, prior to the '469 Patent, conventional sub-pixel value interpolation methods used predetermined sets of particular nearby pixels and sub-pixels to interpolate other sub-pixel values, without providing any choice or flexibility and without sufficiently balancing interpolation accuracy and computational complexity. *Id.* at 11:15-21. These prior methods required the unnecessary interpolation and storage of sub-pixel values that were needed only to interpolate other sub-pixels. *Id.* at 11:14-32. This increased computational complexity and memory requirements, as well as reduced the precision of the interpolated sub-pixel values (due to truncation when storing the values). *Id.* Other methods reduced unnecessary dependencies in the interpolation of certain sub-pixels, but those methods retained numerical precision which required high precision arithmetic and high memory requirements. *Id.* at 13:20-29.

69. The ’469 Patent overcame these technical challenges in the prior systems by inventing a method of sub-pixel value interpolation that improves performance with respect to both computational complexity and memory requirements while maintaining prediction accuracy. The ’469 Patent employs the unconventional solution of providing flexibility and a choice of which pixels and sub-pixels to use in the interpolation of other sub-pixels. ’469 Patent at 38:47-51. For example, the ’469 Patent is superior to prior art methods in that it does not require any ¼ resolution sub-pixels to depend on previously interpolated ¼ resolution sub-pixels. *Id.* at 37:36-41. According to the ’469 Patent, ¼ resolution sub-pixels that have ¼ resolution in both the horizontal and vertical directions are interpolated by a diagonally located pixel and sub-pixel or two diagonally located sub-pixels. *Id.* at 13:66-14:9. This not only reduces the number of calculations required as compared to conventional technology, this increases precision by eliminating truncation and clipping that occurs in the intermediate interpolation steps. *Id.* at 37:41-53. Similarly, the ’469 Patent provides the unconventional flexibility of a choice for the interpolation of the ½ resolution sub-pixels. *Id.* at 38:35-39. This also results in the minimization of operations required to perform sub-pixel interpolation. *Id.* at 38:39-43.

70. As another example, the ’469 Patent is superior to prior art methods in that it does not require high precision arithmetic to be used in the calculation of all sub-pixels. *Id.* at 37:66-38:5. The selective use of lower precision arithmetic decreases the computational complexity and increases the speed at which the calculations can be performed. *Id.* at 38:5-22.

71. The ’469 Patent therefore provides a specific technological improvement to the functionality and capabilities of video coding technology that results in increased efficiency and reduced computational complexity and memory requirements.

72. Conventional technology prior to the '469 Patent was not capable of providing sufficient flexibility or choice of dependencies on pixels and sub-pixels used in sub-pixel interpolation. Conventional technology prior to the '469 Patent also could not avoid unnecessary interpolation and storage of sub-pixel values that were needed only to interpolate other sub-pixels.

73. The '469 Patent recognizes and solves these specific technological problems with the conventional technology at the time. The '469 Patent's ability to use a first weighted sum of values for sub-pixels residing at $½^{N-1}$ unit horizontal and unit vertical locations and a second weighted sum of values for sub-pixels residing at unit horizontal and $½^{N-1}$ unit vertical locations and ability to take a weighted average of the value of a first sub-pixel or pixel situated at a $½^{N-m}$ unit horizontal and $½^{N-n}$ unit vertical location and the value of a second subpixel or pixel located at a $½^{N-p}$ unit horizontal and $½^{N-q}$ unit vertical location, variables m, n, p and q taking integer values in the range 1 to N such that the first and second sub-pixels or pixels are located diagonally with respect to the sub-pixel at $½^{N}$ unit horizontal and $½^{N}$ vertical location was a significant advancement over existing technology.

74. The novel solution of the '469 Patent, including its superior subpixel interpolation techniques, was not well-understood, routine, or conventional, nor was it simply comprised of well-understood, routine, and conventional activities previously known to the industry. Furthermore, the ordered combination of elements, including using a choice of a first weighted sum of values for sub-pixels residing at $½^{N-1}$ unit horizontal and unit vertical locations and a second weighted sum of values for subpixels residing at unit horizontal and $½^{N-1}$ unit vertical locations and taking a weighted average of the value of a first sub-pixel or pixel situated at a $½^{N-m}$ unit horizontal and $½^{N-n}$ unit vertical location and the value of a second sub-pixel or pixel located at a $½^{N-p}$ unit horizontal and $½^{N-q}$ unit vertical location, variables m, n, p and q taking integer

values in the range 1 to N such that the first and second sub-pixels or pixels are located diagonally with respect to the sub-pixel at $½^N$ unit horizontal and $½^N$ vertical location, was not well-understood, routine, or conventional.

75. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the '469 Patent at least because the asserted claims of the '469 Patent are all method claims that do not require marking and/or there is nothing to mark.

C. U.S. Patent No. 8,175,148

76. On May 8, 2012, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 8,175,148 (the "'148 Patent"), entitled "Method and Device for Indicating Quantizer Parameters in a Video Coding System," to inventor Jani Lainema. Nokia owns all rights to the '148 Patent necessary to bring this action. The '148 Patent issued from U.S. Application No. 11/881,367, filed on July 26, 2007, which is a division of U.S. Application No. 10/421,629, filed on April 23, 2003, now U.S. Patent No. 7,263,125, which claims priority to Provisional Application Number 60/374,667, filed on April 23, 2002. A true and correct copy of the '148 Patent is attached hereto as Exhibit 3 and incorporated herein by reference.

77. The '148 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the '148 Patent is directed to novel and unconventional improvements to providing quantization parameter values used in motion-compensated prediction in the field of digital video coding. The '148 Patent provides improvements over prior motion compensated prediction and video compression techniques that result in substantial benefits to motion prediction, video compression, video quality, and video playback.

78. Digital video is comprised of "still images, the illusion of motion being created by displaying the images one after the other" at a relatively fast rate. '148 Patent at 1:20-24. Temporal redundancy refers to the fact that objects appearing in one image or frame of a video are likely to

appear in subsequent frames. *Id*. at 2:55-59. A technique called "motion-compensated prediction" takes advantage of temporal redundancy and predicts a current frame from a previous ("reference") frame "by tracking the motion of objects or regions of an image between a frame to be coded (compressed) and the reference frame(s) using 'motion vectors'." *Id*. at 3:13-23. "Frames of a video sequence, compressed using motion-compensated prediction, are generally referred to as INTER-coded or P-frames." *Id.* at 3:27-29. As the '148 Patent explains, "[m]otion-compensated prediction alone rarely provides a sufficiently precise representation of the image content of a video frame and therefore it is typically necessary to provide a so-called 'prediction error' (PE) frame with each INTER-coded frame." *Id.* at 3:29-33. The "prediction error frame comprises values that represent the difference between pixel values in the frame to be coded and corresponding reconstructed pixel values formed on the basis of a predicted version of the frame in question." *Id*. at 3:36-40.

79. As described in the '148 Patent, the prediction error values undergo transform coding and quantization to reduce the number of bits to be coded. *Id*. at 6:10-18, 4:39-50. However, "in order to stay in synchronization with the encoder, the decoder has to know the exact value of the QP [quantization parameter] used in the coded video sequence." *Id*. at 10:33-35. Prior encoders indicated the QP value "in the encoded bit-stream at the beginning of each picture" and then "also indicated [the QP value] at the beginning of each slice of the frame." *Id*. at 10:44-62.

80. Prior to the '148 Patent, one significant problem was that transmitting the QP value increased the number of bits needed to encode the image. *Id*. at 10:35-37. More specifically, in prior systems, "1.2 kbps is spent for the QP information alone." *Id*. at 10:40-43. Thus, prior systems were "very costly in terms of the number of bits required to represent the quantization parameter information." *Id*. at 10:62-67. Additionally, since systems allow the value of QP to vary at the

macroblock level, QP information in the bit-stream represented "a significant proportion of the overall available bandwidth." *Id*. at 11:3-17.

81. The '148 Patent overcame these technical challenges in the prior systems by inventing a default or reference level of QP that could be applied to multiple pictures. The '148 Patent employs the unconventional solution of using a default level of QP, which an encoder only needs to transmit with a sequence of multiple frames. *Id*. at 11:25-36. Because the default level of QP does not have to be transmitted at the beginning of every picture and every slice, there is a substantial reduction in transmission bit-rate, as well as a reduction in the time needed to transmit the encoded video sequence. *Id*.

82. The '148 Patent therefore provides a specific technological improvement to the functionality and capabilities of video coding technology that results in increased efficiency and significant reduction in transmission bit-rate. *Id*. at 11:37-42 (from 1.2 kpbs to 0.2 kpbs, in one example).

83. Conventional technology prior to the '148 Patent did not contemplate transmitting or receiving a default or reference level of QP that could be applied to multiple pictures. Conventional technology prior to the '148 Patent also did not contemplate transmitting a difference between a level of quantization and the default level of quantization at the beginning of each picture or each slice.

84. The '148 Patent recognizes and solves these specific technological problems with the conventional technology at the time. The '148 Patent's ability to define a default level of quantization for use in encoding of the digital video sequence to quantize the sets of transform coefficient values and ability to provide an indication of the default level of quantization to a decoding process was a significant advancement over existing technology.

85. The novel solution of the '148 Patent, including providing an indication of a default level of QP used for a plurality of pictures, was not well-understood, routine, or conventional, nor was it simply comprised of well-understood, routine, and conventional activities previously known to the industry. Furthermore, the ordered combination of elements, including defining a default level of quantization for use in encoding of the digital video sequence to quantize the sets of transform coefficient values and providing an indication of the default level of quantization to a decoding process, was not well-understood, routine, or conventional.

86. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the '148 Patent at least because the asserted claims of the '148 Patent are all method claims that do not require marking and/or there is nothing to mark.

D. U.S. Patent No. 8,050,321

87. Nokia owns by assignment the entire right, title, and interest in and to U.S. Patent No. 8,050,321 (the "'321 Patent"). The '321 Patent, entitled "Grouping of Image Frames in Video Coding," issued on November 1, 2011, to inventor Miska Hannuksela. Nokia owns all rights to the '321 Patent necessary to bring this action. The '321 Patent issued from U.S. Patent Application No. 11/338,934, filed on January 25, 2006, and claims priority to Foreign Application FI20020127, filed on January 23, 2002. A true and correct copy of the '321 Patent is attached as Exhibit 4 and is incorporated by reference herein.

88. The '321 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the '321 Patent is directed to novel and unconventional improvements to the process of video coding. The '321 Patent provides improvements over prior video coding techniques that result in substantial benefits to video compression, video quality, and video playback.

89. Digital video is comprised of still image frames, which are displayed rapidly in succession to create an impression of a moving image. '321 Patent at 1:55-58. The image frames typically comprise several stationary background objects and few moving objects, such that the information in consecutively displayed image frames is typically largely similar. *Id*. at 1:58-65. Many video coding methods make use of this so-called "temporal redundancy" by using "motion-compensated temporal prediction," in which the contents of an image frame are predicted from other frames. *Id*. at 2:16-23. Frames that use motion-compensated temporal prediction are also called INTER-frames. *Id*. at 2:27-29. Frames that do not use temporal prediction are also called INTRA-frames or I-frames. *Id*. at 2:23-26.

90. Both INTER-frames and INTRA-frames may be used in the motion-compensated prediction of another frame. However, if a frame that is used in the motion-compensated prediction of another frame is lost or corrupted, the frames dependent on it can no longer be correctly decoded. *Id*. at 2:32-33.

91. As another example, prior to the '321 Patent, one significant problem occurred when a user wanted to stream or browse a video from somewhere other than the beginning of the video (e.g., the user wishes to start from a certain position such as the middle or where the user left off from a previous viewing). *Id*. at 3:62-4:4. Prior systems did not include an encoded numbering scheme that allowed the decoder to recognize the first I-frame in a sequence of pictures. *Id*. at 11:11-21. Therefore, when streaming or browsing a digital video from a point other than the beginning, the decoder would interpret starting in the middle of a video stream as an unintentional loss of image frames and unnecessarily try to reconstruct the image frames suspected as lost. *Id*. at 11:20-25.

92. The ’321 Patent overcame these technical challenges in the prior systems by inventing a novel independent sequence of image frames that includes an indication of a first picture in an independently decodable group of pictures. *Id*. at 4:16-35. The ’321 Patent employs the unconventional solution of encoding into the video sequence an indication of at least one image frame, which is the first image frame, in decoding order, of the independent sequence. *Id.* at 22:63-65. This allows the encoder to ensure resiliency in the bitstream in the case that data is lost in transmission or the decoder begins decoding in the middle of a video. *Id*. at 4:16-38.

93. The ’321 Patent therefore provides a specific technological improvement to the functionality and capabilities of video encoding technology that results in increased resiliency and improved video playback. For example, the encoder can now enable the decoder to begin decoding from a random point in a video stream without prediction from any prior picture and without storing any pictures decoded prior to the first picture of the independent sequence in its memory. *Id*. at 4:48-58. For another example, the indication by an encoder of a first picture in an independently decodable group of pictures enables the decoder to identify a loss of a picture that is likely to cause unsatisfactory image quality and therefore require retransmission or picture refresh. *Id*. at 4:64-5:5.

94. Conventional technology prior to the ’321 Patent was not capable of identifying the first image frame of an independent sequence, wherein all motion-compensated temporal prediction references of the independent sequence refer only to image frames within the independent sequence, and resetting the identifier values for indicated first image frames of independent sequences.

95. The ’321 Patent recognizes and solves these specific technological problems that plagued the conventional technology at the time. The ’321 Patent’s ability to utilize at the encoder

an indication of at least one image frame, which is the first image frame, in decoding order, of the independent sequence and to utilize a reset identifier value for the indicated first image frame of the independent sequence was a significant advancement over existing technology.

96. The novel solution of the ’321 Patent, which includes encoding into the video sequence an indication of at least one image frame, which is the first image frame, in decoding order, of the independent sequence, was not well-understood, routine, or conventional, nor was it simply comprised of well-understood, routine, and conventional activities previously known to the industry. Furthermore, the ordered combination of elements, including encoding into the video sequence an indication of at least one image frame, which is the first image frame, in decoding order, of the independent sequence, was not well-understood, routine, or conventional.

97. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the ’321 Patent at least because the asserted claims of the ’321 Patent are all method claims that do not require marking and/or there is nothing to mark.

E. U.S. Patent No. 7,289,674

98. Nokia owns by assignment the entire right, title, and interest in and to U.S. Patent No. 7,289,674 (the “’674 Patent”). The ’674 Patent, entitled “Spatial Prediction Based Intra Coding” issued on October 30, 2007, to inventor Marta Karczewicz. Nokia owns all rights to the ’674 Patent necessary to bring this action. The ’674 Patent issued from U.S. Patent Application No. 10/459,126, filed on June 10, 2003 and claims priority, as a continuation-in-part to U.S. Patent Application No. 10/171,467, filed on June 12, 2002 and to three provisional applications, Provisional Application No. 60/395,178, filed on July 9, 2002; Provisional Application No. 60/391,112, filed on June 21, 2002; and Provisional Application No. 60/388,061, filed on June 11, 2002. A true and correct copy of the ’674 Patent is attached as Exhibit 5 and as incorporated by reference herein.

99. The ’674 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the ’674 Patent is directed to novel and unconventional improvements to coding a digital image wherein the memory and bitrate requirements are reduced. ’674 Patent at 5:49-52; 12:60-62. One improvement provided by the ’674 Patent resides in the fact that the amount of information to be transmitted is reduced if the correlation of the prediction mode for a current block with the prediction modes of adjacent blocks can be used. *Id.* at 4:33-35.

100. The ’674 Patent provides Fig. 3 to demonstrate the spatial relationship of neighboring blocks to the block being coded. Block “L” is the left neighbor, block “U” is the upper neighbor, and block “C” is the current block.

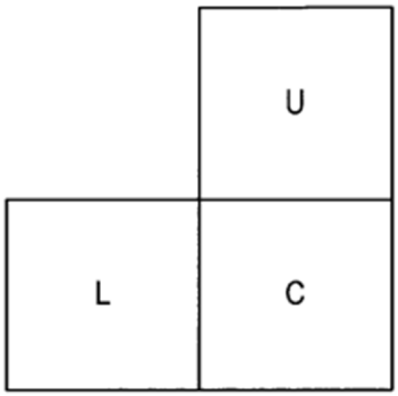


FIG. 3

101. As the ’674 Patent explains, “for each combination of modes for blocks U [upper] and L [left] there are just a few modes for block C [current] that have a high probability of occurrence.” *Id.* at 12:63-13:2. With the invention of the ’674 Patent, “[t]he modes assigned to each combination of prediction modes of U and L may be divided into two groups. The first group

includes m (where m is smaller than the overall number n of available modes) most probable prediction modes and the second group includes the remaining modes." *Id*. at 13:3-17.

102. Prior to the '674 Patent, in systems and methods used to code a block of video data, tables were used to keep track of the order of prediction modes, which relied on "each combination of prediction modes of U and L." *Id.* at 4:44-54. As such, "the memory required to keep ordering of prediction modes for block C given prediction modes of blocks U and L is demanding. In WD2 of the JVT coder, because 9 modes are used for prediction, there are 9×9 possible combinations of modes for blocks U and L. For each combination, an ordering of 9 possible modes has to be specified. That means that 9×9×9 bytes (here it is assumed that one number requires one byte) are needed to specify the ordering of prediction modes. In addition, more memory may be required to specify the special cases—for example, if one or both blocks U and L are not available." *Id.* at 5:37-48.

103. The '674 Patent overcame these technical challenges in the prior systems and methods by inventing a new method for coding a digital image using intra-mode block prediction, wherein, for example, "[a] list of prediction modes for each combination of prediction modes of the neighboring blocks is obtained. The modes assigned to each combination of prediction modes may be divided into two groups. The first group includes m (where m is smaller than the overall number n of available modes) most probable prediction modes and the second group includes the remaining modes. The modes in the first group are ordered according to their probability. This order may be specified as a list of modes ordered from most probable to the least probable mode. The modes belonging to the second group may be ordered in some predetermined manner, which may be specified depending on the information already available to the decoder. Information is sent to the decoder regarding whether the mode selected for a given block belongs to the first group

or to the second group. If it belongs to the first group, information is transmitted indicating that the ith most probable mode shall be used for a block C given the combination of modes for blocks U and L. If the mode belongs to the second group, information is transmitted indicating that jth mode of this group should be used." *Id.* at 5:58-6:29.

104. The '674 Patent therefore provides a specific technological improvement to the functionality and capabilities of video coding technology that results in reduced memory requirements (for example, because the system does not need to store tables to determine the order of probable coding modes; the system only needs to know the nine possible coding modes and a single ordering scheme), which was not well-understood, routine, or conventional. *Id.* at 5:49-52, 12:60-62.

105. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the '674 Patent at least because the asserted claims of the '674 Patent are all method claims that do not require marking and/or there is nothing to mark.

F. U.S. Patent No. 6,968,005

106. On November 22, 2005, the U.S. Patent and Trademark Office duly and legally issued U.S. Patent No. 6,968,005 (the "'005 Patent"), entitled "Video Coding," to inventor Miska Hannuksela. Nokia owns all rights to the '005 Patent necessary to bring this action. The '005 Patent issued from U.S. Application No. 09/855,640, filed on May 15, 2001, and claims priority to UK Patent Application Number 0011597, filed on May 15, 2000. A true and correct copy of the '005 Patent is attached hereto as Exhibit 6 and incorporated herein by reference.

107. The '005 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the '005 Patent is directed to novel and unconventional improvements to error detection when using motion-compensated prediction in the field of digital video coding. The '005 Patent provides improvements over prior motion compensated prediction and video

compression techniques that result in substantial benefits to motion prediction, video compression, video quality, and video playback.

108. A video sequence consists of a series of still pictures or frames, and "objects appearing in a previous image are also likely to appear in the current image." '005 Patent at 1:6-7, 1:14-16. For example, in a particular scene, the background may change very little, or a car may drive by, where the car itself does not change and merely moves across the screen. This type of redundancy is called "temporal redundancy." *Id*. at 1:14-16. Video "[c]ompression can be achieved by taking advantage of this temporal redundancy and predicting the current picture from another picture, termed an anchor or reference picture." *Id*. at 1:16-19.

109. As the '005 Patent explains, not all pictures use temporal redundancy. "A compressed video clip typically consists of a sequence of pictures, which can be roughly categorized into temporally independent INTRA pictures and temporally differentially coded INTER pictures." *Id*. at 1:59-1:62. That is, INTRA pictures do not use temporal redundancy and therefore do not rely on a temporal reference frame. Whereas INTER pictures do use temporal redundancy and therefore rely on a temporal reference frame.

110. Similarly, not all pictures are used as reference pictures, i.e., other pictures are not predicted from them. *Id*. at 1:48-50. Pictures that are not used as reference pictures "can be discarded (intentionally or unintentionally) without impacting the picture quality of future pictures." *Id*. at 1:50-52. Reference pictures, on the other hand, are used to predict other pictures. Therefore, an error in a reference picture "is propagated both spatially and temporally," which means that "once an error occurs, it is easily visible to the human eye for a relatively long time." *Id*. at 2:8-13.

111. Prior to the '005 Patent, one significant problem was that "the bit-stream does not include information identifying the reference picture," such that there is "no means to detect if a reference picture is lost." *Id.* at 3:35-39. Therefore, there was no way to know if a picture error would propagate into future pictures and substantially degrade the quality of the video (as in the case with a reference picture) or whether the picture error could simply be ignored (as in the case with a non-reference picture). *Id*. at 3:52-55. Prior systems could not differentiate the two scenarios and instead would freeze until the next INTRA frame was received or expend resources to perform error concealment techniques. *Id*. at 3:56-62, 2:29-2:64.

112. The '005 Patent overcame these technical challenges in the prior systems by inventing a novel sequence indicator with an independent numbering scheme to identify reference pictures and to enable the differentiation between a loss of a reference picture from a loss of a non-reference picture. *Id*. at 4:3-12, 15:2-17. The '005 Patent employs the unconventional solution of incrementing a new sequence indicator each time a reference picture is encoded so that it is possible to differentiate between errors in or loss of a reference picture versus a non-reference picture. *Id*. at 4:13-19.

113. The '005 Patent therefore provides a specific technological improvement to the functionality and capabilities of video coding technology that results in superior user experience and increased efficiency and video quality because a decoder no longer must freeze and wait for an INTRA frame when a non-reference picture has an error or is lost. *Id*. at 4:23-25, 4:34-37.

114. Conventional technology prior to the '005 Patent was not capable of identifying and distinguishing the loss of a reference frame from a non-reference frame and therefore could not take the action appropriate to compensate for the loss of a reference frame as compared to a non-reference frame.

115. The ’005 Patent recognizes and solves these specific technological problems with the conventional technology at the time. The ’005 Patent’s ability to use a sequence indicator having an independent numbering scheme, such that consecutive pictures used to form reference pictures in encoding order are assigned sequence indicator values that differ with respect to each other by a predetermined amount independent of the number of non-reference pictures encoded between successive reference pictures was a significant advancement over existing technology.

116. The novel solution of the ’005 Patent, including a sequence indicator with an independent numbering scheme to identify reference pictures, was not well-understood, routine, or conventional, nor was it simply comprised of well-understood, routine, and conventional activities previously known to the industry. Furthermore, the ordered combination of elements, including using a sequence indicator having an independent numbering scheme, such that consecutive pictures used to form reference pictures in encoding order are assigned sequence indicator values that differ with respect to each other by a predetermined amount independent of the number of non-reference pictures encoded between successive reference pictures, was not well-understood, routine, or conventional.

117. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the ’005 Patent at least because the asserted claims of the ’005 Patent are all method claims that do not require marking and/or there is nothing to mark.

G. U.S. Patent No. 7,082,450

118. On July 25, 2006, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 7,082,450 (the “’450 Patent”), entitled “Implementation of a Transform and of a Subsequent Quantization,” to inventors Antti Hallapuro and Kim Simelius. Nokia owns all rights to the ’450 Patent necessary to bring this action. The ’450 Patent issued from U.S.

Application No. 09/943,241, filed Aug. 30, 2001. A true and correct copy of the '450 Patent is attached hereto as Exhibit 7 and incorporated herein by reference.

119. The '450 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, it discloses specific, unconventional improvements to computer processing for discrete cosine transform ("DCT") operations and subsequent quantization for use in digital video and image processing and encoding. By re-structuring the DCT operation and including a compensating quantization operation, the '450 Patent provides benefits by increasing computation speed, decreasing complexity, improving power consumption, and providing video encoding efficiency. '450 Patent at Abstract, 1:7-18; 5:10-16.

120. A DCT operation converts blocks of pixel-domain data into frequency-domain coefficients that can be more efficiently compressed. Traditional implementations of DCT operations require numerous multiplications by irrational constants—operations that are computationally expensive and ill-suited to low-power or real-time hardware. *Id*. at 1:20-45.

121. Prior approaches had significant drawbacks, including deterioration in image quality, the sacrificing of too much coding accuracy, or the introduction of cumbersome correction stages that negated any computational benefit. *Id.* at 3:27-4:15.

122. The '450 Patent overcomes these shortcomings by employing a method that factors the exact DCT matrix **T** into $\mathbf{T} = \mathbf{D} \cdot \mathbf{S}$, where **D** is a diagonal matrix and **S** is a "simplified transform matrix." *Id.* at 6:12-19. The '450 Patent's methods then approximate each irrational element of **S** by a rational value whose denominator is a power of two. Because divisions by powers of two reduce to bit-shift operations in binary representations, the resulting transform can use only additions and shifts, without using less efficient multiplications. *Id.* at 6:20-28.

123. The operations removed from the transform matrix during simplification, as well as the errors introduced by approximating irrational numbers, are compensated for by extending and adjusting the following quantization step. Replacing irrational coefficients with rational approximations would ordinarily introduce systematic gain errors. The ’450 Patent resolves this by extending and adapting the quantizer step size so that the quantization stage absorbs those gain differences. *Id.* at 5:22-26. In other words, any error introduced in the forward transform is compensated before entropy coding, thereby preserving overall reconstruction fidelity. *Id.* at 6:36-44, 2:46-67, 3:15-35.

124. The invention is particularly suited for use in digital image and video compression systems. *Id.* at 7:33-39.

125. Because multiplications are eliminated, the invention cuts silicon area, reduces power draw, and increases throughput—critical advantages for mobile devices, battery-powered cameras, and real-time streaming encoders/decoders. *Id.* at 4:43-60.

126. The ’450 Patent therefore provides a specific technological improvement to video-coding hardware and software that results in increased speed, reduced computational complexity, and lower memory and power requirements, without degrading visual quality.

127. This invention presents a novel approach to DCT-based digital data compression by simplifying the transform, approximating complex coefficients, and compensating for these changes in the quantization process. The result is a fast, efficient, and high-quality compression method that is especially advantageous for mobile and embedded systems. *Id.* at 7:33-39.

128. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the ’450 Patent at least because the asserted claims of the ’450 Patent are all method claims that do not require marking and/or there is nothing to mark.

H. U.S. Patent No. 6,711,211

129. Nokia owns by assignment the entire right, title, and interest in and to U.S. Patent No. 6,711,211 (the "'211 Patent"). The '211 Patent, entitled "Method for Encoding and Decoding Video Information" issued on March 23, 2004, to inventor Jani Lainema. Nokia owns all rights to the '211 Patent necessary to bring this action. The '211 Patent issued from U.S. Patent Application No. 09/566,020, filed on May 8, 2000. A true and correct copy of the '211 Patent is attached as Exhibit 8 and is incorporated by reference herein.

130. The '211 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the '211 Patent is directed to novel and unconventional improvements to video coding, specifically in the field of motion-compensated prediction and video compression. The '211 Patent provides technological advancements over prior video compression techniques, resulting in substantial benefits to computational complexity, transmission bandwidth, image quality, and video coding efficiency.

131. As described in the '211 Patent, "[b]ecause of the large number of pixels in a video frame and the large number of video frames even in a typical video sequence, the amount of data required to represent the video sequence quickly becomes large. For instance, a video frame may include an array of 640 by 480 pixels, each pixel having an RGB (red, green, blue) color representation of eight bits per color component, totaling 7,372,800 bits per frame." '211 Patent at 1:14-21; 25-27; 53-54. The amount of data required to represent such a sequence is substantial, especially in applications such as mobile videotelephony. *See id.* at 1:63-66. "Therefore it is clearly evident that methods are required whereby the amount of information used to represent a video sequence can be reduced." *Id*. at 1:66-2:4.

132. The '211 Patent explains that typical video sequences exhibit significant temporal correlation due to motion in the scene, which may be caused by camera movement or moving

objects. *Id*. at 2:6-12. Motion-compensated prediction is a widely recognized technique for video compression, utilizing the fact that image values in a particular frame segment can be predicted from values in a previously coded and transmitted frame, given the motion trajectory between the frames. *Id*. at 2:9-25.

133. The ’211 Patent further explains that prior to the ’211 Patent, conventional video coding systems divided video frames into macroblocks and used motion models to estimate and transmit motion information. However, these systems often required “complex task[s]” where the encoder needs to “perform exhaustive calculations to evaluate all the possible prediction candidates and then select the best prediction block.” *Id*. at 6:1-5.

134. The ’211 Patent overcomes these technical challenges “[b]y restricting the number of possible prediction methods per macroblock segmentation. *Id*. at 7:59-65. This enables the decoder to infer the prediction method from the segmentation information alone, resulting in a method that is “efficient in terms of computation and in terms of the amount of trotted information and furthermore yields good image quality.” *Id*. at 8:24-27.

135. The ’211 Patent therefore provides specific technological improvements to the functionality and capabilities of video coding technology, including: (1) flexible and adaptive motion coefficient prediction associated with macroblock segmentation; (2) reduced computational complexity in the encoder; (3) reduced transmission bandwidth requirements; and (4) maintenance of good image quality, even when using simple motion models. These improvements are particularly beneficial in mobile and bandwidth-constrained environments.

136. The solutions of the ’211 Patent, including the association of prediction methods with macroblock segmentations and the minimization of a cost function to select an optimized pair, were not well-understood, routine, or conventional at the time of invention. The ordered

combination of these elements provides a significant advancement over existing video coding technology.

137. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the '211 Patent at least because the asserted claims of the '211 Patent are all method claims that do not require marking and/or there is nothing to mark.

I. U.S. Patent No. 8,005,145

138. Nokia owns by assignment the entire right, title, and interest in and to U.S. Patent No. 8,005,145 (the "'145 Patent"). The '145 Patent, entitled "Method and Apparatus for Transferring Video Frame in Telecommunication System" issued on August 23, 2011, to inventor Jani Lainema. Nokia owns all rights to the '145 Patent necessary to bring this action. The '145 Patent issued from U.S. Patent Application No. 10/885,256, filed on July 6, 2004, and claims priority as a continuation of U.S. Patent Application No. 09/637,773, filed on August 11, 2000. A true and correct copy of the '145 Patent is attached as Exhibit 9 and is incorporated by reference herein.

139. The '145 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the '145 Patent is directed to novel and unconventional improvements to predicting motion data of blocks of pixels in digital video frames. The '145 Patent provides improvements to motion vector prediction that result in substantial benefits to video compression, video quality, and video playback by providing savings in calculation time and capacity while the picture quality remains adequate.

140. As the '145 Patent explains, "Transferring video frames in telecommunication systems, such as video phones, video conference systems or Internet connections, is a demanding task due to the large amount of data needed to transfer a video frame, since the more bits are needed to transfer the data, the higher the data transmission rate must be." '145 Patent at 1:23-28. Video

frame blocks are defined using information on the luminance, color and location of the frame block in the frame itself. *Id.* at 1:31-33. These frames of video are compressed, based on removing the less significant data, using one or more of three classes of compression: "spectral redundancy reduction, spatial redundancy reduction and temporal redundancy reduction." *Id.* at 1:36-38.

141. With respect to the temporal redundancy reduction class of compression, "[t]emporal redundancy can be reduced by utilizing the fact that consecutive frames usually resemble each other, so instead of compressing each individual frame, motion data of the frame blocks is generated." *Id.* at 1:61-64. The '145 Patent describes that "an as good as possible reference block which has been coded earlier is searched for the frame block to be coded, the motion between the reference block and the frame block to be coded is modeled and the calculated motion vector coefficients are transmitted to the receiver. The difference between the block to be coded and the reference block is indicated as a prediction error component or frame." *Id.* at 1:65-2:4.

142. Prior to the '145 Patent, methods used to reduce temporal redundancy sought to address the problem of finding "a reference block which produces as good a coding efficiency as possible (a sufficiently good picture quality with as small an amount of bits as possible) and a high calculation capacity, and thus also calculation time, required by the comparison." *Id.* at 2:4-8.

143. The '145 Patent provided a superior solution than those in prior methods by inventing a new kind of motion vector prediction based on the unconventional solution of "calculating the motion data of the frame block being coded using only the neighbouring blocks which have the same reference frame that was used to code the frame reconstruction data of the block being coded" where at least one previously coded block has a different reference frame number than the reference frame number of the block to be encoded. *See id*. at 7:31-35.

144. The ’145 Patent achieved these improvements by, for example, “performing a prediction for a block to be coded using one of plurality of reference frames, the prediction comprising motion data and reference frame number,” “comparing the reference frame number of the block to be coded to the reference frame numbers of the previously coded blocks,” and “in response to at least one previously coded block having a different reference frame number than the reference frame number of the block to be coded, predicting the motion data of the block to be coded using only the motion data of the previously coded blocks which have the same reference frame number” as the block to be encoded.

145. The ’145 Patent therefore provides a specific technological improvement to the functionality and capabilities of video encoding technology that results in savings in calculation time and capacity while maintaining or prioritizing picture quality. *See id.* at 3:55-57.

146. Conventional technology prior to the ’145 Patent was not capable of predicting the motion data of the block to be coded using only the motion data of the previously coded blocks which have the same reference frame number as the block to be encoded in response to at least one previously encoded block having a different reference frame number than the reference frame number of the block being encoded.

147. The ’145 Patent recognizes and solves these specific technological problems with the conventional technology at the time. The ’145 Patent’s use of “calculating the motion data of the frame block being coded using only the neighbouring blocks which have the same reference frame that was used to code the frame reconstruction data of the block being coded” was a significant advancement over existing technology. *See id*. at 7:31-35.

148. The novel solution of the ’145 Patent, including performing a prediction for a block to be coded using one of plurality of reference frames, the prediction comprising motion data and

reference frame number, comparing the reference frame number of the block to be coded to the reference frame numbers of the previously coded blocks, and in response to at least one previously coded block having a different reference frame number than the reference frame number of the block to be coded, predicting the motion data of the block to be coded using only the motion data of the previously coded blocks which have the same reference frame number as the block to be encoded was not well-understood, routine, or conventional.

149. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the '145 Patent at least because the asserted claims of the '145 Patent are all method claims that do not require marking and/or there is nothing to mark.

J. U.S. Patent No. 9,800,891

150. Nokia owns by assignment the entire right, title, and interest in and to U.S. Patent No. 9,800,891 (the "'891 Patent"). The '891 Patent, entitled "Method and Associated Device for Filtering Digital Video Images," issued on October 24, 2017, to inventors Ossi Kalevo, Emre Aksu, and Marta Karczewicz. Nokia owns all rights to the '891 Patent necessary to bring this action. The '891 Patent issued from U.S. Patent Application No. 09/766,035, filed on January 19, 2001, and claims priority to Finnish Patent Application Number 20000120, filed on January 20, 2000. A true and correct copy of the '891 Patent is attached as Exhibit 10 and is incorporated by reference herein.

151. The '891 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the '891 Patent is directed to novel and unconventional improvements for reducing visual artefacts at the block boundaries in a frame of a digital video. The '891 Patent provides improvements to filtering techniques used to reduce visual artefacts due to block boundaries that result in substantial benefits to video compression, video quality, and video playback.

152. Digital video is formed from sequential still images or frames. Those frames are further divided into so-called "blocks." '891 Patent at 2:4-5. The '891 Patent describes generally four types of blocks, where the type specifies a method of coding: (i) intra coding, (ii) copy coding, (iii) motion-compensated prediction coding, and (iv) not-coded coding. *Id.* at 2:5-24. Motion-compensated prediction coding may include the use of prediction error, which is the difference between the pixel values of the actual frame and a reconstructed frame formed by using the motion compensated prediction. *Id.* at 2:12-19. In order to reduce the number of bits needed to represent the image, the prediction error blocks are further transform coded and quantized. *Id.* at 3:15-25.

153. As the '891 Patent explains, "[q]uantization causes rounding errors, which can become visible in an image reconstructed from blocks, so that there is a discontinuity of pixel values at the boundary between adjacent blocks." *Id.* at 3:25-29. These errors cause visible edges in the image and are called blocking artefacts. *Id.* at 3:29-34.

154. Prior to the '891 Patent, methods that were used to reduce or remove blocking artefacts considered "the difference between the values of pixels across the block boundary, the size of the quantization step of the coefficients received as the transformation result, and the difference of pixel values on different sides of the pixel being processed." *Id.* at 3:35-53. One significant problem with these methods was that they "tend to remove lines that belong to real features of the image" while "not always [being] capable of removing all blocking artefacts." *Id.* at 3:54-57.

155. The '891 Patent overcame these technical challenges in the prior methods by inventing a new kind of filtering arrangement that adjusts filtering parameters according to the coding type of blocks whose boundary is to be filtered. *Id.* at 3:61-4:1. The '891 Patent employs the unconventional solution of choosing different filtering parameters "according to the type of

block on either side of the boundary in order to yield an improved filtering result." *Id.* at 4:1-3. "Because blocking artefacts only occur at block boundaries, according to the invention, filtering is advantageously only applied to pixels at block boundaries and the vicinity thereof." *Id.* at 4:41-43. That is, "only pixels containing blocking artefacts are selected for corrective filtering" and "the quality of edges that are part of the image itself is not affected during filtering." *Id.* at 4:45-49. This is accomplished by flexibly selecting the number of pixels for filtering based on the type of block on either side of the block boundary. *Id.* at 5:15-30, 4:4-8.

156. The '891 Patent therefore provides a specific technological improvement to the functionality and capabilities of video coding technology that results in more reliable and efficient operations with better video quality. *Id.* at 5:21-28, 3:63-65, 4:4-8. "That means that a larger amount of blocking artefacts can be removed without weakening the real image edges unreasonably." *Id.* at 5:28-30.

157. Conventional technology prior to the '891 Patent did not contemplate adjusting filtering parameters according to the type of blocks whose boundary is to be filtered as described in the '891 Patent.

158. The '891 Patent recognizes and solves these specific technological problems with the conventional technology at the time. The '891 Patent's ability to provide information on the first and second prediction encoding methods to a block boundary filter and ability to determine, by the block boundary filter, a first number of pixels to be examined on the first side of the block boundary and a second number of pixels to be examined on the second side of the block boundary as a parameter of the adaptive block boundary filtering operation, based on the types of the first and the second prediction encoding methods was a significant advancement over existing technology.

159. The novel solution of the '891 Patent, including choosing different block boundary filtering parameters according to the type of block on either side of the boundary, was not well-understood, routine, or conventional, nor was it simply comprised of well-understood, routine, and conventional activities previously known to the industry. Furthermore, the ordered combination of elements, including providing information on the first and second prediction encoding methods to a block boundary filter and determining, by the block boundary filter, a first number of pixels to be examined on the first side of the block boundary and a second number of pixels to be examined on the second side of the block boundary as a parameter of the adaptive block boundary filtering operation, based on the types of the first and the second prediction encoding methods, was not well-understood, routine, or conventional.

160. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the '891 Patent at least because the asserted claims of the '891 Patent are all method claims that do not require marking and/or there is nothing to mark.

K. U.S. Patent No. 6,856,701

161. Nokia owns by assignment the entire right, title, and interest in and to U.S. Patent No. 6,856,701 (the "'701 Patent"). The '701 Patent, entitled "Method and System for Context-Based Adaptive Binary Arithmetic Coding," issued on February 15, 2005, to inventors Marta Karczewicz and Ragip Kurceren. Nokia owns all rights to the '701 Patent necessary to bring this action. The '701 Patent issued from U.S. Application No. 09/995,240, filed on November 27, 2001, which claims priority to U.S. Provisional Application Number 60/322,112, filed on September 14, 2001. A true and correct copy of the '701 Patent is attached as Exhibit 11 and is incorporated by reference herein.

162. The '701 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the '701 Patent is directed to novel and unconventional improvements to context-

based adaptive binary arithmetic coding of digital video. The '701 Patent provides improvements over prior context-based adaptive binary arithmetic coding techniques that result in substantial benefits to video compression, video quality, and video playback.

163. Digital video is formed from sequential still images. A still image in uncompressed form comprises an array of image pixels. '701 Patent at 1:17-18. In still image compression, "an image to be coded is first divided into an array of non-overlapping square blocks." *Id*. at 2:59-63. Transform coding is then applied to the image blocks to convert the pixel values to a set of coefficient values, which are then quantized "to further reduce the amount of data (i.e., number of bits) required" to represent the image blocks. *Id*. at 2:63-3:6. Moreover, "prediction error information for each block of the macroblock is passed to DCT transformation block 304, which performs a two-dimensional discrete cosine transform on each block of prediction error values to produce a two-dimensional array of DCT transform coefficients for each block. Thus, in a situation where the prediction error information for each macroblock comprises four 8×8 blocks of luminance prediction error values and two spatially corresponding 8×8 blocks of chrominance prediction error values, DCT transformation block 304 produces an 8×8 array of transform coefficient values for each prediction error block. The transform coefficients for each prediction error block are passed to quantizer 306 where they are quantized using a quantization parameter QP." *Id*. at 7:31-45.

164. The quantized transform coefficients are scanned in a particular order to convert the two-dimensional array of quantized transform coefficients into a one-dimensional array. *Id*. at 5:56-62. The one-dimensional array is then converted into level and run pairs. That is, each non-zero quantized transform coefficient is represented by two values: level and run. *Id*. at 6:7-9.

"Level is the value of the quantized coefficient and run is the number of consecutive zero-valued coefficients preceding the coefficient in question." *Id*. at 6:9-12.

165. These level and run pairs are then further compressed using entropy coding, in which a variable number of bits is assigned such that values of level and run pairs that are more likely to occur than other values are represented by code-words having fewer bits. *Id*. at 6:19-32. One type of such entropy coding is called "Context-based Adaptive Binary Arithmetic Coding (CABAC)," which is "a form of binary arithmetic coding which continually adapts to the statistical properties of the information being coded." *Id*. at 11:63-12:6. More specifically, with CABAC methods, "data symbols to be coded which have non-binary values are first converted to binary values," also called a "sequence of bins" each of which has a value of either a 0 or 1. *Id*. at 12:42-49. Each of the bins is then assigned a "context" based on having similar statistics. For example, "each bin assigned to a particular context is assumed to have a similar probability of containing the value 1 or 0 as the other bins belonging to that context." *Id*. at 13:1-4. Then, "probability estimates used to generate code-words in the arithmetic coder are defined for each context rather than for each possible bin to be encoded." *Id*. at 13:4-7.

166. Prior to the '701 Patent, CABAC methods were "not optimal with regard to coding efficiency." *Id*. at 15:55-62. The inventors of the '701 Patent "determined that certain relationships exist between the run and level values associated with DCT transform coefficients," as well as significant similarities between consecutive level values. *Id*. at 16:2-20. The inventors recognized that "these relationships can be used to construct improved context models which enable the CABAC method to operate with improved coding efficiency when applied to the run and level values." *Id*. at 16:2-10.

167. The ’701 Patent overcame the shortcomings in the prior systems by inventing a new context model method which considers the relationships between level values and between level and run values. *Id*. at 16:21-24. The ’701 Patent employs the unconventional solution of assigning a current level value to a context considering the context assigned to a previously coded value. *Id*. at 15:64-16:2, 23:15-26. Because the inventors “determined that consecutive level values exhibit a significant similarity,” the improved method of coding of the ’701 Patent exhibited up to 4.74% reduction in bitrate. *Id*. at 16:10-16, 25:37-45.

168. The ’701 Patent therefore provides a specific technological improvement to the functionality and capabilities of video coding technology that results in more efficient operations with superior bitrate savings. *Id*. at 16:10-16, 25:37-45.

169. Conventional technology prior to the ’701 Patent was not capable of taking into account relationships that exist between the level values or between the run and level values associated with DCT transform coefficients.

170. The ’701 Patent recognizes and solves these specific technological problems with the conventional technology at the time. The ’701 Patent’s ability to assign the first numbers of a run-level number pair to one of a plurality of contexts representative of the first numbers such that the first number of a first number pair is assigned to a context at least partly in dependence on a first number of a second number pair was a significant advancement over existing technology.

171. The novel solution of the ’701 Patent, including assigning contexts taking into account the level value of another run-level pair, was not well-understood, routine, or conventional, nor was it simply comprised of well-understood, routine, and conventional activities previously known to the industry. Furthermore, the ordered combination of elements, including assigning the first numbers of a run-level number pair to one of a plurality of contexts

representative of the first numbers such that the first number of a first number pair is assigned to a context at least partly in dependence on a first number of a second number pair, was not well-understood, routine, or conventional.

172. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the '701 Patent at least because the asserted claims of the '701 Patent are all method claims that do not require marking and/or there is nothing to mark.

L. U.S. Patent No. 8,107,744

173. Nokia owns by assignment the entire right, title, and interest in and to U.S. Patent No. 8,107,744 (the "'744 Patent"). The '744 Patent, entitled "Picture Buffering for Prediction References and Display," issued on January 31, 2012, to inventors Dong Tian, Miska Hannuksela, and Ye-Kui Wang. Nokia owns all rights to the '744 Patent necessary to bring this action. The '744 Patent issued from U.S. Application No. 10/703,109, filed on November 6, 2003, which claims priority to U.S. Provisional Application Numbers 60/424,409, filed on November 6, 2002, 60/429,953, filed on November 29, 2002, and 60/430,712, filed on December 3, 2002. A true and correct copy of the '744 Patent is attached as Exhibit 12 and is incorporated by reference herein.

174. The '744 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the '744 Patent is directed to novel and unconventional improvements to picture buffering for prediction references and reordering of pictures for display used in digital video coding. The '744 Patent provides improvements over prior picture buffering techniques that result in substantial benefits to video compression, error resiliency, and memory savings.

175. As described by the '744 Patent, when using "conventional video coding standards, the decoding order of pictures is the same as the display order except for B pictures," which "can be bi-directionally temporally predicted from two reference pictures, where one reference picture is temporally preceding and the other reference picture is temporally succeeding in display order."

'744 Patent at 1:58-64. However, generally speaking, "[o]nly the latest reference picture in decoding order can succeed the B picture in display order" and "[a] conventional B picture cannot be used as a reference picture for temporal prediction," which means "a conventional B picture can be disposed of without affecting the decoding of any other pictures." *Id.* at 1:64-2:4.

176. Prior efforts attempted to, *inter alia*, decouple "decoding order of pictures," permit reference pictures to be bi-predictive such that "[r]eference pictures for a block in a B picture can either be before or after the B picture in display order," allow any picture to be a reference or non-reference picture where "[p]ictures that are not used as reference pictures are marked explicitly," and allow pictures to "contain slices that are coded with a different coding type." *Id.* at 1:30-31, 2:5-22. As noted by the '744 Patent, "[d]ecoupling of display order from decoding order can be beneficial from compression efficiency and error resiliency point of view." *Id.* at 2:23-25; *see also id.* at 2:26-40 (discussing "[a]n example of a prediction structure potentially improving compression efficiency"), 2:41-61 (discussing "an example of the intra picture postponement method that can be used to improve error resiliency").

177. These efforts to permit flexibility in decode order and use of different pictures as reference pictures created issues with buffering. *Id.* at 3:1-23. As the '744 Patent explains, "[i]n the JVT coding standard, decoded pictures have to be buffered for two reasons: First, decoded pictures are used as reference pictures for predicting subsequent coded pictures. Second, due to decoupling of the decoding order from the display order, decoded pictures have to be reordered in display order." *Id.* at 2:62-67. This was because, "in conventional video coding standards," "the display order for all reference pictures is the same as their decoding order and because only the latest decoded reference picture has to be buffered to reorder pictures in display order if B pictures are in use." *Id.* at 3:24-28. Because of this, "[t]he conventional video coding standard[s] supporting

reference picture selection have a reference picture buffer but they do not have a picture buffer for display reordering." *Id.* at 3:28-31. Thus, a proposal was made to have separate buffers for display reordering and reference pictures. *Id.* at 3:32-36.

178. Prior to the '744 Patent, this solution of two buffers presented the problem of needing more buffer space than was necessary while also storing the same pictures in multiple locations. *Id.* at 3:66-4:3. As the '744 Patent explains, "[t]he invention solves the decoded picture buffering problem." *Id.* at 6:63-65.

179. The '744 Patent overcame the shortcomings of the prior solution by inventing techniques "for, for example, encoding an indication to support a unified buffer covering "both the reference pictures and the pictures waiting to be displayed" whereby "the pictures are not stored twice in the memory." *Id.* at 4:4-10. The '744 Patent employs the unconventional solution of, for instance, "provid[ing] a signal containing an encoded picture stream, the pictures being defined as reference pictures or non-reference pictures, and information relating to decoding order and output order of a picture is defined for pictures of the picture stream," including where "the signal contains an indication of such a number of pictures arranged to be buffered in decoding order that is sufficient to recover the output order of pictures." *Id.* 4:56-64. As the '744 Patent explains, its techniques allow, for example, encoders to exploit "[t]he advantage that the memory needed for buffering the pictures can be minimized is a significant advantage in small devices like mobile terminals," which can enable superior encoding processes resulting in superior playback experiences. *Id.* at 6:65-7:2.

180. The '744 Patent therefore provides a specific technological improvement to the functionality and capabilities of video coding technology that results in better video compression, error resiliency, and memory savings. *Id*. at 2:23-61, 6:65-7:2.

181. Conventional technology prior to the '744 Patent did not contemplate signaling to support a unified buffer to handle reference pictures and pictures decoupled from their display order.

182. The '744 Patent recognizes and solves these specific technological problems with the conventional technology at the time. The '744 Patent's ability to encode an indication of "a number of decoded pictures arranged to be buffered in decoding order in a unified picture buffer" that is "sufficient to recover the output order of the decoded pictures" was a significant advancement over existing technology.

183. The novel solution of the '744 Patent, including its use of a unified buffer, was not well-understood, routine, or conventional, nor was it simply comprised of well-understood, routine, and conventional activities previously known to the industry. Furthermore, the ordered combination of elements, including use of an indication corresponding to a unified buffer in the manner claimed, was not well-understood, routine, or conventional.

184. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the '744 Patent at least because the asserted claims of the '744 Patent are all method claims that do not require marking and/or there is nothing to mark.

M. U.S. Patent No. 8,776,204

185. Nokia owns by assignment the entire right, title, and interest in and to U.S. Patent No. 8,776,204 (the "'204 Patent"). The '204 Patent, entitled "Secure Dynamic Authority Delegation" issued on July 8, 2014, to inventors Igor Faynberg and Hui-Lan Lu. Nokia owns all rights to the '204 Patent necessary to bring this action. The '204 Patent issued from U.S. Patent Application No. 12/723,049, filed on June 10, 2003 and claims priority, as a continuation-in-part to U.S. Patent Application No. 10/171,467, filed on March 12, 2010. A true and correct copy of the '204 Patent is attached as Exhibit 13 and as incorporated by reference herein.

186. The ’204 Patent is not directed to merely an abstract idea or any patent-ineligible concept. Instead, the ’204 Patent is directed to novel and unconventional improvements to secure methods for dynamic delegation of authority to enable applications (e.g., mashups and third-party applications) on communication networks (e.g., World Wide Web or in Next Generation networks) that involve access to protected resources by entities other than the resource owner. ’204 Patent at 1:51-56. The improvement provided by the ’204 Patent resides in the fact that the dynamic authority delegation techniques of the invention are applicable to web and non-web applications, without relying on the use of HTTP redirection, and without requiring multiple round trips for obtaining delegated authorization, thereby resulting in authority delegation techniques that are less complex than existing authority delegation schemes. *Id.* at 3:25-31.

187. Prior to the ’204 Patent, users could create their own applications or web pages, such as, a “mashup,” which is a web page or application that uses or combines data or functionality from two or many more sources to create a new service or application. *Id.* at 1:20-25. A problem arises, however, “when the user is required to give his/her credentials (username and password) for one source to another source, thus exposing information between sources and giving one source full access to the other source. This may not be desirable to the user.” *Id.* at 1:26-30.

188. A protocol known as OAuth attempted, but failed, to provide a solution to this problem. As the ’204 Patent states, “[i]n general, the OAuth protocol (see http://oauth.net/) enables users to provide third-party access to their web resources without sharing their passwords. However, there are several limitations and weaknesses to this protocol. First, since the protocol is tied to the Hypertext Transfer Protocol (HTTP), it is not applicable to non-web applications. Second, since the protocol relies on the use of HTTP redirection, it is vulnerable to phishing attacks. The protocol also requires multiple round trips for obtaining delegated authorization, and

it is not optimal for application performance. Lastly, since the protocol uses more than one type of delegation proof and a proofing scheme that involves repeated cryptographic signing, it is more complex than necessary." *Id.* at 1:32-44.

189. The '204 Patent overcame these technical challenges in the prior systems and methods by inventing a new method for authority delegation. As the '204 Patent explains, "embodiments of the invention provide techniques whereby a resource requestor can dynamically obtain, directly from a resource owner, permission to access its resources in a resource residence. . . . A resource requestor can access the protected resources in the resource residence by presenting a proof of authorization delegated by the resource owner. The proof (namely an authorization token) has a verifiable structure and a limited lifetime, and specifies, among other things, the method or the level of assurance for authenticating the resource requestor. The resource requestor can obtain an authorization token dynamically from the resource owner in one round trip through a mechanism that is request-response based and can be bound to an existing application protocol." *Id.* at 4:35-45. Thus, for example, "a resource token request/response can be carried over HTTP or the Session Initial Protocol (SIP) as part of the message header or body or both. The mechanism for presenting the resource token to gain access to the protected resources is request-response based and can be bound to an existing application protocol" and therefore, "the token can be carried over HTTP or SIP as part of the message header or body." *Id.* at 4:45-52.

190. The '204 Patent therefore provides a specific technological improvement to the functionality and capabilities of authority delegation technology that results in less complex authority delegation techniques that are applicable to web and non-web applications, do not rely on the use of HTTP redirection, and do not require multiple round trips for obtaining delegated authorization, which was not well-understood, routine, or conventional. *Id.* at 3:25-31.

191. Nokia complied with any applicable marking requirements under 35 U.S.C. § 287 as to the '204 Patent at least because the asserted claims of the '204 Patent are all method claims that do not require marking and/or there is nothing to mark.

COUNT I: PATENT INFRINGEMENT OF THE '808 PATENT

192. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

193. Paramount had knowledge and notice of the '808 Patent no later than December 7, 2022.

194. Paramount infringes the '808 Patent by, for example, using in the United States the methods covered by one or more claims of the '808 Patent and thus directly infringes the '808 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

195. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the '808 Patent, including in this District and elsewhere in the United States.

196. Paramount's infringement of the '808 Patent has damaged and will continue to damage Nokia.

197. A claim chart that applies claim 1 of the '808 Patent to the Accused Services is attached as Exhibit 14.

COUNT II: PATENT INFRINGEMENT OF THE '469 PATENT

198. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

199. Paramount had knowledge and notice of the '469 Patent no later than December 7, 2022.

200. Paramount infringes the ’469 Patent by, for example, using in the United States the methods covered by one or more claims of the ’469 Patent and thus directly infringes the ’469 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

201. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’469 Patent, including in this District and elsewhere in the United States.

202. Paramount’s infringement of the ’469 Patent has damaged and will continue to damage Nokia.

203. A claim chart that applies claim 1 of the ’469 Patent to the Accused Services is attached as Exhibit 15.

COUNT III: PATENT INFRINGEMENT OF THE ’148 PATENT

204. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

205. Paramount had knowledge and notice of the ’148 Patent no later than December 7, 2022.

206. Paramount infringes the ’148 Patent by, for example, using in the United States the methods covered by one or more claims of the ’148 Patent and thus directly infringes the ’148 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

207. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’148 Patent, including in this District and elsewhere in the United States.

208. Paramount’s infringement of the ’148 Patent has damaged and will continue to damage Nokia.

209. A claim chart that applies claim 1 of the ’148 Patent to the Accused Services is attached as Exhibit 16.

COUNT IV: PATENT INFRINGEMENT OF THE ’321 PATENT

210. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

211. Paramount had knowledge and notice of the ’321 Patent no later than December 7, 2022.

212. Paramount infringes the ’321 Patent by, for example, using in the United States the methods covered by one or more claims of the ’321 Patent and thus directly infringes the ’321 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

213. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’321 Patent, including in this District and elsewhere in the United States.

214. Paramount’s infringement of the ’321 Patent has damaged and will continue to damage Nokia.

215. Claim charts that apply claim 1 of the ’321 Patent to the Accused Services are attached as Exhibits 17 and 18.

COUNT V: PATENT INFRINGEMENT OF THE ’674 PATENT

216. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

217. Paramount had knowledge and notice of the ’674 Patent no later than December 7, 2022.

218. Paramount infringes the ’674 Patent by, for example, using in the United States the methods covered by one or more claims of the ’674 Patent and thus directly infringes the ’674 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

219. On information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’674 Patent, including in this District and elsewhere in the United States.

220. Paramount’s infringement of the ’674 Patent has damaged and will continue to damage Nokia.

221. A claim chart that applies claim 1 of the ’674 Patent to the Accused Services is attached as Exhibit 19.

COUNT VI: PATENT INFRINGEMENT OF THE ’005 PATENT

222. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

223. Paramount had knowledge and notice of the ’005 Patent no later than December 7, 2022.

224. Paramount infringes the ’005 Patent by, for example, using in the United States the methods covered by one or more claims of the ’005 Patent and thus directly infringes the ’005 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

225. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’005 Patent, including in this District and elsewhere in the United States.

226. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’005 Patent in the Accused Services.

227. Paramount's infringement of the '005 Patent has damaged and will continue to damage Nokia.

228. A claim chart that applies claim 1 of the '005 Patent to the Accused Services is attached as Exhibit 20.

COUNT VII: PATENT INFRINGEMENT OF THE '450 PATENT

229. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

230. Paramount had knowledge and notice of the '450 Patent no later than December 7, 2022.

231. Paramount infringes the '450 Patent by, for example, using in the United States the methods covered by one or more claims of the '450 Patent and thus directly infringes the '450 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

232. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the '450 Patent, including in this District and elsewhere in the United States.

233. Paramount's infringement of the '450 Patent has damaged and will continue to damage Nokia.

234. A claim chart that applies claim 31 of the '450 Patent to the Accused Services is attached as Exhibit 21.

COUNT VIII: PATENT INFRINGEMENT OF THE '211 PATENT

235. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

236. Paramount had knowledge and notice of the '211 Patent no later than December 7, 2022.

237. Paramount infringes the ’211 Patent by, for example, using in the United States the methods covered by one or more claims of the ’211 Patent and thus directly infringes the ’211 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

238. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’211 Patent, including in this District and elsewhere in the United States.

239. Paramount’s infringement of the ’211 Patent has damaged and will continue to damage Nokia.

240. A claim chart that applies claim 1 of the ’211 Patent to the Accused Services is attached as Exhibit 22.

COUNT IX: PATENT INFRINGEMENT OF THE ’145 PATENT

241. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

242. Paramount had knowledge and notice of the ’145 Patent no later than December 7, 2022.

243. Paramount infringes the ’145 Patent by, for example, using in the United States the methods covered by one or more claims of the ’145 Patent and thus directly infringes the ’145 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

244. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’145 Patent, including in this District and elsewhere in the United States.

245. Paramount’s infringement of the ’145 Patent has damaged and will continue to damage Nokia.

246. A claim chart that applies claim 1 of the ’145 Patent to the Accused Services is attached as Exhibit 23.

COUNT X: PATENT INFRINGEMENT OF THE ’891 PATENT

247. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

248. Paramount had knowledge and notice of the ’891 Patent no later than December 7, 2022.

249. Paramount infringes the ’891 Patent by, for example, using in the United States the methods covered by one or more claims of the ’891 Patent and thus directly infringes the ’891 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

250. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’891 Patent, including in this District and elsewhere in the United States.

251. Paramount’s infringement of the ’891 Patent has damaged and will continue to damage Nokia.

252. A claim chart that applies claim 23 of the ’891 Patent to the Accused Services is attached as Exhibit 24.

COUNT XI: PATENT INFRINGEMENT OF THE ’701 PATENT

253. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

254. Paramount had knowledge and notice of the ’701 Patent no later than December 7, 2022.

255. Paramount infringes the ’701 Patent by, for example, using in the United States the methods covered by one or more claims of the ’701 Patent and thus directly infringes the ’701 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

256. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’701 Patent, including in this District and elsewhere in the United States.

257. Paramount’s infringement of the ’701 Patent has damaged and will continue to damage Nokia.

258. A claim chart that applies claim 1 of the ’701 Patent to the Accused Services is attached as Exhibit 25.

COUNT XII: PATENT INFRINGEMENT OF THE ’744 PATENT

259. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

260. Paramount had knowledge and notice of the ’744 Patent no later than December 7, 2022.

261. Paramount infringes the ’744 Patent by, for example, using in the United States the methods covered by one or more claims of the ’744 Patent and thus directly infringes the ’744 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

262. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the ’744 Patent, including in this District and elsewhere in the United States.

263. Paramount’s infringement of the ’744 Patent has damaged and will continue to damage Nokia.

264. A claim chart that applies claim 12 of the '744 Patent to the Accused Services is attached as Exhibit 26.

COUNT XIII: PATENT INFRINGEMENT OF THE '204 PATENT

265. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

266. Paramount had knowledge and notice of the '204 Patent no later than November 23, 2024.

267. Paramount infringes the '204 Patent by, for example, using in the United States the methods covered by one or more claims of the '744 Patent and thus directly infringes the '744 Patent literally and/or under the Doctrine of Equivalents, in violation of 35 U.S.C. § 271.

268. Upon information and belief, Paramount derives revenue, directly and indirectly, from the activities relating to the Accused Services and to infringement of the '204 Patent, including in this District and elsewhere in the United States.

269. Paramount's infringement of the '204 Patent has damaged and will continue to damage Nokia.

270. A claim chart that applies claim 1 of the '204 Patent to the Accused Services is attached as Exhibit 27.

COUNT XIV: DECLARATORY JUDGMENT OF NO RAND OBLIGATION/VIOLATION

271. Nokia incorporates by reference the preceding paragraphs as though fully set forth herein.

272. The ITU's Common Patent Policy thus deems "essential" only patent claims that are required to implement a specific Recommendation.

273. The H.264 Recommendation specifies the implementation of decoders. It does not, however, specify the implementation of encoders. The H.264 Recommendation defines "encoding process" as "[a] process, ***not specified in this Recommendation*** | International Standard, that produces a bitstream conforming to this Recommendation | International Standard."

274. Similarly, the H.265 Recommendation only specifies the implementation of decoders. *See* Recommendation ITU-T H.265 (defining "encoding process" as "[a] process ***not specified in this Specification*** that produces a bitstream conforming to this Specification.").

275. Under the ITU's Common Patent Policy, only *de*coding patent claims "essential" to the H.264 and/or H.265 Recommendations are encumbered by a RAND commitment.

276. Accordingly, as tribunals have recognized, patent claims covering encoding processes are not "essential" to the H.264 and/or H.265 Standards and are thus not RAND encumbered.

277. Thus, Nokia's encoding patent claims are not subject to the ITU Common Patent Policy, that Policy's RAND commitment, or any other provisions of that Policy.

278. A dispute exists between Nokia and Paramount concerning whether Nokia's encoding patent claims are not subject to the ITU Common Patent Policy, that Policy's RAND commitment, or any other provisions of that Policy. Nokia has been negotiating in good faith with Paramount for years. Despite Nokia making clear during years of negotiations that its encoding patent claims are not subject to the ITU Common Patent Policy, Paramount has not agreed or conceded that Nokia's encoding patent claims are not subject to the ITU Common Patent Policy, that Policy's RAND commitment, or any other provisions of that Policy. On information and belief, Paramount disagrees that Nokia's encoding patent claims are not subject to the ITU

Common Patent Policy. There is a case or controversy of sufficient immediacy, reality, and ripeness to warrant the issuance of a declaratory judgment.

279. Nokia seeks a declaration that Nokia's encoding patent claims are not subject to the ITU Common Patent Policy, that Policy's RAND commitment, or any other provisions of that Policy, or, to the extent Paramount contends otherwise in this case, a declaration that Nokia has not violated RAND.

ATTORNEYS' FEES

280. Nokia is entitled to recover reasonable and necessary attorneys' fees under applicable law.

DEMAND FOR JURY TRIAL

281. Nokia hereby demands a jury trial for all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, Nokia respectfully requests that this Court enter judgment in its favor as follows and afford Nokia the following relief:

A. adjudge and declare that Paramount infringes method claims of the Asserted Patents;

B. adjudge and declare that Paramount's infringement of method claims of the Asserted Patents was willful, and that Paramount's continued infringement is willful;

C. award Nokia its actual damages going back six years from the date of the Original Complaint due to Paramount's infringement and the fact that the asserted method claims do not require marking and/or there is nothing to mark;

D. award Nokia enhanced damages pursuant to 35 U.S.C. § 284;

E. award Nokia pre-judgment and post-judgment interest to the full extent allowed under the law, as well as its costs;

F. adjudge and declare that this is an exceptional case and award Nokia its reasonable attorneys' fees pursuant to 35 U.S.C. § 285;

G. order an accounting of damages for acts of infringement;

H. adjudge and declare that Nokia's encoding patent claims are not subject to a RAND obligation and that there has been no violation of the same;

I. award Nokia its costs of suit; and

J. award such other relief, including equitable relief, that the Court deems appropriate.

Dated: August 21, 2025

Respectfully submitted,

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