UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

Nokia of America Corporation *et al.*,
Petitioner,

v.

Iarnach Technologies Limited,
Patent Owner

---

Case IPR2024-00899
Patent 9,806,892

**DECLARATION OF BRUCE SCHOFIELD IN SUPPORT OF PATENT OWNER'S PRELIMINARY RESPONSE**

Signed:
Bruce Schofield
September 13, 2024

## I. Introduction

1. My name is Bruce Schofield. I am over eighteen years of age, of sound mind, and qualified to make the statements set forth in this Declaration. I have been retained as an expert on behalf of Patent Owner Iarnach Technologies Ltd. ("Iarnach" or "Patent Owner") in the above captioned IPR to provide my professional opinions and conclusions relating to U.S. Patent No. 9,806,892 (the "Patent '892").

2. With the exception of the legal principles counsel has supplied to me, all the facts and statements contained herein are within my personal knowledge and are in all respects true and correct. I further understand that willful false statement and the like are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code. I declare under penalty of perjury that the following statements are true and correct.

3. My work on this matter is being billed at an hourly rate of $500 per hour and is not contingent on the outcome of this proceeding. I am also being reimbursed for reasonable expenses I incur in relation to my services provided for this proceeding.

## II. Qualifications

4. I have summarized in this section my educational background, career history, publications, and other relevant qualifications. My full *curriculum vitae* is attached to this declaration, and my granted patents are also listed in the attachment.

5. For most of my career as an engineer, I specialized in optical communication technologies and networks for long haul, metro, and access regions.

6. My early experience was designing optical networks at the physical layer, designing optical transceivers, and developing jitter and power budgets. As my career progressed, my work included moving up the layers of the OSI model, designing with network protocols such as Ethernet and Fiber Channel, and then designing network products such as ROADM and

inventing application engagement with the network. This growth eventually enabled me to become lead architect for product developments of concepts in which I was the lead inventor. I have over 30 years of experience working on research and development for optical products and services while in the Advanced Development Group at Digital Equipment Cooperation and in the CTO office at Nortel Networks. I then transitioned to consulting, first working for Rockstar, and then as an independent contractor.

**A. Educational Background**

7. In 1976, I received a Bachelor of Engineering (B.E.) in electrical engineering from Northeastern University. In 1977, I received a Master of Science (M.S.) in electrical engineering, also from Northeastern University.

**B. Career**

8. In terms of my professional career, I worked for Eaton Corporation/AIL Division, where I was responsible for the design of the DSP modules for an Adaptive Phased Array research and development project for a government funded project. Upon completion of my design efforts, I joined the systems integration team. While working on the systems integration team, the lead architect and team concluded that three additional bits of accuracy were necessary to have the system meet the design goals, which would have required a complete redesign of all the entire system. Independently, I discovered a solution that with simple changes to the AD converters, programable changes to the host processor, and minor changes to my DSP modules, would make possible, the extra three bits of accuracy, saving the project millions of dollars and 3 months of redesign work.

9. From 1980 to 1999, I worked for Digital Equipment Corporation (DEC), mostly in the AD group within the Networks Division. I conducted the prototype designs of next generation transceivers and transitioned the technology, link specifications, and cost analysis to the

development team. I became a member of the All Optical Network Consortium, a DARPA funded project, as a designer. I was moved to the architecture team when I proposed and proved that the team's proposed use of optical burst transmission in an asynchronous network was not feasible. The consortium was composed of DEC, MIT, Lincoln Labs and Bell Labs. This project may have influenced the PON architects to require synchronous network to enable their burst mode optical transmission. I worked with this team on numerous other DARPA projects, as well as conducting related advanced development work for DEC. This included directly and indirectly contributing to numerous standard efforts, such as Optical Transport Network, ITU.T G.709 and FDDI, Fiber Distribution Data Interface. I hosted an IEEE meeting at the DEC site because I discovered an optical non-linear interference pattern that would greatly reduce the value of using most types of lasers over multimode fiber.

10. I was employed at Nortel Networks from 1999 to 2011, working in the CTO office as lead optical architect. I, both individually and jointly, developed numerous patents with many contributing to new develop efforts and enhancing existing products. These products included integration of layer 1 with layer 3 products, expanding control plan capabilities, and application engaged networking. I also was awarded an NSA contract to evaluate and project the leading semiconductor materials for its applicability to enhance the development of integrated optical devices. This solitary effort was later used as the benchmark for two additional rounds of funding from NSA. I also contributed to design review of Nortel's WDM-PON project.

11. I worked at IP-RockStar from 2011 to 2015, where I transitioned from an optical architect to a technical consultant.

12. From 2015 to present, I have worked as an independent contractor.

**C. Patents and Publications**

13. I am a named inventor on 32 issued US patents and 13 international patents.

14. I am the author or co-author in at least 2 IEEE publications, identified in the attachment to this declaration.

## III. Materials Considered

Among the materials I have reviewed in forming my opinions are the Patent '892, the prosecution file history, and the other materials referenced in this declaration.

## IV. LEGAL PRINCIPLES

15. I am not a lawyer. In forming my opinions as set forth in this Declaration, I have relied upon legal principles supplied to me by attorneys for Patent Owner. In forming my opinions, I have not relied upon Patent Owner's attorneys for any purpose other than the following legal principles.

### A. Claim Construction

16. I understand that determining whether a patent claim is valid requires a two-step analysis. First, the claim must be construed. Second, the properly construed claim must be compared to the prior art.

17. With respect to the first step, I understand that claims are construed from the perspective of a person of ordinary skill in the art ("POSITA") at the time of the purported invention. I understand that in the context of an *inter partes* review proceeding, absent a disclaimer or express definition, claim terms are given their plain and ordinary meaning to a POSITA in view of the specification and file history and the knowledge of a POSITA. Unless otherwise noted, I have applied what I consider to be the plain and ordinary meaning of all terms as understood by a POSITA at the time of the invention. I understand that the Patent '892 claims priority to a Foreign Application filed on July 13, 2012.

### B. Anticipation

18. I understand that in an *inter partes* review, the challenger must show that the claim is invalid by a preponderance of the evidence. I understand the preponderance of the evidence to require the greater weight of evidence in favor of the challenger.

19. I understand that, although not expressly disclosed, subject matter may be inherently disclosed in a prior art reference where that subject matter is necessarily present in the subject matter disclosed and would be understood to be so by those of ordinary skill in the art. I understand that the fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.

20. I understand that a claim is invalid if each and every element of the claim is disclosed in a single prior art reference with the elements arranged as specified in the claim, either expressly or inherently. I understand that invalidity based on the disclosure of a single prior art reference in this manner is called anticipation.

**C. Obviousness**

21. I understand that a claim would have been obvious under 35 U.S.C. § 103 if one or more prior art references disclose, expressly or inherently, every claim limitation in such a way so as to render the claim, as a whole, obvious to a person of ordinary skill in the art at the time the purported invention was made. The relevant standard for obviousness is as follows:

> A patent may not be obtained through the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

35 U.S.C. § 103(a) (pre-AIA).

22. In determining whether or not a patented invention would have been obvious, the following factors should be considered: (a) the scope and content of the prior art; (b) the differences between the prior art and the claims at issue; (c) the level of ordinary skill in the art; and (d) whatever "secondary considerations" may be present.

23. I understand that certain "secondary considerations" may be relevant in determining whether or not an invention would have been obvious, and that these secondary considerations may include commercial success of a product using the invention, if that commercial success is due to the invention; long-felt but unsolved need for the invention; evidence of copying of the claimed invention by others; industry acceptance; initial skepticism of the invention; failure of others to solve the problem; praise of the invention by others; the taking of licenses under the patents by others; and simultaneous invention by others (which may be an indication that the claimed invention was the result of ordinary skill in the art).

24. I understand that a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. While multiple prior art references or elements may, in some circumstances, be combined to render a patent claim obvious, I understand that I should consider whether there is an apparent reason to combine the prior art references or elements in the way the patent claims. To determine whether such an apparent reason exists to combine the prior art references or elements in the way a patent claims, it will often be necessary to look to the interrelated teaching of multiple patents, to the effects of demands known to the design community or present in the marketplace, and to the background knowledge possessed by a person having ordinary skill in the art.

25. I also understand that when the prior art teaches away from combining prior art references or certain known elements, discovery of a successful means of combining them is more

likely to be non-obvious. A prior art reference may be said to teach away from a patent when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the patent or would be led in a direction divergent from the path that was taken by the patent.

26. I also understand that it is not permissible to use hindsight in assessing whether a claimed invention is obvious. Rather, I understand that, to assess obviousness, you must place yourself in the shoes of a person having ordinary skill in the relevant field of technology at the time the inventions were made who is trying to address the issues or solve the problems faced by the inventor and ignore the knowledge you currently now have of the inventions.

27. I also understand that there are numerous ways in which to articulate the legal standard for obviousness, including: (1) combining prior art elements according to known methods to yield predictable results, (2) simple substitution of one known element for another to obtain predictable results, (3) use of a known technique to improve similar devices (methods, or products) in the same way, (4) applying a known technique to a known device, method, or product ready for improvement to yield predictable results, (5) choosing from a finite number of identified, predictable solutions with a reasonable expectation of success, (6) known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art, and (7) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention

**D. Person of Ordinary Skill in the Art**

28. I understand that the meaning of claim terms and a patent's validity are to be determined from the vantage point of one of ordinary skill in the art at the time of the invention.

In determining who would be one of such ordinary skill, I understand it is appropriate to consider criteria such as: (a) the type of problems encountered in the art; (b) prior art solutions to those problems; (c) the rapidity with which innovations are made; (d) the sophistication of the technology; and (e) the education level of active workers in the field.

## V. Person of Ordinary Skill in the Art

29. Based on the materials and information I have reviewed and on my experience in the technical areas relevant to the Patent '892, a person of ordinary skill in the art ("POSITA") at the time of the inventions would have at least a bachelor's degree in electrical engineering, computer science, or a similar degree plus at least two years of experience in optical networks. This description is approximate, and a higher level of education or skill might make up for less experience, and vice versa. I was a person of at least ordinary skill in the art at the time of the inventions of the Patent '892.

## VI. U.S. Patent No. 9,806,892

30. The technology discussed in this declaration primarily deals with PON, Passive Optical Networks. This technology is utilized in the Access portion of an optical network, often referenced as, The Last Mile. Its function is to supply network provider clients with both local and remote access to the broader internet. The other two major portions of a complete optical network are the metro region and the long-haul/backbone networks.

31. The two active devices in a PON network are the OLT, Optical Line Terminal which controls the network and resides in the Central Office of a service provider, and the ONU, Optical Network Unit, which resides on the customer premises.

32. The inventive elements of Patent '892 include an improved power management technique that reduces the power consumption of an ONU. Previous techniques switched between a full power level and a low power level. In the full power level, both the ONU transmitter and

receiver are powered on. One low power level was referred to as doze or listen mode, where the ONU transmitter is powered off while the ONU receiver is on. Another low power level was referred to as sleep or cyclic sleep mode, where both the ONU transmitter and receiver are powered off. As shown in Figure 7A below, the standard XG-PON ONU state machine at the time of the invention did not allow direct transitions between the Doze Aware and the Sleep Aware states:

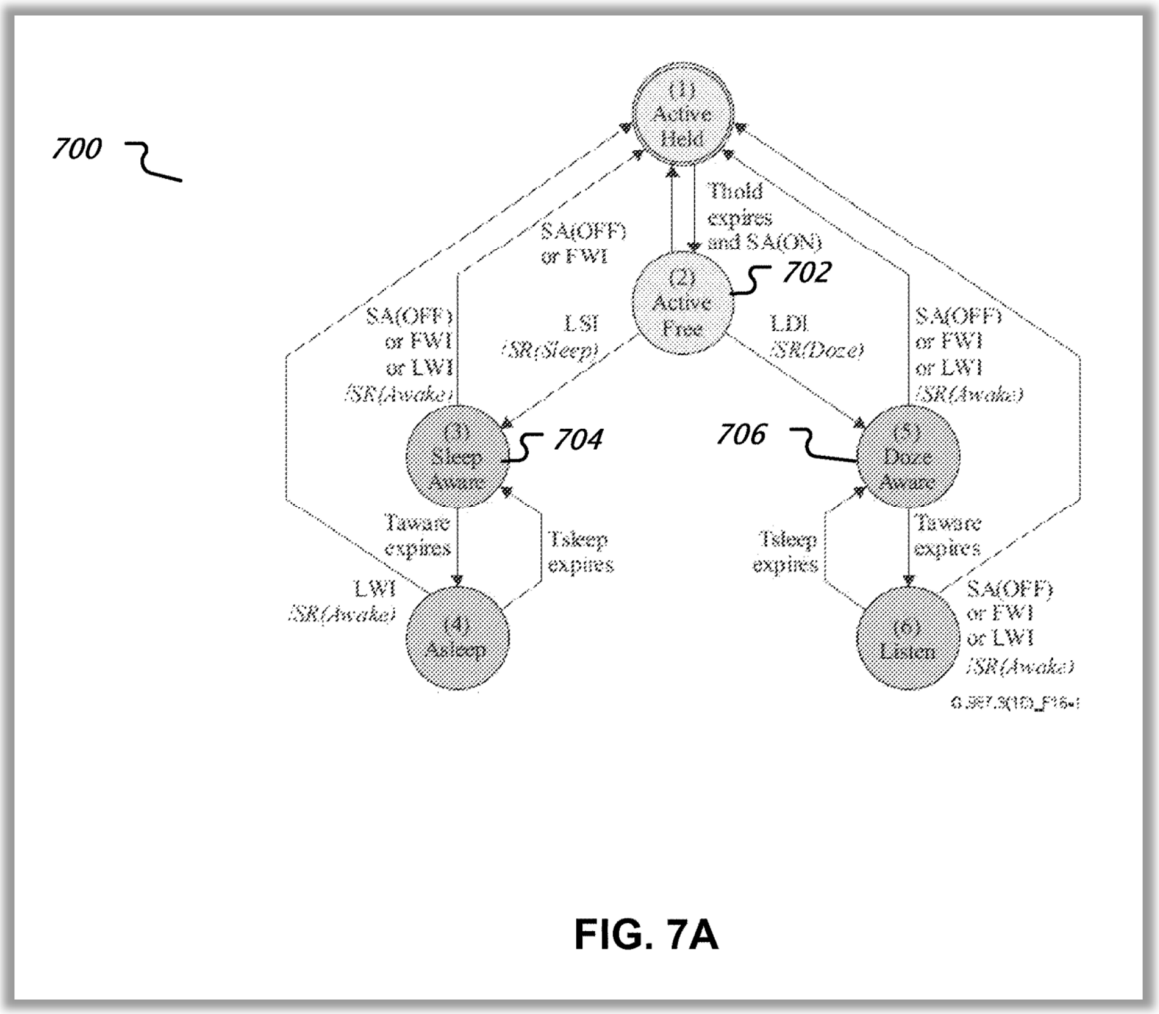



FIG. 7A

Direct transitions between the Listen and Asleep states were also prohibited.

33. Patent '892 provides a technique with lower power consumption by allowing direct transitions between low power states. This technique is superior to using only doze mode because the introduction of sleep phases lowers the average power level. Furthermore, the technique is superior to using only sleep mode because the ONU can now spend a longer time in a low power state. An ONU using only sleep mode would not be able to spend much time in a sleep state because it could not detect an external wakeup stimulus while in such a state. By entering a doze state from the sleep state, an ONU would be able to detect an external wakeup stimulus without having to reach a full power level. In addition, the transition from the doze state to the sleep state is direct without an intermediate full power state, thereby further reducing power consumption. This is shown, for example, in Figure 5:

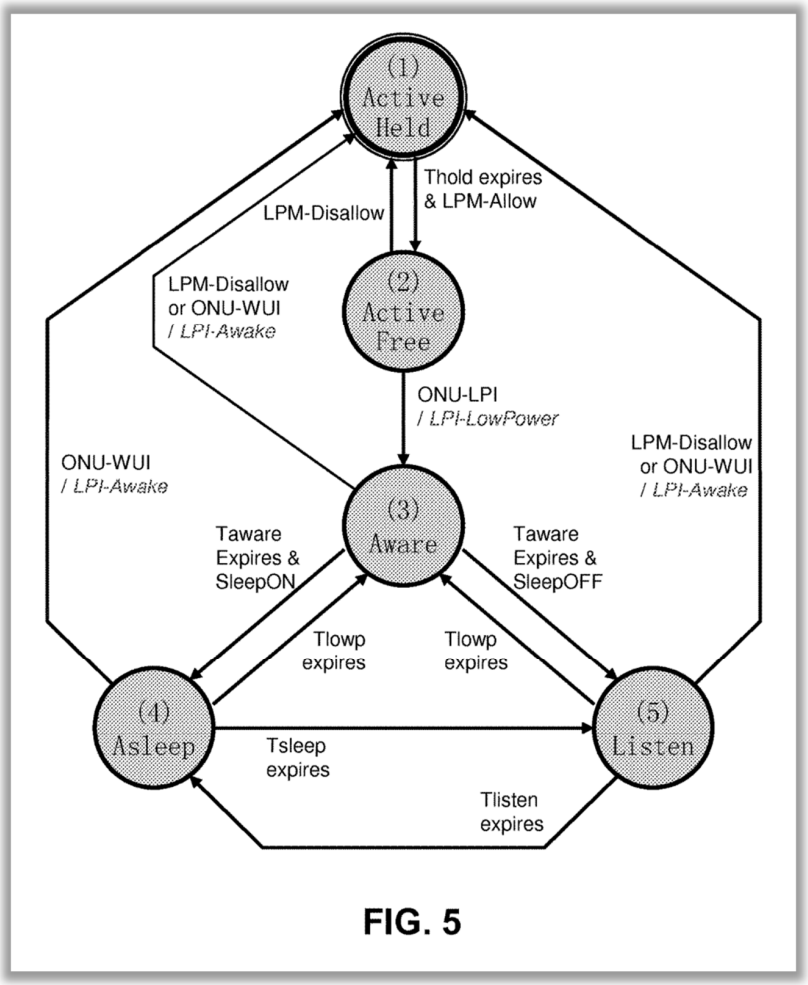



FIG. 5

## VII. The Asserted References

34. I understand the Petitioners have asserted that a combination of G.987.3, Röger, and G.988 would render obvious Claims 1-5 and 14-15 of Patent '892. I further understand the Petitioners have asserted that a combination G.987.3, Röger, G.988, and Ghazisaidi would render obvious Claims 10-13 of Patent '892.

### A. G.987.3

35. The ITU-T G.987.X series of specifications define the XG-PON Standard. The document asserted against Patent '892 in this proceeding is the Transmission Convergence Layer

Specification, G.987.3. This section of the XG-PON Standard standardizes the communication link between the ONU and the OLT, and it describes ONU power management.

36. G.987.3 provides two low power modes for the ONU: Doze mode and Cyclic Sleep mode. Ex1007 at 97. The receiver is active in Doze mode but inactive in Cyclic Sleep mode. *Id.* at 59. G.987.3 specifically states that "[d]irect transitions between Doze mode and Cyclic Sleep mode are disallowed." *Id.* at 105. The standard did not allow for direct transitions until well after the Patent '892 was filed.

**B. Röger**

37. Röger is a paper titled "Optically powered fiber networks." Ex1006 at 1. Röger describes "power-efficient innovative hardware" and "a novel low-energy medium access control protocol." *Id*. at 1. Röger was focused on minimizing subscriber power consumption associated with maintaining synchronization with the central office. To that end, it provided two new power modes: (1) a "snooze mode" where subscribers attempt to maintain synchronism with the central office by using a local quartz clock; and (2) a "sleep mode" where subscribers lose synchronism with the central office." *Id.* at 6, 8. Röger never mentions direct transitions between two low power consumption states and does not contain any state diagrams.

**C. G.988**

38. G.988 is an ITU-T Recommendation titled "ONU management and control interface (OMCI) specification." Ex1008 at 1. The document specifies the optical network unit (ONU) management and control interface (OMCI) for optical access networks.

**D. Ghazisaidi**

39. Ghazisaidi is a published international patent application (WO 2013/014483). It is focused on scheduling traffic exchanges in a PON. Ex1009 at 1.

## VIII. The Invalidity Grounds

**A. Direct Transitions**

40. Dr. Sergienko contends that a POSITA would have been motivated to apply direct transitions between the "Listen" and "Asleep" states to G.987.3 "to save energy by not powering on the transmitter when transitioning between the 'Listen' and 'Asleep' states." Ex. 1003 at ¶ 81. I disagree. A POSITA would not have been motivated to modify G.987.3 in this way because it would cause the modified ONU and OLT to no longer be compliant with the standard. G.987.3 explicitly disallows "[d]irect transitions between Doze mode and Cyclic Sleep mode," which is exactly what Dr. Sergienko is proposing. Ex1007 at 105. A POSITA would have been focused on complying with the standard to ensure interoperability with other standard-compliant equipment.

41. Dr. Sergienko argues that the statement in G.987.3 prohibiting direct transitions does not apply to ONUs. Specifically, Dr. Sergienko asserts that the statement "is only applicable to the OLT, and there is no similar restriction or note in the ONU state transition and output table." Ex. 1003 at ¶ 69. I disagree. The language prohibiting direct transitions between Doze mode and Cyclic Sleep mode applies to ONUs because those modes are ONU power saving modes:

**11.3.4.5 Sleep_Request message**

An ONU sends Sleep_Request to signal its intention to change power saving modes. Clause 16 defines the use and function of this message in detail.

| Octet | Content | Description |
|---|---|---|
| 1-2 | ONU-ID | |
| 3 | 0x10 | Message type ID "Sleep_Request". |
| 4 | SeqNo | Always 0. |
| 5 | Activity _level | 0- Sleep_Request (awake).<br>1- Sleep_Request (doze). Doze request, ONU receiver active – During low-power periods of doze mode, the ONU can receive downstream traffic.<br>2- Sleep_Request (sleep). Cyclic sleep request, ONU receiver inactive – During low-power periods of cyclic sleep mode, the ONU cannot receive downstream traffic.<br>Other values reserved. |
| 6-40 | Padding | Set to 0x00 by the transmitter; treated as "don't care" by the receiver. |
| 41-48 | MIC | Message integrity check |

Ex1007 at 59 (emphasis added).

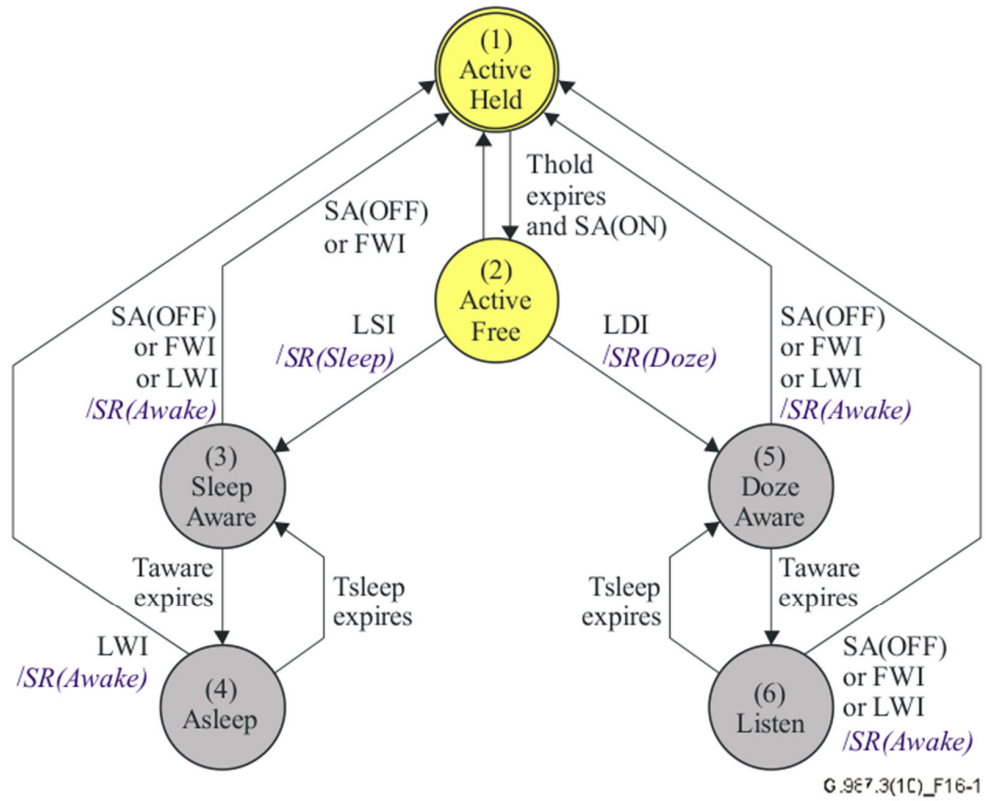



**Figure 16-1 – ONU state transition diagram (initial state circled)**

*Id.* at 101.

The statement prohibiting direct transitions was made when discussing OLT state transitions because the OLT is involved in controlling ONU power states, not because the statement applies to only the OLT. *See* Ex1007 at 99 ("The power management behaviour of a given ONU is controlled by a pair of state machines residing at the OLT and the ONU.").

42. Dr. Sergienko contends that his interpretation of the statement is correct because it also appears in G.9807.1, which allows direct transitions in Watchful Sleep mode. *See* Ex. 1003 at ¶ 69. But the existence of direct transitions in Watchful Sleep mode is not contradictory because that mode is distinct from the Doze and Cyclic Sleep modes. *See* Ex1010 at 230 ("This clause

addresses three additional means of power management . . . . One is called Doze mode; another is referred to as Cyclic sleep mode; the third is known as Watchful sleep mode.”). Moreover, Watchful Sleep mode was not standardized until after the Patent ‘892 was filed. One can use direct transitions and comply with G.9807.1, but the same is not true for G.987.3.

43. Dr. Sergienko argues that his proposed modification would have been “driven by a well-known problem in the field, reducing power consumption.” Ex. 1003 at ¶ 70. I disagree. A POSITA would not have been driven solely by reducing power consumption, as Dr. Sergienko suggests. Instead, as I mentioned earlier, a POSITA would have been focused on standard compliance. Moreover, Dr. Sergienko’s proposed modification would add complexity to the ONU state machine, which would discourage a POSITA from making it.

44. Dr. Sergienko suggests that the invention is obvious because “there are a finite number of solutions to reduce power consumption in optical networks.” *Id.* at ¶ 70. I disagree. There are numerous potential solutions to reduce power consumption in optical networks. This includes power shedding, which itself takes into account numerous shedding classes. Ex1008 at 71. It would not have been obvious to use the patent’s approach to transition mechanics between two specific low power states in the ONU (as opposed to looking for power savings in, for example, another network component).

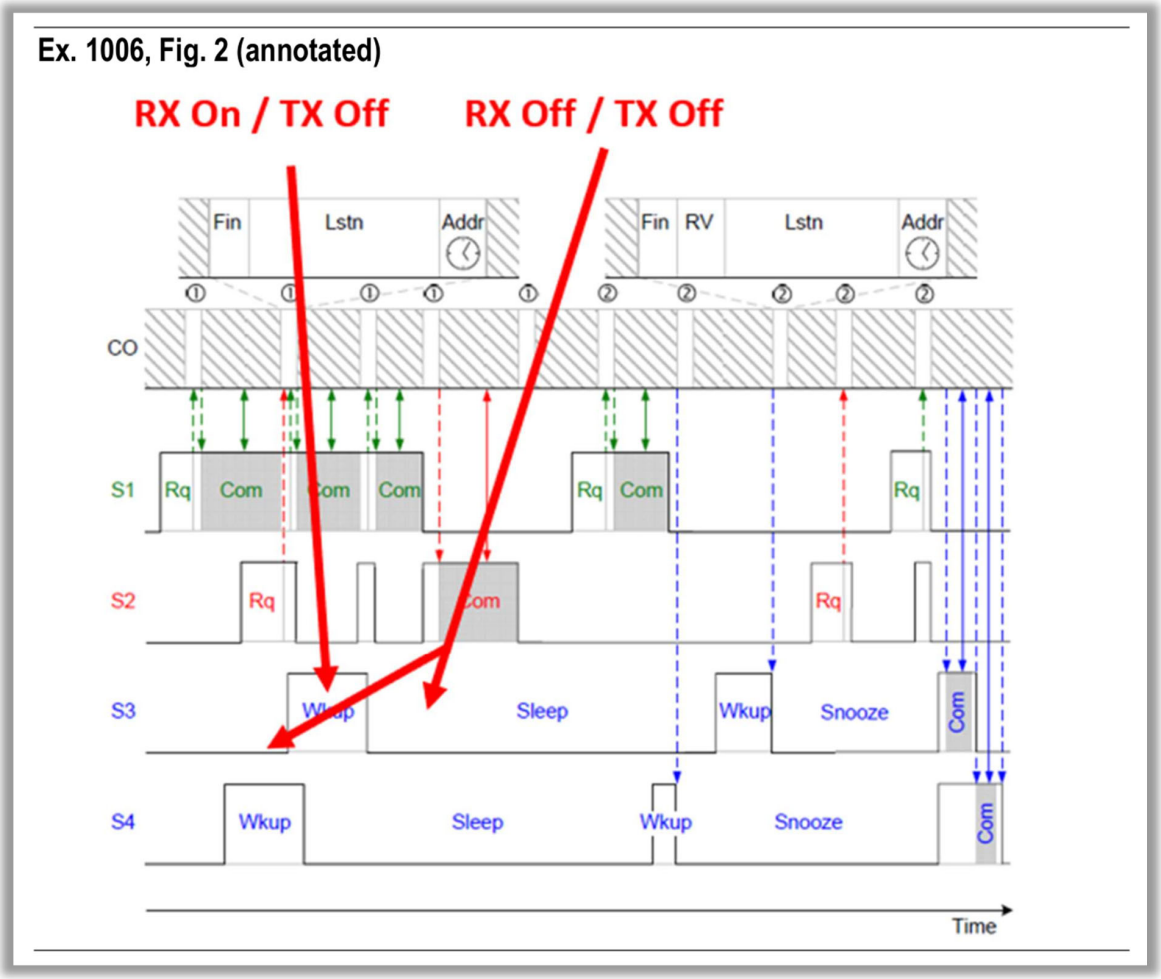
45. Dr. Sergienko contends that the combination of G.987.3 and Röger discloses direct transitions. *See* Ex. 1003 at ¶ 82. I disagree. Unlike the Patent ‘892, Röger is not concerned with transitions at a state machine level and does not discuss them. *See, e.g.*, Ex1001 at Fig. 5. Indeed, Röger does not contain a single state diagram.

46. Dr. Sergienko contends that Röger discloses a direct transition from a sleep mode to a receive mode because it states that subscribers “activate their basic receiver circuitry.” Ex.

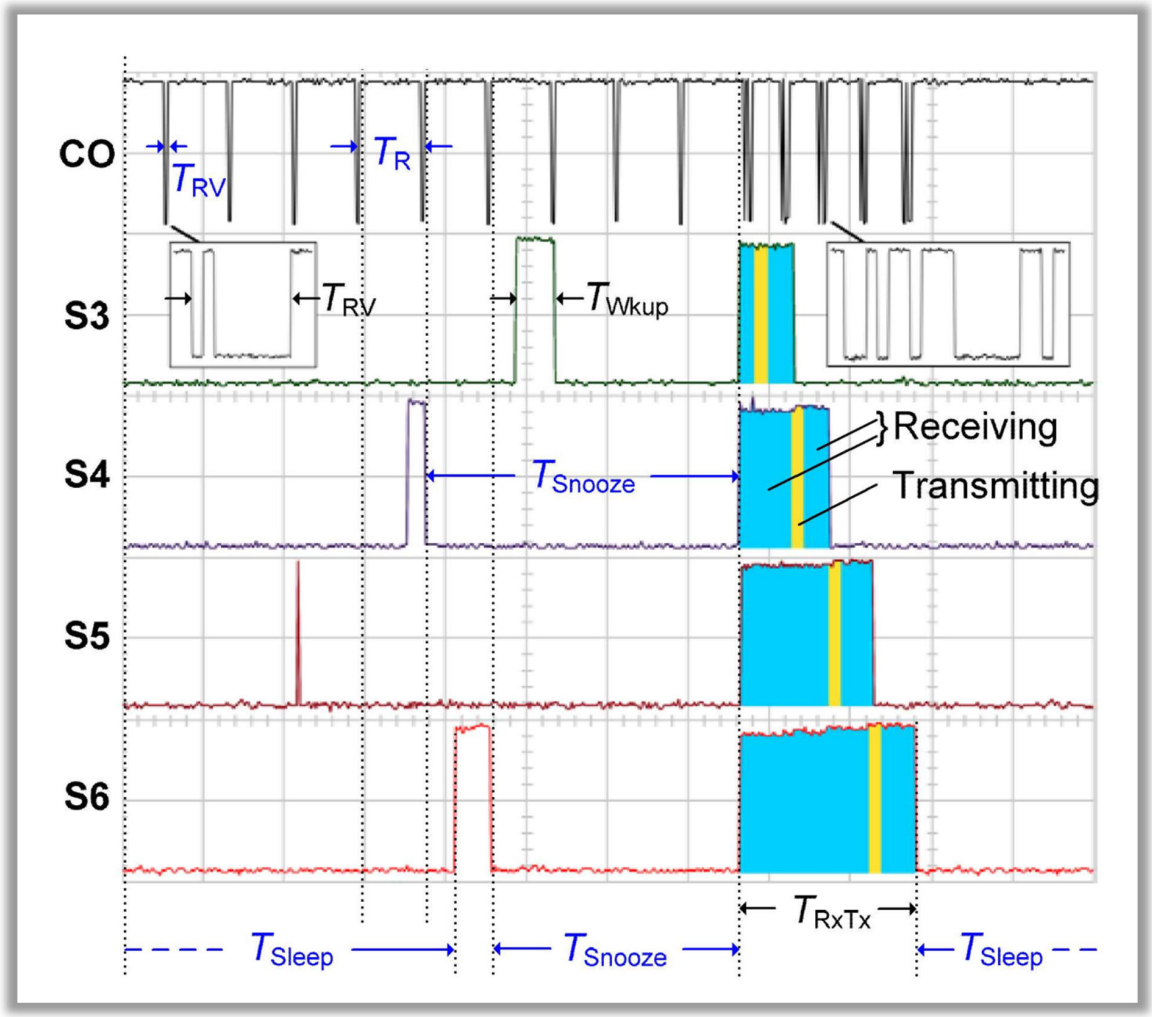
1003 at ¶ 82. But this statement says nothing about whether the transition from sleep mode to receive mode was direct. As explained by the Patent '892, "[d]irect transition refers to changing the operational state of the ONU between the first and the second states ***without having to go through an intermediate third state***." Ex1001 at 12:33–36 (emphasis added). Notably, G.987.3-compliant ONUs would also "activate their basic receiver circuitry" when transitioning from the "Asleep" state to the "Listen" state, but even Dr. Sergienko admits that such a transition would be indirect. *See* Ex. 1003 at ¶ 68; Ex1007 at 101.

47. Dr. Sergienko similarly argues that Röger discloses a direct transition from a receive mode to a sleep mode because it states that "the subscribers go back to sleep." Ex. 1003 at ¶ 83. But this statement also says nothing about whether the transition was direct, and Dr. Sergienko admits that G.987.3-compliant ONUs would undergo an indirect transition when they "go back to sleep." *See* Ex. 1003 at ¶ 68; Ex1007 at 101.

48. Dr. Sergienko points to "low portion[s]" and "high portion[s]" of a line in his annotated version of Figure 2 to allege direct transitions:




Ex. 1003 at ¶ 83. However, Figure 2 does not describe transitions between sleep mode and receive mode at a state machine level. A POSITA would understand that there is an intermediate state that is simply not illustrated in the diagram. For example, using Dr. Sergienko's logic, one could interpret Figure 6 as showing that the "receive" mode (shown in blue) and "transceive" mode (shown in yellow) have the same power consumption because they both correspond to high portions of a line:




Ex1006 at 12. But the supply current for transceive mode is almost double the supply current for receive mode:

Table 2. Subscriber operating modes and total DC supply currents $I_b$ for a supply voltage $V_b$ = 3.6 V.

| Subscriber modes | | Attributes | μC current $I_{\mu C}$ | Supply current $I_b$ | Total $I_b$ |
|---|---|---|---|---|---|
| Sleep | μC low-power modes | Low-Q clock | 0.5 μA | $I_{Sleep}$ | 0.5 μA |
| Snooze | | High-Q clock | 1 μA | $I_{Snooze}$ | 1 μA |
| Receive | μC active mode | Receiver on | 3.5 mA | $I_{Rx}$ | 6 mA |
| Transceive | | Transceiver on | | $I_{RxTx}$ | 11 mA |

*Id.* at 11. Just as Figure 6 fails to show power consumption details, Figure 2 fails to show state transition details. Moreover, Röger explains that the high levels in Figure 6 indicate "receive ***or*** transceive" modes, so a single high portion of a line in Röger's diagrams can indicate multiple different states. Ex1006 at 12 (emphasis added). Indeed, each color-coded high level in Figure 6 shows at least three separate states. Ex1006 at 11–12 ("At rendezvous time all subscribers switch to receive mode . . . . When for instance subscriber S4 recognizes its address (transition from the dark (blue) to the light (yellow) region in Fig. 6), it activates its transmitter, sends to CO whatever information was required, and deactivates its transmitter again (transition from the light (yellow) to the dark (blue) region in Fig. 6).") And based on Figure 6, the corresponding high level labeled "Com" in Figure 2 also corresponds to multiple states. Accordingly, a POSITA would not interpret Figure 2 as disclosing direct transitions.

49. Dr. Sergienko's own description of Röger confirms this conclusion. Figure 6 shows that an ONU exiting snooze mode transitions to receive mode. But according to Dr. Sergienko, "[a] POSITA would have known that the ONUs would have had to be fully powered up and capable of responding to upstream and downstream traffic (i.e., capable of receiving and transmitting messages between the ONU and OLT) before exiting the snooze mode ('second state') . . . in order to communicate with the OLT." Ex. 1003 at ¶ 90. Therefore, Dr. Sergienko agrees that Röger's ONU enters an intermediate "fully powered up" state capable of transmitting messages between snooze mode and receive mode. The intermediate state is just not shown in the diagram. Dr. Sergienko effectively contends that the Röger reference meets this limitation, when in fact it is silent on the ability to perform direct transitions.

50. Additionally, a POSITA would not have combined G.987.3 or G.988 with Röger because G.987.3 explicitly prohibits the proposed combination. The ONU of Dr. Sergienko's

proposed combination would directly "alternate between sleep and doze modes," but G.987.3 disallows "[d]irect transitions between Doze mode and Cyclic Sleep mode." Ex. 1003 at ¶ 74; Ex1007 at 105. And as I explained earlier, a POSITA would have been focused on complying with the standard to ensure interoperability with other standard-compliant equipment. When viewing G.987.3 and Röger in combination, a person skilled in the art would not have been motivated to vary from the teachings of the standard and to adopt direct transitioning, especially when the Röger reference was silent on direct transitioning between low power states.

51. Dr. Sergienko contends that a POSITA would have been motivated to apply Röger's allegedly direct transitions "to the optical network units of G.987.3 in view of the known advancements in technology at the time." Ex. 1003 at ¶ 72. Specifically, he argues that "a POSITA would have been motivated to apply the direct transitions of Röger in light of advancements in how fast a receiver could be switched on from a sleep mode" due to the decreased clock and data recovery (CDR) time disclosed in Wong. *Id.* I disagree. The classic device for recovering a clock signal from the data transitions is utilizing a Phase Lock Loop, PLL. The technology always evolves but not substantially enough during this period to drive the selection of power saving modes of the ONU. There is a design tradeoff that always needs to be made for any PLL that is very application dependent. The closed loop bandwidth of the PLL dictates two major competing design goals. The incoming signal always has jitter (noise) on it, but the recovered clock should be as stable (jitter free) as possible. So, to reduce the jitter on the clock, it is best to have a very low closed loop bandwidth. However, the lower the closed loop bandwidth, the slower the acquisition time. As result, it is not ideal to have a superfast locking time, at the cost of having excessive noise on the recovered clock. Thus, the PLL properties are a design consideration, not a

technology limitation for ONUs. And the CDR advancements that Dr. Sergienko points to would not have motivated a POSITA to apply Röger to G.987.3.

52. In sum, G.987.3 does not allow direct transitions between the two low power states. Röger does not cure this deficiency because it is imprecise and ambiguous. It contains no state diagrams, the power levels in its diagrams are inaccurate, and high levels in its diagrams can indicate multiple states.

53. I understand that claims 1–5 and 10–15 all require direct transitions. Therefore, for the reasons discussed above, none of the invalidity grounds renders claims 1–5 and 10–15 unpatentable.

### B. "a periodic consent message to allow the optical network unit to remain in either the first low power state or the second low power state"

54. Claim 12 requires "a periodic consent message to allow the optical network unit to ***remain*** in either the first low power state or the second low power state." Ex. 1001 at 16:50–53 (emphasis added). As such, the message applies to an ONU that is already in one of the low power states. Dr. Sergienko points to the Sleep_Allow(ON) event as the claimed consent message. Ex. 1003 at ¶ 162. But according to Dr. Sergienko's own argument, Sleep_Allow(ON) "gives permission to the ONU to ***transition into*** a low power mode." *Id.* at ¶ 163 (emphasis added). Accordingly, Dr. Sergienko's consent message gives permission to ***enter*** a low power mode, not ***remain*** in a low power state as required by the claim.

55. This is confirmed by G.987.3's ONU state diagram and table, which show that Sleep_Allow(ON), or SA(ON), applies only when the ONU is in the ActiveHeld state:

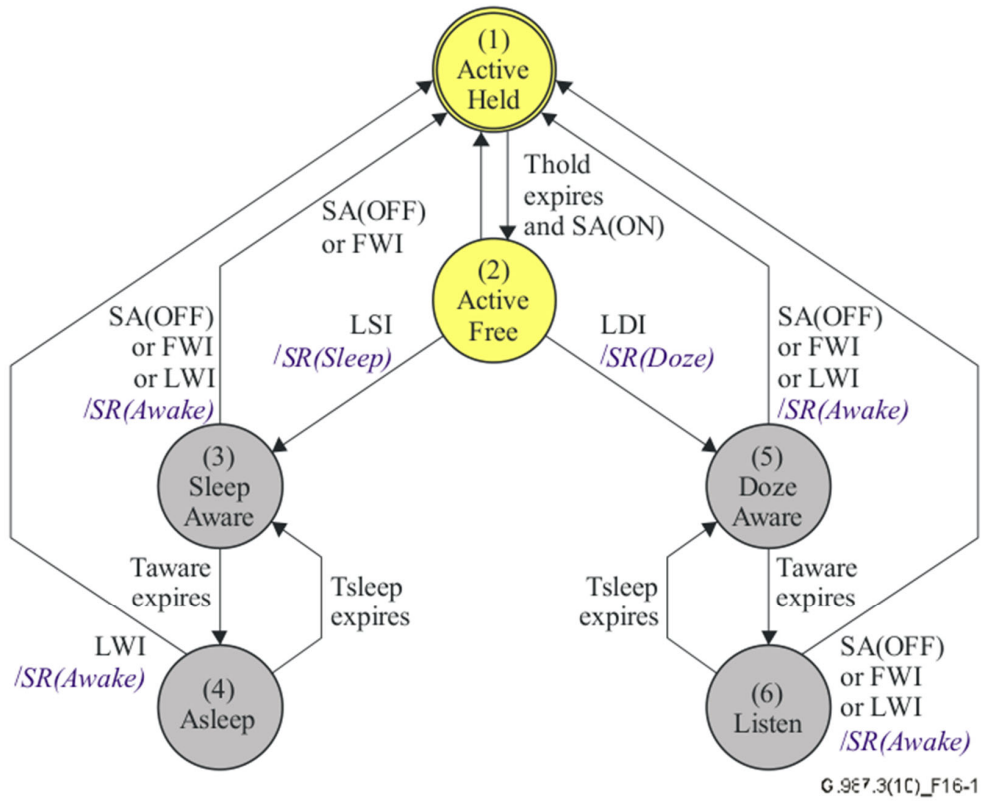



**Figure 16-1 – ONU state transition diagram (initial state circled)**

Ex1007 at 101.

**Table 16-4 – ONU state transition and output table**

| Inputs | ONU power management states | | | | | |
|---|---|---|---|---|---|---|
| | (1) ActiveHeld | (2) ActiveFree | (3) SleepAware | (4) Asleep | (5) DozeAware | (6) Listen |
| FWI | * | → (1) | → (1) /SR(Awake) | | → (1) /SR(Awake) | → (1) /SR(Awake) |
| SA (OFF) | * | → (1) | → (1) /SR(Awake) | | → (1) /SR(Awake) | → (1) /SR(Awake) |
| SA (ON) | → (2) Upon Thold exp. (Note) | * | * | | * | * |
| LWI | * | * | → (1) /SR(Awake) | → (1) /SR(Awake) | → (1) /SR(Awake) | → (1) /SR(Awake) |
| LSI | | → (3) /SR(Sleep) | * | * | | |
| LDI | | → (5) /SR(Doze) | | | * | * |
| Tsleep exp. | | | | → (3) | | → (5) |
| Taware exp. | | | → (4) | | → (6) | |

* Indicates a self-transition.

A shaded cell means that the input is not applicable in the given state.

NOTE – An ONU remains in the ActiveHeld state for at least Ihold upon entry into that state regardless of the SA message parameter value indicated by the OLT. The minimum sojourn in the ActiveHeld state is controlled by timer Thold that is initiated to Ihold upon ONU's entry into the ActiveHeld state. When Thold expires, the ONU executes a transition into to the ActiveFree state if the latched value of SA message parameter is ON or as soon as SA (ON) message is received.

*Id.* at 102.

56. Therefore, for the reasons discussed above, none of the invalidity grounds renders claim 12 unpatentable.

# BRUCE A. SCHOFIELD

***15 Farwell Road***
***Tyngsborough, MA 01879***

***Home: 978.649.6287*** ***bschofield52@gmail.com***
***Mobile: 978.512.9196***


## Core Accomplishments

- Evaluated portions of NEC optical portfolio to assess value and potential licensing candidates

- Expert Witness in Verizon versus Huawei optical patent suit. Testified at trial and wrote Infringement and Validity Expert Reports for 5 optical patents related to OTN technology including multiplexing, framing and high bit rate transmission. Provided 6-hour legal deposition.

- Expert Witness: provided technical guidance on behalf of Level 3 via Law Firm, Foley and Lardner in defense of patent infringement allegations. Patent involved optical networks including GFP and OTN. Generated Expert Report exposing technical errors in plaintiff's claim charts and analysis. My Export Report was sited by judge in favorable ruling in Summary Judgement. Testified in legal Deposition in defense of my Expert Report.

- IP Technical Expert: optical transmission from access networks to long haul 40 Gb/s; wireline access networks (ADSL, VDSL, DOCSIS, GPON); network protocols (Sonet, OTN, Ethernet, GFP); Data Center network solutions (Fiber Channel, Infiniband, Fabric Path); network control plans and protocols (GMPLS) and their interaction between layers of the OSI model; all optical elements (ROADM, Mux/DeMux, transport switches, optical amplification, photonic switches, dispersion compensation techniques).

- Inventor: 32 US patents granted plus 13 international granted patents and numerous IEEE published papers within data networking with 8 granted patents and 3 patents pending related to Application Engaged Networking (Software Defined Networking)

  Application Engage Network concepts including BW and Connection Management and creation of used Service Agent and Network Abstraction, transitioning them into product development teams, which became key in winning multiple R&E Network deployments.

  Network utilization of dynamic QoS features via time-value curves, assisting in its transitioning into both Nortel's Optical and Enterprise Business Units products.

  Optical Switch interworking within Layer 3 router with a single control plane for both layers.

- Senior Optical Architect with industry leaders, Nortel Networks and Digital Equipment: initiating product concepts, leading Advanced Development efforts and small product teams, designing optical network products and products enabling interaction between network elements and applications.

  Awarded over $2 million in external funding mainly from DoD to supplement $20 million of internal funding to develop new product concepts and accelerate product development, leading to over $100 million worth of product revenue.

  Technical lead DoD funded project and invented solution for world class Service Provider solving network instability due to MPLS interaction with creation of optical short-cuts, enabling SP to become lead customer for Nortel's electronic Dispersion Compensation solution at 40 Gb/s.

# Professional Experience

**IP Optical Consultant** **Jan 2016 to Present**

- Fish and Richardson P.C – engaged to evaluate and quantify value of NEC's optical patents and develop claim construction and charts for those highly rated patents.

- Caldwell, Cassady and Curry representing Huawei: developed claim charts to OTN Standard, wrote expert reports on Infringement and Validity, six-hour deposition and testified in trial. Responsible for 5 optical patents. Testified at trial. Huawei Technologies v. Verizon et al., Case No. 2:20-cv30 JRG, United States District Court for the Eastern District of Texas, Marshall Division

- Foley and Lardner representing Level 3: Won Summary Judgement in defense of Level 3; provided deposition and wrote expert report cited by judge in his ruling. Won agreement with plaintive prior to deposition to drop 3 of their 4 assertions of infringement prior to deposition, on 10 Gb, 40 Gb Ethernet and 10 Gb Fiber Channel. Sycamore IP Holdings v. AT&T et al., Case No. 2:16-CV-588-WCB, United States District Court for the Eastern District of Texas, Marshall Division

- Prince Lobel: Patent mined client portfolio; developed claim charts, which led to successful settlement with a major network product development company.

- Patent Holders consultant: Evaluated patent portfolio; selected valuable patents and developed those claim charts. Provided recommendation to best monetizes their patents.

**IP-RockStar, Ottawa, ON** **Aug 2011 to Feb 2015**

**IP Technical Expert**

- Evaluated Networking patents specializing in: optical transmission technology - ROADM, OTN, Sonet, SDH, DWDM, OXC; physical layer technologies - optical dispersion compensation, external modulation techniques, data encoding, coherent optical transmission; access networks - ADSL, VDSL, GPON and EPON; protocols - GMPLS, GFP, RPR, VLAN, and Ethernet; Storage networking - Fiber Channel, Infiniband and Fabric Path.
- Developed defenses against invalidity assertions, evaluated significance of Prosecution History and present technology concepts to internal lawyers and potential license customers.
- Developed claim charts on industry Standards like ITU-T, IEEE and RFCs as well as industry implementations.
- Assessed value and applicability of third parties patent portfolios.

**Nortel Networks, Billerica, MA** **Feb 1999 to Aug 2011**

**Senior Network Architect – Nortel IP Business Unit (Jan 2009 – Aug 2011)**

- Lead Optical Network Expert for sale of Optical and Enterprise divisions of Nortel - each deal worth nearly $1 billion. Assigned ownership of IPR based upon dominance of usage criteria within M&A deals for Optical (optical elements, network architecture, WDM architectures, network protection schemes, signaling and control protocols, and xPON) and Enterprise Business Units (network architectures, Carrier Ethernet, network interfaces, service-related middleware, HW and SAN networks).
- Contributed to Nortel's patent portfolio auction sale of $4.5 billion by patent mining extensive portfolio and

identifying high value patents based upon industry impact, developing claim charts for Electronic Data Center for view of potential bidders and assessing market impact via technology trends.

**Senior Optical Architect – Nortel CTO Office (Sept 2001 – Jan 2009)**

- Invented new product concepts, features and capabilities with goal to transition concepts into product groups.
- Conducted feasibility studies and validated concepts to test product readiness. Areas of investigation: Optical Short-Cuts, Lossless Ethernet for Data Centers, network virtualization, cloud computing and image distribution.
- Awarded over $2 million worth of research funding from DARPA/NSA, which complemented internal funding of $20 million and responsible for executing:
  - 40 Gb/s Encryption Feasibility Study – investigated future ASIC speed and capacity, identified technology limitations and trends where NSA needed to simulate the commercial industry to obtain project goals.
  - Omega – DARPA project – applied Time-value curves to create a dynamic QoS structure to enable improved likelihood of military mission completion. Leveraged workflow analysis and Mission Goals to network requirements translation to compliment new QoS effectiveness.
  - Coronet – DARPA Consortium with Telcordia and AT&T – focused on architecture and design of Service-enabling middleware which abstracts network complexity to facilitate client's controlling network services.
  - On-Ramp - DAPRA Consortium with MIT, Lincoln Labs and AT&T - created cost effective solutions to gather Mega-Data from access networks and pipe them into the optical super-highway.

**Lead Architect – IPT Leadership Team (Feb 1999 – Sept 2001)**

- Lead architect and inventor with accountability for two R&D programs (>$25M) - Photonic Cross-Connect/ROADM integrated with IP router and Application Engaged Networking which enable automatic optical management of end-user devices.
- Transitioned eventually into three product initiative and industry's first Application Engaged Network and service-enabling with policy control network resource allocation, DRAC and ACE with initial deployment in multiple R&E networks in Europe and eventually production networks leading to over $100 million in revenue.
- Contributed as member of leadership team, building a team of 20 engineers and created a 'start-up' mentality.
- Validated concepts and features by working directly with lead customers like EMC and demo's at trade shows.

## Digital Equipment Corp, Maynard, MA March 1980 to Feb. 1999

**Consultant Engineer, Network Product Business**

- Leading corporate expert in optical transmission and high-speed signal integrity.
- Lead designer for all high-speed optical network products.
- Project leader for DARPA All Optical Network consortium. Responsible for design of Optical Terminal board.
- Architect of various back plane options including Next Generation cross bar switch.
- Consultant into many projects and solving technical problems to re-ignite stalled product development efforts.

## Eaton Corporation/AIL Division, Melville NY

**Design Engineer**: Responsible for design of DSP modules, system integration and system performance evaluation. Designed 3 modules (FFTs) used in 20 channel adaptive phased array and floating-point processor module and interface design to host, creating memory maps and writing assembly code.

## Harris Corporation/PRD Division, Syosset, NY

**Test Engineer**: Program design and development, formulating test specs of RF modules, coding and compiling.

# Patents and Papers

### 32 US granted patents

Sample of patents:

- US7,664,838 B2; US7,984,154 B2; US8,943,212; System and method for translating application program network service requests into actions…
- US7,849,225 B2, System, device, and method for managing communication services in an optical system

- US7,840,692; System, device, and method for bandwidth management in an optical communication system
- US7,698,366; Method and apparatus for facilitating the transportation of medical images on a communication network

**IEEE Journal publication articles**

Samples of Published Papers:

"Modeling of workflow-engaged networks on radiology transfers across a metro network"
***Authors:*** *S. Camorlinga, B. Schofield*
Information Technology in Biomedicine, IEEE Transactions on. 05/2006; 10(2):275-281.

"A wideband all-optical WDM network"
***Authors:*** *I.P. Kaminow, C.R. Doerr, C. Dragone, T. Koch, U. Koren, A.A.M. Saleh, A.J. Kirby, C.M. Ozveren, B. Schofield, R.E. Thomas, R.A. Barry, D.M. Castagnozzi, V.W.S. Chan, Hemenway, B.R., Jr, D. Marquis, S.A. Parikh, M.L. Stevens, E.A. Swanson, S.G. Finn, R.G. Gallager*
Selected Areas in Communications, IEEE Journal on. 07/1996; 14(5):780-799.

## Education

Northeastern University, Boston, MA
Masters of Science in Electrical Engineering
Bachelor of Science in Electrical Engineering

## USA patents granted to Bruce Schofield

1 9,225,417 Managing alternate site switching in an optical communication system
2 9,129,253 Workflow locked loops to enable adaptive networks to change a policy statement responsive to mission level exceptions and reconfigure the software-controllable network responsive to network level exceptions
3 9,021,130 Photonic line sharing for high-speed routers
4 9,002,148 Monitoring eDC polarization inverse filter coefficients to identify real-time physical intrusion into a core or metro optical network
5 8,949,846 Time-value curves to provide dynamic QoS for time sensitive file transfers
6 8,943,212 System and method for translating application program network service requests into actions and performing those actions through the management and/or control plane responsive to previously defined policies and previous requests by the same or another application program
7 8,583,449 Method and apparatus for providing network based load balancing of medical image data
8 8,494,313 Monitoring eDC polarization inverse filter coefficients to identify real-time physical intrusion into a core or metro optical network
9 8,315,159 Utilizing optical bypass links in a communication network
10 8,146,090 Time-value curves to provide dynamic QoS for time sensitive file transfer
11 8,000,601 Method and apparatus for securing fiber in an optical network
12 7,984,154 System and method for translating application program network service requests into actions and performing those actions through the management and/or control plane responsive to previously defined policies and previous requests by the same or another application program
13 7,958,225 Method and apparatus for monitoring the transportation of medical images on a communication network
14 7,849,225 System, device, and method for managing communication services in an optical communication system
15 7,840,692 System, device, and method for bandwidth management in an optical communication system
16 7,738,359 System, device, and method for managing alternate site switching in an optical communication system
17 7,698,366 Method and apparatus for facilitating the transportation of medical images on a communication network
18 7,664,838 System and method for translating application program network service requests into actions and performing those actions through the management and/or control plane responsive to previously defined policies and previous requests by the same or another application program
19 7,656,823 Automated network to SAN topology linkage
20 7,493,040 Method and apparatus for securing fiber in an optical network
21 7,492,932 Method and apparatus for processing medical image data in a network

environment

22 7,437,449 T System, device, and method for managing service level agreements in an optical communication system

23 7,426,580 T System and method for virtualization of the network management and control planes to provide an abstracted view and control of underlying network resources

24 7,321,932 T System, device, and method for managing connection establishment and related services in an optical communication system

25 7,283,747 T Optical switch router

26 7,079,770 T System and apparatus for dropping and adding optical data streams in an optical communication network

27 6,556,329 T Method and system for preventing low order optical transmission modes in multimode optical fiber computer network using annulus laser

28 6,356,680 T Method and system for removal of low order optical transmission modes to improve modal bandwidth in a multimode optical fiber computer network

29 6,154,589 T Method and system for removal of low order optical transmission modes in multimode optical fiber computer network to improve modal bandwidth

30 5,396,239 T Data and forward error control coding techniques for digital signals

31 5,144,304 T Data and forward error control coding techniques for digital signals

32 5,138,675 T Mode scrambler as an optical isolator for higher-coherence lasers in multi-mode fiber plants

## International Patents granted

33 EP2362983B1 Utilizing optical bypass links in a communication network

34 DE60135165D1 Managing alternate site switching in an optical communication system

35 CA2419793C Managing alternate site switching in an optical communication system

36 EP1705813B1 Managing alternate site switching in an optical communication system

37 JP201422884A Managing alternate site switching in an optical communication system

38 DE60121350D1 System, device, and method for managing connection establishment and related services in an optical communication system

39 EP1323251B1 System, device, and method for managing connection establishment and related services in an optical communication system

40 CA2419793C System, device, and method for managing connection establishment and related services in an optical communication system

41 CA2419547C Optical switch router

42 EP1323255B1 Optical switch router

43 EP2333995B1 Optical switch router

44 CA2324569C Method and system for removal of low order optical transmission modes in multimode optical fiber computer network to improve modal bandwidth

45 CA232446C Method and system for removal of low order optical transmission modes in multimode optical fiber computer network to improve modal bandwidth