

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NOKIA OF AMERICA CORPORATION,
Petitioner,

v.

SPADA INNOVATIONS, INC.,
Patent Owner.

Patent No. 11,589,142

Inter Partes Review

DECLARATION OF SYLVIA HALL-ELLIS, PH.D.

I. INTRODUCTION

1. My name is Sylvia D. Hall-Ellis. I have been retained as an expert on behalf of Nokia of America Corporation (“Nokia” or “Petitioner”).

2. I have written this report on behalf of Petitioner to provide my expert opinion regarding the authenticity and public availability of several publications. My report sets forth my opinions in detail and provides the basis for my opinions regarding the public availability of these publications.

3. I reserve the right to supplement or amend my opinions, and bases for them, in response to any additional evidence, testimony, discovery, argument, and/or other additional information that may be provided to me after the date of this report.

4. I am being compensated for my time spent working on this matter at my normal consulting rate, plus reimbursement for any additional reasonable expenses. My compensation is not in any way tied to the content of this report, the substance of my opinions, or the outcome of this litigation. I have no other interests in this proceeding or with any of the parties.

5. All of the materials that I considered are discussed explicitly in this declaration.

II. QUALIFICATIONS

6. I am currently an Adjunct Professor in the School of Information at San José State University. I obtained a Master of Library Science from the University of North Texas in 1972 and a Ph.D. in Library and Information Science from the University of Pittsburgh in 1985. Over the last 55-plus years, I have held various positions in the field of library and information resources. I was first employed as a librarian in 1966 and have been involved in the field of library sciences since, holding numerous positions.

7. I am a member of the American Library Association (ALA) and its Association for Library Collections & Technical Services (ALCTS) Division, and I served on the Committee on Cataloging: Resource and Description (which wrote the new cataloging rules) and as the chair of the Committee for Education and Training of Catalogers and the Competencies and Education for a Career in Cataloging Interest Group. I also served as the Chair of the ALCTS Division's Task Force on Competencies and Education for a Career in Cataloging. Additionally, I have served as the Chair for the ALA Office of Diversity's Committee on Diversity, as a member of the REFORMA National Board of Directors, as a member of the Editorial Board for the ALCTS premier cataloging journal, *Library Resources and Technical Services*, as a Co-Chair of the Membership Committee for the Library Research Round Table (LRRT) for the American Library Association, and as a member of the LRRT Nominating

Committee. Currently I serve on the CORE Margaret Mann Citation Committee and the CORE Awards & Scholarships Coordination Committee.

8. I have also given over one hundred presentations in the field, including several on library cataloging systems and Machine-Readable Cataloging (“MARC”) standards. My current research interests include library cataloging systems, metadata, and organization of electronic resources.

9. My full curriculum vitae is provided as Exhibit 1031.

III. PRELIMINARIES

10. *Scope of this declaration.* I am not an attorney and will not offer opinions on the law. I am, however, rendering my expert opinion on the authenticity of the documents referenced herein and on when and how each of these documents was disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, could have located the documents before, on, or around the listed dates of their respective publications below.

11. I am informed by counsel that a printed publication qualifies as publicly accessible as of the date it was disseminated or otherwise made available such that a person interested in and ordinarily skilled in the relevant subject matter could locate it through the exercise of ordinary diligence.

12. While I understand that the determination of public accessibility under the foregoing standard rests on a case-by-case analysis of the facts particular to an individual publication, I also understand that a printed publication is rendered “publicly accessible” if it is cataloged and indexed by a library such that a person interested in the relevant subject matter could locate it (*i.e.*, I understand that cataloging and indexing by a library is sufficient, though there are other ways that a printed publication may qualify as publicly accessible). One manner of sufficient indexing is indexing according to subject matter category. I understand that the cataloging and indexing by a single library of a single instance of a particular printed publication is sufficient, even if the single library is in a foreign country. I understand that, even if access to a library is restricted, a printed publication that has been cataloged and indexed therein is publicly accessible so long as a presumption is raised that the portion of the public concerned with the relevant subject matter would know of the printed publication. I also understand that the cataloging and indexing of information that would guide a person interested in the relevant subject matter to the printed publication, such as the cataloging and indexing of an abstract for the printed publication, is sufficient to render the printed publication publicly accessible.

13. I understand that routine business practices, such as general library cataloging and indexing practices, can be used to establish an approximate date on which a printed publication became publicly accessible.

14. *Persons of ordinary skill in the art.* I am informed by counsel that the subject matter of this proceeding generally relates to systems and methods using virtual routing and forwarding on a passive optical network.

15. I have been informed by counsel that a person of ordinary skill in the art (“POSITA”) at the time of the alleged invention is a hypothetical person who is presumed to be familiar with the relevant field and its literature at the time of the alleged invention of the patent (which in this case is assumed to be August 2, 2012). This hypothetical person is also a person of ordinary creativity, capable of understanding the scientific principles applicable to the pertinent field.

16. I am told by counsel that persons of ordinary skill in this subject matter or art would have had a Bachelor’s degree in computer or electrical engineering, computer science, or a similar discipline, and two years of experience with optical communications and networks. A person with a different degree but with additional relevant experience could still qualify if the additional experience compensates for the different educational background.

17. It is my opinion that such a person would have been engaged in research and familiar with accessing print resources like those discussed in this

declaration. Indeed, over the course of my career including the years leading up to August 2012, I have assisted many similar engineers in acquiring such resources.

IV. LIBRARY CATALOGING PRACTICES

A. MARC RECORDS AND THE ONLINE LIBRARY CATALOG

18. I am fully familiar with the library cataloging standard known as the MARC standard, which is an industry-wide standard method of storing and organizing library catalog information.¹ MARC was first developed in the 1960s by the Library of Congress. A MARC-compatible library is one that has a catalog consisting of individual MARC records for each of its items. Today, MARC is the primary communications protocol for the transfer and storage of bibliographic metadata in libraries.

19. MARC is a framework into which descriptive bibliographic data are transcribed to interact with the software in online library catalogs to provide access to books, journals, and other resources in the collection. Bibliographic data provide points of access and can be searched by a person of ordinary skill in the art at the time of the invention (“POSITA,” see paragraphs 14-17 above) to identify and obtain resources in the library collection. An information seeker (or POSITA) can search a local online library catalog or the holdings of a group of libraries in a state

¹ The full text of the standard is available from the Library of Congress at <http://www.loc.gov/marc/bibliographic/> (last visited June 19, 2025).

or region or in the global catalog WorldCat.

20. MARC records are not designed for public viewing. Although a significant number of libraries provide access to the MARC version of a bibliographic record, the public display is designed to show information in a succinct manner that is quickly understood and useful to the information seeker. Libraries determine the default search for the online catalog to make the entry of search terms efficient and result in a successful search. Information seekers can enter a keyword, title, author, or standard number for the item. Libraries may also provide a search capability called “Summon” that allows the information seeker to enter known information about the item to conduct a search.

21. Since at least the early 1970s and continuing to the present day, MARC has been the primary communications protocol for the transfer and storage of bibliographic metadata in libraries.² As explained by the Library of Congress:

You could devise your own method of organizing the bibliographic information, but you would be isolating your library, limiting its options, and creating much more work for yourself. Using

² A complete history of the development of MARC can be found in *MARC: Its History and Implications* by Henrietta D. Avram (Washington, DC: Library of Congress, 1975) and available online from the Hathi Trust (<https://babel.hathitrust.org/cgi/pt?id=mdp.39015034388556;view=1up;seq=1>; last visited June 19, 2025).

the MARC standard prevents duplication of work and allows libraries to better share bibliographic resources. Choosing to use MARC enables libraries to acquire cataloging data that is predictable and reliable. If a library were to develop a “home-grown” system that did not use MARC records, it would not be taking advantage of an industry-wide standard whose primary purpose is to foster communication of information.

Using the MARC standard also enables libraries to make use of commercially available library automation systems to manage library operations. Many systems are available for libraries of all sizes and are designed to work with the MARC format. Systems are maintained and improved by the vendor so that libraries can benefit from the latest advances in computer technology. The MARC standard also allows libraries to replace one system with another with the assurance that their data will still be compatible.

Why Is a MARC Record Necessary? LIBRARY OF CONGRESS.³

22. Thus, almost every major library in the world is MARC-compatible.

See, e.g., MARC Frequently Asked Questions (FAQ), LIBRARY OF CONGRESS.⁴

³ <http://www.loc.gov/marc/umb/um01to06.html#part2>

⁴ <https://www.loc.gov/marc/faq.html>

(“MARC is the acronym for MACHine-Readable Cataloging. It defines a data format that emerged from a Library of Congress-led initiative that began fifty years ago. It provides the mechanism by which computers exchange, use, and interpret bibliographic information, and its data elements make up the foundation of most library catalogs used today.”). MARC is the ANSI/NISO Z39.2-1994 standard (reaffirmed in 2016) for Information Interchange Format. The full text of the standard is available from the Library of Congress.⁵

23. Examining the MARC records for a specific item reveals the comprehensive data transcribed about a particular item at the time that cataloging and classification occurred. In addition to the creator, title, subjects, and standard numbers, additional information may provide additional and relevant data depending on the type of resource. Understanding the full extent of bibliographic data for an item and the points of access associated with it provides essential information that can be used to determine the indexing and public availability for documents described in this declaration.

B. MARC RECORDS

24. A MARC record comprises several fields, each of which contains specific data about the work. Each field is identified by a standardized, unique, three-digit code corresponding to the type of data that follow. For example, a

⁵ <http://www.loc.gov/marc/bibliographic/>

work's title is recorded in Field 245; the primary author of the work is transcribed in Field 100; an item's International Standard Book Number ("ISBN") consisting of ten or thirteen digits is transcribed in Field 020; an item's International Standard Serial Number ("ISSN") is transcribed in Field 022; the Library of Congress classification notation is recorded in Field 050; and the publication date is recorded in Field 260 under the subfield "c." If a work is a periodical, then its publication frequency is recorded in Field 310, and the publication dates (e.g., the first and last publication) are recorded in Field 362, which is also referred to as the enumeration/chronology field.⁶

25. The library that created the record is recorded in Field 040 in subfield "a" with a unique library code. When viewing the MARC record online via Online Computer Library Center's ("OCLC") bibliographic database, hovering over this code with the mouse reveals the full name of the library. I used this method of "mousing over" the library codes in the OCLC database to identify the originating library for the MARC records discussed in this Declaration. Where this "mouse over" option was not available, I consulted the Directory of OCLC Libraries to identify the institution that created the MARC record.⁷

26. MARC records also include several fields that include subject matter

⁶ <http://www.loc.gov/marc/bibliographic/bd3xx.html>

⁷ <https://www.oclc.org/en/contacts/libraries.html>

classification information. An overview of MARC record fields is available through the Library of Congress.⁸ For example, 6XX fields are termed “Subject Access Fields.”⁹ Among these, for example, is the 650 field; this is the “Subject Added Entry – Topical Term” field.¹⁰ The 650 field is a “[s]ubject added entry in which the entry element is a topical term.” These entries “are assigned to a bibliographic record to provide access according to generally accepted thesaurus-building rules (e.g., *Library of Congress Subject Headings* (LCSH), *Medical Subject Headings* (MeSH)).” *Id.* Further, MARC records include call numbers, which themselves include a classification number. For example, the 050 field is the “Library of Congress Call Number.”¹¹ A defined portion of the Library of Congress Call (LCC) Number is the classification number, and “source of the classification number is *Library of Congress Classification* and the *LC Classification-Additions and Changes*.” Thus, included in the 050 field is a subject matter classification. Further, the 082 field is the “Dewey Decimal Call Number.”¹² A defined portion of the Dewey Decimal Call (DDC) Number is the classification

⁸ <http://www.loc.gov/marc/bibliographic/>

⁹ <http://www.loc.gov/marc/bibliographic/bd6xx.html>

¹⁰ <http://www.loc.gov/marc/bibliographic/bd650.html>

¹¹ <http://www.loc.gov/marc/bibliographic/bd050.html>

¹² <http://www.loc.gov/marc/bibliographic/bd082.html>

number, and “source of the classification number is the *Dewey Decimal Classification and Relative Index*.” Thus, included in the 082 field is a subject matter classification. Each item in a library has a single classification number. A library selects a classification scheme (*e.g.*, the Library of Congress classification scheme just described or a similar scheme such as the Dewey Decimal classification scheme) and uses it consistently. When the Library of Congress assigns the LCC classification number, it appears as part of the 050 field. When the Library of Congress assigns the DDC classification number, it appears as part of the 082 field. If a local library assigns the classification number, it appears in a 090 field. In either scenario, the MARC record includes a classification number that represents a subject matter classification.

C. OCLC

27. The OCLC was created “to establish, maintain and operate a computerized library network and to promote the evolution of library use, of libraries themselves, and of librarianship, and to provide processes and products for the benefit of library users and libraries, including such objectives as increasing availability of library resources to individual library patrons and reducing the rate of rise of library per-unit costs, all for the fundamental public purpose of furthering ease of access to and use of the ever-expanding body of worldwide scientific,

literary and educational knowledge and information.”¹³ Among other services, OCLC and its members are responsible for maintaining the WorldCat database (<http://www.worldcat.org/>), used by independent and institutional libraries throughout the world.

28. OCLC also provides its members online access to MARC records through its OCLC bibliographic database. When an OCLC member institution acquires a work, it creates a MARC record for this work in its computer catalog system in the ordinary course of its business. MARC records created at the Library of Congress are tape-loaded into the OCLC database through a subscription to MARC Distribution Services daily or weekly. Once the MARC record is created by a cataloger at an OCLC member institution or is tape-loaded from the Library of Congress, the MARC record is then made available to any other OCLC members online, and therefore made available to the public. Accordingly, once the MARC record is created by a cataloger at an OCLC member institution or is tape-loaded from the Library of Congress or another library anywhere in the world, any publication corresponding to the MARC record has been cataloged and indexed according to its subject matter such that a person interested in that subject matter

¹³ Third Article, Amended Articles of Incorporation of OCLC Online Computer Library Center, Incorporated (available at <https://www.oclc.org/content/dam/oclc/membership/articles-of-incorporation.pdf>).

could, with reasonable diligence, locate and access the publication through any library with access to the OCLC bibliographic database or through the Library of Congress.

29. When an OCLC member institution creates a new MARC record, OCLC automatically supplies the date of creation for that record. The date of creation for the MARC record appears in the fixed Field (008), characters 00 through 05. The MARC record creation date reflects the date on which, or shortly after which, the item was first acquired or cataloged. Initially, Field 005 of the MARC record is automatically populated with the date the MARC record was created in year, month, day format (YYYYMMDD) (some of the newer library catalog systems also include hour, minute, second (HHMMSS)). Thereafter, the library's computer system may automatically update the date in Field 005 every time the library updates the MARC record (*e.g.*, to reflect that an item has been moved to a different shelving location within the library). Field 005 is visible when viewing a MARC record via an appropriate computerized interface. The date of the most recent update to the MARC record appears in Field 005. Thus, when an item's MARC record has been printed to hardcopy—as is the case with the MARC attachments to this Declaration—the date reflected next to Field 008 is necessarily on or after the date the library first cataloged and indexed the underlying item.

30. Once one library has cataloged and indexed a publication by creating

a MARC record for that publication, other libraries that receive the publication do not create additional MARC records—the other libraries instead rely on the original MARC record. They may update or revise the MARC record to ensure accuracy, but they do not replace or duplicate it. This practice does more than save libraries from duplicating labor. It also enhances the accuracy of MARC records. Further, it allows librarians around the world to know that a particular MARC record is authoritative (in contrast, a hypothetical system wherein duplicative records were created would result in confusion as to which record is authoritative).

31. Catalogers can create MARC records for all types of print, online, and digital resources. The date of creation of the MARC record by a cataloger at an OCLC member institution reflects when the underlying item is accessible to the public. Upwards of two-thirds to three-quarters of book sales and magazine subscriptions to libraries come from a jobber or wholesaler for online and print resources. These resellers make it their business to provide items to their customers as fast as possible, often providing turnaround times of only a single day after publication. Libraries purchase a significant portion of the balance of their books and journals directly from publishers themselves, which provide delivery on a similarly expedited schedule. In general, libraries make these purchases throughout the year and shelve the newly received items as soon thereafter as possible to make them available to their patrons.

32. In preparing this report, I used authoritative databases, such as the OCLC bibliographic database and the Library of Congress Online Catalog, to confirm citation details of the various publications discussed.

33. *Indexing.* A researcher may discover material relevant to his or her topic in a variety of ways. One common means of discovery is to search for relevant information in an index of periodical and other publications. Having found relevant material, the researcher will then normally obtain it online, look for it in libraries, or purchase it from a publisher, a bookstore, a document delivery service, or other provider. Sometimes, the date of a document's public accessibility will involve both indexing and library date information. However, date information for indexing entries is often unavailable. This is especially true for online indices.

34. Indexing services use a wide variety of controlled vocabularies to provide subject access and other means of discovering the content of documents. The formats in which these access terms are presented vary from service to service.

35. Online indexing services commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often provide lists of publications that cite a given document. A citation of a document is evidence that the document was publicly available and in use by researchers no

later than the publication date of the citing document.

36. Before the widespread development of online databases to index articles in journals, magazines, conference papers, and technical reports, libraries purchased printed volumes of indices. Graduate library school education mandated that students learn about the bibliographic control of disciplines, the prominent indexing volumes, and searching strategies required to use them effectively and efficiently. Half of the courses that I studied in library school were focused on the bibliography and resources in academic disciplines.

37. Librarians consult with information seekers to verify citations, check availability in union catalogs, printed books catalogs, the OCLC database, and make formal requests for materials (e.g., books, conference proceedings, journal articles). Requests were transmitted using Telex machines, rudimentary email systems, and the United States Postal Service. During my career, I have performed and supervised staff who handled these resource sharing tasks.

38. A major firm known for the breadth of subjects and comprehensive treatment in the preparation of index volumes, the H. W. Wilson Company offered these reference resources since the firm was founded in 1898. The *Reader's Guide to Periodical Literature* is one of the best-known titles available from H. W. Wilson. Each volume includes a comprehensive index for 300 of the most popular and important periodicals published in the United States and Canada. Information

seekers have subject access expressed in plain language terminology, author access, and cross references to find the desired results from their searches. The family of index titles included *Science & Technology Index*, *Business Periodicals*, *Applied Science & Technology Index*, *Humanities Index*, *Biological & Agricultural Index*, and *Industrial Arts Index*. These printed indices have been superseded by digital database offerings available to information seekers through Ebsco.

39. Online indexing services such as *Google Scholar*¹⁴ or *ScienceDirect*¹⁵ commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often provide lists of publications that cite a given document.

40. A citation of a document by another is evidence that the document was publicly available and in use no later than the publication date of the citing document.

V. PUBLICATIONS

A. *Gigabit-Capable Passive Optical Networks (GPON): General Characteristics – ITU-T Recommendation G.984.1* [Exhibit 1011]

41. Exhibit 1011 is a technical standards document, *Gigabit-Capable Passive Optical Networks (GPON): General Characteristics*, issued by the

¹⁴ <https://scholar.google.com/>

¹⁵ <https://www.sciencedirect.com/>

Telecommunication Standardization Sector of ITU of the International Telecommunication Union (ITU) (hereafter “ITU-T Recommendation G.984.1”), and published as part of Series G: Transmission Systems and Media, Digital Systems and Networks: Digital Sections and Digital Line System – Optical Line Systems for Local and Access Networks. The G.984.1 document is designated as ITU-T Recommendation G.984.1 with a March 2008 date (03/08). The ITU-T Recommendation G984.1 was approved on March 29, 2008, by the ITU-T Study Group 15 (Exhibit 1011, page 3). Exhibit 1011 is a true and correct copy of the ITU-T Recommendation G.984.1 document that I understand is being submitted as an exhibit in this proceeding. I obtained this copy of the ITU-T Recommendation G.984.1 document from the ITU website.¹⁶ The text of the document is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next. Further, there are no visible alterations to the document. Exhibit 1011 was found within the custody of the issuing organization—a place where, if authentic, a copy of this document would likely be. Exhibit 1011 is a true and correct copy in a condition that creates no suspicion about its authenticity. I understand that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence could have located the ITU-T Recommendation G.984.1 document from the ITU website. It is my opinion that the ITU-T

¹⁶ <https://www.itu.int/rec/T-REC-G.984.1-200803-I/en> (Exhibit 1011)

Recommendation G.984.1 document was publicly accessible digitally by March 2008.

42. ITU-T Recommendations are available in the “ITU Electronic Bookshop” (see Attachment 1A; Ex. 1032). Clicking on the “Publications by Sector” tab results in a listing of four main categories including “ITU-T Standardization (ITU-T).” Selecting the “ITU-T Standardization” brings up a choice of eleven categories including “ITU-T Recommendations” (see Attachment 1B; Ex. 1033). A list of 26 categories appears. Selecting “G Transmission systems and media, digital systems and networks” brings up a list of all ITU-T Recommendations” (see Attachment 1C; Ex. 1034). Scrolling down the numerical list to the subject ITU-T recommendation enables the information seeker to find and download a specific document. The document identified as ITU-T Recommendation G.984.1 (03/08) – *Gigabit-Capable Passive Optical Networks (GPON): General Characteristics* was available as a publication in the “ITU Electronic Bookshop” (see Attachment 1D; Ex. 1035).

43. I understand that prior to August 2012, ITU would have been known to persons at least of ordinary skill in the art as the “United Nations specialized agency for information and communication technologies.”¹⁷ Established in 1865, ITU promotes cooperation among international telegraphy networks of the day and

¹⁷ <https://www.itu.int/en/about/Pages/default.aspx>

continues its work in three areas: radiocommunications, standardization, and development.¹⁸ Furthermore, I understand that persons of ordinary skill in the art would have reasonably considered this organization and its website (<https://www.itu.int/en/Pages/default.aspx>) as reliable and useful sources of information for research, study, development or design.

44. The ITU website traces the history of the development of the ITU-T G.984.1 Recommendations (see Attachment 1E; Ex. 1036). The ITU website indicates that the first edition of ITU-T Recommendation G.984.1 (03/03) was dated March 2003 and that two amendments have been issued since that date. The first amendment was issued in October 2009 (10/09)¹⁹ and the second amendment was issued in April 2012 (04/12).²⁰ The ITU-T Recommendation G.984.1 and two amendments remain in force and can be downloaded from the website.

45. Therefore, it is my opinion that the standard document titled *Gigabit-Capable Passive Optical Networks (GPON): General Characteristics* was publicly available on or shortly after March 10, 2009, because by that date it had been posted on the ITU-T website.²¹ For these reasons, it is my opinion that Exhibit

¹⁸ <https://www.itu.int/en/about/Pages/whatwedo.aspx>

¹⁹ <https://www.itu.int/rec/T-REC-G.984.3-201401-I/en>

²⁰ <https://www.itu.int/rec/T-REC-G.984.1-201204-I!Amd2/en>

²¹ <https://www.itu.int/rec/T-REC-G.984.1-200803-I/en>

1011 was digitally published and accessible to the public on or shortly after March 10, 2009.

B. *Gigabit-Capable Passive Optical Networks (GPON): Physical Media Dependent (PMD) Layer Specification* – ITU-T Recommendation G.984.2 [Exhibit 1012]

46. Exhibit 1012 is a technical standards document, *Gigabit-Capable Passive Optical Networks (GPON): Physical Media Dependent (PMD) Layer Specification*, issued by the Telecommunication Standardization Sector of ITU of the International Telecommunication Union (ITU) (hereafter “ITU-T Recommendation G.984.2”), and published as part of Series G: Transmission Systems and Media, Digital Systems and Networks: Digital Sections and Digital Line System – Optical Line Systems for Local and Access Networks. The G.984.2 document is designated as ITU-T Recommendation G.984.2 with a March 2003 date (03/03). The ITU-T Recommendation G984.2 was approved on March 16, 2003, by the ITU-T Study Group 15 (Exhibit 1012, page 3). Exhibit 1012 is a true and correct copy of the ITU-T Recommendation G.984.2 document that I understand is being submitted as an exhibit in this proceeding. I obtained this copy of the ITU-T Recommendation G.984.2 document from the ITU website.²² The text of the document is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next. Further, there are no visible

²² <https://www.itu.int/rec/T-REC-G.984.2-200303-S/en> (Exhibit 1012)

alterations to the document. Exhibit 1012 was found within the custody of the issuing organization—a place where, if authentic, a copy of this document would likely be. Exhibit 1012 is a true and correct copy in a condition that creates no suspicion about its authenticity. I understand that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence could have located the ITU-T Recommendation G.984.2 document from the ITU website. It is my opinion that the ITU-T Recommendation G.984.2 document was publicly accessible digitally by October 2003.

47. ITU-T Recommendations are available in the “ITU Electronic Bookshop” (see Attachment 1A; Ex. 1032). Clicking on the “Publications by Sector” tab results in a listing of four main categories including “ITU-T Standardization (ITU-T).” Selecting the “ITU-T Standardization” brings up a choice of eleven categories including “ITU-T Recommendations” (see Attachment 1B; Ex. 1033). A list of 26 categories appears. Selecting “G Transmission systems and media, digital systems and networks” brings up a list of all ITU-T Recommendations” (see Attachment 1C; Ex. 1034). Scrolling down the numerical list to the subject ITU-T recommendation enables the information seeker to find and download a specific document. The document identified as ITU-T Recommendation G.984.1 (03/08) – *Gigabit-Capable Passive Optical Networks (GPON): General Characteristics* was available as a publication in the “ITU

Electronic Bookshop” (see Attachment 2A; Ex. 1037).

48. I understand that prior to August 2012, ITU would have been known to persons at least of ordinary skill in the art as the “United Nations specialized agency for information and communication technologies.”²³ Established in 1865, ITU promotes cooperation among international telegraphy networks of the day and continues its work in three areas: radiocommunications, standardization, and development.²⁴ Furthermore, I understand that persons of ordinary skill in the art would have reasonably considered this organization and its website (<https://www.itu.int/en/Pages/default.aspx>) as reliable and useful sources of information for research, study, development or design.

49. The ITU website traces the history of the development of the ITU-T G.984.2 Recommendations (see Attachment 2B; Ex. 1038). The ITU website indicates that two amendments were issued since the G.984.2 document was approved. The first amendment was issued in February 2006 (02/06)²⁵ and the second amendment was issued in March 2008 (03/08).²⁶ The ITU-T Recommendation G.984.2 and two amendments were replaced in August 2019

²³ <https://www.itu.int/en/about/Pages/default.aspx>

²⁴ <https://www.itu.int/en/about/Pages/whatwedo.aspx>

²⁵ <https://www.itu.int/rec/T-REC-G.984.2-200602-S!Amd1/en>

²⁶ <https://www.itu.int/rec/T-REC-G.984.2-200803-S!Amd2/en>

(08/19) and can be downloaded from the website.

50. Therefore, it is my opinion that the standard document titled *Gigabit-Capable Passive Optical Networks (GPON): Physical Media Dependent (PMD) Layer Specification* was publicly available on or shortly after October 31, 2003, because by that date it had been posted on the ITU-T website.²⁷ For these reasons, it is my opinion that Exhibit 1012 was digitally published and accessible to the public on or shortly after October 31, 2003.

C. *Gigabit-Capable Passive Optical Networks (GPON): Transmission Convergence Layer Specification* – ITU-T Recommendation G.984.3 [Exhibit 1013]

51. Exhibit 1013 is a technical standards document, *Gigabit-Capable Passive Optical Networks (GPON): Transmission Convergence Layer Specification*, issued by the Telecommunication Standardization Sector of ITU of the International Telecommunication Union (ITU) (hereafter “ITU-T Recommendation G.984.3”), and published as part of Series G: Transmission Systems and Media, Digital Systems and Networks: Digital Sections and Digital Line System – Optical Line Systems for Local and Access Networks. The G.984.3 document is designated as ITU-T Recommendation G.984.3 with a March 2008 date (03/08). The ITU-T Recommendation G984.3 was approved on March 29, 2008, by the ITU-T Study Group 15 (Exhibit 1013, page 3). Exhibit 1013 is a true

²⁷ <https://www.itu.int/rec/T-REC-G.984.2>

and correct copy of the ITU-T Recommendation G.984.3 document that I understand is being submitted as an exhibit in this proceeding. I obtained this copy of the ITU-T Recommendation G.984.3 document from the ITU website.²⁸ The text of the document is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next. Further, there are no visible alterations to the document. Exhibit 1013 was found within the custody of the issuing organization—a place where, if authentic, a copy of this document would likely be. Exhibit 1013 is a true and correct copy in a condition that creates no suspicion about its authenticity. I understand that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence could have located the ITU-T Recommendation G.984.3 document from the ITU website. It is my opinion that the ITU-T Recommendation G.984.3 document was publicly accessible digitally by April 2009.

52. ITU-T Recommendations are available in the “ITU Electronic Bookshop” (see Attachment 1A; Ex. 1032). Clicking on the “Publications by Sector” tab results in a listing of four main categories including “ITU-T Standardization (ITU-T).” Selecting the “ITU-T Standardization” brings up a choice of eleven categories including “ITU-T Recommendations” (see Attachment 1B; Ex. 1033). A list of 26 categories appears. Selecting “G Transmission systems

²⁸ <https://www.itu.int/rec/T-REC-G.984.3-200803-S/en> (Exhibit 1013)

and media, digital systems and networks” brings up a list of all ITU-T Recommendations” (see Attachment 1C; Ex. 1034). Scrolling down the numerical list to the subject ITU-T recommendation enables the information seeker to find and download a specific document. The document identified as ITU-T Recommendation G.984.1 (03/08) – *Gigabit-Capable Passive Optical Networks (GPON): General Characteristics* was available as a publication in the “ITU Electronic Bookshop” (see Attachment 3A; Ex. 1039).

53. I understand that prior to August 2012, ITU would have been known to persons at least of ordinary skill in the art as the “United Nations specialized agency for information and communication technologies.”²⁹ Established in 1865, ITU promotes cooperation among international telegraphy networks of the day and continues its work in three areas: radiocommunications, standardization, and development.³⁰ Furthermore, I understand that persons of ordinary skill in the art would have reasonably considered this organization and its website (<https://www.itu.int/en/Pages/default.aspx>) as reliable and useful sources of information for research, study, development or design.

54. The ITU website traces the history of the development of the ITU-T G.984.3 Recommendations (see Attachment 3B; Ex. 1040). The ITU website

²⁹ <https://www.itu.int/en/about/Pages/default.aspx>

³⁰ <https://www.itu.int/en/about/Pages/whatwedo.aspx>

indicates that an erratum and three amendments were issued since the G.984.3 document was approved. The erratum was issued in April 2009.³¹ The first amendment was issued in February 2009 (02/09),³² the second amendment was issued in November 2009 (11/09),³³ and the third amendment was issued in April 2012 (04/12).³⁴ The ITU-T Recommendation G.984.3 and three amendments were replaced in January 2014 (01/14) and can be downloaded from the website.

55. Therefore, it is my opinion that the standard document titled *Gigabit-Capable Passive Optical Networks (GPON): Transmission Convergence Layer Specification* was publicly available on or shortly after April 28, 2009, because by that date it had been posted on the ITU-T website.³⁵ For these reasons, it is my opinion that Exhibit 1003 was digitally published and accessible to the public on or shortly after April 28, 2009.

D. *BGP/MPLS IP Virtual Private Networks (VPNs)* prepared by Eric C. Rosen and Yakov Rekhter. RFC 4364 [Exhibit 1014]

56. Exhibit 1014 is a true and accurate copy of the standard document titled *BGP/MPLS IP Virtual Private Networks (VPNs)*, which was issued as a

³¹ <https://www.itu.int/rec/T-REC-G.984.3-201004-S!Err1/en>

³² <https://www.itu.int/rec/T-REC-G.984.3-200902-S!Amd1/en>

³³ <https://www.itu.int/rec/T-REC-G.984.3-200911-S!Amd2/en>

³⁴ <https://www.itu.int/rec/T-REC-G.984.3-201204-S!Amd3/en>

³⁵ <https://www.itu.int/rec/T-REC-G.984.3-201401-I/en>

Request for Comments (RFC) document (hereafter “RFC 4364”) and published by the Network Working Group of the Internet Engineering Task Force (IETF).³⁶ The RFC 4364 document was prepared under the leadership of Eric C. Rosen and Yakov Rekhter and bears a February 2006 date (Exhibit 1014, page 1). Each RFC document was published on the IETF website³⁷ as discussed below. RFC 4364 was also published in the Association for Computing Machinery (ACM) Digital Library on February 1, 2006.³⁸

57. I understand that the RFC development and publication process is set forth in RFC 2026 (Attachment 4A; Ex. 1041), which I identify below. RFC 2026 explains that: (i) RFC publications are widely disseminated on the Internet (Attachment 4A; Ex. 1041 (*RFC 2026*) at 4, 6); and (ii) once a standard is adopted, it will be formally published; (*id.* at 19). RFC 2026 also explains that RFC documents are published on a specific date, which starts a period for others to provide comments on the document (*id.* at 20). Based on my review and understanding, the publication date of each RFC is contained in the RFC, typically in the top right corner of the first page of the document. Each RFC document is uniquely numbered. If it becomes necessary to make a substantive change (e.g.,

³⁶ <https://datatracker.ietf.org/doc/rfc4364/>

³⁷ <https://ietf.org/>

³⁸ <https://dl.acm.org/doi/book/10.17487/RFC4364>

other than a minor typographical error), the RFC will be republished with a different number (*id* at 20).

58. I also understand that once RFCs are published, the IETF does not make changes to any published RFC. Attached hereto as Attachment 4A (Ex. 1041) is the “Publication Process”³⁹ webpage of the RFC Editor, which publishes RFCs on behalf of the IETF (“RFCs from the IETF,” p. 2), indicating that “We DO NOT make changes to RFCs once they have been published...” (p. 4). Thus, it is my understanding that versions of the RFCs identified below that were captured by the Wayback Machine before the alleged August 2, 2012, priority date are substantively the same as versions of the RFCs identified below that I recently downloaded. And, while I have not undertaken a word-by-word comparison of the respective documents, this appears to be the case based on my initial review.

59. Also attached hereto as Attachment 4B (Ex. 1042) is a true and correct copy of the MARC record⁴⁰ for *Internet documentation (RFC's, FYI's, etc.) and IETF information* issued by the Internet Engineering Task Force from the OCLC bibliographic database. As previously noted, the library that created the record is recorded in field 040 with a unique library code. For Attachment 4B, that library code is “NBS,” which means that the MARC record for this document was

³⁹ <https://www.rfc-editor.org/pubprocess/>

⁴⁰ See following section for an explanation of MARC records.

cataloged at the National Institute of Standards and Technology Library (Gaithersburg, Maryland). As can be seen in the “Entered” field in the MARC record for this exhibit, a cataloger at the National Institute of Standards and Technology Library created OCLC record number 37343206 on July 23, 1997 (“970723”), as shown in field 008 (“Date entered on file”). The most recent enhancement to Attachment 4B occurred on November 10, 2024, as shown in field 005 (“20241110”). I personally identified and retrieved the MARC record that is Attachment 4B.

60. The MARC record provided as Attachment 4B indicates that RFCs are serial publications, as I would expect from my review of Exhibit 1014. Attachment 4B further includes an entry in field 050 (“TK5105.875.I57 \$b I555”)—as described above, this includes a subject matter classification number consistent with the Library of Congress classification system (analogous to the Dewey Decimal classification system). Attachment 4B further includes two subject entries reading “Internet” (see Attachment 4C (Ex. 1043), Library of Congress subject heading sh92002816) and “TCP/IP (Computer network protocol)” (see Attachment 4D (Ex. 1044), Library of Congress subject heading sh91005299). Thus, as of its cataloging, the publication corresponding to the MARC record attached hereto as Attachment 4B was indexed according to its subject matter by virtue of at least two independently sufficient classifications: the

field 050 entry and the field 650 entries. Further, as of July 23, 1997, the MARC record attached hereto as Attachment 4B was accessible through any library with access to the OCLC bibliographic database or the online catalog at a library that acquired this document, which means that the corresponding publication was publicly available on or before that same date through any library with access to the OCLC bibliographic database or through an individual library.

61. Therefore, it is my opinion that the standard document titled *BGP/MPLS IP Virtual Private Networks (VPNs)* was publicly available on or shortly after February 1, 2006, because by that date it had been posted on the ACM Digital Library website and added to the OCLC bibliographic database. For these reasons, it is my opinion that Exhibit 1014 was digitally published and accessible to the public on or shortly after February 1, 2006.

E. “A Study on Ethernet-PON System Functionality for L2_L3 MPLS Based VPN Service” by Ahn Shin-Young and Jae-Doo Huh [Exhibit 1015]

62. Exhibit 1015 is a true and accurate copy of a conference paper published in the *18th Korea Information Processing Society: Proceedings of the Autumn Academic Conference* found in the Korea Science database hosted by the Korea Institute of Science and Technology Information (Daedeok Science Town, Daejeon, Korea). The conference paper titled “A Study on Ethernet-PON System Functionality for L2_L3 MPLS Based VPN Service” by Ahn Shin-Young and Jae-

Doo Huh (hereafter “Shin-Young”) appears beginning on page 1503 in volume 9, number 2 dated November 2002. Exhibit 1015 is a true and correct copy of the Shin-Young conference paper (volume 9, number 2, pages 1503-1506).

63. I obtained a copy of the Shin-Young conference paper in the original Korean language (Exhibit 1005A) and a certified translation to the English language (Exhibit 1015) from counsel. The certified translation was prepared by Corey Colling at Morningside on June 9, 2025 (see Attachment 5A (Ex. 1045)) under the guidance of Project Manager Emily Paras (see Attachment 5B (Ex. 1046)). Specifically, the text of the Ahn conference paper is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next; further, there are no visible alterations to the document.

64. Exhibit 1015 was found within the custody of the digital repository maintained by the sponsoring organization, the Korea Information Processing Society (KIPS)⁴¹ – a place where, if authentic, a copy of this conference paper would likely be. Exhibit 1015 is a true and correct copy in a condition that creates no suspicion about authenticity. The Shin-Young conference paper is also available in the digital repository Earticle, an academic paper search service. The Ahn conference paper is listed as document 42 which was published in 2002 (see Attachment 5C (Ex. 1047)). The Shin-Young conference paper is also available

⁴¹ <https://kips.or.kr/eng/about>

through Naver, the largest online portal in Korea which features an academic information section. The Shin-Young conference paper is listed with a 2002 publication date (see Attachment 5D (Ex. 1048)). Lead author Mr. Shin-Young works in the Supercomputing System Research Section at the Electronics and Telecommunications Research Institute (ETRI) headquartered in Daejeon, Korea.⁴² His articles are listed on a researcher's page and include the document titled "A Study on Ethernet-PON System Functionality for L2_L3 MPLS Based VPN Service" as the earliest entry with a November 2002 publication date (see Attachment 5E (Ex. 1049)). Further, the Shin-Young conference paper is also available through ScienceOn, a research database operated by the Korea Institute of Science and Technology Information (KISTI).⁴³ Founded in 1962 and supported by the Ministry of Science and ICT of South Korea, the government-funded research institute includes a copy of the Shin-Young conference paper and lists a November 15, 2002 publication date (see Attachment 5F (Ex. 1050)).

65. Therefore, it is my opinion that the Shin-Young conference paper titled "A Study on Ethernet-PON System Functionality for L2_L3 MPLS Based VPN Service" was publicly available on or shortly after November 15, 2002, because by that date it had been published by KIPS and posted on at least the

⁴² <https://www.etri.re.kr/eng/main/main.etri>

⁴³ <https://www.kisti.re.kr/ko/index.do>

KISTI website. For these reasons, it is my opinion that Exhibit 1015 was digitally published and accessible to the public on or shortly after November 15, 2002.

VI. SUMMARY OF OPINIONS

66. In view of the foregoing, it is my opinion that the publication described above was publicly available no later than the corresponding date listed in the table below:

Exhibit	Publication	Publicly Available
1011	International Telecommunication Union. Telecommunication Standardization Sector. Series G: Transmission Systems and Media, Digital Systems and Networks: Digital sections and digital line system – Optical line systems for local and access networks. <i>Gigabit-Capable Passive Optical Networks (GPON): General Characteristics</i> . ITU-T Recommendation G984.1 (March 2008). Geneva, Switzerland: International Telecommunication Union, c2008.	March 10, 2009
1012	International Telecommunication Union. Telecommunication Standardization Sector. Series G: Transmission Systems and Media, Digital Systems and Networks: Digital sections and digital line system – Optical line systems for local and access networks. <i>Gigabit-Capable Passive Optical Networks (GPON): Physical Media Dependent (PMD) Layer Specification</i> . ITU-T Recommendation G984.2 (March 2003). Geneva, Switzerland: International Telecommunication Union, c2003.	October 31, 2003
1013	International Telecommunication Union. Telecommunication Standardization Sector. Series G: Transmission Systems and Media, Digital Systems and Networks: Digital sections	April 28, 2009

Exhibit	Publication	Publicly Available
	and digital line system – Optical line systems for local and access networks. <i>Gigabit-Capable Passive Optical Networks (GPON): Transmission Convergence Layer Specification</i> . ITU-T Recommendation G984.3 (March 2008). Geneva, Switzerland: International Telecommunication Union, c2008.	
1014	Internet Engineering Task Force. Network Working Group. Informational Group. <i>BGP/MPLS IP Virtual Private Networks (VPNs)</i> . Prepared by Eric C. Rosen and Yakov Rekhter. RFC 4364. February 2006. Wilmington, DE: IETF, 2006.	February 1, 2006
1015	Shin-Young, Ahn, and Jae-Doo Huh. “A Study on Ethernet-PON System functionality for L2_L3 MPLS based VPN Service.” <i>18th Korea Information Processing Society: Proceedings of the Autumn Academic Conference</i> , vol. 9, no. 2 (November 2002): 1503-1506.	November 15, 2002

67. In signing this Declaration, I recognize that the Declaration will be filed as evidence in a case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

68. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are

believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

DATED: August 12, 2025

By: Sylvia D. Hall-Ellis
Sylvia D. Hall-Ellis, Ph.D.