

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NOKIA OF AMERICA CORPORATION

Petitioner,

v.

SPADA INNOVATIONS, INC.

Patent Owner.

Case No. IPR2025-01442

U.S. Patent No. 11,589,142

**PRELIMINARY RESPONSE TO THE PETITION FOR
INTER PARTES REVIEW**

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I. INTRODUCTION

Pursuant to 37 C.F.R. § 42.107, Patent Owner SPADA Innovations, Inc. submits this Preliminary Response to Nokia of America Corporation's Petition for inter partes review of U.S. Patent No. 11,589,142. The Petition fails to demonstrate a reasonable likelihood of prevailing on any of the challenged claims under 35 U.S.C. § 314(a), and should therefore be denied.¹

The Petition cobbles together various references, but none shows that any claim is obvious. First, the Office already considered—and rejected—the same disclosures and arguments during prosecution, so the Petition is cumulative. Second, the Petition offers no articulated reason with a rational underpinning to combine the references, relying instead on hindsight. The objective indicia demonstrate it would **not** have been obvious to do so. Third, even if combined, the cited references still

¹ The Patent Owner filed a separate Discretionary Denial Brief under 35 U.S.C. § 325(d) on October 27, 2025. That brief explains that the Petition repeats substantially the same arguments on substantially the same references and disclosures that the Office considered—and rejected—during examination across the '142 patent family, and that the Petition identifies no material error in that evaluation. *See Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 7–10 (PTAB Feb. 13, 2020) (precedential) (two-part framework under § 325(d): (1) same or substantially the same art/arguments previously presented; and (2) whether petitioner shows material error in the Office's prior evaluation); *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17–18 (PTAB Dec. 15, 2017) (precedential as to § III.C.5) (identifying non-exclusive factors for assessing prior presentation and extent of consideration). That separate brief addresses discretionary considerations only; the merits are presented here.

would not teach the claim limitation that a PON (Passive Optical Network) OLT (Optical Line Terminal) must (i) receive at least one private data stream that has been virtually separated using VRF (Virtual Routing and Forwarding) prior to receipt by the OLT, and (ii) aggregate that same received, virtually separated data stream into a common data feed for distribution to ONUs (Optical Network Units). This was the basis for allowance (*see* Ex. 1005 at 105–06; Ex. 1004 at 18–19) and is neither disclosed nor suggested by the art cited in the Petition.

Each independent claim of the ‘142 patent requires: (i) receipt at the OLT of at least one private *data stream that has been virtually separated using VRF* (*i.e.*, virtually separated *before* the OLT receives it), and (ii) aggregating within the OLT *that same received virtually separated data stream* into a common data feed. The Petition does not identify where any cited reference discloses the steps of such continuity of data streams received and aggregated by an OLT. Instead, its primary reference (Ahn) teaches the opposite, performing VRF separation at the OLT (*i.e.*, “routing and MPLS edge functionalities are implemented at the OLT level,” with the OLT managing VRF tables and implementing MP-BGP). Ex. 1015 at 3–4, for received data streams that have not been virtually separated using VRF.

An OLT performing virtual separation within itself was considered during prosecution, and found insufficient to disclose, to teach, or to suggest the claimed method. The steps of the method are not found in any combination of references

proffered by the Petition. The Petition merely repeats the same inadequate disclosures and makes the same rejected arguments that were made during prosecution. Thus, the Petition fails to identify with specificity where the prior art discloses each claim limitation (37 C.F.R. § 42.104(b)(4)) or to provide articulated reasoning with a rational underpinning for any proposed combination (*KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007)) sufficient to meet the reasonable-likelihood threshold of 35 U.S.C. § 314(a).

The attempt by the Petition to fill the gap in its argument with conclusory assertions provided in a declaration, rather than identifying where the cited patents or printed publications disclose those claim elements, is improper and cannot supply the missing disclosure.

Each of the four Grounds advanced in the Petition (Petition at 18-87) fails because the Petition cannot—and does not—specify where this ‘142 patent claim limitation is found in the prior art. In the face of this fatal failure in its argument, the Petition resorts to attempting to rewrite the claims to eliminate this novel claim limitation so its cited references might reach those rewritten claims. The Petition’s improper attempt to rewrite the claims of the ‘142 patent fails.

Because the Petition does not specify where each element of the claims is found in the cited art and offers no articulated reasoning with a rational underpinning for its proposed combinations, it does not meet the requirements of § 314(a).

Institution should therefore be denied.

II. THE DIRECTOR'S JULY 31, 2025 MEMORANDUM REQUIRES DENIAL OF THE PETITION

A. A Declaration Cannot Provide A Missing Claim Element

On July 31, 2025, the USPTO issued guidance emphasizing strict enforcement of 37 C.F.R. § 42.104(b)(4). Memorandum from Acting Director, USPTO, “Enforcement and Non-Waiver of 37 C.F.R. § 42.104(b)(4) and Permissible Uses of General Knowledge in Inter Partes Reviews” at 1–2 (July 31, 2025) (“Director Memo”). The Director Memo reiterates that: (a) Petitions “must specify where each element of the claim is found in the prior art patents or printed publications relied upon”; (b) General knowledge, including expert testimony, “may not be used to supply a missing claim limitation”; and (c) “Per 35 U.S.C. § 312(a)(4), the Board shall deny an IPR petition that fails to comply with Rule 104(b)(4).” Director Memo at 1–2. Rule 42.104(b)(4) has applied since 2012; thus, the Petition’s obligation to specify where each element is found in prior art patents or printed publications is independent of the Director Memo’s effective date.

The Director Memo further clarifies that, while general knowledge may be used to “support a motivation to combine or to demonstrate the knowledge of a person having ordinary skill in the art,” such general knowledge cannot supply missing claim elements. Director Memo at 1.

The Director’s enforcement policy follows Federal Circuit precedent holding that petitioners must identify claim limitations in prior art patents or printed publications, not in expert testimony or general knowledge. *Qualcomm Inc. v. Apple Inc.*, 134 F.4th 1355, 1364-65 (Fed. Cir. 2025). This requirement existed before the Director Memo and applies to the Petition.

B. The Petition Fails Under 37 C.F.R. § 42.104(b)(4)

The Petition violates this claim limitation identification requirement. As demonstrated in Section III, *infra*, the Petition fails to identify where the cited references disclose a critical claim limitation of the challenged claims—namely, that the PON OLT receives private data streams that have been virtually separated using VRF, and then aggregates those virtually separated private data streams into one or more common data feeds for distribution to the PON ONUs. Instead, the Petition relies entirely on Dr. Hajduczenia's conclusory expert testimony in a failed attempt to bridge this gap in disclosure, not found in or suggested by the cited references.

Under 37 C.F.R. § 42.104(b)(4), the Petition “must specify where each element of the claim is found in the prior art.” The Petition fails to do so. That failure alone warrants denial of institution of the IPR. *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) (petitioner bears the burden of demonstrating unpatentability with specificity). In addition, the Petition provides no articulated reasoning with a rational underpinning for its proposed combinations, and cites no

contemporaneous evidence establishing a reasonable expectation of success for a person of ordinary skill in the art (POSITA). The prosecution record and the prior art demonstrate there was no such expectation. *See* Section III.C, *infra*.

The Federal Circuit enforced this requirement in *Qualcomm*, 134 F.4th at 1364-65, holding that § 311(b) limits “the basis” of an IPR ground to “prior art consisting of patents or printed publications” and that applicant-admitted prior art and expert testimony cannot supply missing claim limitations. The Court rejected the USPTO’s prior approach of permitting general knowledge to fill gaps in the prior art, emphasizing that petitioners must identify where claim limitations are actually disclosed in patents or printed publications. *Id.*

None of the cited references—Ahn, G.984.1, G.984.3 or RFC 4364—discloses the limitation present in all challenged claims: the PON OLT receives private data streams that have been virtually separated using VRF, and then aggregates those virtually separated private data streams into one or more common data feeds for distribution to the PON ONUs. The Petition cites to various pages of G.984.1, G.984.3, RFC 4364 and Ahn, but nowhere identifies where those references teach this ‘142 patent claim limitation. (*See* Petition at 31-34). Instead, the Petition:

- Points to standard PON aggregation in G.984.1 Figure 2 (Petition at 32-34), which describes Layer-2 GPON operations and says nothing about receiving and aggregating the same stream that has been VRF-separated prior to receipt

by the OLT;

- Characterizes Ahn as showing that “downstream data is aggregated in the OLT” (Petition at 31, citing Ex. 1015, Figs. 1, 2, 5, and Ex. 1002 ¶ 161), but that discussion describes standard EPON Layer 2 multiplexing/broadcast, not OLT aggregation of data streams that have been VRF-separated before they are received at an OLT;
- Relies on RFC 4364 (Petition at 55-57), which describes Layer 3 Virtual Private Network operations, but is silent regarding PONs, OLTs, and how an OLT might handle data streams that have been virtually separated using VRF.

None of these references discloses the claimed OLT operation. The failure to specify where each claim limitation is found in cited references and printed publications requires denial under 37 C.F.R. § 42.104(b)(4) and the Director's July 31, 2025 Memorandum.

The 251-page expert declaration provided with the Petition is entitled to no weight. It provides nothing more than legal conclusions and legal arguments, and block quotations or summaries of references, without supplying anything else—including factual underpinnings showing how a POSITA in 2012 would allegedly have read the cited references to disclose the steps of the claimed method. *See* 37 C.F.R. § 42.65(a) (opinion testimony that does not disclose underlying facts or data is entitled to little or no weight). The declaration fails to address any disclosure of

data streams that have been virtually separated using VRF before being received by an OLT, and the OLT then aggregating those virtually separated private data streams into one or more common data feeds for distribution to ONUs, as claimed. The declaration ignores this '142 patent claim limitation, for which there is no disclosure in any of the references cited in the declaration, as explained above. The declaration identifies no passage in G.984.1/.3, RFC 4364, Ahn, Ravindran or BCM56685 that teaches or suggests this '142 patent claim limitation.

In view of this fundamental failure of the declaration, and because the obviousness arguments in the Petition turn (and fail) on the plain and ordinary meaning of the claims of the '142 patent and the disclosures made in the cited references themselves (or lack thereof), the declaration serves no useful purpose.

The Petition is premised on the precise scenario the Director Memo prohibits, and should be denied.

III. THE PETITION FAILS TO IDENTIFY WHERE THE CLAIMED METHOD IS DISCLOSED IN THE CITED REFERENCES

The claims require that a PON OLT receive a private data stream that has been (*i.e.*, past perfect) virtually separated using VRF and aggregate that same VRF-separated data stream into a common data feed for distribution to ONUs. This method stands in stark contrast to Ahn, and to references the Examiner considered during prosecution, that perform VRF separation within the OLT. In those references

(unlike the claimed method), the OLT itself performs VRF separation, rather than receiving data streams that have been VRF-separated prior to receipt by the OLT.

PONs were designed to operate at Layer 2, receiving and processing Layer 2 data streams. Thus, OLTs were designed for use with Layer 2 data streams, which are not VRF-separated. The claimed method receives at the OLT Layer 3 data streams that have been virtually separated using VRF, and aggregates those Layer 3 data streams within the OLT into a common data feed that is distributed through the PON to ONUs. Prior art approaches that contemplated combining PONs with Layer 3 data streams proposed performing VRF separation at the OLT level, ***after the OLT receives data streams***. (Ex. 1005 at 79-80; Ex. 1015 at 4). The claimed method differs fundamentally in that it operates on data streams that have been VRF-separated ***before*** OLT receipt.

A. The Claimed Method Requires VRF Separation Before OLT Receipt

The '142 patent has three independent claims—Claims 1, 5 and 8. Each of those claims (and, hence, all of the claims of the '142 patent) recites: (1) that the OLT receives private data streams that ***have been*** virtually separated using VRF and (2) that the OLT aggregates those received virtually separated private data streams into common data feeds.

Claim 8, the broadest independent claim, recites in relevant part:

receiving at a passive optical network (PON) optical line terminal (OLT), at least one private data stream out of a plurality of data streams, wherein said at least one private data stream has been virtually separated using Virtual Routing and Forwarding (VRF) to form at least one virtually separated private data stream comprised of Internet Protocol (IP) data packages, and wherein said at least one virtually separated private data stream including said IP data packages is intended for at least one of a plurality of ONUs...;

aggregating within said PON OLT said plurality of data streams and **said** at least one virtually separated private data stream into a common data feed;

distributing said common data feed to said plurality of ONUs;

* * *

extracting within said at least one of said plurality of ONUs, said at least one virtually separated private data stream including said IP data packages from said common data feed;

sending said at least one virtually separated private data stream including said IP data packages from said at least one of said plurality of ONUs to said at least one private user device ...

(Ex. 1001, Claim 8).

Claim 8 recites that the OLT receives:

at least one private data stream . . . wherein said at least one private data stream has been virtually separated using Virtual Routing and Forwarding (VRF) to form at least one virtually separated private data stream comprised of Internet Protocol (IP) data packages.

A critical aspect of this claim language is the phrase “has been virtually separated using Virtual Routing and Forwarding (VRF).” The past perfect tense (“has been”) combined with the passive voice (“separated”) indicates completed action before the receiving step. The use of “**said** at least one virtually separated

private data stream” in the aggregation step means that the virtually separated private data stream aggregated within the OLT is the same virtually separated data stream that is received by the OLT. The use of “said” creates an antecedent basis requiring that the data stream aggregated in the common data feed is identical to the data stream received by the OLT, precluding any intermediate VRF separation of the received data stream at the OLT. Thus, the claim requires: (1) VRF separation occurring before the virtually separated private data stream is received by the OLT; and (2) the OLT aggregating the virtually separated private data stream into a common data feed. This stands in stark contrast to prior art methods, including Ahn, which teach performing VRF separation at the OLT on data streams that have not been VRF-separated.

Claims 1 and 5 contain the same limitation, with additional limitations concerning how the virtually separated private data streams received by OLTs are sent to OLTs. Thus, all three independent claims—and thus all challenged claims—share the same requirement: (1) VRF separation must occur on data streams *before an OLT receives those data streams* and (2) the OLT then aggregates *those received virtually separated private data streams* into one or more common data feeds.

The use of “said” virtually separated private data stream in the aggregation step (*i.e.*, “**said** at least one virtually separated private data stream;” emphasis added) means that the virtually separated private data stream received by the OLT is the

same virtually separated private data stream as that aggregated within the OLT into a common data feed. To the extent the references cited in the Petition disclose anything about VRF-separated data streams and PON OLTs, those references teach that **the OLT performs the VRF separation on received data streams**—contrary to the claim language, which recites that OLTs receive “at least one private data stream out of a plurality of data streams, wherein said at least one private data stream has been virtually separated using Virtual Routing and Forwarding (VRF) to form at least one virtually separated private data stream.” Moreover, the OLT then aggregates “said at least one virtually separated private data stream.” The claims thus require that VRF separation occur before the data streams are received by an OLT, and the OLT then aggregates those same VRF-separated data streams. OLTs that perform VRF separation, like those disclosed in the references cited in the Petition, do not meet this claim limitation.

This temporal requirement—that VRF separation has occurred before OLT receipt—is a key limitation. The claim language “has been virtually separated using Virtual Routing and Forwarding (VRF)” uses the past perfect tense to indicate completed action before the receiving step occurs. The use of “said” in the aggregation step confirms that the same VRF-separated data stream received by the OLT is aggregated into the common data feed.

The asserted claims in the Central District of California litigation (*i.e.*, Claims

5 and 8) thus recite that PONs “receive and successfully deliver to [their] end users one or more data streams that have been virtually separated using Virtual Routing and Forwarding (VRF),” without claiming how VRF was performed on the received data streams. (Ex. 1028 at 6, 16). What matters is that a data stream received by an OLT “has been virtually separated using VRF” before it is received by the OLT. The claims do not include any limitations on the method of generating those received VRF-separated data streams. That is precisely what SPADA told the Court. The Petition’s argument (Petition at 14-17) mischaracterizes both the record and the claims of the ‘142 patent.

B. Ahn Does Not Disclose OLT Receipt Of Streams That Have Been VRF-Separated Prior to Receipt by the OLT

Ahn contradicts the claimed method, expressly performing VRF separation within the OLT:

ONU does not operate as a system with upper-layer protocol capabilities, such as MPLS or routing protocols. Rather, ONU performs traffic multiplexing for subscribers. ***Such routing and MPLS edge functionalities are implemented at the OLT level.***

(Ex. 1015 at 3; emphasis supplied). Ahn further teaches an OLT must implement

VRF separation, such as with VRF tables:

Accordingly, to enable the exchange of routing information between dispersed subscriber sites, the OLT must implement Multi-Protocol BGP (MP-BGP) functionality, which extends the capabilities of conventional BGP. In MP-BGP, routing information for IPv6, IPX,

VPN-IPv4, and the like, can be exchanged. *In addition, the OLT can manage VRF tables* to map subscriber traffic to the MPLS tunnels.

(Ex. 1015 at 4; emphasis supplied).

Industry experts at the time of the invention confirmed it was understood that an OLT could not receive virtually separated data streams. As Michael Zegarski, Motorola Mobility's Senior Systems Engineer and Subject Matter Expert on PON technology, declared during prosecution:

Our OLT had been specifically designed to provide shared information to end users existing under the umbrella of a single entity such as a corporation, a government agency or similar organization. At the time of its development, it was not anticipated that our OLT was going to be used to provide virtually and thus absolutely separated information to its end users within any entity.

(Ex. 1006 at 83 (Zegarski Decl. at 2)). Mr. Zegarski further explained that “through my previous years supporting IT experts programming routers to interface with our OLTs, I had never heard or experienced the use of VRF-labeled Ethernet frames going through a layer-2 OLT.” (*Id.*). This confirms that the prior art universally taught what Ahn teaches: VRF separation *within the OLT* level, not data streams *that have been* VRF-separated received by an OLT.

Ahn’s disclosure—with an OLT managing VRF tables—contradicts the claim limitation that the same VRF-separated private data stream is both (1) received at the OLT (as input) and (2) aggregated within the OLT into a common data feed (as output). The claims of the ‘142 patent recite receiving data streams that “**have been**

virtually separated using Virtual Routing and Forwarding (VRF)” (emphasis added), using the past tense and passive voice to indicate separation occurred before the data streams are received at the OLT. Ahn teaches the opposite: ***the OLT performs VRF separation*** by “implement[ing] Multi-Protocol BGP (MP-BGP) functionality” and “manag[ing] VRF tables to map subscriber traffic to the MPLS tunnels.” (Ex. 1015 at 4). In Ahn's disclosed method, the data streams received by the OLT have not been virtually separated using VRF before OLT receipt. Instead, Ahn teaches that the OLT itself must perform VRF operations on those received data streams through integrated routing functionality. Ahn thus fails to disclose the claimed method for the same reason the Examiner rejected references that likewise teach VRF separation within the OLT, contrary to the claims, which require the OLT to receive VRF-separated data streams.

C. The Petition's Reliance On RFC 4364 Is Unavailing

RFC 4364 describes how data streams can be virtually separated using VRF. The method by which those data streams, which are received as claimed by an OLT, have been generated is ***not*** claimed, and whatever those generation steps may be is irrelevant to the claims. RFC 4364 describes a method by which Service Providers may use their backbones to provide IP Virtual Private Networks (VPNs) to their customers (which can be ISPs) through the backbone's PE (Provider Edge) routers and customers' CE (Customer Edge) routers (Ex. 1014 at 1). RFC 4364 says nothing

about PONs, OLTs, ONUs or the steps they perform. Thus, RFC 4364 does not teach or suggest anything about OLTs receiving VRF-separated data streams or what an OLT might do with those received data streams, such as aggregating them within the OLT into a common data feed for ONUs. Nor does RFC 4364, alone or in combination with G.984.x, teach or suggest anything about an OLT receiving virtually separated data streams, or how any such data streams may be used by an OLT or by a PON.

The Petition asserts, without support, that “a POSITA would have been motivated to combine the VRF teachings of RFC 4364 with the standardized PON architecture of G.984.” (Petition at 31). The G.984 standards do not teach or disclose anything about a Layer 2 OLT accepting Layer 3 VRF-separated data streams, and RFC 4364 does not teach or disclose anything about PONs or PON OLTs, including anything about VRF separation occurring within an OLT, or not. The references cited in the Petition provide no support for the hindsight combinations proffered by the Petition. Therefore, the Petition provides no articulated reasoning with rational underpinning for making those combinations, and no contemporaneous evidence that a POSITA would have had a reasonable expectation of success in integrating VRF-separated data streams with PONs using the method claimed in the ‘142 patent. Only innovators, such as Ahn and the authors of references submitted to the USPTO during SPADA’s patent prosecution, described the potential combination of VRF-

separated data streams and PONs, and they described using OLTs to perform VRF separation to process incoming data streams that have not been VRF-separated, using VRF. Their contemplated need to perform VRF on data streams at the OLT is contrary to the method claimed in the ‘142 patent.

Thus, the mere fact that both VRF and PON may have been known does not mean that the method claimed in the ‘142 patent, which uses the combination of VRF and PONs in a particular way, was obvious. The prior art (including the method described in the Ahn reference) and the secondary indicia of non-obviousness demonstrate that the claimed method was **not** obvious.

D. The Petition Fails To Show Disclosure Of An OLT Receiving And Aggregating The Same VRF-Separated Data Stream

The three independent claims, and thus all of the claims, of the ‘142 patent recite “aggregating within said PON OLT said plurality of data streams and ***said at least one virtually separated private data stream*** into a common data feed.” See Ex. 1001, Claims 1, 5, and 8. The use of “said” refers to the virtually separated private data stream that is received at the OLT (*i.e.*, the Layer 3 data stream that has been virtually separated using VRF). The claims recite that the OLT aggregates ***that received virtually separated private data stream*** into a common data feed, which is distributed to ONUs so each data stream in the aggregation can be retrieved for its intended recipient. *Id.*

Consistent with the claimed steps of the method—aggregating received virtually separated private data streams into a common data feed, distributing that feed, and extracting within an ONU that same virtually separated private data stream—the claims recite “aggregating within said PON OLT ... **said at least one virtually separated private data stream** into a common data feed.” Thus, the OLT aggregation step preserves the identity of “said” received VRF-separated data stream, through the PON.

The Petition incorrectly focuses only on whether an OLT performs aggregation, glossing over the claim requirement that **the same** VRF-separated data stream received by the OLT must be aggregated into the common data feed. (See Petition at 31-34). Ahn's method, in which **the OLT performs VRF separation** on the data streams it receives—and does not receive data streams that “have been” VRF-separated—contradicts the claim requirement of identity of the VRF-separated data stream received by the OLT and aggregated within the OLT into a common data feed.

As Mr. Zegarski explained during prosecution, OLTs were “specifically designed to provide shared information to end users existing under the umbrella of a single entity” (Ex. 1006 at 83), not to receive and preserve virtually separated private data streams. Because the OLT described in Ahn performs VRF separation on received data streams (Ex. 1015 at 4), the data streams received by Ahn’s OLT

are not VRF-separated, but the data streams *aggregated* into the common data feed are VRF-separated. Thus, under Ahn’s architecture, VRF separation is performed by the OLT on data streams that are not VRF-separated when received by the OLT. This contradicts the claim requirement that the data stream “has been virtually separated using Virtual Routing and Forwarding (VRF)” before OLT receipt—*i.e.*, that VRF separation is a completed state of the data stream at the time the OLT receives it.

The references cited in the Petition do not teach or suggest an OLT performing the claimed aggregation steps on received data streams that have been VRF-separated prior to receipt by the OLT. (*See* Petition 31). The references, instead, point away from that claimed same VRF-separated-stream continuity.

The claimed method is counter-intuitive precisely because PON architecture operated at Layer 2. Mr. Zegarski testified during prosecution: “I was very skeptical that this could be accomplished because to my knowledge, this specific application was not an operational consideration of our OLT and as such, it had not been tested and verified to be possible by our organization.” (Ex. 1006 at 83). He explained that “VRF was a hardly used, very specialized and little known information routing configuration and as such, and without understanding how it was accomplished and tested, I was very skeptical that it would work with our OLT or any PON OLT for that matter.” (*Id.*).

This skepticism arose precisely because PON standards are directed to Layer 2, not to Layer 3. G.984.1 and G.984.3 describe that an OLT transmits GEM (GPON Encapsulation Method) frames downstream in a time-division multiplexed manner, with each frame tagged with a GEM Port-ID that allows the intended ONU to identify frames destined for it. (Ex. 1013 at 17). This GEM framing and Port-ID filtering is a Layer 2 GPON mechanism; it does not disclose anything about applicability to Layer 3 data streams, such as VRF-separated data streams. The prior art—including Ahn—taught the need to perform VRF separation within the OLT, precisely because the art taught that performing VRF separation within an OLT was necessary for Layer 3 VRF-separated streams. The claimed method obviates the need for VRF separation within the OLT, claiming an OLT receiving data streams that have been VRF-separated (*i.e.*, Layer 3 data streams) by a Layer 2 OLT and aggregating those same received VRF-separated data streams within an OLT. The references thus teach away from the claimed identity of VRF-separated data streams received and aggregated by an OLT.

G.984.1 and G984.3 say nothing at all about VRF-separated data streams. The Petition’s assertion that Figure 2 of G.984.1 teaches “aggregating within the PON OLT,” just because it shows transmission from the OLT to multiple ONUs, is without support. (Petition at 32-34). Ahn belies this suggestion that Figure 2 makes any disclosure about received VRF-separated data streams because Ahn teaches

VRF separation within the OLT. Thus, Ahn describes precisely the opposite of what the Petition argues by teaching that the OLT must perform VRF separation on the data streams received by the OLT—because the data streams received by the OLT have not been virtually separated at the time of receipt by the OLT.

The Petition conflates the fact that GPON generally operates to aggregate Layer 2 data streams, with the claimed OLT aggregation *of VRF-separated, Layer 3 data streams* received by the OLT. Figure 2 depicts nothing beyond standard GPON transmission in which the OLT aggregates data streams into common data feeds that are split by optical splitters. (Ex. 1011, Fig. 2 at 12; Ex. 1013 at 17). This is basic GPON functionality, which was taught to be applicable only to Layer 2 data streams. It says nothing about VRF-separated Layer 3 data streams, including OLT receipt and aggregation of such data streams into a common data feed. This omission is consistent with GPON standards being silent about VRF-separated Layer 3 data streams. After all, PONs were designed as a network for use with Layer 2 data streams, not with Layer 3 data streams.

The Petition characterizes Ahn as showing that “downstream data is aggregated in the OLT” (Petition at 31, citing Ex. 1015, Figs. 1, 2, 5, and Ex. 1002 ¶ 161). But that discussion describes standard PON Layer 2 multiplexing/broadcast and does not disclose an OLT aggregating the same VRF-separated data stream it receives. Because Ahn teaches VRF/MPLS edge separation within the OLT

(Ex. 1015 at 3–4), the data streams received by the Ahn OLT (not yet VRF-separated) differ from the data streams aggregated by the Ahn OLT (VRF-separated). By contrast, the claims require that the data stream received by the OLT has been VRF-separated prior to receipt by the OLT and that this **same VRF-separated data stream** is then aggregated by the OLT. Neither Ahn’s cited figures nor Ex. 1002 ¶ 161 identifies both receipt by, and aggregation within, the OLT of the same VRF-separated Layer 3 stream.

The other references relied on in the Petition are equally unavailing. RFC 4364 provides no teaching about PONs or PON operation because it addresses provider-edge VRF/MPLS VPNs in backbone IP networks and does not address PONs. (Ex. 1014). Ravindran suggests only the existence of ONUs, without any PON context. Ravindran does not disclose or suggest OLT-level aggregation of received VRF-separated data streams into a common data feed in a PON context (Ex. 1016), consistent with PON standards (intended for Layer 2 data streams) being silent about VRF-separated data streams (which are Layer 3 data streams).

IV. THE PROSECUTION HISTORY CONFIRMS THE CITED REFERENCES DO NOT RENDER THE CLAIMS OBVIOUS

During prosecution of the application that issued as the ‘142 patent, and of the applications from which the ‘142 patent claims priority, the Examiner considered the same arguments made in the Petition and the same references (or references that

make substantially the same disclosures as those cited in the Petition), and concluded the claims are allowable. For example, the Examiner considered (1) GPON standards (substantively identical to G.984.1 and G.984.3), (2) RFC materials (substantively identical to RFC 4364), and (3) references that disclose the OLT performing VRF separation operations (substantively identical to Ahn). (Ex. 1005 at 58, 79-81, 83-85, 96-101, 136; Ex. 1006 at 54-59, 111-12).

The Examiner also considered declarations that describe the compelling objective evidence of non-obviousness of the claims of the '142 patent. (Ex. 1006 at 67-84, 104-106).

The Examiner explained in the Notice of Allowance of the '142 patent why the claims of the '142 patent are allowable over those references and arguments, including that the claimed method steps of an OLT receiving data streams that have been virtually separated using VRF prior to receipt by the OLT and then the OLT aggregating *those same data streams* into a common data feed for ONUs. (Ex. 1004 at 18-19; Ex. 1005 at 105-06).

The examination was thorough. The prosecution included Track One Priority Examination with multiple Office Actions and a First Action Interview (Ex. 1005 at 12, 49, 51-57; Ex. 1006 at 15, 50-60), technical declarations from the inventor and an industry expert addressing counter-intuitiveness and skepticism (Ex. 1006 at 67-84, 104-106), an IDS citing references that teach receipt of non-VRF-separated data

streams by an OLT, VRF separation performed within the OLT, and VRF-separated data streams exiting the OLT (like Ahn) (Ex. 1005 at 96-101), an exhaustive prior art search with over 100 EAST queries and ACM/IEEE database searches (Ex. 1006 at 151-58, 181-214), and detailed reasons for allowance (Ex. 1005 at 105-06; Ex. 1004 at 18, 62). The Petition offers no new disclosures or arguments beyond what the Examiner already considered, and rejected.

A. The Prosecution History Of The ‘142 Patent Family

The ‘142 patent issued from Application No. 17/377,223, filed on July 15, 2021, in a chain of continuation and continuation-in-part applications claiming priority to Provisional Application No. 61/678,997, filed August 2, 2012. (Ex. 1001; Ex. 1004). The related parent application culminated in Reasons for Allowance explaining that “conventional methods do not use the virtual routing and forwarding in the same way as the [claims].” Ex. 1005 at 105–06. Four patents have issued in that family of applications. Across that family of related applications, the Examiners conducted extensive examination involving multiple Office Actions, Applicant responses and amendments, an Information Disclosure Statement, and inventor and expert declarations addressing SPADA’s method using OLT-received data streams that have been virtually separated using VRF, where the OLT aggregated those same received Layer 3 data streams into common data feeds.

During examination of patent Application No. 17/128,042 (which issued as

U.S. Patent No. 11,070,898), the Examiner considered, *inter alia*:

- GPON and EPON standards;
- RFC documents addressing VRF and MPLS in IP networks;
- References that disclose OLTs performing MPLS/VRF separation operations; and
- Non-patent literature discussing optical network architectures.

(See, e.g., Ex. 1005 at 58, 79-81, 83-85 and 136).

In Application No. 16/600,302 (which issued as U.S. Patent No. 10,904,649), the Examiner considered multiple PON and VRF/MPLS references in combination and allowed the claims over those references. (Ex. 1006 at 54-58, 111-12). The prosecution record includes an Information Disclosure Statement identifying prior art that expressly teach **MPLS/VRF separation within an OLT**. (Ex. 1005 at 83-85, 136). Both the parent '898 patent and the '142 patent issued over that art.

B. Ahn Is Cumulative Of Art Considered During Prosecution

Ahn is cumulative of multiple references considered during prosecution that, like Ahn, disclose the OLT performing VRF separation of the data streams the OLT receives. In contrast to all of those references, the claims of the '142 patent recite that the same VRF-separated data stream (1) is received by the OLT, having been virtually separated using VRF and (2) is aggregated by the OLT into a common data feed. Thus, the claims require that VRF separation occur before the OLT receives

the data streams, not at the OLT. In contrast, if VRF separation is performed at the OLT (as disclosed in the references considered by the Examiner—and by Ahn), the data streams received by the OLT are not VRF-separated when received, but they are when they are aggregated. Therefore, the “said” limitation of the claims is not met because the data stream received by the OLT has not yet been VRF-separated at the time of receipt. Thus, the Examiner correctly concluded that the claims of the ‘142 patent are allowable over the references before him.

The following chart demonstrates the cumulative nature of Ahn compared to references considered during prosecution:

Comparison of Ahn to References Considered During Prosecution

Reference Considered During Prosecution	Disclosure	Petition Reference	Disclosure
Cheng (Bloomberg Decl., Ex A)	OLT performs MPLS operations on received streams	Ahn (Pet. Ex. 1015 at 3-4)	OLT performs VRF/MPLS operations; “routing and MPLS edge functionalities are implemented at the OLT level”
Zheng (Bloomberg Decl., Ex B)	PON-based LFIB table in OLT	Ahn (Pet. Ex. 1015 at 4)	OLT manages VRF tables
Schmidtke (Bloomberg Decl.,	GPON OLT performs VRF	Ahn (Pet. Ex. 1015 at 3)	Routing and MPLS edge

Ex C)	separation		functionalities at OLT level
Rarick/Doiron (Bloomberg Decl., Ex D)	“Push MPLS functionality out to the OLT”; “integrating service edge router functionality into OLTs”	Ahn (Pet. Ex. 1015 at 3-4)	OLT performs VRF/MPLS operations; “routing and MPLS edge functionalities are implemented at the OLT level”

Each reference—whether Ahn or the prosecution references—teaches that VRF separation operations are performed at the OLT on data streams that have not yet been VRF-separated when received by the OLT. This is the opposite of what the claims recite: receiving data streams that have been VRF-separated before OLT receipt:

Cheng (U.S. Patent Application Publication No. 2012/0014693 A1): Cheng (Bloomberg Decl., Ex A) discloses a combination of an MPLS system with a PON where the OLT performs MPLS operations on the data streams it receives.

Zheng (U.S. Patent Application Publication No. 2011/0116796 A1): Zheng (Bloomberg Decl., Ex B), which was included in the May 18, 2021 Information Disclosure Statement, discloses an OLT maintaining and updating a PON-based Label Forwarding Information Base (LFIB) table—operations involving the OLT performing label forwarding functions on received data streams.

Schmidtke (European Application No. EP215754A1): Schmidtke (Bloomberg Decl., Ex C), which was included in the May 18, 2021 Information Disclosure Statement, teaches a GPON OLT that performs VRF separation.

Rarick/Doiron (MPLS and GPON: Happy together in the next-generation OLT): This non-patent literature reference (Bloomberg Decl., Ex D), which is included in the May 18, 2021 Information Disclosure Statement, proposes to “push [MPLS] functionality out to the [OLT]” and discusses “[i]ntegrating service edge router functionality into OLTs” as part of an MPLS-over-PON deployment.

These references, all of which were considered during prosecution, disclose the same fundamental method as Ahn: the OLT performing VRF separation on data streams it receives, rather than the OLT receiving data streams that have been virtually separated using VRF prior to receipt by the OLT. Thus, although these references (like Ahn) disclose using Layer 3 data streams with PON, they do so using different methods than the claimed method. In particular, they disclose the OLT performing VRF separation, unlike the claimed method where the OLT receives data streams that have been VRF-separated. The claim limitation requires that **the same** VRF-separated data stream (1) is received by an OLT and (2) is aggregated into a common data feed by the OLT—a limitation none of these references (or Ahn) teaches.

The Petition’s reliance on Ahn is thus insufficient to render the claims obvious

for at least the same reasons as references already evaluated and found insufficient to render the claims obvious during prosecution. Ahn is cumulative of those references.

C. The Other References In The Petition Are Also Cumulative

The other references cited in the Petition are likewise cumulative of the references considered during prosecution of the application that issued as the ‘142 patent and the applications upon which the ‘142 patent claims priority:

- **GPON standards:** During prosecution, the Examiner considered PON/GPON art addressing the same standardized architecture and TC/GEM operations the Petition cites. *See* Ex. 1005 at 52-57 (Non-Final Office Action acknowledging and considering prior art), 58 (Notice of References Cited including PON/optical network references); Ex. 1006 at 138-46 (Office Action in related application combining PON/OLT references with VRF/MPLS). The Petition relies on the same G.984.x standards.
- **RFC 4364/VRF/MPLS:** RFC 4364 (successor to RFC 2547/2547bis) and substantively similar VRF/MPLS materials were part of the record. *See* Ex. 1005 at 83-85 (IDS listing Vasseur and other VRF/MPLS materials); Ex. 1005 at 79–81 (Applicant’s remarks discussing VRF/MPLS and distinguishing Zheng/Schmidtke/Rarick-Doiron); Ex. 1006 at 138-146 (Office Action in related application combining VRF/MPLS with PON).

- **OLT-resident VRF/MPLS (Ahn cumulative):** The Examiner considered references disclosing OLTs that perform VRF separation within OLTs—materially the same as Ahn. *See* Ex. 1005 at 58 (notice of References Cited listing Cheng), 83-85 (IDS listing Schmidtke and Rarick/Doiron); Ex. 1005 at 79-81 (Applicant’s remarks distinguishing Zheng, Schmidtke, and Rarick-Doiron). All of these references teach performing VRF separation within an OLT; substituting Ahn does not change that landscape.
- **The argument that VRF and PON are combinable “known technologies” was presented to—and rejected by—the Office:** During prosecution, Applicants and the Examiner squarely addressed whether combining known VRF/MPLS techniques with known PON architectures rendered the claims obvious. The Examiner concluded that “conventional methods do no[t] use the virtual routing and forwarding in the same way as the [claims],” and allowed the claims on that basis. Ex. 1005 at 105-06 (Reasons for Allowance). Thus, Petitioner’s central thesis—that RFC 4364 (VRF) and G.984.x (PON) were known and combinable—was already evaluated and rejected in allowance.

D. The Prosecution Declarations Confirm The Claimed Methods Are Non-Obvious

In response to the Examiner’s obviousness rejection of pending claims in

grandparent Application 16/600,302 (which issued as U.S. Patent 10,904,649), the Applicant submitted declarations from the inventor, Joseph L. Vilella, and from Michael Zegarski, a Senior Systems Engineer at Motorola, addressing PON hardware and deployment. (Ex. 1006 at 67-85; 104-106 (Vilella Declaration); at 82-83 (Zegarski Declaration)).

The Vilella Declaration explained that, at the time of his invention, VRF was “available but rarely used in copper networks” and that, “[b]ecause of its rare, limiting and infrequent use, few people in the IT community clearly understood the VRF process.” Mr. Vilella explained that, although Cisco routers supported VRF, it was unknown if implementing VRF over a PON required more than simply using a standard OLT to preserve the VRF-based virtual separation through the PON. (Ex. 1006 at 70-81). Mr. Vilella directed SPADA to ask Mr. Zegarski if an OLT had ever been used with the method Mr. Vilella proposed, and Mr. Zegarski advised SPADA that, to his knowledge, that OLT-VRF combination had never been used or tested by Motorola Mobility, and that he was uncertain and skeptical it would work properly.

The Zegarski Declaration, based on Mr. Zegarski’s experience as Motorola Mobility’s Senior Systems Engineer designing and deploying PON hardware, explained the industry skepticism and technical impediments to transporting VRF-separated data streams through standard OLT/ONU implementations. (Ex. 1006 at 82-83). Mr. Zegarski was skeptical about this different way of using Motorola’s OLT

because it was not anticipated that the OLT was going to be used to provide virtually and thus absolutely separated information to end users and, to his knowledge, this specific application was not an operational consideration of the OLT and as such, it had not been tested and verified to be possible. Mr. Zegarski described his skepticism as follows:

Skepticism

I was very skeptical about this different way of using our OLT for two reasons: Reason 1: Our OLT had been specifically designed to provide shared information to end users existing under the umbrella of a single entity such as a corporation, a government agency or similar organization. At the time of its development, it was not anticipated that our OLT was going to be used to provide virtually and thus absolutely separated information to its end users within any entity. In view of this, I had to advise Mr. Reynante that I was skeptical that this could be accomplished because to my knowledge, this specific application was not an operational consideration of our OLT and as such, it had not been tested and verified to be possible by our organization.

Reason 2: The existence of a method by which information could be virtually and absolutely separated within a router was, to my knowledge, definitively not a mainstream routing set up process. Through my previous years supporting IT experts programming routers to interface with our OLTs, I had never heard or experienced the use of VRF-labeled Ethernet frames going through a Layer-2 OLT. In my mind, VRF was a hardly used, very specialized and little-known information routing configuration and as such, and without understanding how it was accomplished and tested, I was very skeptical that it would work with our OLT or any PON OLT for that matter.

(Ex. 1006 at 83.)

Thus, persons of ordinary skill in the art would not have expected VRF-

separated data streams to traverse standard PON equipment without corruption or misdirection, given the mismatch between Layer 3 constructs (like VRF routing forwarding construct of the IP packages) and Layer 2 PON transmission constructs (like GEM framing and ONU filtering mechanisms).

In view of this skepticism and uncertainty, Mr. Vilella commissioned a prototype test of his method at SPADA. The prototype test verified that VRF-separated traffic was successfully transported through a PON using a standard OLT. (Ex. 1006 at 70-72). Mr. Vilella's declaration attached an email reporting the successful test results, confirming the method worked despite industry skepticism. (Ex. 1006 at 80-81).

The Vilella and Zegarski declarations demonstrate that the industry doubted whether the claimed method would work—specifically, whether an OLT could receive data streams that had been virtually separated using VRF and aggregate those same data streams into a common data feed. The prototype testing proved these doubts unfounded, demonstrating unexpected results.

E. The Allowance of the Claims

The Examiner allowed the claims following this extensive prosecution, including multiple Office Actions, an IDS submission identifying references describing OLTs performing VRF separation within the OLTs themselves, Applicant's amendments and arguments, and the Vilella and Zegarski declarations.

The Notice of Allowance for parent Application No. 17/128,042, which issued as United States Patent 11,070,898, stated:

Applicant's inventive steps [] disclose novel method [sic] for its distribution and replication of a feed in an optical network, which is not disclosed by conventional methods which pertain to optical networks. Such us [sic] conventional methods do no[t] use the virtual routing and forwarding in the same way as the [claims].

(Ex. 1005 at 105-06).

The Notice of Allowability for the '142 patent stated: "the instant application is allowed for similar reasons as parent Application 17/128,042." (Ex. 1004 at 19). The Notice further stated "The closest prior art fails to disclose, teach or even suggest" the claimed invention. (Ex. 1004 at 18, ¶ 6). This finding applies with equal force to the references in the Petition.

This allowance rationale likewise applies to the arguments in the Petition, which fails to show any teaching or suggestion of an OLT receiving data streams that have been virtually separated using VRF prior to receipt by the OLT, and aggregating "said" data streams—*i.e.*, the same data streams—into a common data feed. As the Notice of Allowability acknowledges, conventional methods do not use VRF "in the same way" as claimed. Thus, the Petition's proffered combination of VRF specifications (RFC 4364) with PON (G.984.1/G.984.3) argument fails. Indeed, the Examiner distinguished references considered during prosecution that, like Ahn, disclose the OLT performing VRF separation. None of those references—

or Ahn—teaches the claimed steps of the PON OLT receiving private data streams that have been virtually separated using VRF, and then aggregating those virtually separated private data streams into one or more common data feeds for distribution to the PON ONUs.

F. Secondary Considerations Further Support Non-Obviousness

Secondary considerations further confirm the claimed method is non-obvious. The prosecution record evidences that the method was counterintuitive, operated contrary to existing methods used in the industry, and faced skepticism from industry experts when it was disclosed to them. Before filing the provisional application in August 2012 from which the '142 patent claims priority, Mr. Vilella directed SPADA to consult with Motorola Mobility, the then leading provider of PON equipment in the United States, to ask whether existing OLTs, which were designed to operate using Layer 2 data streams, would accept and work properly with received data streams that had been virtually separated using VRF—which are Layer 3 data streams. Motorola's internal PON expert, Mr. Zegarski, advised SPADA that he had never heard of such use, that OLTs were not designed for that use, and that he was skeptical they would work properly with received Layer 3 data streams. (Ex. 1006 at 83).

This skepticism came from the industry's leading PON equipment manufacturer. Mr. Zegarski was not a junior engineer, but was Motorola Mobility's

Senior Systems Engineer and “Subject Matter Expert on Passive Optical Networks,” who “also required [himself] to be extremely familiar and conversant with the most current IP Routing and Switching processes” because Motorola's “layer-2 optical switch, had to be properly interfaced with any of the existing brands of routers in the US marketplace.” (Ex. 1006 at 82). Based on his expertise, Mr. Zegarski declared: “I had never heard or experienced the use of VRF-labeled Ethernet frames going through a layer-2 OLT. In my mind, VRF was a hardly used, very specialized and little-known information routing configuration and as such, and without understanding how it was accomplished and tested, I was very skeptical that it would work with our OLT or any PON OLT for that matter.” (Ex. 1006 at 83). This is powerful evidence of non-obviousness: the person most qualified to assess whether the claimed method would work with Motorola's OLT—the leading PON equipment in the United States—had never encountered it and was skeptical it would succeed given the technical challenges. PON standards, including G.984.1 and G.984.3, were designed for Layer 2 operations. (Ex. 1011; Ex. 1013). Thus, the leading PON equipment manufacturer was unaware of any implementation in which an OLT received Layer 3 VRF-separated data streams and successfully aggregated them and distributed them to ONUs. There was no disclosure in these standards, or in any other prior art, regarding how an OLT might receive and properly handle Layer 3 VRF-separated data streams—to be clear, without any need to perform any VRF

separation within the OLT itself.

Given Mr. Zegarski's skepticism, SPADA performed a prototype test, which confirmed that the method worked. The test demonstrated that OLTs successfully received Layer 3 data streams that had been virtually separated using VRF prior to receipt by the OLTs and aggregated those data streams and distributed them through the PON, with correct ONU extraction and delivery to the intended end user device. (Ex. 1006 at 70-81). This result was contrary to industry expectations.

Thus, prototype testing proved the conventional wisdom and skepticism was mistaken. This unexpected result confirms the non-obvious nature of the claimed method.

This evidence was submitted to the Examiner by declaration in grandparent Application No. 16/600,302. (Ex. 1006 at 67-85; 104-106 (Vilella Declaration); at 82-83 (Zegarski Declaration)). The Examiner credited this evidence in allowing the claims of the '898 patent, finding that "conventional methods do not use the virtual routing and forwarding in the same way as the [claims]." (Ex. 1005 at 105-06). The Zegarski Declaration demonstrated that Motorola Mobility—the leading PON equipment manufacturer—had not intended to use VRF operationally with its OLT, had not tested such use, and could give no assurances that VRF-separated data streams would work with its PON device. (Ex. 1006 at 82–83).

The Examiner allowed the claims of the '142 patent "for similar reasons as

parent Application 17/128,042.” (Ex. 1004 at 18).

Thus, the use of an OLT that receives VRF-separated data streams, and aggregates those data streams into a common data feed, distinguishes the claimed method from proposed prior art methods in which the OLT performs VRF separation on the data streams it receives (*i.e.*, Ahn, Cheng, Schmidtke, and Rarick/Doiron).

Commercial success and industry adoption: Since the 2012 priority date, many major ISPs have adopted the use of the method claimed in the ‘142 patent. For example, materials in the parallel litigation in the Central District of California describe the patented method as enabling secure services over shared PON infrastructure. (Ex. 1029). Adoption of the method supports a nexus between the claimed method and commercial success. *See WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1331, 1337 (Fed. Cir. 2016); *see also Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1052 (Fed. Cir. 2016) (en banc).

Opposite prior-art direction and skepticism: The record shows that, as of 2012, PON vendors had not implemented OLTs receiving VRF-separated Layer-3 data streams, and contemporaneous experts were skeptical such data streams would traverse standard OLTs successfully. *See* Ex. 1006 at 70–72 (First Vilella Decl.: Motorola “could give no assurances that VRF tagged information packets would work within their PON system”); *id.* at 82–83 (Zegarski Decl.: “I was very skeptical ... it had not been tested and verified ... I had never heard ... VRF-labeled Ethernet

frames going through a layer-2 OLT”); *see also id.* at 104–106 (Second Vilella Decl.: background on industry practice and why SPADA undertook prototype testing to validate feasibility). Consistent with that record, the prior art cited in the Petition points in the opposite direction from the claims—performing VRF separation on received data streams ***within the OLT*** (e.g., Ahn’s express assignment of routing/MPLS edge functionality to the OLT), rather than OLTs receiving data streams that have been virtually separated using VRF prior to receipt by the OLTs—to be clear, without any need to perform virtual separation within the OLTs—and aggregating those same received data streams into a common data feed. The Petition does not explain why the Office’s prior evaluation of these references was erroneous. *See In re Fulton*, 391 F.3d 1195, 1199-1200 (Fed. Cir. 2004) (what the prior art teaches and whether it suggests the claimed approach are fact questions assessed on the record as a whole).

The Federal Circuit has emphasized that secondary considerations “may often be the most probative and cogent evidence [of non-obviousness] in the record.” *Apple*, 839 F.3d at 1052. The strong nexus between the invention claimed in the ‘142 patent and these objective indicia is compelling. This is even more so given that the Examiner agreed with their significance in the Notice of Allowance.

V. EACH OF THE FOUR GROUNDS IN THE PETITION FAILS

With this prosecution history as context, each of Nokia’s four grounds plainly

fails for the same reasons the Examiner identified during prosecution. As a fundamental matter, the Petition fails to meet the burden under 35 U.S.C. § 314(a) because it does not identify, with the required specificity, where the prior art discloses at least one limitation applicable to all of the claims; namely, the PON OLT receives private data streams that have been virtually separated using VRF prior to receipt by the PON OLT, and then aggregates those virtually separated private data streams into one or more common data feeds for distribution to the PON ONUs.

A. Ground 1 Fails (Claims 1-9)

Ground 1 fails because none of the cited references—Ahn, G.984.1, G.984.3 or RFC 4364—discloses the limitation present in all of the challenged claims: an OLT receiving a private data stream that has been virtually separated using VRF and aggregating that same data stream into a common data feed. As explained in Section III, *supra*, the claims require that VRF separation occur **before** the data stream is received by an OLT. Thus, the OLT receives, and aggregates into a common feed, *the same VRF-separated data stream*.

Ahn does not disclose this requirement because it places “routing and MPLS edge functionalities ... at the OLT level” (Ex. 1015 at 3), meaning Ahn’s OLT performs virtual separation on the data streams it receives, rather than receiving data streams that “have been” virtually separated using VRF. G.984.1 and G.984.3 describe *only Layer 2* operations, and say nothing about VRF-separated, Layer 3

data streams. RFC 4364 describes Layer 3 VPN operations, but is silent regarding PONs and OLT operations. None of the cited references, alone or in combination, discloses or suggests the claimed method.

Further, as demonstrated in Section IV.B, Ahn is cumulative of references the Examiner considered, and rejected, during prosecution. In particular, the Examiner considered Cheng, Zheng, Schmidtke and Rarick/Doiron before allowing the claims. (Ex. 1005 at 79-81, 108, 127-128, 136; Section IV.B, *supra*). Ahn's disclosure—in which the OLT performs VRF separation—is substantively identical to these rejected references. Ahn thus has nothing new to add. Under *Advanced Bionics*, this counsels against institution.

The cited standards do not cure Ahn's deficiencies. G.984.1 and G.984.3 describe standard PON functionality and operation, and say nothing about a PON OLT receiving data streams that have been (*i.e.*, past tense) virtually separated using VRF, and then aggregating those same virtually separated data streams into one or more common data feeds for distribution to PON ONUs. (Ex. 1011; Ex. 1013). G.984.1 says nothing about a PON receiving VRF-separated data streams. (Ex. 1011). Likewise, G.984.3 says nothing about receiving VRF-separated data streams. (Ex. 1013). Although RFC 4364 describes the ***generation and transmission of VRF data streams*** (both of which relate to steps performed in the backbone), it says nothing about steps performed by PONs, or even the existence of PONs. (Ex. 1014).

Thus, RFC 4364 says nothing about the claimed steps performed by an OLT. In sum, neither Ahn nor these PON and VRF standards—alone or in combination—teaches or suggests the ‘142 patent claimed OLT receiving data streams that have been (*i.e.*, past tense) virtually separated using VRF, and then aggregating those virtually separated data streams into one or more common data feeds for distribution to the PON ONUs.

Because none of the references in the Petition, or any combination of those references, teaches or suggests the claim limitations, Ground 1 fails, and cannot support a finding of obviousness for Claims 1-9.

In addition, the motivation arguments in the Petition fail because they are circular and rely on hindsight. The Petition argues a POSITA “would have been motivated” to combine VRF with PON because a PON is “agnostic as to the type of data transmitted” (Petition at 19) and to “limit the number of physical devices required” (Petition at 20, 23). This reasoning applies to any combination of networking technologies, and does not explain why a POSITA would have combined these specific references at all, much less in the specific way claimed (which the cited references do not disclose—even if combined). Indeed, the prior art points in the opposite direction. Ahn expressly states that “routing and MPLS edge functionalities are implemented at the OLT level” and the “ONU does not operate as a system with upper-layer protocol capabilities, such as MPLS or routing

protocols.” (Ex. 1015 at 3). This contradicts the claims, which recite that the OLT receives data streams that “have been virtually separated using [VRF],” and aggregate those received data streams into a common data feed (Ex. 1001, claim 8). The claimed method requires an OLT to receive data streams that have been (*i.e.*, past tense) virtually separated using VRF.

B. Ground 2 Fails (Claims 4 and 7)

Claims 4 and 7 are dependent claims and thus include all of the limitations of independent claims 1 and 5, respectively, from which they depend. As set forth in connection with Ground 1, the Petition fails to show independent claims 1 and 5 are invalid at least because the Petition does not, and cannot, show at least one limitation of the method recited in those claims—namely, a PON OLT receiving private data streams that have been virtually separated using VRF prior to receipt by the PON OLT, and then aggregating those virtually separated private data streams into one or more common data feeds for distribution to the PON ONUs. Because dependent claims 4 and 7 contain all of the limitations of the independent claims from which they depend, they must be valid for at least the reasons the independent claim are valid.

1. The Additional Claim Limitations of Claims 4 and 7

Claim 4 is dependent on Claim 3 which, in turn, is dependent on Claim 1. Claim 3 adds the limitation that the “secondary interface router” of claim 1 is

connected to “at least one additional PON interface router” that is serially connected to a PON OLT and that delivers virtually separated data streams to the OLT. Claim 4 further adds that an “aggregation switch” is serially connected to a PON OLT to deliver virtually separated data streams to the OLT. Dependent Claim 4 includes all the limitations recited in Claims 1 and 3 in addition to the limitations specific to Claim 4.

Claim 7 is dependent on Claim 5. Claim 7 adds the limitation that the “PON interface router” of Claim 5 is connected to a PON OLT to deliver VRF-separated data streams to the OLT. Dependent Claim 7 includes all the limitations recited in Claim 5 in addition to the limitations specific to Claim 7.

The additional limitations specific to Claims 4 and 7 relate only to steps through which VRF-separated data streams are provided to an OLT. They have nothing to do with what a PON (including an OLT) does with those data streams after they are received by an OLT. As explained for Ground 1, the references cited in the Petition, alone or in combination, do not teach or suggest a limitation of the operation of an OLT recited in independent claims 1 and 5: the PON OLT receives private data streams that have been virtually separated using VRF, and then *aggregates those same virtually separated private data streams* into one or more common data feeds for distribution to the PON ONUs. Independent Claims 1 and 5 are therefore valid. Dependent claims 4 and 7, which add further limitations to those

independent claims, must also be valid for at least those reasons.

2. The Petition's Reliance on BCM56685 Is Unavailing

The BCM56685 reference describes an “Integrated Multilayer Ethernet Switch” that is alleged to be a “next-generation” solution for PON access equipment. (Ex. 1020). Its purpose is to be used, among other things, in connection with routing VRF data streams to a PON. It has nothing to do with how any component of a PON, including the OLT, operates. Thus, it does not provide any support for the Petition's failed argument of any teaching, suggestion or disclosure of the method claimed in the independent claims of the '142 patent. The Petition does not argue otherwise, because it cannot. And, because the BCM56685 reference does not support the argument that the independent claims of the '142 patent are obvious, it does not support the argument that dependent claims 4 and 7 are obvious, either.

C. Ground 3 Fails (Claims 1-9)

Like Ground 1, Ground 3 fails because the Petition does not show at least the limitation of a PON OLT receiving private data streams that have been virtually separated using VRF and then aggregating *those virtually separated private data streams* into one or more common data feeds for distribution to the PON ONUs. Ground 3 replaces the reliance on Ahn of Ground 1 with reliance on Ravindran and otherwise relies on the same references as Ground 1: G.984.1 and G.984.3 for PON operations (which disclose nothing about VRF) and RFC 4364 (which discloses

nothing about PONs or about OLTs). As with Ground 1, the combination of these PON and RFC references does not teach or suggest sending VRF-separated data streams to a PON OLT, much less what method might be used by the OLT or by the PON on those data streams—including the claimed method.

Ravindran does not provide the missing link. Indeed, it does not disclose anything about how a PON may operate on received data streams of any sort. Ravindran (Ex. 1016) describes a content-oriented network with label-switched components. Ravindran includes only one passing reference to ONUs (*see* Ex. 1016, page 19, ¶ 31). It does not describe OLTs or any OLT operation, including whether an OLT receives data streams that have been virtually separated using VRF and, if so, what steps an OLT might perform on any such data streams.

Thus, there is no teaching or suggestion in Ravindran, or in any combination of references listed in Ground 3, of a PON OLT receiving private data streams that have been virtually separated using VRF and then aggregating those virtually separated private data streams into one or more common data feeds for distribution to the PON ONUs. Ground 3 fails.

D. Ground 4 Fails (Claims 4 and 7)

Ground 4 relies on the same references as Ground 2, except Ground 4 includes Ravindran instead of Ahn. Ground 4 fails for the same reasons that Ground 2 and Ground 3 fail.

First, as for Ravindran, there is no teaching or suggestion in Ravindran, or in any combination of references listed in Ground 3, of a PON OLT receiving private data streams that have been virtually separated using VRF, and then aggregating those virtually separated private data streams into one or more common data feeds for distribution to the PON ONUs.

Second, as for BCM56685, the Petition fails to show that independent claims 1 and 5 are invalid, at least because the Petition does not, and cannot, show a limitation of the method recited in those claims—namely, a PON OLT receiving private data streams that have been virtually separated using VRF, and then aggregating those virtually separated private data streams into one or more common data feeds for distribution to PON ONUs. Independent Claims 1 and 5 are therefore valid. Thus, dependent claims 4 and 7, which add further limitations to those independent claims, must also be valid.

None of the references identified in the Petition for Ground 4, and no combination of those references (including combinations with Ravindran and BCM56685) teaches or suggests any of the inventions claimed in the ‘142 patent. Ground 4 fails.

VI. THE PETITION MISCHARACTERIZES THE CLAIMS

The Petition recasts the claims as mere coexistence of VRF and PON, but the claims require specific method steps performed in a PON. Those steps exist in each

independent claim. *See* Ex. 1001, claims 1, 5, 8. Thus, the Petition argues that the claims are nothing more than the use of VRF-separated data streams in PONs, asserting there is “no daylight” between those standards and the prior art. (Petition at 17). The Petition further asserts that the claims require only that VRF and PON technologies “coexist” in a network, and that the claims recite “nothing more than the combination of two known technologies.” (Petition at 14-18).

The Petition is incorrect on both scores. It ignores the claim language, which recites how VRF-separated data streams received by a PON OLT are used by the PON: the OLT receives at least one private data stream that has been virtually separated using VRF, and ***aggregates that same virtually separated stream*** within the OLT into a common data feed for distribution to ONUs. *See, e.g.,* Ex. 1001, claim 8. The arguments in the Petition therefore fail on the plain language of the claims, which require an OLT to receive a data stream that has been VRF-separated and then to aggregate that data stream into a common data feed for distribution to ONUs.

The ignored claim steps require that the OLT receive at least one private data stream that has been virtually separated using VRF and aggregate within the OLT that same virtually separated private data stream into a common data feed for distribution to ONUs. The references cited in the Petition plainly do not teach, suggest or disclose the steps of the claimed method. Faced with this fatal deficiency,

the Petition glosses over the requirement of same-stream continuity recited in the claims and instead recasts the claims merely as the generic combination of VRF and PON. But the claim language controls: the past perfect “has been virtually separated” and the repeated use of “said” tie the OLT’s aggregation back to the very stream received by the OLT, which the Petition does not show in any cited reference or combination of references.

The Petition’s flawed argument is improper and fails.

A. The Petition Ignores the Limitations of the Claims

The claims do not merely recite the combination of VRF-separated data streams with PONs, as the Petition urges. Rather, they recite the steps of a specific method by which VRF-separated data streams received by a PON OLT are used by PONs. Among other things, the OLT receives data streams that have been virtually separated prior to the OLT’s receipt of the data streams and aggregates those VRF-separated data streams into a common data feed. As explained above, this method had never been used or suggested before the invention, and experts in the field were skeptical an OLT would work in this way when SPADA disclosed the method Mr. Vilella conceived. The prior art taught implementations in which the OLT itself performs VRF operations on received traffic. Here, the claims recite OLT steps of receiving a data stream that has been virtually separated using VRF prior to receipt by the OLT, followed by aggregation within the OLT of that same VRF-separated

data stream into a common feed.

As explained in Section III.A, the use of “said” in the claims establishes that the same virtually separated private data stream received by the OLT must be aggregated into the common feed. The Petition ignores this limitation entirely.

This failure explains why the Petition repeatedly rests its arguments on the mere combination of generic VRF (RFC 4364) and generic PON operations (like G.984.x), while ignoring the actual claim language of the steps of the claimed method for using VRF and PONs together. For example, the Petition cites to RFC 4364 and VRF (Petition at 55–57) but does not identify any disclosure of receiving VRF-separated data streams at a PON OLT for performing the claimed aggregation step on those data streams. Thus, the Petition relies on the G.984.3 description of GEM framing and GEM Port-ID filtering (Petition at 40–41) but never refers to any teaching or suggestion that such disclosed Layer 2 mechanism may be used with, or work with, Layer 3 VRF-separated data streams. There is none.

B. Reliance on SPADA’s Litigation Positions Fails

The Petition’s reliance on SPADA’s litigation statements is unavailing because the Petition mischaracterizes what was said. The Petition asserts that “SPADA admits that its alleged invention is nothing more than the combination of two technologies that were long-known in the industry: PONs and VRF.” (Petition at 14 (quoting Ex. 1028 at 5)). That is not so. The Petition’s citation is taken out of

context.

The statement from the litigation to which the Petition refers relates to the steps by which VRF data streams received by an OLT *are generated* (which is not claimed), *not* to steps concerning how such received data streams *are used in a PON* (which are claimed). SPADA was responding to the defendants’ argument in their motion to dismiss that the Amended Complaint failed to identify specific equipment used *to generate* data streams that are virtually separated using VRF. SPADA explained to the Court—correctly so—that the claims do not require identification of devices that generate VRF-separated data streams because “[a]ll that is required by the claims is that a PON receive and successfully deliver to its end users one or more data streams that have been virtually separated using Virtual Routing and Forwarding (VRF). The means used to generate such virtually separated data streams via VRF are not claimed.” (Ex. 1028 at 6). Thus, it is plain that SPADA was talking only about unclaimed generation steps, not about the claimed steps of the method practiced on a data stream received by an OLT.

SPADA’s litigation statement aligns perfectly with the claim language, the specification, and the prosecution history. The claims are not directed in any way to *the generation of* data streams that are virtually separated using VRF. Rather, the steps of the claimed methods start with receiving data streams that “have been virtually separated using Virtual Routing and Forwarding (VRF)” (emphasis

supplied). All that matters is that such data streams are received by an OLT. It is not relevant how those received data streams may have been generated.

C. The Petition’s “No Daylight” Argument Fails

The Petition incorrectly asserts that “there is no daylight between the standards that SPADA alleges prove infringement and the prior art.” (Petition at 17-18). This argument conflates two distinct inquiries: (1) whether the accused methods use certain standards (they do, which is part of proof of infringement), and (2) whether the standards or other prior art references disclose the claimed methods (they do not). As for (1), the use of the standards provides *some evidence* of infringement, but the standards themselves are not sufficient to prove infringement of the claimed methods. As for (2), the standards do **not** teach or suggest the limitations of the claims and are insufficient to support the argument that the claims are obvious.

The Petition’s argument fails because these standards do not disclose the specific steps that are claimed in the ‘142 patent, including that an OLT that receives Layer 3, VRF-virtually separated data streams, and aggregates those Layer 3, VRF-virtually separated data streams in a common data feed—to be clear, without any need to perform virtual separation within the OLT itself. The invention claimed in the ‘142 patent is the first time those standards were combined *with the addition of the steps of using an OLT as claimed in the ‘142 patent.*

VII. THE EXPERT DECLARATION CANNOT SUPPLY THE MISSING CLAIM LIMITATION

Petitioner's declarant, Dr. Hajduczenia, provides a 251-page declaration that does nothing more than recite legal standards, summarize references, and offer legal conclusions. (Ex. 1002). The declaration fails to provide the factual basis required for expert testimony. *See* 37 C.F.R. § 42.65(a).

Critically, Dr. Hajduczenia's declaration fails to address a key claim limitation: a PON OLT receiving private data streams that have been virtually separated using VRF, and then aggregating those virtually separated private data streams into one or more common data feeds for distribution to the PON ONUs. Instead, the declaration:

- Describes Ahn's proposed OLT, which performs VRF separation *within the OLT itself* (Ex. 1015 at 3-4), without addressing how Ahn discloses the claimed steps in which an OLT receives a data stream *that has been virtually separated* using VRF prior to receipt by the OLT, and aggregates that received data stream into a common data feed, and
- Fails to explain how a POSITA in 2012 would have understood the references cited in the Petition to teach the claimed method, given that industry experts at that time (including Motorola's internal PON expert) were skeptical that OLTs would work properly with VRF-separated data streams. (Ex. 1006 at

73-83).

Dr. Hajduczenia's declaration fails under the Board's recent decision in *Bytemark, Inc.* In *Bytemark*, the Board denied institution where the petitioner's expert merely repeated, verbatim, the conclusory assertion that "a POSITA would understand that such a blocking would require recording the blocking in a data record associated with that user's account." *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15 (PTAB Aug. 24, 2022). The Board gave this testimony "little weight" because the expert "does not cite to any additional supporting evidence or provide any technical reasoning to support his statement." *Id.* The Board further explained that this "is particularly problematic in cases where, like here, expert testimony is offered not simply to provide a motivation to combine prior-art teachings, but rather to supply a limitation missing from the prior art." *Id.* at 16.

Dr. Hajduczenia's declaration suffers from the same defect. Throughout his 251-page declaration, Dr. Hajduczenia repeatedly offers bare conclusions that a POSITA would understand Ahn, G.984.1, G.984.3 and RFC 4364 to teach the claimed method, without ever identifying where those references disclose a PON OLT receiving private data streams that have been virtually separated using VRF, and then aggregating those virtually separated private data streams into one or more common data feeds for distribution to the PON ONUs. These are precisely the type of "conclusory statements" that *Bytemark* holds insufficient.

The July 31, 2025 Director Memorandum reinforces why such conclusory expert declarations cannot cure the Petition’s fundamental failure. The Director made plain that “general knowledge, including expert testimony... may not be used to supply a missing claim limitation.” Director Memorandum at 1. While general knowledge “may still be used in an IPR to support a motivation to combine or to demonstrate the knowledge of a person having ordinary skill in the art,” it cannot fill the gaps that exist in the cited prior art patents and printed publications. *Id.* Here, Dr. Hajduczenia’s declaration does not explain why a POSITA would combine the cited references. Instead, it attempts to supply the missing claim limitation that none of the references discloses.

This improper use of an expert declaration to supply missing limitations violates both 37 C.F.R. § 42.65(a) and 37 C.F.R. § 42.104(b)(4). As the Federal Circuit recently emphasized, expert testimony cannot serve as a substitute for actual disclosure in prior art patents or printed publications. *See Qualcomm*, 134 F.4th at 1364-65 (holding that § 311(b) strictly limits the basis of an IPR ground to prior art consisting of patents or printed publications).

Because Dr. Hajduczenia’s declaration provides no factual basis for his conclusions regarding this critical limitation, and because the declaration improperly attempts to supply what is missing from the cited references, the declaration is entitled to no weight. The Petition thus fails because it provides no support that the

cited references disclose the claimed method of a PON OLT receiving private data streams that have been virtually separated using VRF and then aggregating those virtually separated private data streams into one or more common data feeds for distribution to the PON ONUs.

VIII. CONCLUSION

The Director's July 31, 2025 Memorandum makes plain that petitions that rely on expert declarations to supply missing claim limitations must be denied. That is precisely what Nokia's Petition does here. Because the Petition cannot—and does not—identify where in Ahn, RFC 4364, G.984.1, or G.984.3 a critical claim limitation is disclosed, institution must be denied under 35 U.S.C. § 314(a) and 37 C.F.R. § 42.104(b)(4).

Institution should be denied for two independent reasons. First, the Petition fails to meet the threshold burden under 37 C.F.R. § 42.104(b)(4) and the Director's July 31, 2025 Memorandum because it does not identify where in the cited references a claim limitation is disclosed, and instead improperly relies on an expert declaration to supply this missing limitation. Second, the prosecution history confirms non-obviousness, including objective evidence that the claimed method was unexpected and faced industry skepticism. The Examiner credited this evidence, as stated in the reasons for allowance.

None of the cited references (Ahn, G.984.1, G.984.3 or RFC 4364) discloses

a PON OLT receiving private data streams *that have been* virtually separated using VRF and then aggregating *those data streams* into one or more common data feeds for distribution to PON ONUs. Ahn expressly teaches the opposite: “routing and MPLS edge functionalities are implemented at the OLT level” with the “OLT manag[ing] VRF tables.” (Ex. 1015 at 3-4) to perform VRF separation on received data streams that are not virtually separated. That is the same approach the Examiner found insufficient during prosecution. The Petition offers nothing new.

Accordingly, the Petition should be denied.

Certification Of Word Count

Pursuant to 37 C.F.R. § 42.24(a)(1)(iii), the undersigned certifies that this Preliminary Response contains 13,828 words, excluding the table of contents, table of authorities, certificates, and appendices, as counted by Microsoft Word. This Response complies with the word count limit of 14,000 words for a preliminary response. 37 C.F.R. § 42.24(a)(1)(iii).

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Respectfully submitted,

/s/ Mark H. Bloomberg

Lead Counsel Mark H. Bloomberg
mbloomberg@zuberlawler.com
Registration No. 33158
260 Madison Avenue, Suite
8021
New York, NY 10016
Tel: +1 (212) 899-9830
Fax: +1 (213) 596-5621

Back-Up Counsel Casey Kniser
ckniser@zuberlawler.com
Registration No. 57461
ZUBER LAWLER LLP
2029 Century Park E, Suite 400
Los Angeles, California 90067
USA
Tel: +1 (213) 596-5620
Fax: +1 (213) 596-5621

*Attorneys for SPADA
INNOVATIONS, INC.*