IN THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF NORTH CAROLINA

FAR NORTH PATENTS, LLC, Plaintiff, v. AVAYA INC., Defendant.	CIVIL ACTION NO. ______ ORIGINAL COMPLAINT FOR PATENT INFRINGEMENT **JURY TRIAL DEMANDED**

ORIGINAL COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Far North Patents, LLC ("Far North Patents" or "Plaintiff") files this original complaint against Defendant Avaya Inc., ("Avaya" or "Defendant"), alleging, based on its own knowledge as to itself and its own actions and based on information and belief as to all other matters, as follows:

PARTIES

1. Far North Patents is a limited liability company formed under the laws of the State of Texas, with its principal place of business at 18383 Preston Rd Suite 250, Dallas, Texas, 75252.

2. Defendant Avaya Inc. is a corporation organized and existing under the laws of Delaware and having a place of business in Durham, North Carolina. Avaya Inc. may be served through its registered agent, CT Corporation System, at 160 Mine Lake Ct. Ste. 200, Raleigh, NC 27615.

3. Avaya Inc. and its foreign and United States subsidiaries, affiliates, and related companies ("Avaya and its affiliates") comprise one of the world's largest entities specializing in communications technologies, including under the Avaya brand.

4. Avaya and its affiliates are part of the same corporate structure and distribution chain for the making, importing, offering to sell, selling, and/or using of the accused devices in the United States, including in this judicial district.

5. Avaya and its affiliates share the same management, common ownership, advertising platforms, facilities, distribution chains and platforms, and accused product lines and products involving related technologies.

6. Avaya and its affiliates regularly contract with customers regarding equipment or services that will be provided by their affiliates on their behalf.

7. Thus, Avaya and its affiliates operate as a unitary business venture and are jointly and severally liable for the acts of patent infringement alleged herein.

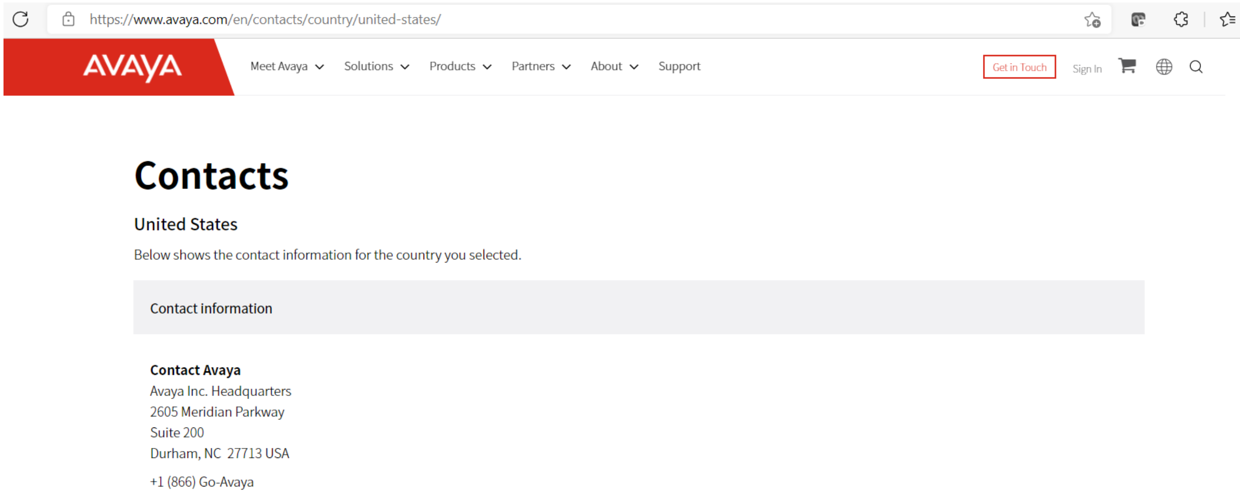
JURISDICTION AND VENUE

8. This is an action for infringement of United States patents arising under 35 U.S.C. §§ 271, 281, and 284–85, among others. This Court has subject matter jurisdiction of the action under 28 U.S.C. § 1331 and § 1338(a).

9. This Court has personal jurisdiction over Avaya pursuant to due process and/or the North Carolina Long Arm Statute because, *inter alia*, (i) Avaya Inc. has done and continues to do business in North Carolina; and (ii) Avaya has committed and continues to commit acts of patent infringement in the State of North Carolina, including

making, using, offering to sell, and/or selling accused products in North Carolina, and/or importing accused products into North Carolina, including by Internet sales and sales via retail and wholesale stores, inducing others to commit acts of patent infringement in North Carolina, and/or committing a least a portion of any other infringements alleged herein.

10. Venue is proper in this District as to Avaya Inc. pursuant to 28 U.S.C. § 1400(b). Venue is further proper because Avaya Inc. has committed and continues to commit act of patent infringement in this district, including making, using, offering to sell, and/or selling accused products in this district, and/or importing accused products into this district, including by Internet sales and sales via retail and wholesale stores, inducing others to commit acts of patent infringement in this district, and/or committing at least a portion of any other infringements alleged herein in this district. Avaya Inc. also has regular and established places of business in this district, including its headquarters at 2605 Meridian Parkway, Suite 200, Durham, NC 27713 (as shown in the below screenshot from Avaya Inc.'s website).



(Source: https://www.avaya.com/en/contacts/country/united-states)

BACKGROUND

11. The patents-in-suit generally pertain to communications networks and other technology used in the provision of wireless services, Voice over Internet Protocol ("VoIP") phone systems, and other advanced communication services. The technology disclosed by the patents was developed by personnel at MCI WorldCom ("WorldCom") and personnel at Robelight LLC ("Robelight").

12. WorldCom was a leading telecommunications service provider in the late 1990s and early 2000s. Verizon acquired WorldCom in 2005. The patents developed at WorldCom ("the Hardy patents") are related to Quality of Service ("QoS") evaluation in telecommunications systems.

13. The inventor of the Hardy patents, former principal analyst for quality measurement and analyses at WorldCom Dr. William C. Hardy, was at the forefront of QoS in telecommunications systems. Dr. Hardy developed, disclosed, and patented a

solution for efficiently and consistently evaluating QoS. In fact, Dr. Hardy literally wrote the book on QoS in telecommunications systems. *See* Hardy, William C., QoS Measurement and Evaluation of Telecommunications Quality of Service (Wiley 2001).

14. Dr. Hardy has received considerable praise for his work in QoS. Luis Sousa Cardoso, Quality of Service Development Group Chairman, left little doubt regarding the esteem with which he holds Dr. Hardy: "William C. 'Chris' Hardy is unquestionably among the leading lights in the field of QoS[.]" Dr. Hardy's book was reviewed in *IEEE Communications Magazine*, Vol. 40, No. 2, Feb. 2002, which stated that the book "provides a straightforward and very accessible approach to measurement and evaluation of QoS in telecommunications networks…strongly recommended for all people, either experienced professionals or graduates, involved in the area of networking[.]" He is even an honorary member of the Russian Academy of Science.

15. The Hardy patents (or the applications leading to them) have been cited during patent prosecution hundreds of times, by numerous leading companies in the computer networking and telecommunications industries industry, including Adtran, Alcatel-Lucent, Arris, AT&T, Avaya, Cisco, Deutsche Telekom (T-Mobile), Dolby Laboratories Licensing Corporation, Empirix, Ericsson, Genband, General Electric, IBM, Juniper, Microsoft, Motorola, NEC, Oracle, Panasonic, Ringcentral, Sharp, Siemens, Sprint, USAA, and Verizon.

16. The patents developed at Robelight ("the Light patents") relate to obtaining presence information over a network. Inventors Elliot D. Light and Jon L. Roberts are

named inventors on over 30 patents combined. The Light patents (or the applications leading to them) have been cited during patent prosecution over a hundred times, by numerous leading companies in the computer networking and telecommunications industries, including Alcatel-Lucent, Apple, AT&T, Avaya, Google, LG Electronics, Nortel Networks, Qualcomm, Rockstar Consortium, SAP, Shoretel, Vonage, and ZTE.

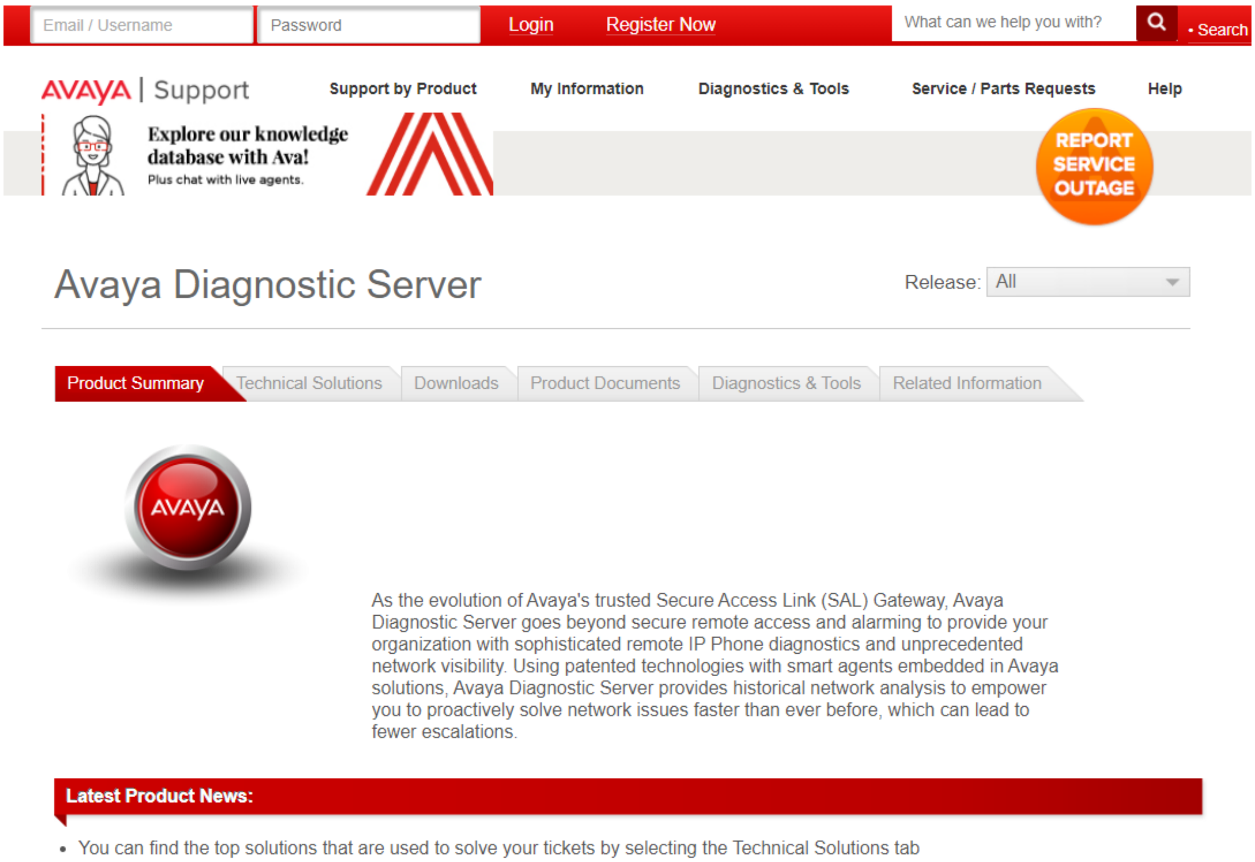
COUNT I

INFRINGEMENT OF U.S. PATENT NO. 8,689,105

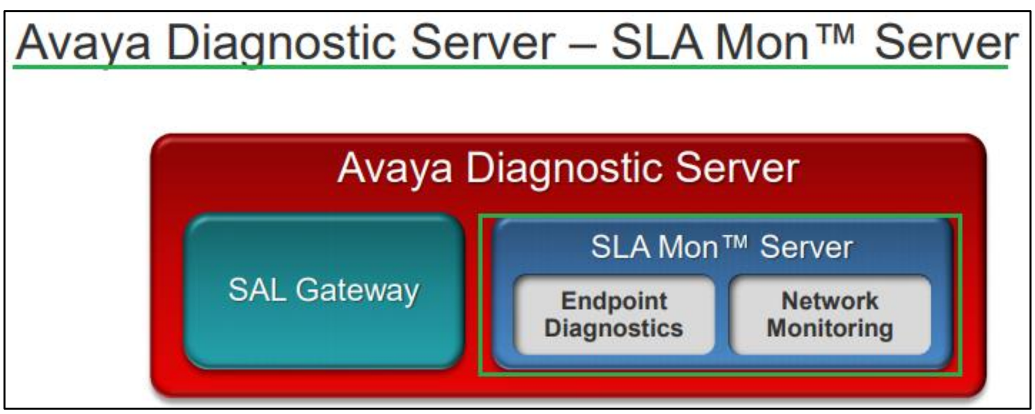
17. On April 1, 2014, United States Patent No. 8,689,105 ("the '105 Patent") was duly and legally issued by the United States Patent and Trademark Office for an invention entitled "Real-Time Monitoring of Perceived Quality of Packet Voice Transmission."

18. Far North Patents is the owner of the '105 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the '105 Patent against infringers, and to collect damages for all relevant times.

19. Avaya made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Avaya Diagnostic Server with SLA Monitor family of products that include advanced quality monitoring capabilities (collectively, "accused products").



(Source : https://support.avaya.com/products/P1558/avaya-diagnostic-server/All)



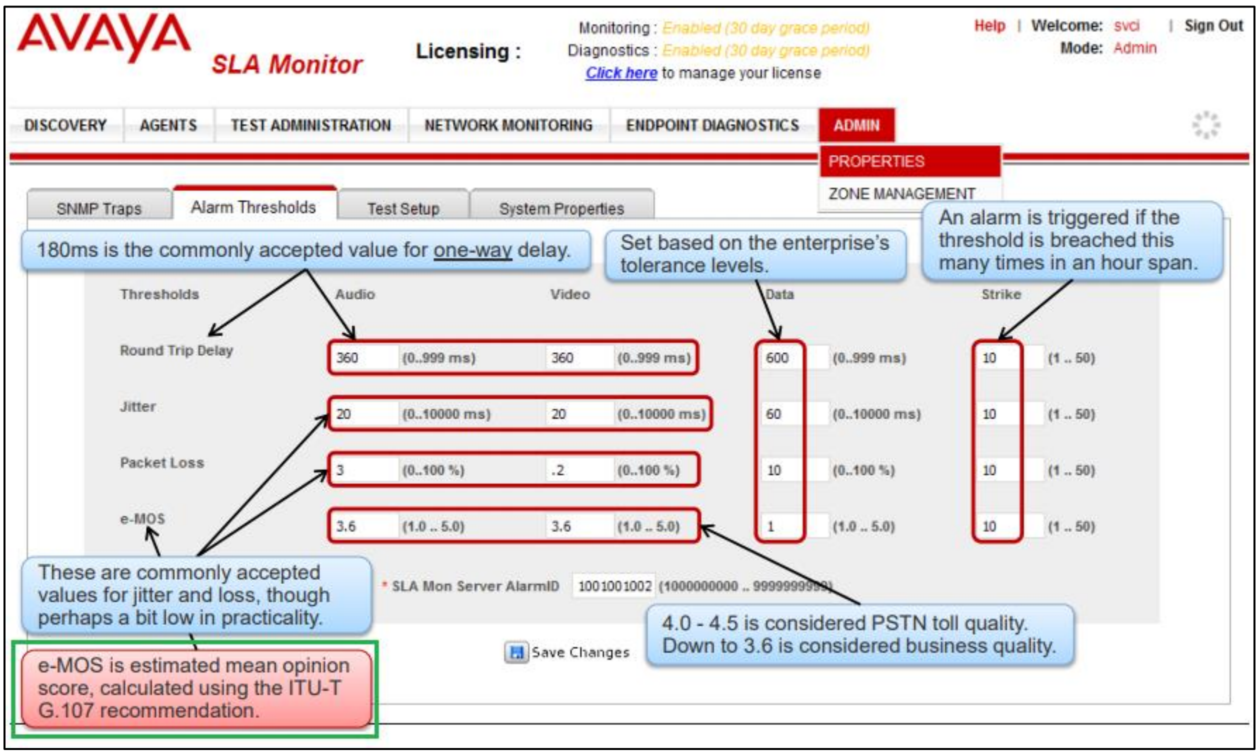
(Source : https://downloads.avaya.com/css/P8/documents/101042613)

SLA Mon server and agent deployment

You can use the SLA Mon server and agents for network monitoring purposes, providing a network wide analysis of differentiated services (DiffServ) and relationship of DiffServ to the network performance.

The SLA Mon server is configured to run periodic Real-time Transport Protocol (RTP) tests between pairs of SLA Mon agents that are present on Avaya endpoints. The SLA Mon server analyzes the test data and monitors network quality of service (QoS), such as loss, jitter, delay, and e-MOS. The SLA Mon server provides a history of network QoS metric and the relationship of the QoS parameters to the network topology and DiffServ.

(Source : https://downloads.avaya.com/css/P8/documents/101037184)



(Source : https://downloads.avaya.com/css/P8/documents/101042613)

Thresholds for e-MOS:	
Audio	The Estimated mean opinion score (e-MOS) threshold for audio traffic. If the Network Voice Quality (NVQ), an estimation of MOS, measured for a test of audio traffic is less than this configured value, the SLA Mon server considers the occurrence to generate a QoS alarm. You must enter a value between 1.0 to 5.0. The default value is 3.6.
Video	The e-MOS threshold for video traffic. If the NVQ measured for a test of video traffic is less than this configured value, the SLA Mon server considers the occurrence to generate a QoS alarm. You must enter a value between 1.0 to 5.0. The default value is 3.6.
Data	The e-MOS threshold for data traffic. If the NVQ measured for a test of data traffic is less than this configured value, the SLA Mon server considers the occurrence to generate a QoS alarm. You must enter a value between 1.0 to 5.0. The default value is 1.

(Source : https://downloads.avaya.com/css/P8/documents/101037184)

20. By doing so, Avaya has directly infringed (literally and/or under the doctrine of equivalents) at least Claims 1 and 23 of the '105 Patent. Avaya's infringement in this regard is ongoing.

21. Avaya has infringed the '105 Patent by using the accused products and thereby practicing a method that includes obtaining, by a network device, a reference matrix based on estimates of perceived audio quality of at least portions of one or more first packetized audio messages, the reference matrix modeling values of a plurality of characteristics associated with a particular quality level. For example, the accused products are used by Avaya to implement the ITU-T G.107 Recommendation. The quality of audio in VoIP networks (packet switched networks) are calculated using MOS (Mean Opinion score) values according to ITU-T G.107 Recommendation E-model. The E-model computes a transmission rating value R, which is a combinational effect of all

the transmission parameters in an audio conversation. The E-model uses a reference table (“reference matrix”) based on the estimates of perceived audio conversational/audio quality. The reference table includes modelling values like MOS-CQE (Mean Opinion Score – Estimated Conversational Quality), each associated with a quality level.

7 Target services

This Recommendation gives guidelines for QoE assessment of various telecommunication services mainly utilizing audio and visual media.

7.1 Audio

– Conversational voice and voice messaging

Speech communication services such as mobile telephony and voice over Internet protocol (VoIP), as well as conventional public switched telephone network (PSTN) and integrated services digital network (ISDN) services, are important targets of this Recommendation. The speech bandwidth can be either narrowband (NB) (300-3400 Hz) or wideband (WB) (100-7000 Hz).

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-G.1011-201506-S!!PDF-E&type=items)

8.5 Planning models

The input for planning models (Figure 8-5) includes the quality planning parameters of networks or terminals. It usually requires prior knowledge about the system under test. Such models can be applied to network planning and terminal/application design.

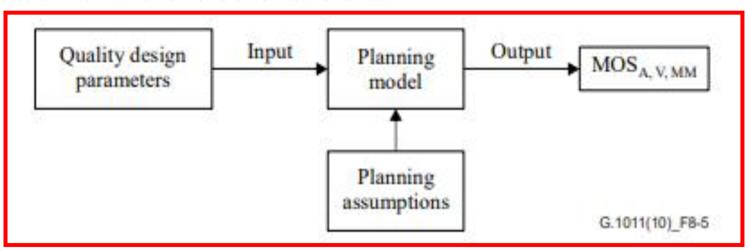


Figure 8-5 – Planning model

Standard examples of such models are [ITU-T G.107] for speech and [ITU-T G.1070] for videophone.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-G.1011-201506-S!!PDF-E&type=items)

Recommendation ITU-T G.107

The E-model: a computational model for use in transmission planning

1 Scope

This Recommendation describes a computational model, known as the E-model, that has proven useful as a transmission planning tool for assessing the combined effects of variations in several transmission parameters that affect conversational[1] quality of 3.1 kHz handset telephony. This computational model can be used, for example, by transmission planners to help ensure that users will be satisfied with end-to-end transmission performance whilst avoiding over-engineering of networks. It must be emphasized that the primary output from the model is the "rating factor" *R* but this can be transformed to give estimates of customer opinion. Such estimates are only made for transmission planning purposes and not for actual customer opinion prediction (for which there is no agreed-upon model recommended by the ITU-T).

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

7 Structure and basic algorithms of the E-model

The E-model is based on the equipment impairment factor method, following previous transmission rating models. It was developed by an ETSI ad hoc group called "Voice Transmission Quality from Mouth to Ear".

The reference connection, as shown in Figure 1, is split into a send side and a receive side. The model estimates the conversational quality from mouth to ear as perceived by the user at the receive side, both as listener and talker.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

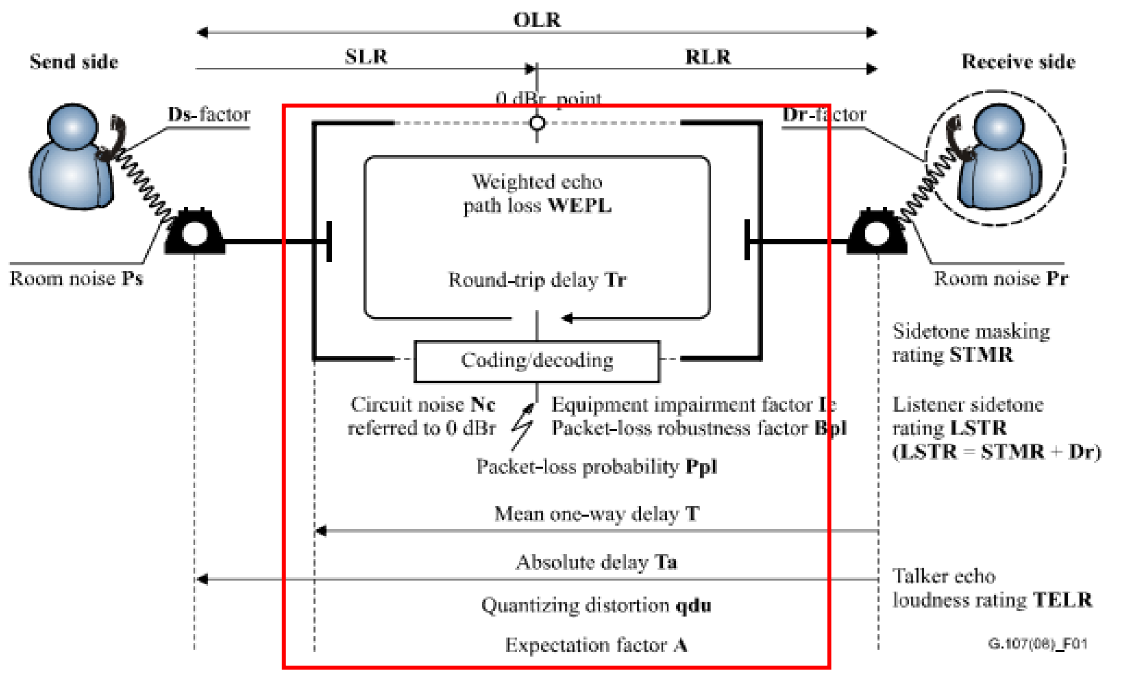


Figure 1 – Reference connection of the E-model

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

7.1 Calculation of the transmission rating factor, R

According to the equipment impairment factor method, the fundamental principle of the E-model is based on a concept given in the description of the OPINE model (see [b-ITU-T P-Sup.3]).

Psychological factors on the psychological scale are additive.

The result of any calculation with the E-model in a first step is a transmission rating factor *R*, which combines all transmission parameters relevant for the considered connection. This rating factor *R* is composed of:

$$R = Ro - Is - Id - Ie\text{-}eff + A \qquad (7\text{-}1)$$

Ro represents in principle the basic signal-to-noise ratio, including noise sources such as circuit noise and room noise. Factor *Is* is a combination of all impairments which occur more or less simultaneously with the voice signal. Factor *Id* represents the impairments caused by delay and the effective equipment impairment factor *Ie-eff* represents impairments caused by low bit-rate codecs. It also includes impairment due to randomly distributed packet losses. The advantage factor *A* allows for compensation of impairment factors when the user benefits from other types of access to the user. The term *Ro* and the *Is* and *Id* values are subdivided into further specific impairment values. The following clauses give the equations used in the E-model.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

An estimated mean opinion score (MOS_{CQE}) for the conversational situation in the scale 1-5 can be obtained from the R-factor using the equations:

For $R < 0$: $MOS_{CQE} = 1$

For $0 < R < 100$: $$MOS_{CQE} = 1 + 0.035R + R(R-60)(100-R)7 \cdot 10^{-6} \quad \text{(B-4)}$$

For $R > 100$: $MOS_{CQE} = 4.5$

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

In some cases, transmission planners may not be familiar with the use of quality measures such as the R rating factor obtained from planning calculations, and thus provisional guidance for interpreting calculated R factors for planning purposes is given in Table B.1[3]. This table also contains equivalent transformed values of R into estimated conversational MOS_{CQE}, GoB and PoW.

Table B.1 – Provisional guide for the relation between *R*-value and user satisfaction

***R*-value (lower limit)**	**MOS_{CQE} (lower limit)**	**GoB (%) (lower limit)**	**PoW (%) (upper limit)**	**User satisfaction**
90	4.34	97	~0	Very satisfied
80	4.03	89	~0	Satisfied
70	3.60	73	6	Some users dissatisfied
60	3.10	50	17	Many users dissatisfied
50	2.58	27	38	Nearly all users dissatisfied

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

7.2.3 MOS-CQE

The score is calculated by a network planning model which aims at predicting the quality in a conversational application situation. Estimates of conversational quality carried out according to [ITU-T G.107], when transformed to mean opinion score, give results in terms of MOS-CQE.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-P.800.1-201607-I!!PDF-E&type=items)

22. The methods practiced by Avaya's use of the accused products include receiving, by the network device, one or more second packetized audio messages and evaluating, by the network device, at least portions of one or more of the one or more second packetized audio messages to obtain measurements associated with the plurality of characteristics. For example, the accused products are used by Avaya to implement the ITU-T G.107 Recommendation. The E-model is applied to a real-time voice call ("second packetized audio messages") for measuring its voice quality by calculating the R value. The R value can be converted into a MOS value. The R value represents the combinational effect of all transmission parameters in an audio conversation. The E-Model estimates the MOS-CQE/audio quality of the speech signals.

7.1 Calculation of the transmission rating factor, R

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Psychological factors on the psychological scale are additive.

The result of any calculation with the E-model in a first step is a transmission rating factor *R*, which combines all transmission parameters relevant for the considered connection. This rating factor *R* is composed of:

$$R = Ro - Is - Id - Ie\text{-}eff + A \qquad (7\text{-}1)$$

Ro represents in principle the basic signal-to-noise ratio, including noise sources such as circuit noise and room noise. Factor *Is* is a combination of all impairments which occur more or less simultaneously with the voice signal. Factor *Id* represents the impairments caused by delay and the effective equipment impairment factor *Ie-eff* represents impairments caused by low bit-rate codecs. It also includes impairment due to randomly distributed packet losses. The advantage factor *A* allows for compensation of impairment factors when the user benefits from other types of access to the user. The term *Ro* and the *Is* and *Id* values are subdivided into further specific impairment values. The following clauses give the equations used in the E-model.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

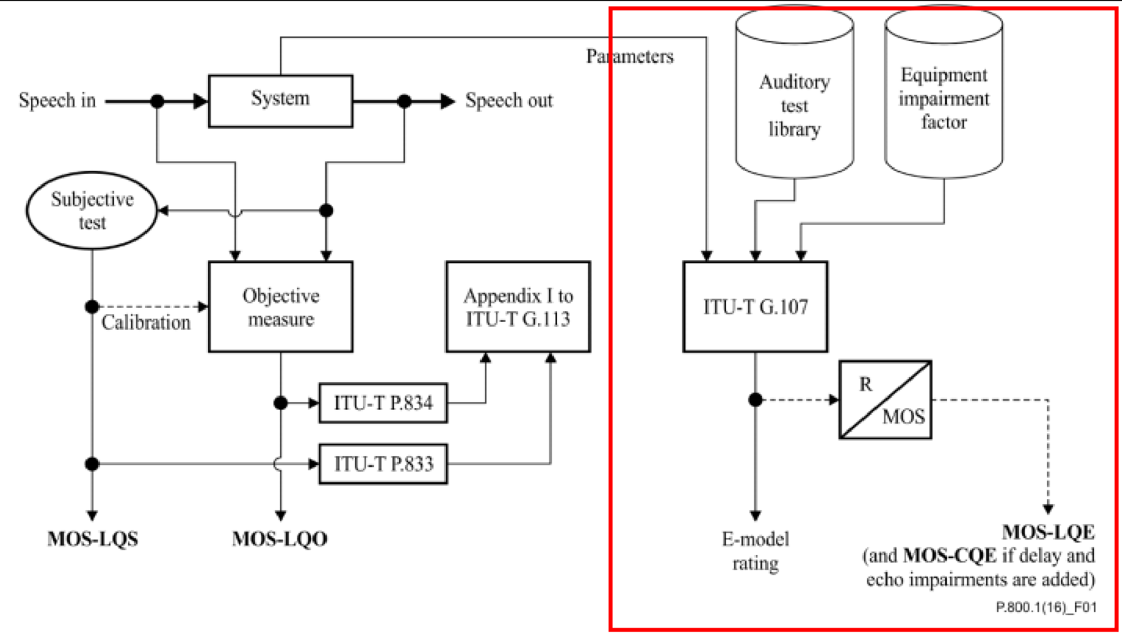

Figure 1 – Relationship between some audio MOS qualifiers

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-P.800.1-201607-I!!PDF-E&type=items)

23. The methods practiced by Avaya's use of the accused products include creating, by the network device, a test matrix using the obtained measurements and comparing, by the network device, the test matrix and the reference matrix to predict a quality level associated with the one or more second packetized audio messages. For example, the accused products are used by Avaya to implement the ITU-T G.107 Recommendation. ITU-T G.107 E-Model estimates MOS-CQE/audio quality of the speech signals. The test speech signal parameters are input to the G.107 E-Model for calculating the R and MOS values. The calculated R/MOS value ("test matrix") is then compared with the reference table ("reference matrix") for determining the perceived

audio quality. For example, a comparison is performed between estimated MOS value and existing reference values to determine the perceived audio quality of the test speech. For instance, a MOS value of 4.5 and a R value of 95 is compared with each row of the reference table and a perceived voice quality is determined accordingly, which is Best/Very satisfied in this case.

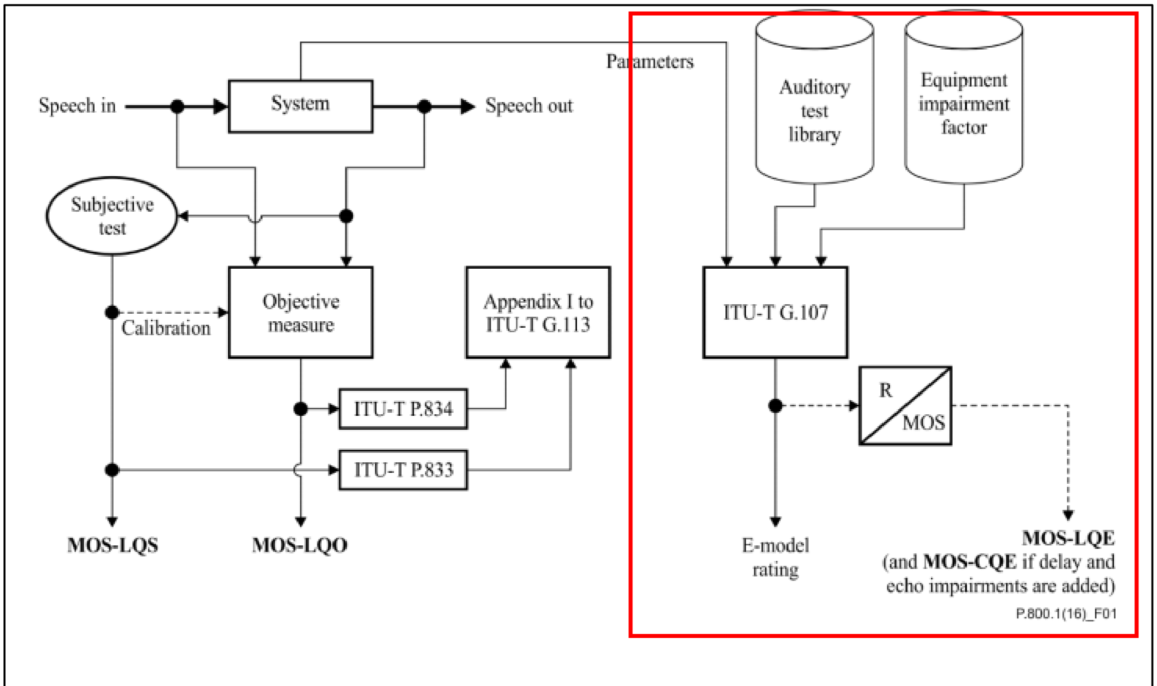

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Table 1 - Definition of categories of speech transmission quality		
Range of E-model Rating R	**Speech transmission quality category**	**User satisfaction**
90 ≤ R < 100	Best	Very satisfied
80 ≤ R < 90	High	Satisfied
70 ≤ R < 80	Medium	Some users dissatisfied
60 ≤ R < 70	Low	Many users dissatisfied
50 ≤ R < 60	Poor	Nearly all users dissatisfied
NOTE 1 – Connections with E-model Ratings R below 50 are not recommended. NOTE 2 – Although the trend in transmission planning is to use E-model Ratings R, equations to convert E-model Ratings R into other metrics, e.g. %MOS, %GoB, PoW can be found in **ITU-T Rec. G.107 Annex B** [1].		

(Source: https://www.itu.int/ITU-T/studygroups/com12/emodelv1/tut.htm)

24. Avaya has infringed the '105 Patent by making, having made, using, importing, providing, supplying, distributing, selling or offering for sale products including the claimed non-transitory computer-readable medium having instructions stored thereon configured to cause a computing device to perform operations, and those operations including obtaining a reference matrix based on estimates of perceived audio quality of at least portions of one or more first packetized audio messages, the reference matrix modeling values of a plurality of characteristics associated with a particular quality level. For example, the accused products are configured to be used to implement the ITU-T G.107 Recommendation. The quality of audio in VoIP networks (packet switched networks) is calculated using MOS (Mean Opinion score) values according to ITU-T G.107 Recommendation E-model. The E-model computes a transmission rating value R, which is a combinational effect of all the transmission parameters in an audio conversation. The E-model uses a reference table ("reference matrix") based on the estimates of perceived audio conversational/audio quality. The reference table includes modelling values like MOS-CQE (Mean Opinion Score – Estimated Conversational Quality), each associated with a quality level.

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– Conversational voice and voice messaging

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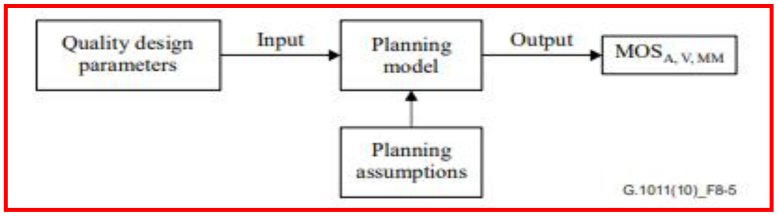

Figure 8-5 – Planning model

Standard examples of such models are [ITU-T G.107] for speech and [ITU-T G.1070] for videophone.

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Recommendation ITU-T G.107

The E-model: a computational model for use in transmission planning

1 Scope

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7 Structure and basic algorithms of the E-model

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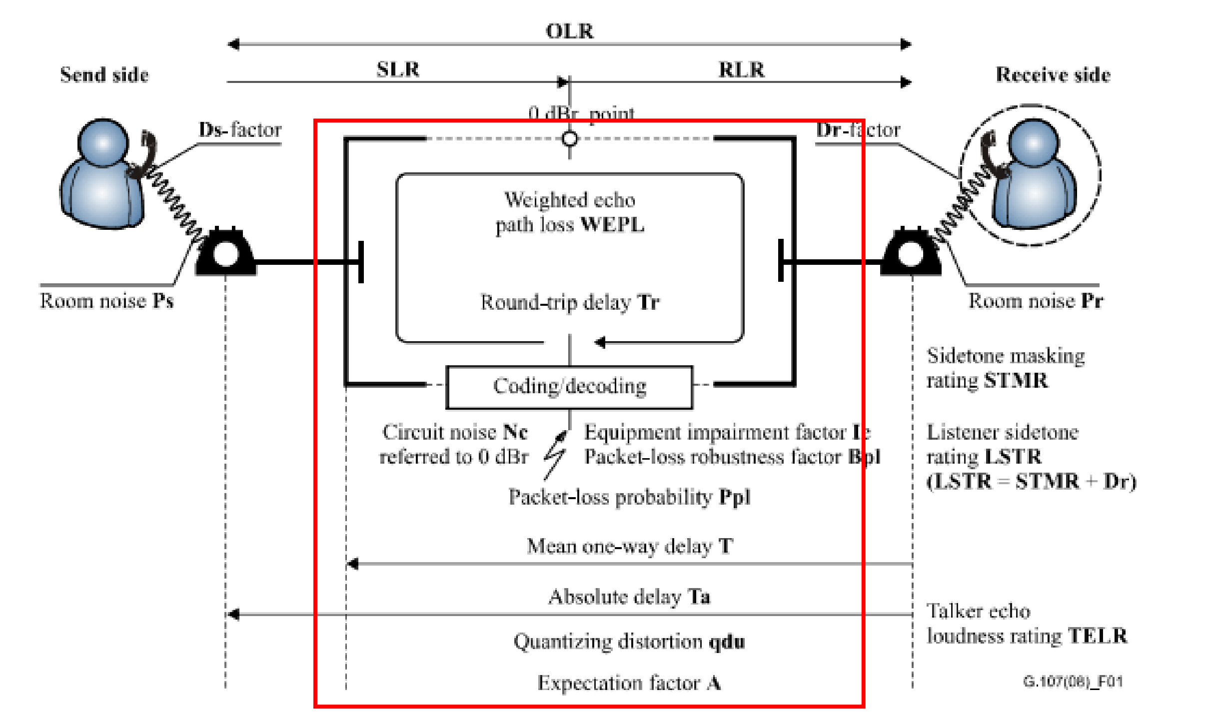

Figure 1 – Reference connection of the E-model

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According to the equipment impairment factor method, the fundamental principle of the E-model is based on a concept given in the description of the OPINE model (see [b-ITU-T P-Sup.3]).

Psychological factors on the psychological scale are additive.

The result of any calculation with the E-model in a first step is a transmission rating factor *R*, which combines all transmission parameters relevant for the considered connection. This rating factor *R* is composed of:

$$R = Ro - Is - Id - Ie\text{-}eff + A \qquad (7\text{-}1)$$

Ro represents in principle the basic signal-to-noise ratio, including noise sources such as circuit noise and room noise. Factor *Is* is a combination of all impairments which occur more or less simultaneously with the voice signal. Factor *Id* represents the impairments caused by delay and the effective equipment impairment factor *Ie-eff* represents impairments caused by low bit-rate codecs. It also includes impairment due to randomly distributed packet losses. The advantage factor *A* allows for compensation of impairment factors when the user benefits from other types of access to the user. The term *Ro* and the *Is* and *Id* values are subdivided into further specific impairment values. The following clauses give the equations used in the E-model.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

An estimated mean opinion score (MOS_{CQE}) for the conversational situation in the scale 1-5 can be obtained from the R-factor using the equations:

For $R < 0$: $MOS_{CQE} = 1$

For $0 < R < 100$: $MOS_{CQE} = 1 + 0.035R + R(R-60)(100-R)7 \cdot 10^{-6}$ (B-4)

For $R > 100$: $MOS_{CQE} = 4.5$

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

In some cases, transmission planners may not be familiar with the use of quality measures such as the R rating factor obtained from planning calculations, and thus provisional guidance for interpreting calculated R factors for planning purposes is given in Table B.1[3]. This table also contains equivalent transformed values of R into estimated conversational MOS_{CQE}, GoB and PoW.

Table B.1 – Provisional guide for the relation between *R*-value and user satisfaction

***R*-value (lower limit)**	**MOS_{CQE} (lower limit)**	**GoB (%) (lower limit)**	**PoW (%) (upper limit)**	**User satisfaction**
90	4.34	97	~0	Very satisfied
80	4.03	89	~0	Satisfied
70	3.60	73	6	Some users dissatisfied
60	3.10	50	17	Many users dissatisfied
50	2.58	27	38	Nearly all users dissatisfied

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

7.2.3 MOS-CQE

The score is calculated by a network planning model which aims at predicting the quality in a conversational application situation. Estimates of conversational quality carried out according to [ITU-T G.107], when transformed to mean opinion score, give results in terms of MOS-CQE.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-P.800.1-201607-I!!PDF-E&type=items)

25. The operations performed by the accused products include creating a test matrix using measurements of at least portions of one or more second packetized audio messages associated with the plurality of characteristics and predicting a quality level associated with the at least portions of one or more second packetized audio messages by comparing the test matrix to the reference matrix. For example, the accused products are configured to be used to implement the ITU-T G.107 Recommendation. The E-model is applied to a real-time voice call ("second packetized audio messages") for measuring its voice quality by calculating the R value. The R value can be converted into a MOS value. The R value represents the combinational effect of all transmission parameters in an audio conversation. ITU-T G.107 E-Model estimates MOS-CQE/audio quality of the speech signals. The test speech signal parameters are input to the G.107 E model for calculating the R and MOS values. The calculated R/MOS value ("test matrix") is then compared with the reference table ("reference matrix") for determining the perceived audio quality. For example, a comparison is performed between estimated MOS value and existing reference values to determine the perceived audio quality of the test speech. For instance, a MOS value of 4.5 and a R value of 95 would be compared with each row of the reference table and a perceived voice quality is determined accordingly, which is Best/Very satisfied in this case.

7.1 Calculation of the transmission rating factor, R

According to the equipment impairment factor method, the fundamental principle of the E-model is based on a concept given in the description of the OPINE model (see [b-ITU-T P-Sup.3]).

Psychological factors on the psychological scale are additive.

The result of any calculation with the E-model in a first step is a transmission rating factor *R*, which combines all transmission parameters relevant for the considered connection. This rating factor *R* is composed of:

$$R = Ro - Is - Id - Ie\text{-}eff + A \quad (7\text{-}1)$$

Ro represents in principle the basic signal-to-noise ratio, including noise sources such as circuit noise and room noise. Factor *Is* is a combination of all impairments which occur more or less simultaneously with the voice signal. Factor *Id* represents the impairments caused by delay and the effective equipment impairment factor *Ie-eff* represents impairments caused by low bit-rate codecs. It also includes impairment due to randomly distributed packet losses. The advantage factor *A* allows for compensation of impairment factors when the user benefits from other types of access to the user. The term *Ro* and the *Is* and *Id* values are subdivided into further specific impairment values. The following clauses give the equations used in the E-model.

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An estimated mean opinion score (MOS_{CQE}) for the conversational situation in the scale 1-5 can be obtained from the *R*-factor using the equations:

For $R < 0$: $MOS_{CQE} = 1$

For $0 < R < 100$: $MOS_{CQE} = 1 + 0.035R + R(R-60)(100-R)7 \cdot 10^{-6}$ (B-4)

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(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

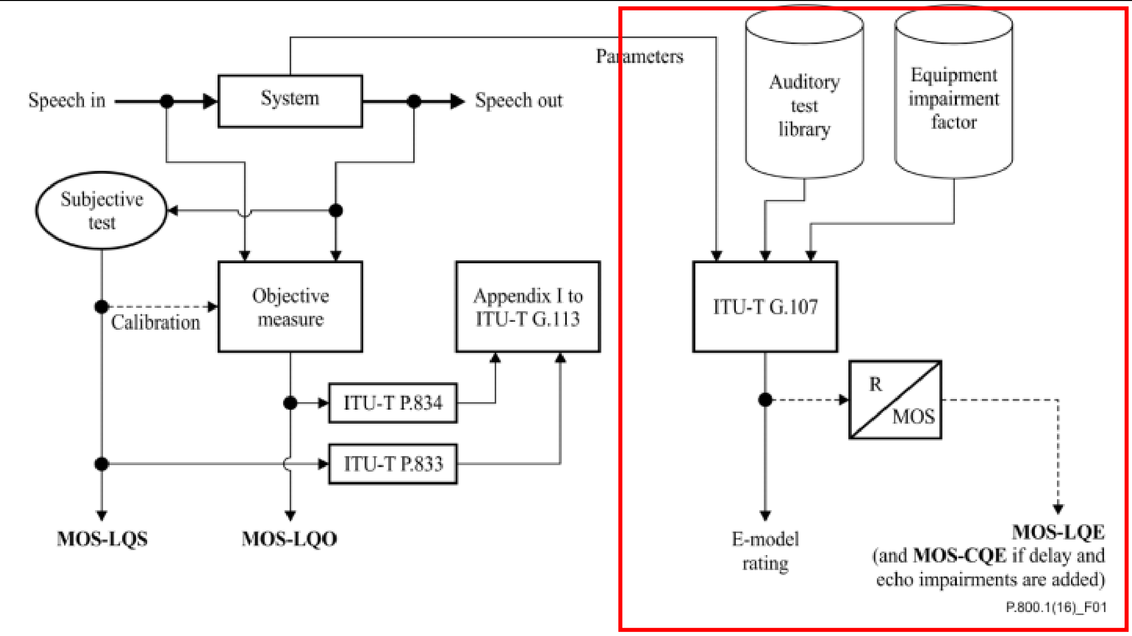

Figure 1 – Relationship between some audio MOS qualifiers

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-P.800.1-201607-I!!PDF-E&type=items)

In some cases, transmission planners may not be familiar with the use of quality measures such as the *R* rating factor obtained from planning calculations, and thus provisional guidance for interpreting calculated *R* factors for planning purposes is given in Table B.1[3]. This table also contains equivalent transformed values of *R* into estimated conversational MOS_{CQE}, GoB and PoW.

Table B.1 – Provisional guide for the relation between *R*-value and user satisfaction

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50	2.58	27	38	Nearly all users dissatisfied

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

Table 1 - Definition of categories of speech transmission quality

Range of E-model Rating R	Speech transmission quality category	User satisfaction
90 ≤ R < 100	Best	Very satisfied
80 ≤ R < 90	High	Satisfied
70 ≤ R < 80	Medium	Some users dissatisfied
60 ≤ R < 70	Low	Many users dissatisfied
50 ≤ R < 60	Poor	Nearly all users dissatisfied
NOTE 1 – Connections with E-model Ratings R below 50 are not recommended. NOTE 2 – Although the trend in transmission planning is to use E-model Ratings R, equations to convert E-model Ratings R into other metrics, e.g. %MOS, %GoB, PoW can be found in **ITU-T Rec. G.107 Annex B** [1].		

(Source: https://www.itu.int/ITU-T/studygroups/com12/emodelv1/tut.htm)

26. Avaya has had actual knowledge of the ‘105 Patent at least as of the date when it was notified of the filing of this action. By the time of trial, Avaya will have known and intended (since receiving such notice) that its continued actions would infringe and actively induce and contribute to the infringement of one or more claims of the ‘105 Patent.

27. Avaya has also indirectly and willfully infringed, and continues to indirectly and willfully infringe, the ‘105 Patent, as explained further below in the “Additional Allegations Regarding Infringement” section.

28. Far North Patents has been damaged as a result of the infringing conduct by Avaya alleged above. Thus, Avaya is liable to Far North Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

29. Far North Patents and/or its predecessors-in-interest have satisfied all statutory obligations required to collect pre-filing damages for the full period allowed by law for infringement of the ‘105 Patent.

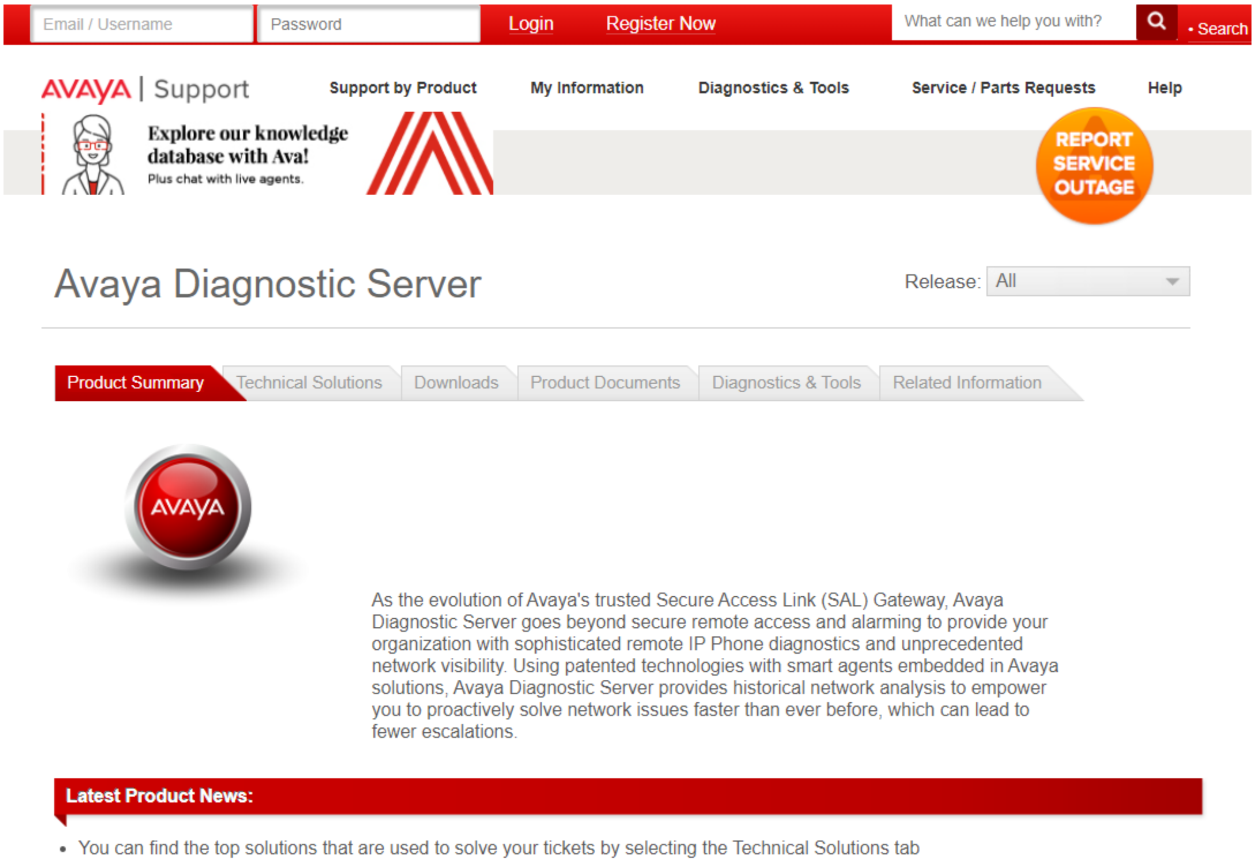
COUNT II

INFRINGEMENT OF U.S. PATENT NO. 8,068,437

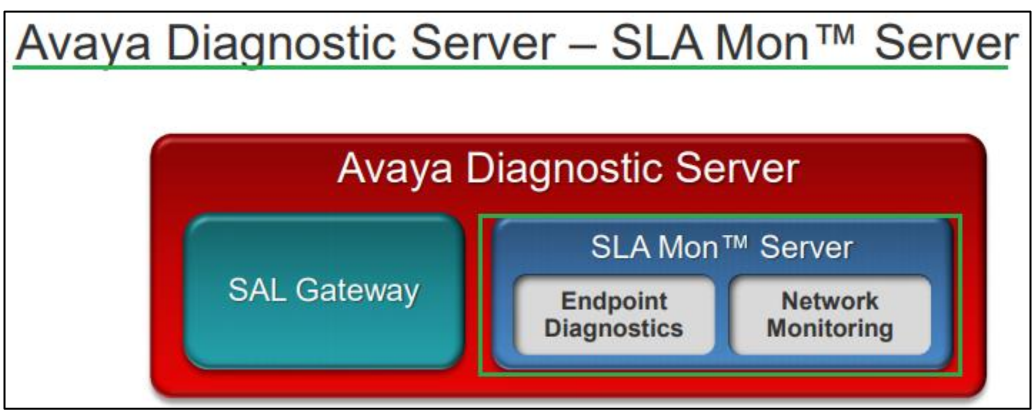
30. On November 29, 2011, United States Patent No. 8,068,437 (“the ‘437 Patent”) was duly and legally issued by the United States Patent and Trademark Office for an invention entitled “Determining the Effects of New Types of Impairments on Perceived Quality of a Voice Service.”

31. Far North Patents is the owner of the ‘437 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the ‘437 Patent against infringers, and to collect damages for all relevant times.

32. Avaya made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Avaya Diagnostic Server with SLA Monitor family of products that include advanced quality monitoring capabilities (collectively, “accused products”).



(Source : https://support.avaya.com/products/P1558/avaya-diagnostic-server/All)



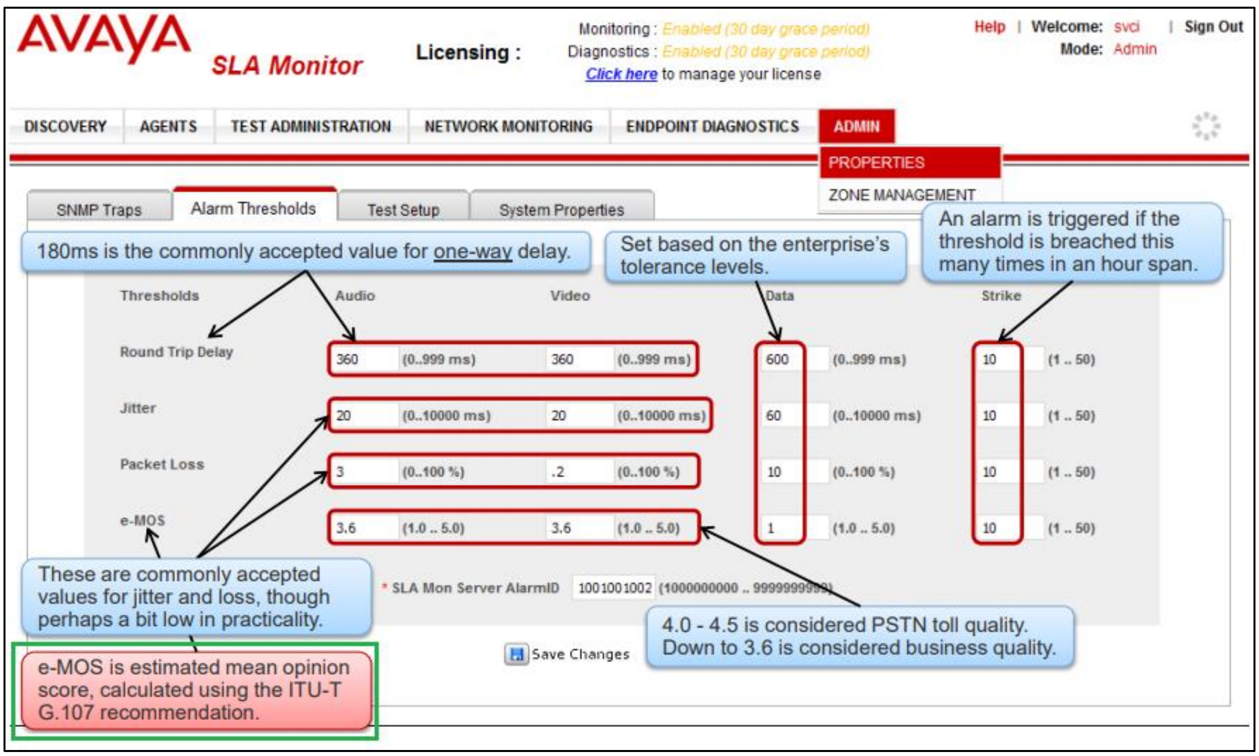
(Source : https://downloads.avaya.com/css/P8/documents/101042613)

SLA Mon server and agent deployment

You can use the SLA Mon server and agents for network monitoring purposes, providing a network wide analysis of differentiated services (DiffServ) and relationship of DiffServ to the network performance.

The SLA Mon server is configured to run periodic Real-time Transport Protocol (RTP) tests between pairs of SLA Mon agents that are present on Avaya endpoints. The SLA Mon server analyzes the test data and monitors network quality of service (QoS), such as loss, jitter, delay, and e-MOS. The SLA Mon server provides a history of network QoS metric and the relationship of the QoS parameters to the network topology and DiffServ.

(Source : https://downloads.avaya.com/css/P8/documents/101037184)



(Source : https://downloads.avaya.com/css/P8/documents/101042613)

Thresholds for e-MOS:	
Audio	The Estimated mean opinion score (e-MOS) threshold for audio traffic. If the Network Voice Quality (NVQ), an estimation of MOS, measured for a test of audio traffic is less than this configured value, the SLA Mon server considers the occurrence to generate a QoS alarm. You must enter a value between 1.0 to 5.0. The default value is 3.6.
Video	The e-MOS threshold for video traffic. If the NVQ measured for a test of video traffic is less than this configured value, the SLA Mon server considers the occurrence to generate a QoS alarm. You must enter a value between 1.0 to 5.0. The default value is 3.6.
Data	The e-MOS threshold for data traffic. If the NVQ measured for a test of data traffic is less than this configured value, the SLA Mon server considers the occurrence to generate a QoS alarm. You must enter a value between 1.0 to 5.0. The default value is 1.

(Source : https://downloads.avaya.com/css/P8/documents/101037184)

33. By doing so, Avaya has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 9 of the '437 Patent.

34. Avaya has infringed the '437 Patent by using the accused products and thereby practicing a method performed by a computer system that includes generating, by a processor of the computer system, an assumed model for a second communication service, where the assumed model is used to transform data regarding a first performance characteristic in the second communication service to reflect effects from a second performance characteristic in the second communication service. For example, the accused products are and have been used by Avaya to implement the ITU-T G.107 Recommendation. The ITU-T G.107 Recommendation includes an E-model for calculating voice quality as perceived by a typical telephone user. The E-model outputs a transmission rating factor i.e., R, which can be transformed into Mean Opinion Score i.e.,

MOS value that represents the voice quality. The R value combines the effects of all relevant transmission parameters, and comprises of an effective Equipment impairment factor, $I_{e\text{-}eff}$. The E-model is applied to a real-time voice call ("second communication service") for measuring its voice quality. The effective Equipment impairment factor is calculated using a mathematical algorithm ("assumed model"). The mathematical algorithm includes an addition of two values. The first value is an equipment impairment factor ("first performance characteristic") at zero packet loss, or I_e. The I_e values are based on subjective MOS test results and are predefined for different codecs in ITU-T G.113 recommendation. The second value is a computation of different packet-loss-based parameters ("second performance characteristic") namely, a packet loss robustness factor (Bpl), packet loss probability (Ppl) and a burst ratio. Thus, the computed $I_{e\text{-}eff}$ value reflects the effects of packet loss in the voice quality.

The E-model: a computational model for use in transmission planning

1 Scope

This Recommendation describes a computational model, known as the E-model, that has proven useful as a transmission planning tool for assessing the combined effects of variations in several transmission parameters that affect the conversational[1] quality of 3.1 kHz handset telephony. This computational model can be used, for example, by transmission planners to help ensure that users will be satisfied with end-to-end transmission performance whilst avoiding over-engineering of networks. It must be emphasized that the primary output from the model is the "rating factor" *R* but this can be transformed to give estimates of customer opinion. Such estimates are only made for transmission planning purposes and not for actual customer opinion prediction (for which there is no agreed-upon model recommended by the ITU-T).

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

An estimated mean opinion score (MOS_{CQE}) for the conversational situation in the scale 1-5 can be obtained from the R-factor using the equations:

For $R < 0$: $MOS_{CQE} = 1$

For $0 < R < 100$: $MOS_{CQE} = 1 + 0.035R + R(R-60)(100-R)7 \cdot 10^{-6}$ (B-4)

For $R > 100$: $MOS_{CQE} = 4.5$

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

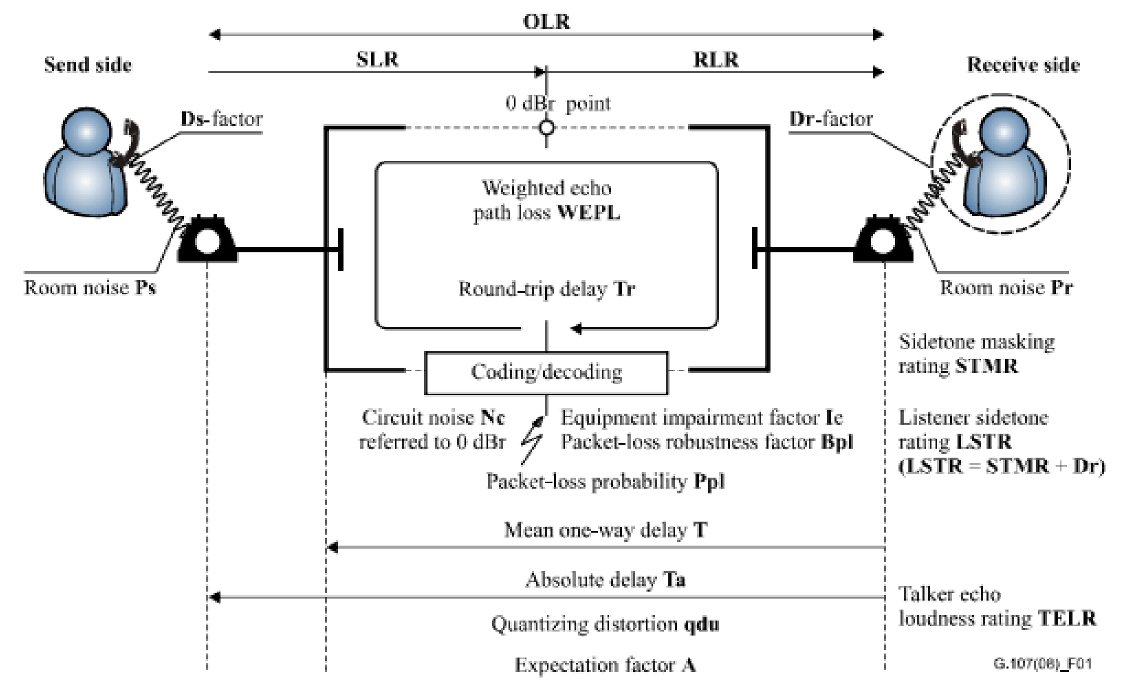


Figure 1 – Reference connection of the E-model

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

7.1 Calculation of the transmission rating factor, R

According to the equipment impairment factor method, the fundamental principle of the E-model is based on a concept given in the description of the OPINE model, see [b-ITU-T P-Sup.3].

Psychological factors on the psychological scale are additive.

The result of any calculation with the E-model in a first step is a transmission rating factor *R*, which combines all transmission parameters relevant for the considered connection. This rating factor *R* is composed of:

$$R = Ro - Is - Id - Ie\text{-}eff + A \qquad (7\text{-}1)$$

Ro represents in principle the basic signal-to-noise ratio, including noise sources such as circuit noise and room noise. Factor *Is* is a combination of all impairments which occur more or less simultaneously with the voice signal. Factor *Id* represents the impairments caused by delay and the effective equipment impairment factor *Ie-eff* represents impairments caused by low bit-rate codecs. It also includes impairment due to randomly distributed packet losses. The advantage factor *A* allows for compensation of impairment factors when the user benefits from other types of access to the user. The term *Ro* and the *Is* and *Id* values are subdivided into further specific impairment values. The following clauses give the equations used in the E-model.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

7.5 Equipment impairment factor, Ie

The values for the equipment impairment factor *Ie* of elements using low bit-rate codecs are not related to other input parameters. They depend on subjective mean opinion score (MOS) test results as well as on network experience. Refer to Appendix I of [ITU-T G.113] for the currently recommended values of *Ie*.

Specific impairment factor values for codec operation under random[2] packet-loss have formerly been treated using tabulated, packet-loss dependent *Ie*-values. Now, the packet-loss robustness factor *Bpl* is defined as a codec-specific value. The packet-loss dependent effective equipment impairment factor *Ie-eff* is derived using the codec-specific value for the equipment impairment factor at zero packet-loss *Ie* and the packet-loss robustness factor *Bpl*, both listed in Appendix I of [ITU-T G.113] for several codecs. With the packet-loss probability *Ppl*, *Ie-eff* is calculated using the equation:

$$Ie\text{-}eff = Ie + (95 - Ie) \cdot \frac{Ppl}{\frac{Ppl}{BurstR} + Bpl} \qquad (7\text{-}29)$$

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

This appendix provides up-to-date information on available values of the equipment impairment factor, *Ie*, and packet-loss robustness factor, *Bpl*, for codecs or codec families. It is intended to be updated regularly.

Table I.1 provides provisional planning values for the equipment impairment factor, *Ie*. These *Ie* values refer to non-error conditions without propagation errors, frame-erasures or packet loss. Subsequent tables deal with error and various loss conditions.

Table I.1 – Provisional planning values for the equipment impairment factor, *Ie*

Codec type	Reference	Operating rate [kbit/s]	*Ie* value
PCM (see Note)	G.711	64	0
ADPCM	G.726, G.727	40	2
	G.721, G.726, G.727	32	7
	G.726, G.727	24	25
	G.726, G.727	16	50

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-G.113-200711-I!!PDF-E&type=items)

35. The methods practiced by Avaya's use of the accused products include establishing, by the processor, a communication session via the second communication service and obtaining, by the processor, subjective ratings of the first performance characteristic in the second communication service using the established communication session. For example, the accused products are and have been used by Avaya to implement the ITU-T G.107 Recommendation. The E-model is applied to a real-time voice call session over a system including the accused products ("second communication service") for measuring the call's voice quality by calculating the R value. The R value comprises of an effective Equipment impairment factor, $I_{e\text{-}eff}$ which is calculated using various parameters like an equipment impairment factor at zero packet loss I_e ("first

performance characteristic"), and other packet loss based parameters. The I_e values ("subjective ratings") are derived from the results of subjective listening-only tests and are used as an input to the E-Model. They can be obtained from predefined values based on the implemented codec.

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Ro represents in principle the basic signal-to-noise ratio, including noise sources such as circuit noise and room noise. Factor *Is* is a combination of all impairments which occur more or less simultaneously with the voice signal. Factor *Id* represents the impairments caused by delay and the effective equipment impairment factor *Ie-eff* represents impairments caused by low bit-rate codecs. It also includes impairment due to randomly distributed packet losses. The advantage factor *A* allows for compensation of impairment factors when the user benefits from other types of access to the user. The term *Ro* and the *Is* and *Id* values are subdivided into further specific impairment values. The following clauses give the equations used in the E-model.

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$$Ie\text{-}eff = Ie + (95 - Ie) \cdot \frac{Ppl}{\frac{Ppl}{BurstR} + Bpl} \qquad (7\text{-}29)$$

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36. The methods practiced by Avaya's use of the accused products include generating, by the processor, altered subjective ratings using the assumed model to reflect effects of the second performance characteristic on the subjective ratings. For example, the accused products are and have been used by Avaya to implement the ITU-T G.107 Recommendation. The effective equipment impairment factor $I_{e\text{-}eff}$ is calculated using a mathematical algorithm ("assumed model"). The mathematical algorithm includes an addition of two values. The first value is an equipment impairment factor ("first performance characteristic") at zero packet loss i.e., I_e. The I_e values are based on subjective MOS test results and are predefined for different codecs in ITU-T G.113

recommendation. The second value is a computation of different packet loss ("second performance characteristic") based parameters namely, a packet loss robustness factor (Bpl), packet loss probability (Ppl) and a burst ratio. Thus, the computed $I_{e\text{-}eff}$ value reflects the effects of packet loss on the equipment impairment factor at zero packet loss.

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(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

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	G.726, G.727	16	50

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-G.113-200711-I!!PDF-E&type=items)

37. The methods practiced by Avaya's use of the accused products include generating, by the processor, quality index values from the altered subjective ratings. For example, the accused products are and have been used by Avaya to implement the ITU-T G.107 Recommendation. The MOS_{CQE} values are calculated using the R values. The R value is calculated using various parameters which includes the effective equipment impairment factor $I_{e\text{-}eff}$ ("altered subjective rating").

7.1 Calculation of the transmission rating factor, R

According to the equipment impairment factor method, the fundamental principle of the E-model is based on a concept given in the description of the OPINE model, see [b-ITU-T P-Sup.3].

Psychological factors on the psychological scale are additive.

The result of any calculation with the E-model in a first step is a transmission rating factor *R*, which combines all transmission parameters relevant for the considered connection. This rating factor *R* is composed of:

$$R = Ro - Is - Id - Ie\text{-}eff + A \qquad (7\text{-}1)$$

Ro represents in principle the basic signal-to-noise ratio, including noise sources such as circuit noise and room noise. Factor *Is* is a combination of all impairments which occur more or less simultaneously with the voice signal. Factor *Id* represents the impairments caused by delay and the effective equipment impairment factor *Ie-eff* represents impairments caused by low bit-rate codecs. It also includes impairment due to randomly distributed packet losses. The advantage factor *A* allows for compensation of impairment factors when the user benefits from other types of access to the user. The term *Ro* and the *Is* and *Id* values are subdivided into further specific impairment values. The following clauses give the equations used in the E-model.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

An estimated mean opinion score (MOS_{CQE}) for the conversational situation in the scale 1-5 can be obtained from the *R*-factor using the equations:

For $R < 0$: $MOS_{CQE} = 1$

For $0 < R < 100$: $MOS_{CQE} = 1 + 0.035R + R(R-60)(100-R)7\cdot 10^{-6}$ (B-4)

For $R > 100$: $MOS_{CQE} = 4.5$

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

38. The methods practiced by Avaya's use of the accused products include comparing, by the processor, the generated quality index values to quality index values of a first communication service and determining, by the processor, whether the quality of the second communication service is comparable to a quality of the first communication

service based on the comparison. For example, the accused products are and have been used by Avaya to implement the ITU-T G.107 Recommendation. The E-model is based on modeling the results from multiple subjective tests performed on a wide range of transmission parameters. It also includes a reference table with different R value and MOS value thresholds, and corresponding perceived voice quality. The MOS values (quality index) in the reference table are obtained using an aggregate of multiple test calls' ("first communication service") data. The computed MOS value is then compared with the reference table. Based on the comparison, it is determined whether the computed MOS value is comparable to the reference MOS value—e.g., whether the second communication service is expected to fall into the same user satisfaction category as the first communication service.

The E-model (**ITU-T Rec. G.107** [1]) is a transmission planning tool that provides a prediction of the expected voice quality, as perceived by a typical telephone user, for a complete end-to-end (i.e. mouth-to-ear) telephone connection under conversational conditions. The E-model takes into account a wide range of telephony-band impairments, in particular the impairment due to low bit-rate coding devices and one-way delay, as well as the "classical" telephony impairments of loss, noise and echo. It can be applied to assess the voice quality of wireline and wireless scenarios, based on circuit-switched and packet-switched technology.

The E-model is based on modeling the results from a large number of subjective tests done in the past on a wide range of transmission parameters. The primary output of the E-model calculations is a scalar quality rating value known as the "Transmission Rating Factor, R". R can be transformed into other quality measures such as Mean Opinion Score (MOS-CQE [2]), Percentage Good or Better ((GoB) or Percentage Poor or Worse ((PoW). However, caution should be exercised when comparing these transformed measures with values of MOS, %GoB or %PoW from other sources, which may not have been obtained under comparable conditions.

(Source: https://www.itu.int/ITU-T/studygroups/com12/emodelv1/tut.htm)

Table B.1 – Provisional guide for the relation between *R*-value and user satisfaction

***R*-value (lower limit)**	**MOS_{CQE} (lower limit)**	**GoB (%) (lower limit)**	**PoW (%) (upper limit)**	**User satisfaction**
90	4.34	97	~0	Very satisfied
80	4.03	89	~0	Satisfied
70	3.60	73	6	Some users dissatisfied
60	3.10	50	17	Many users dissatisfied
50	2.58	27	38	Nearly all users dissatisfied

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

An estimated mean opinion score (MOS_{CQE}) for the conversational situation in the scale 1-5 can be obtained from the R-factor using the equations:

For $R < 0$: $MOS_{CQE} = 1$

For $0 < R < 100$: $MOS_{CQE} = 1 + 0.035R + R(R-60)(100-R)7 \cdot 10^{-6}$ (B-4)

For $R > 100$: $MOS_{CQE} = 4.5$

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

Table 1 - Definition of categories of speech transmission quality

Range of E-model Rating R	Speech transmission quality category	User satisfaction
$90 \le R < 100$	Best	Very satisfied
$80 \le R < 90$	High	Satisfied
$70 \le R < 80$	Medium	Some users dissatisfied
$60 \le R < 70$	Low	Many users dissatisfied
$50 \le R < 60$	Poor	Nearly all users dissatisfied

NOTE 1 – Connections with E-model Ratings R below 50 are not recommended.
NOTE 2 – Although the trend in transmission planning is to use E-model Ratings R, equations to convert E-model Ratings R into other metrics, e.g. %MOS, %GoB, PoW can be found in **ITU-T Rec. G.107 Annex B** [1].

(Source: https://www.itu.int/ITU-T/studygroups/com12/emodelv1/tut.htm)

39. Far North Patents only asserts method claims from the ‘437 Patent.

40. Avaya has had knowledge of the ‘437 Patent at least as of its issuance on November 29, 2011. For example, Avaya has had knowledge of patents related to the ‘437 Patent at least as of July 3, 2007, when the ‘230 Patent, which is the grandparent of the ‘437 Patent, was used by the examiner during the prosecution of U.S. Patent Application No. 10/070,338 (“the ‘338 application”), titled “Method and Apparatus for Characterizing the Quality of a Network Path,” to reject pending claim 49 as obvious. The ‘282 Patent, which is the parent of the ‘437 Patent, was also cited by the examiner

during that same prosecution on July 21, 2008. The '338 application, and the patent that issued therefrom, was originally assigned to Routescience Technologies, Inc., a predecessor in interest to Avaya, and then ultimately assigned to Avaya Inc. Avaya went on to cite the '230 Patent and the '282 Patent to the United States Patent and Trademark Office during the prosecution of numerous additional patent applications. Avaya employees Mansour J. Karam, Sean P. Finn, Omar C. Baldonado, Michael A. Lloyd, Herbert S. Madden, and James G. McGuire, who are listed as inventors on U.S. Patent Application No. 10/070,338, and others involved in the prosecution of the patent, including Matthew R. Ellsworth, Douglas W. Swartz, and Yolanda Del Toro, have had knowledge of the '437 Patent at least as of its issuance on November 29, 2011.

41. Avaya has also indirectly and willfully infringed the '437 Patent, as explained further below in the "Additional Allegations Regarding Infringement" section.

42. Far North Patents has been damaged as a result of the infringing conduct by Avaya alleged above. Thus, Avaya is liable to Far North Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

43. Far North Patents and/or its predecessors-in-interest have satisfied all statutory obligations required to collect pre-filing damages for the full period allowed by law for infringement of the '437 Patent.

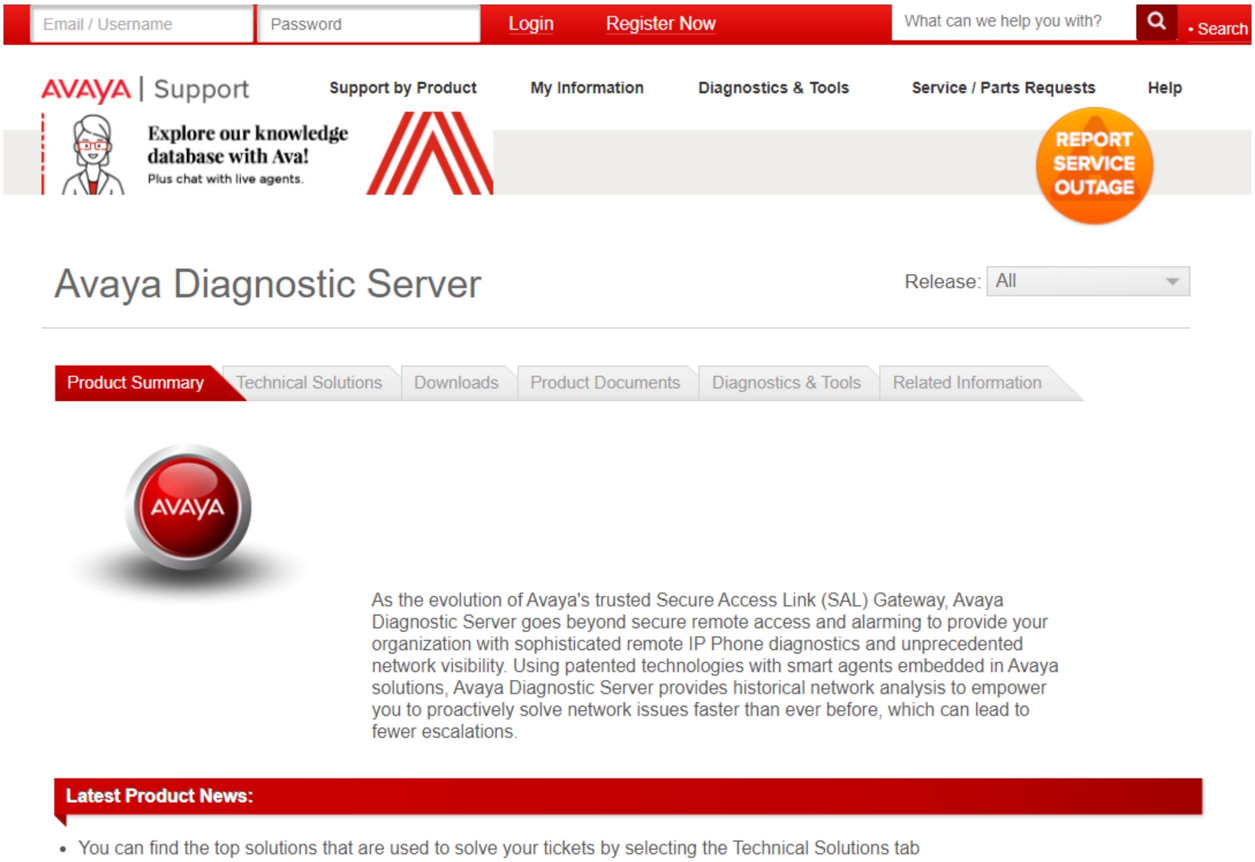
COUNT III

INFRINGEMENT OF U.S. PATENT NO. 7,085,230

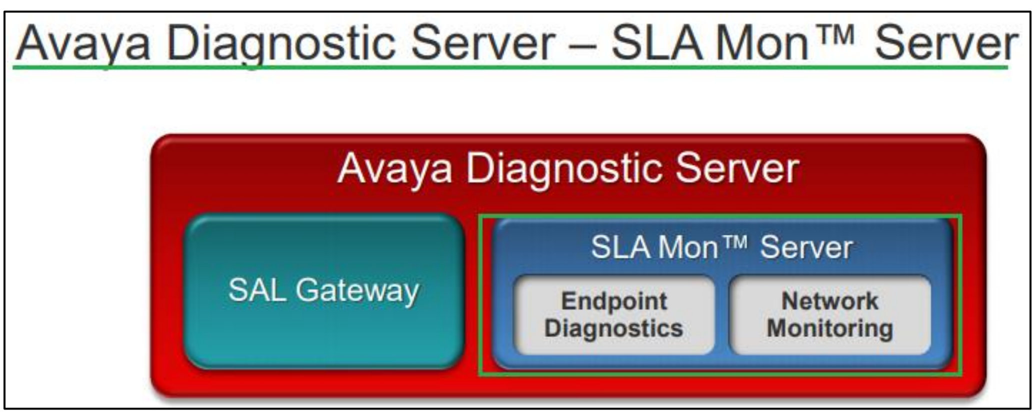
44. On August 1, 2006, United States Patent No. 7,085,230 ("the '230 Patent") was duly and legally issued by the United States Patent and Trademark Office for an invention entitled "Method and System for Evaluating the Quality of Packet-Switched Voice Signals."

45. Far North Patents is the owner of the '230 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the '230 Patent against infringers, and to collect damages for all relevant times.

46. Avaya made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Avaya Diagnostic Server with SLA Monitor family of products that include advanced quality monitoring capabilities (collectively, "accused products").



(Source : https://support.avaya.com/products/P1558/avaya-diagnostic-server/All)



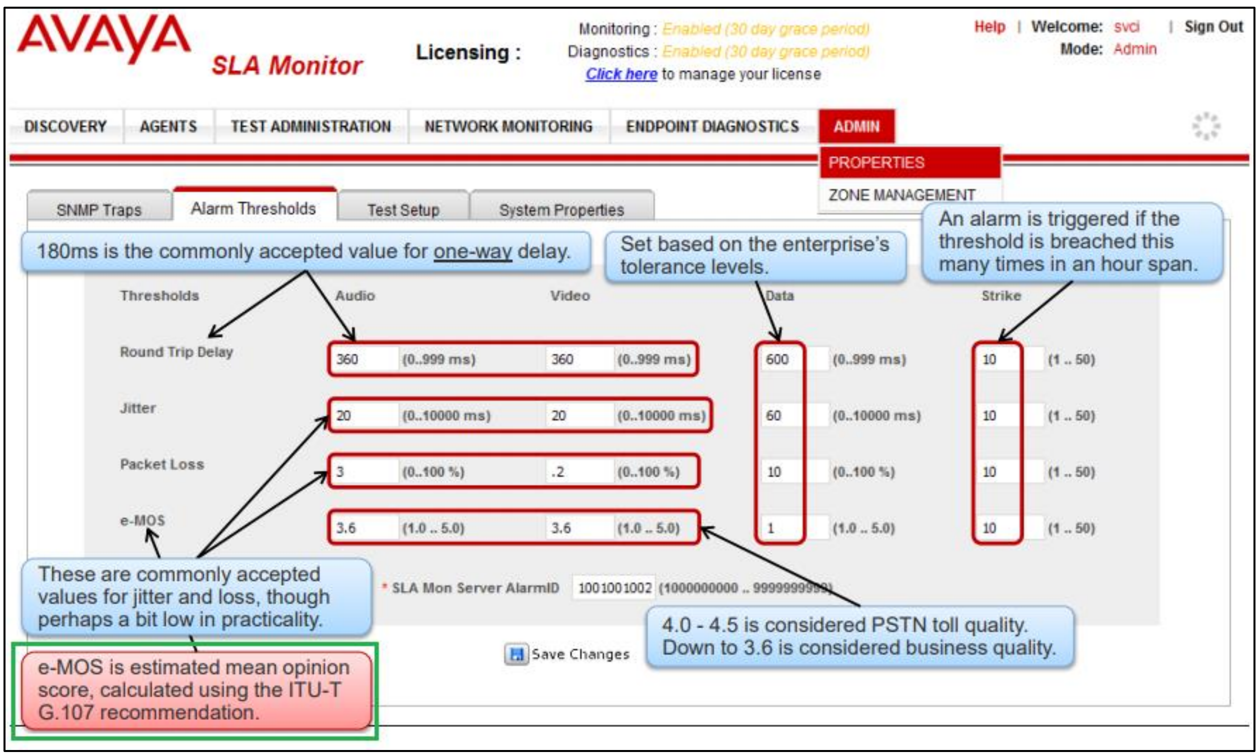
(Source : https://downloads.avaya.com/css/P8/documents/101042613)

SLA Mon server and agent deployment

You can use the SLA Mon server and agents for network monitoring purposes, providing a network wide analysis of differentiated services (DiffServ) and relationship of DiffServ to the network performance.

The SLA Mon server is configured to run periodic Real-time Transport Protocol (RTP) tests between pairs of SLA Mon agents that are present on Avaya endpoints. The SLA Mon server analyzes the test data and monitors network quality of service (QoS), such as loss, jitter, delay, and e-MOS. The SLA Mon server provides a history of network QoS metric and the relationship of the QoS parameters to the network topology and DiffServ.

(Source : https://downloads.avaya.com/css/P8/documents/101037184)



(Source : https://downloads.avaya.com/css/P8/documents/101042613)

Thresholds for e-MOS:	
Audio	The Estimated mean opinion score (e-MOS) threshold for audio traffic. If the Network Voice Quality (NVQ), an estimation of MOS, measured for a test of audio traffic is less than this configured value, the SLA Mon server considers the occurrence to generate a QoS alarm. You must enter a value between 1.0 to 5.0. The default value is 3.6.
Video	The e-MOS threshold for video traffic. If the NVQ measured for a test of video traffic is less than this configured value, the SLA Mon server considers the occurrence to generate a QoS alarm. You must enter a value between 1.0 to 5.0. The default value is 3.6.
Data	The e-MOS threshold for data traffic. If the NVQ measured for a test of data traffic is less than this configured value, the SLA Mon server considers the occurrence to generate a QoS alarm. You must enter a value between 1.0 to 5.0. The default value is 1.

(Source : https://downloads.avaya.com/css/P8/documents/101037184)

47. By doing so, Avaya has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 1 of the ‘230 Patent.

48. Avaya has infringed the ‘230 Patent by using the accused products and thereby practicing a method for determining acceptability of quality of a second communications service, in comparison to a first communications service which is deemed to exhibit acceptable quality. For example, the accused products are and have been used by Avaya to implement the ITU-T G.107 Recommendation. The ITU-T G.107 Recommendation includes an E-model for calculating voice quality as perceived by a typical telephone user. The E-model outputs a transmission rating factor i.e., R, which can be transformed into Mean Opinion Score—i.e., MOS value—that represents the voice quality. This E-model is applied to a real-time voice call (“second communication service”) for measuring its voice quality. The E-model is based on modeling the results

from multiple subjective tests performed on a wide range of transmission parameters. It also includes a reference table with different R value and MOS value thresholds, and corresponding perceived voice quality. The MOS values (quality index) in the reference table are obtained using an aggregate of data from multiple test calls using a first communication service. A MOS value of 4.34 and above, or an R value of 90 and above is considered to be very satisfied ("acceptable quality").

The E-model: a computational model for use in transmission planning

1 Scope

This Recommendation describes a computational model, known as the E-model, that has proven useful as a transmission planning tool for assessing the combined effects of variations in several transmission parameters that affect the conversational[1] quality of 3.1 kHz handset telephony. This computational model can be used, for example, by transmission planners to help ensure that users will be satisfied with end-to-end transmission performance whilst avoiding over-engineering of networks. It must be emphasized that the primary output from the model is the "rating factor" *R* but this can be transformed to give estimates of customer opinion. Such estimates are only made for transmission planning purposes and not for actual customer opinion prediction (for which there is no agreed-upon model recommended by the ITU-T).

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

An estimated mean opinion score (MOS_{CQE}) for the conversational situation in the scale 1-5 can be obtained from the *R*-factor using the equations:

For $R < 0$: $MOS_{CQE} = 1$

For $0 < R < 100$: $MOS_{CQE} = 1 + 0.035R + R(R-60)(100-R)7 \cdot 10^{-6}$ (B-4)

For $R > 100$: $MOS_{CQE} = 4.5$

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

The E-model (**ITU-T Rec. G.107** [1]) is a transmission planning tool that provides a prediction of the expected voice quality, as perceived by a typical telephone user, for a complete end-to-end (i.e. mouth-to-ear) telephone connection under conversational conditions. The E-model takes into account a wide range of telephony-band impairments, in particular the impairment due to low bit-rate coding devices and one-way delay, as well as the "classical" telephony impairments of loss, noise and echo. It can be applied to assess the voice quality of wireline and wireless scenarios, based on circuit-switched and packet-switched technology.

The E-model is based on modeling the results from a large number of subjective tests done in the past on a wide range of transmission parameters. The primary output of the E-model calculations is a scalar quality rating value known as the "Transmission Rating Factor, R". R can be transformed into other quality measures such as Mean Opinion Score (MOS-CQE [2]), Percentage Good or Better ((GoB) or Percentage Poor or Worse ((PoW). However, caution should be exercised when comparing these transformed measures with values of MOS, %GoB or %PoW from other sources, which may not have been obtained under comparable conditions.

(Source: https://www.itu.int/ITU-T/studygroups/com12/emodelv1/tut.htm)

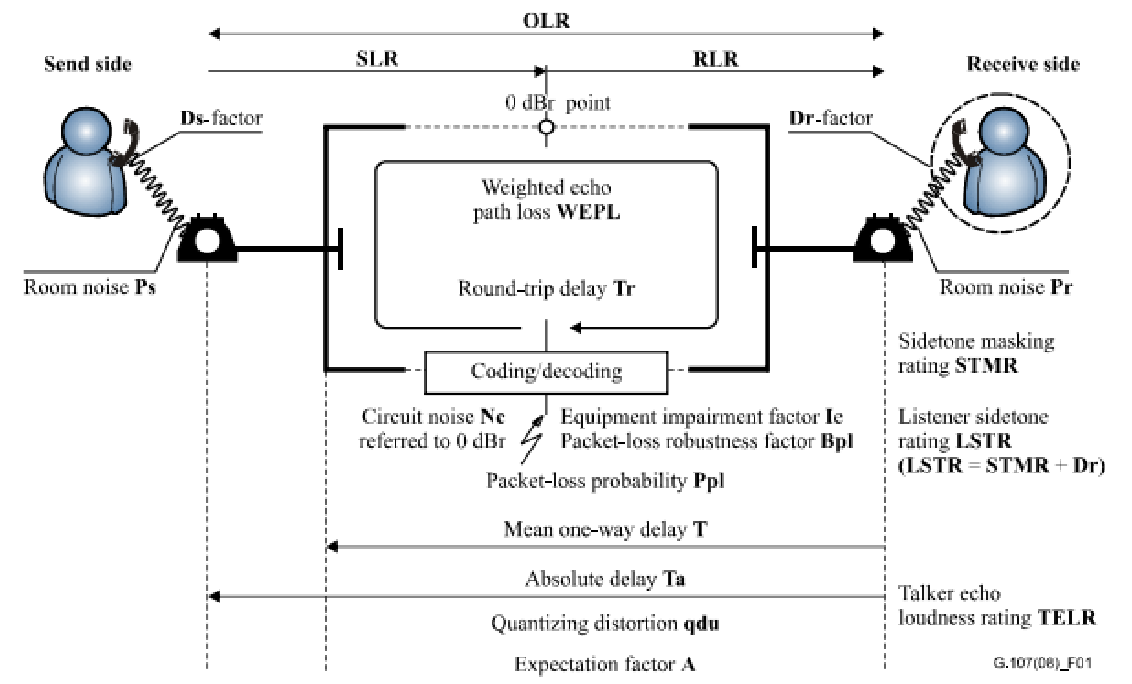


Figure 1 – Reference connection of the E-model

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

7.1 Calculation of the transmission rating factor, R

According to the equipment impairment factor method, the fundamental principle of the E-model is based on a concept given in the description of the OPINE model, see [b-ITU-T P-Sup.3].

Psychological factors on the psychological scale are additive.

The result of any calculation with the E-model in a first step is a transmission rating factor *R*, which combines all transmission parameters relevant for the considered connection. This rating factor *R* is composed of:

$$R = Ro - Is - Id - Ie\text{-}eff + A \quad (7\text{-}1)$$

Ro represents in principle the basic signal-to-noise ratio, including noise sources such as circuit noise and room noise. Factor *Is* is a combination of all impairments which occur more or less simultaneously with the voice signal. Factor *Id* represents the impairments caused by delay and the effective equipment impairment factor *Ie-eff* represents impairments caused by low bit-rate codecs. It also includes impairment due to randomly distributed packet losses. The advantage factor *A* allows for compensation of impairment factors when the user benefits from other types of access to the user. The term *Ro* and the *Is* and *Id* values are subdivided into further specific impairment values. The following clauses give the equations used in the E-model.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

Table B.1 – Provisional guide for the relation between *R*-value and user satisfaction

R-value (lower limit)	MOS_{CQE} (lower limit)	GoB (%) (lower limit)	PoW (%) (upper limit)	User satisfaction
90	4.34	97	~0	Very satisfied
80	4.03	89	~0	Satisfied
70	3.60	73	6	Some users dissatisfied
60	3.10	50	17	Many users dissatisfied
50	2.58	27	38	Nearly all users dissatisfied

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

49. The methods practiced by Avaya's use of the accused products include obtaining a first quality index pertaining to the first communications service. For example, the accused products are and have been used by Avaya to implement the ITU-T

G.107 Recommendation. The E-model includes a reference table with different R value and MOS value thresholds, and corresponding perceived voice quality. Further, the E-model is modelled using large number of subjective tests. Thus, the thresholds of MOS value are based on an aggregate of multiple subjective calls' data. For instance, a MOS value ("first quality index") threshold of 4.34 for best quality is based on an aggregate of data for multiple high quality voice calls using a first communication service.

The E-model (**ITU-T Rec. G.107** [1]) is a transmission planning tool that provides a prediction of the expected voice quality, as perceived by a typical telephone user, for a complete end-to-end (i.e. mouth-to-ear) telephone connection under conversational conditions. The E-model takes into account a wide range of telephony-band impairments, in particular the impairment due to low bit-rate coding devices and one-way delay, as well as the "classical" telephony impairments of loss, noise and echo. It can be applied to assess the voice quality of wireline and wireless scenarios, based on circuit-switched and packet-switched technology.

The E-model is based on modeling the results from a large number of subjective tests done in the past on a wide range of transmission parameters. The primary output of the E-model calculations is a scalar quality rating value known as the "Transmission Rating Factor, R". R can be transformed into other quality measures such as Mean Opinion Score (MOS-CQE [2]), Percentage Good or Better ((GoB) or Percentage Poor or Worse ((PoW). However, caution should be exercised when comparing these transformed measures with values of MOS, %GoB or %PoW from other sources, which may not have been obtained under comparable conditions.

(Source: https://www.itu.int/ITU-T/studygroups/com12/emodelv1/tut.htm)

An estimated mean opinion score (MOS_{CQE}) for the conversational situation in the scale 1-5 can be obtained from the *R*-factor using the equations:

For $R < 0$: $MOS_{CQE} = 1$

For $0 < R < 100$: $MOS_{CQE} = 1 + 0.035R + R(R - 60)(100 - R)7 \cdot 10^{-6}$ (B-4)

For $R > 100$: $MOS_{CQE} = 4.5$

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

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(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

Table 1 - Definition of categories of speech transmission quality

Range of E-model Rating R	Speech transmission quality category	User satisfaction
90 ≤ R < 100	Best	Very satisfied
80 ≤ R < 90	High	Satisfied
70 ≤ R < 80	Medium	Some users dissatisfied
60 ≤ R < 70	Low	Many users dissatisfied
50 ≤ R < 60	Poor	Nearly all users dissatisfied

NOTE 1 – Connections with E-model Ratings R below 50 are not recommended.
NOTE 2 – Although the trend in transmission planning is to use E-model Ratings R, equations to convert E-model Ratings R into other metrics, e.g. %MOS, %GoB, PoW can be found in **ITU-T Rec. G.107 Annex B** [1].

(Source: https://www.itu.int/ITU-T/studygroups/com12/emodelv1/tut.htm)

50. The methods practiced by Avaya's use of the accused products include obtaining a second quality index pertaining to the second communications service. For example, the accused products are and have been used by Avaya to implement the ITU-T G.107 Recommendation. The E-model is applied to a real-time voice call made using a system including an accused product ("second communication service") for measuring its voice quality by calculating the R value and its corresponding MOS value ("second quality index").

7.1 Calculation of the transmission rating factor, R

According to the equipment impairment factor method, the fundamental principle of the E-model is based on a concept given in the description of the OPINE model, see [b-ITU-T P-Sup.3].

Psychological factors on the psychological scale are additive.

The result of any calculation with the E-model in a first step is a transmission rating factor *R*, which combines all transmission parameters relevant for the considered connection. This rating factor *R* is composed of:

$$R = Ro - Is - Id - Ie\text{-}eff + A \qquad (7\text{-}1)$$

Ro represents in principle the basic signal-to-noise ratio, including noise sources such as circuit noise and room noise. Factor *Is* is a combination of all impairments which occur more or less simultaneously with the voice signal. Factor *Id* represents the impairments caused by delay and the effective equipment impairment factor *Ie-eff* represents impairments caused by low bit-rate codecs. It also includes impairment due to randomly distributed packet losses. The advantage factor *A* allows for compensation of impairment factors when the user benefits from other types of access to the user. The term *Ro* and the *Is* and *Id* values are subdivided into further specific impairment values. The following clauses give the equations used in the E-model.

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

An estimated mean opinion score (MOS_{CQE}) for the conversational situation in the scale 1-5 can be obtained from the *R*-factor using the equations:

For $R < 0$: $MOS_{CQE} = 1$

For $0 < R < 100$: $MOS_{CQE} = 1 + 0.035R + R(R-60)(100-R)7 \cdot 10^{-6}$ (B-4)

For $R > 100$: $MOS_{CQE} = 4.5$

(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

51. The methods practiced by Avaya's use of the accused products include determining that the second communication service is of unacceptable quality if the second quality index differs from the first quality index service by more than a selected amount. For example, the accused products are and have been used by Avaya to implement the ITU-T G.107 Recommendation. The calculated MOS value is then

compared with the reference table to determine the perceived voice quality. If the R value differs from a R value of 90 by more than 40, then the call is considered to be of unacceptable quality. Similarly, if the calculated MOS value ("second quality index") differs from a MOS value of 4.34 ("first quality index") by more than 1.76, then the call is considered to be of unacceptable quality.

Table B.1 – Provisional guide for the relation between *R*-value and user satisfaction

R-value (lower limit)	MOS_{CQE} (lower limit)	GoB (%) (lower limit)	PoW (%) (upper limit)	User satisfaction
90	4.34	97	~0	Very satisfied
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(Source: https://www.itu.int/rec/dologin_pub.asp?lang=s&id=T-REC-G.107-201402-S!!PDF-E&type=items)

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Range of E-model Rating R	Speech transmission quality category	User satisfaction
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NOTE 1 – Connections with E-model Ratings R below 50 are not recommended.
NOTE 2 – Although the trend in transmission planning is to use E-model Ratings R, equations to convert E-model Ratings R into other metrics, e.g. %MOS, %GoB, PoW can be found in **ITU-T Rec. G.107 Annex B** [1].

(Source: https://www.itu.int/ITU-T/studygroups/com12/emodelv1/tut.htm)

52. Far North Patents only asserts method claims from the '230 Patent.

53. Avaya has had knowledge of the '230 Patent at least as of July 3, 2007, when the '230 Patent was used by the examiner to reject a pending claim as obvious

during the prosecution of U.S. Patent Application No. 10/070,338 ("the '338 application"), titled "Method and Apparatus for Characterizing the Quality of a Network Path." The '282 Patent, which is the child of the '230 Patent, was also cited by the examiner during that same prosecution on July 21, 2008. The '338 application, and the patent that issued therefrom, was originally assigned to Routescience Technologies, Inc., a predecessor in interest to Avaya, and then ultimately assigned to Avaya Inc. Avaya went on to cite the '230 Patent and the '282 Patent to the United States Patent and Trademark Office during the prosecution of numerous additional patent applications. Avaya employees Mansour J. Karam, Sean P. Finn, Omar C. Baldonado, Michael A. Lloyd, Herbert S. Madden, and James G. McGuire, who are listed as inventors on U.S. Patent Application No. 10/070,338, and others involved in the prosecution of the patent, including Matthew R. Ellsworth, Douglas W. Swartz, and Yolanda Del Toro, have had knowledge of the '230 Patent at least as of July 3, 2007.

54. Avaya has also indirectly and willfully infringed the '230 Patent, as explained further below in the "Additional Allegations Regarding Infringement" section.

55. Far North Patents has been damaged as a result of the infringing conduct by Avaya alleged above. Thus, Avaya is liable to Far North Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

56. Far North Patents and/or its predecessors-in-interest have satisfied all statutory obligations required to collect pre-filing damages for the full period allowed by law for infringement of the '230 Patent.

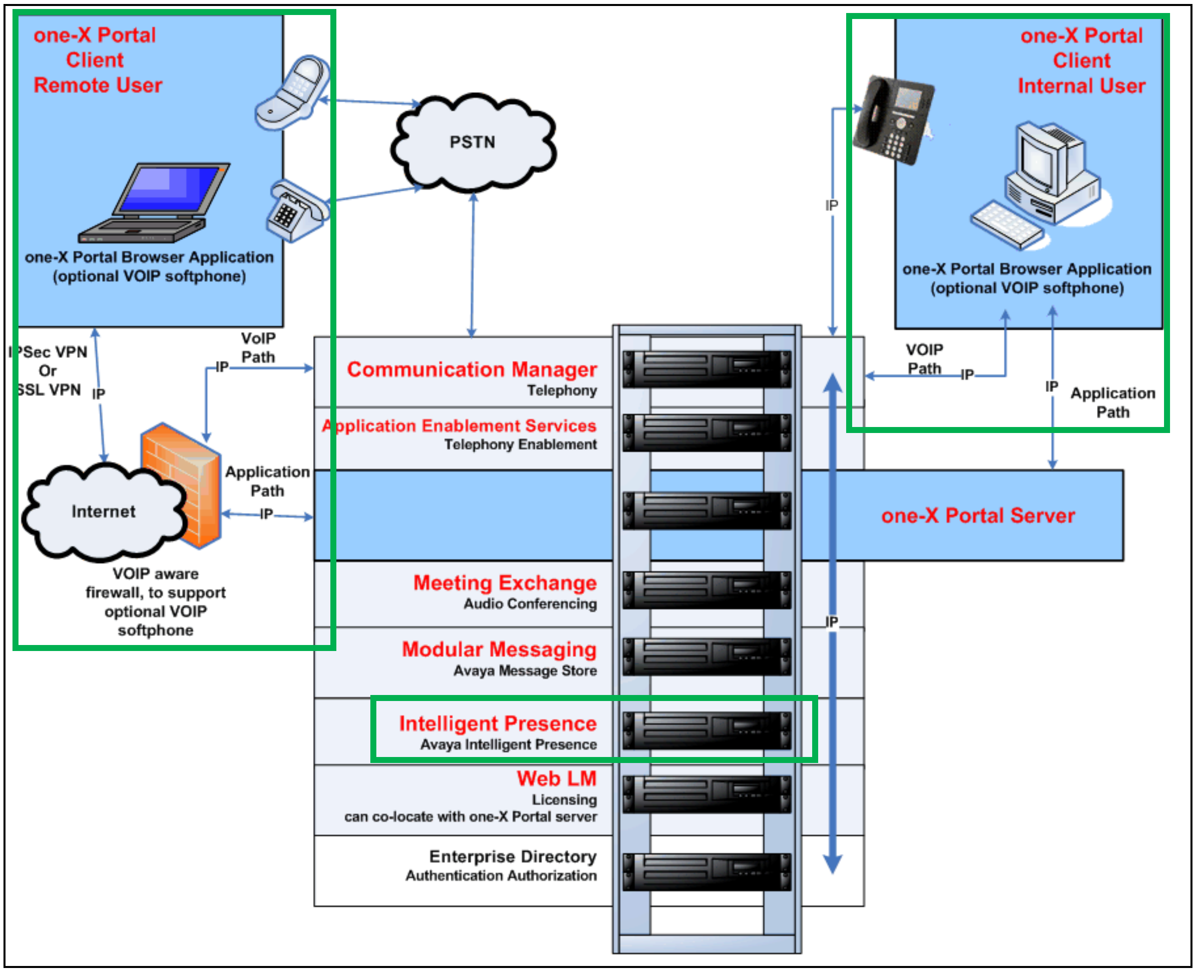
COUNT IV

DIRECT INFRINGEMENT OF U.S. PATENT NO. 7,986,770

57. On July 26, 2011, United States Patent No. 7,986,770 ("the '770 Patent") was duly and legally issued by the United States Patent and Trademark Office for an invention entitled "Method and Apparatus for Obtaining Telephone Status Over a Network."

58. Far North Patents is the owner of the '770 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the '770 Patent against infringers, and to collect damages for all relevant times.

59. Avaya made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Avaya One-X Communicator and Avaya Aura Presence Services families of products that include advanced presence information capabilities (collectively, "accused products").



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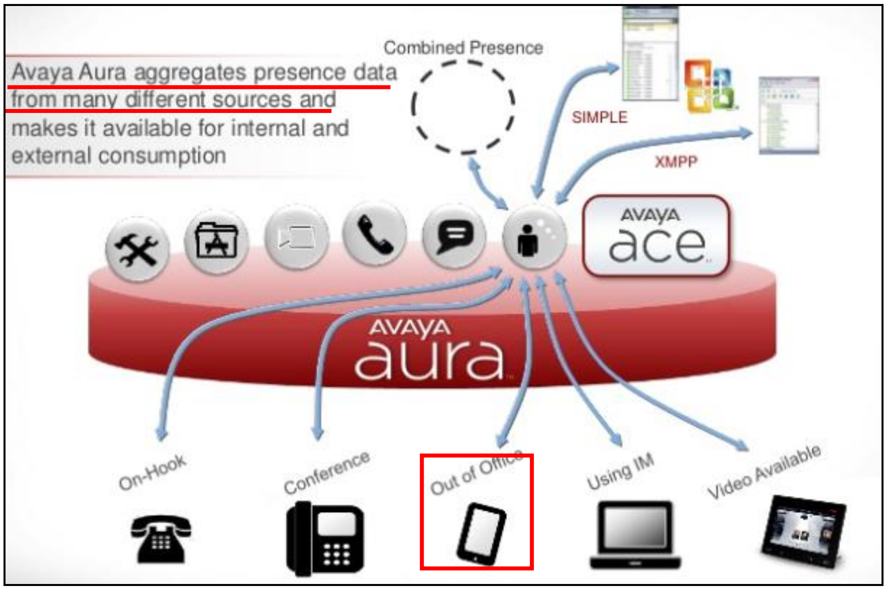

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> • **Intelligent Presence** – Know colleagues' availability and preferred communication options. See whether co-workers are online, on the phone, available to IM, in a conference call, traveling, or on vacation. Quickly determine the likelihood of reaching an associate by phone, IM, or high-definition video. Avaya one-X Communicator aggregates presence from Avaya and other sources via Avaya Aura® Presence Services.

(Source : https://www.devconnectprogram.com/fileMedia/download/69ecbc3f-93ed-4873-85c8-4df0fae3afc4)

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Avaya Aura® Presence Services provides the presence of a user through the presence states. For example, busy, away, or Do Not Disturb. The presence is an indication of the availability of a user and the readiness to communicate across services, such as telephony, instant messaging (IM), and video.

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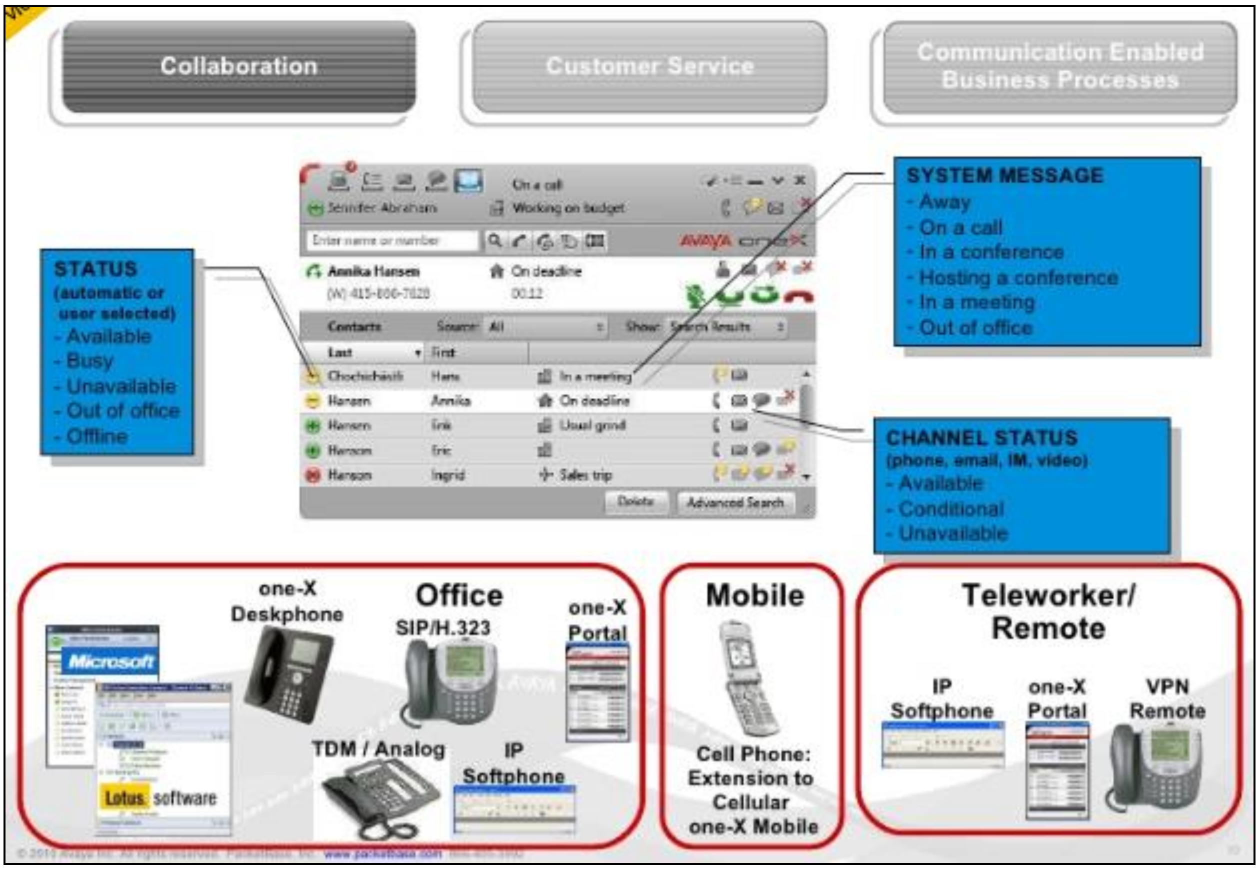

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Avaya one-X Mobile Preferred Video

(Source : screenshot from video available at

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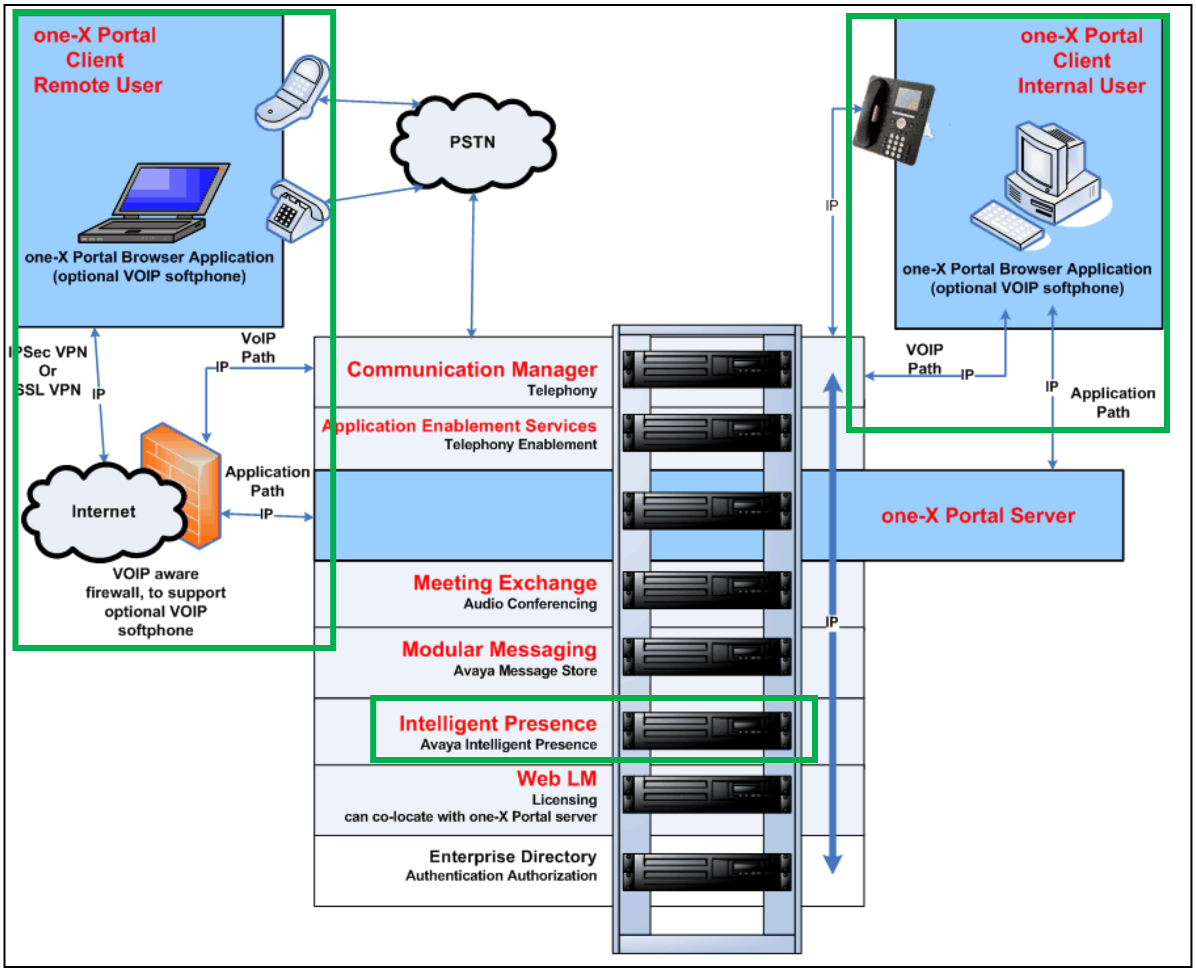
60. By doing so, Avaya has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 1 of the '770 Patent.

61. Avaya has infringed the '770 Patent by using the accused products and thereby practicing a method that includes monitoring, by a telephone status monitoring device, a status of a telephone via a first network, wherein the status includes an indication of whether the telephone is engaged in an active telephone call. For example, the accused products provide a collaboration system for organizations. The accused products provide and have provided a communication path to a Private Branch Exchange

(PBX) system, a collaboration server, and other integrated applications. The accused products' service components, such as Intelligent Presence and Status, are and have been used to monitor the status of desk and/or office phones of users. The accused products have also been operated in LAN mode, wherein all the PCs and desk phones of the users are connected to the client server through a LAN, indicating that the client server monitors the status of users' desk phones via LAN. The presence server component provides the users with the status of the phones of other users. For example, the status that a co-worker is on the phone (i.e., active in an ongoing call) is monitored by the accused products.



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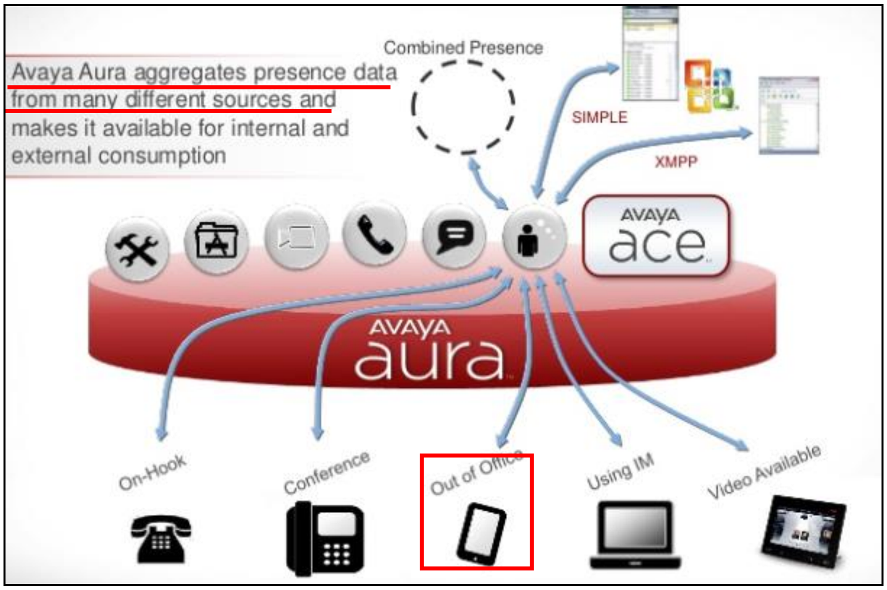

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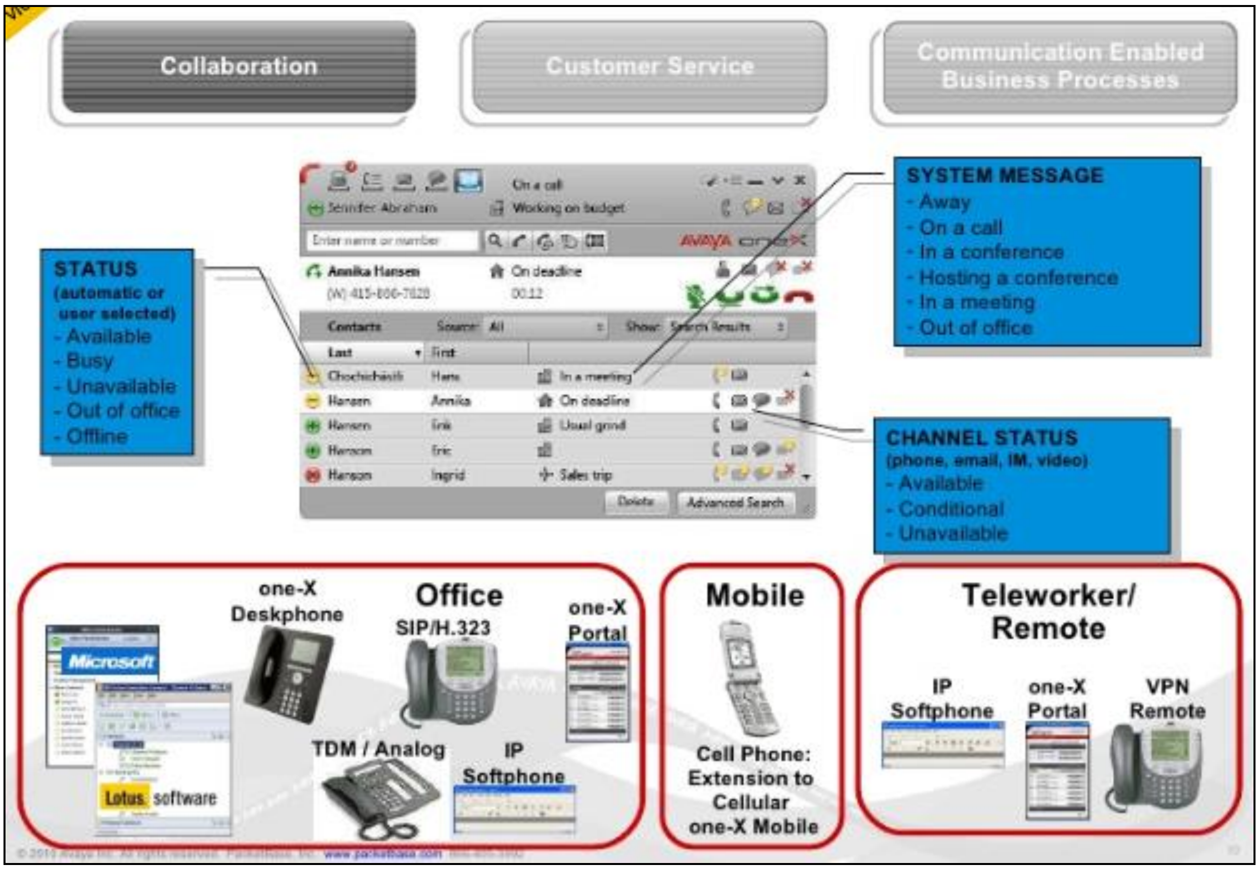

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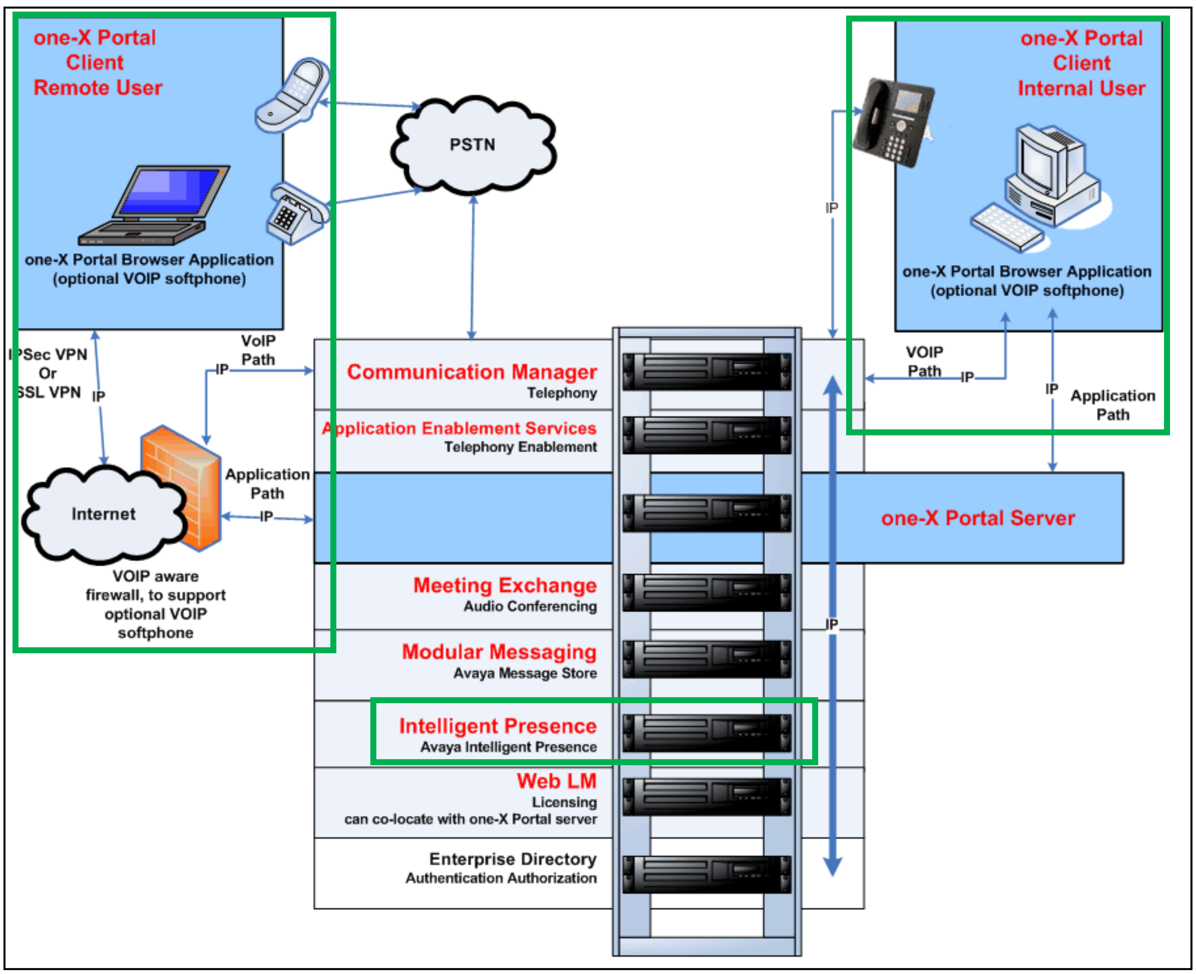
Avaya one-X Mobile Preferred Video

(Source : screenshot from video available at https://www.youtube.com/watch?v=ywraoVaCtdA)

62. The methods practiced by Avaya's use of the accused products include transmitting, by the telephone status monitoring device, the status of the telephone to another device via a second network, wherein the transmitting is in response to the another device attempting to place a call to the telephone, and wherein the first and the second networks are different networks. For example, features of the accused products can be and have been accessed by mobile users using the accused products. This provides and has provided mobile users with the presence feature, wherein the telephony, instant messaging and dynamic status of other users can be transmitted to the mobile user

via internet. The accused products provide the mobile user with the status of other users. When a user searches for a contact in the contact list (attempts to call), icons are presented that represent the status of the user. The accused products exchange information from external devices (like teleworker or mobile users) via internet, indicating that the status of the internal phones (monitored via LAN) is sent to users of the accused products via internet. The first network for monitoring the status (i.e., LAN) and the second network used to transfer the status (i.e., internet) are different.



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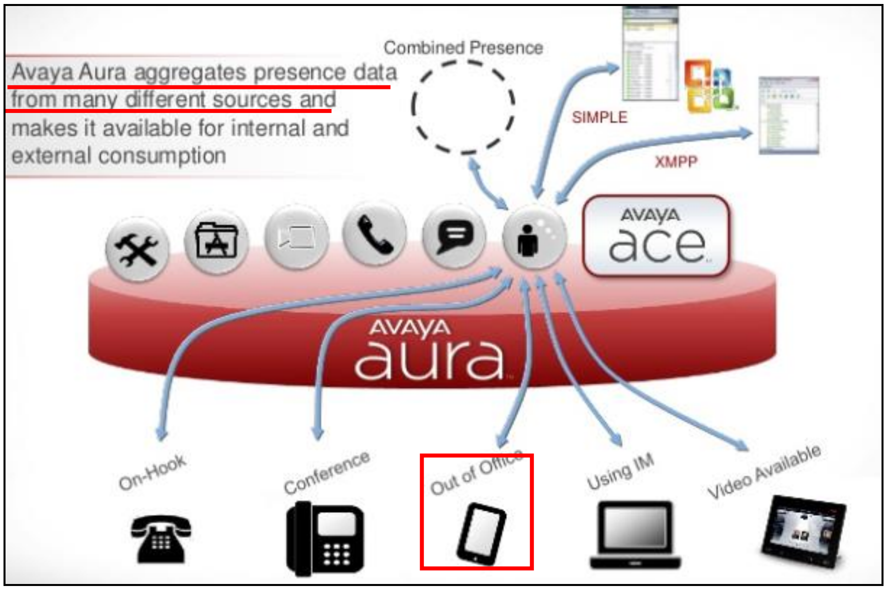

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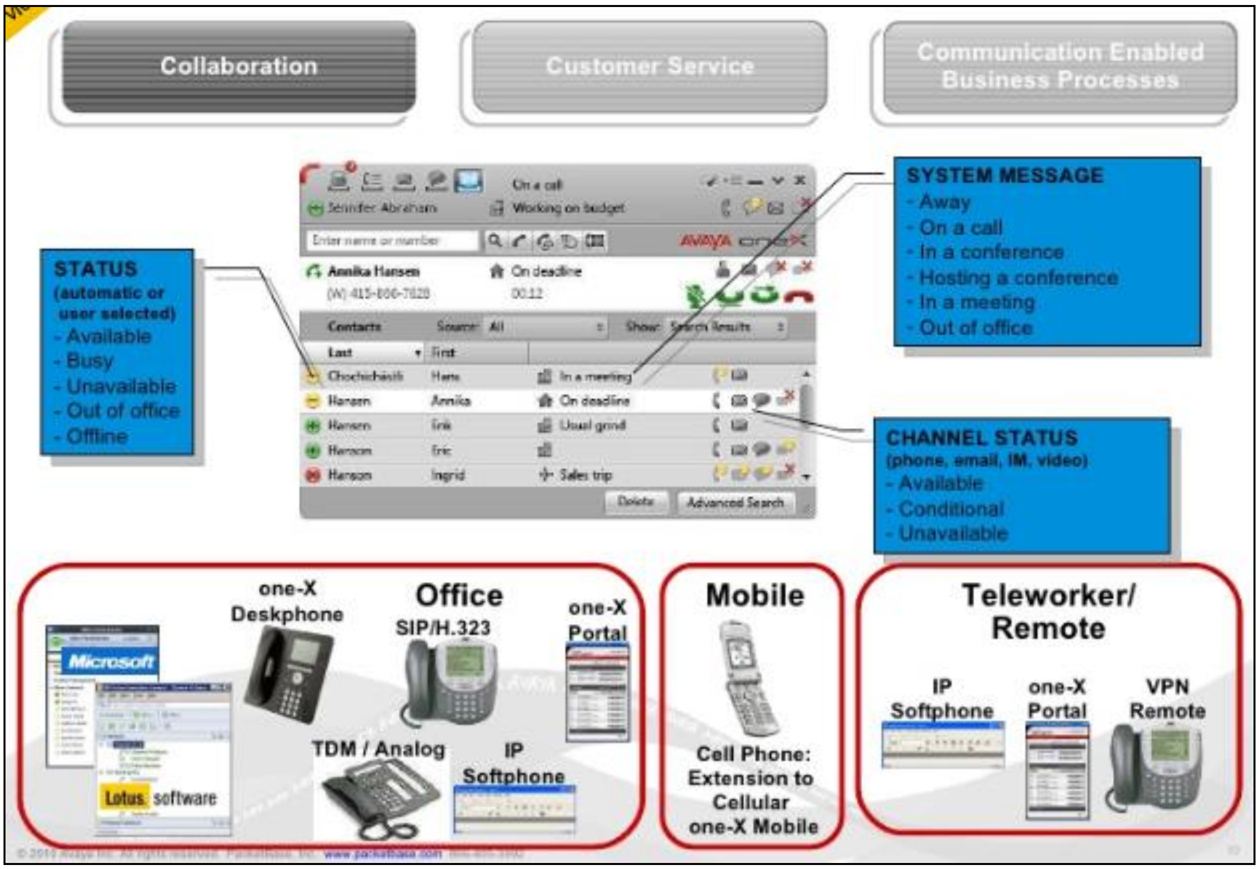

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Avaya one-X Mobile Preferred Video

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63. Far North Patents only asserts method claims from the ‘770 Patent.

64. Avaya has had knowledge of the ‘770 Patent at least as of its issuance on July 26, 2011. For example, Avaya has had knowledge of patents related to the ‘770 Patent at least as of June 24, 2004, when the ‘616 Patent, which is the great-grandparent of the ‘770 Patent, and U.S. Patent Application Publication No. 2001/0005412, which is the published application of the grandparent of the ‘770 Patent, was cited by Avaya in an Information Disclosure Statement during the prosecution of U.S. Patent Application No. 10/805,887 (“the ‘887 application”), titled “Personal Location Information

Management." Later during the prosecution of the '887 application, Avaya cited U.S. Patent Application Publication No. 2006/0078101, which is the published application of another application related to the '770 Patent. The '887 application, and the patent that issued therefrom, was originally assigned to Nortel Networks Limited, a predecessor in interest to Avaya, and then ultimately assigned, prior to issuance, to Avaya Inc. Avaya employee John H. Yoakum, who is listed as an inventor on U.S. Patent Application No. 10/805,887, and others involved in the prosecution of the patent, including Jaspreet K. Harit, Russell W. Binns, Jr., Benjamin S. Withrow, John R. Witcher, III, Anthony J. Josephson, and Steven Terranova, have had knowledge of the '770 Patent at least as of its issuance on July 26, 2011.

65. Avaya has also indirectly and willfully infringed the '770 Patent, as explained further below in the "Additional Allegations Regarding Infringement" section.

66. Far North Patents has been damaged as a result of the infringing conduct by Avaya alleged above. Thus, Avaya is liable to Far North Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

67. Far North Patents and/or its predecessors-in-interest have satisfied all statutory obligations required to collect pre-filing damages for the full period allowed by law for infringement of the '770 Patent.

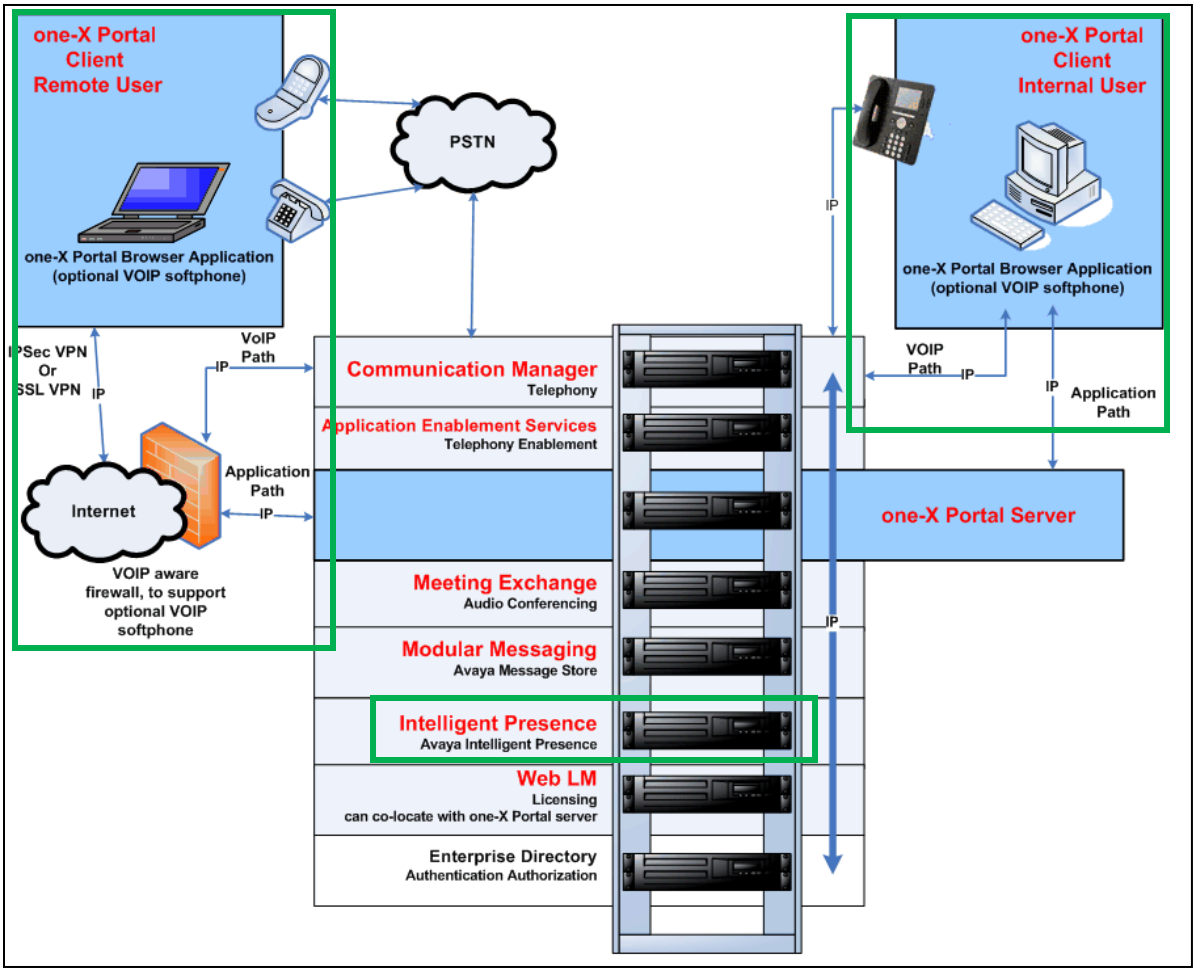
COUNT V

DIRECT INFRINGEMENT OF U.S. PATENT NO. 7,088,802

68. On August 8, 2006, United States Patent No. 7,088,802 ("the '802 Patent") was duly and legally issued by the United States Patent and Trademark Office for an invention entitled "Method and Apparatus for Obtaining Telephone Status Over a Network."

69. Far North Patents is the owner of the '802 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the '802 Patent against infringers, and to collect damages for all relevant times.

70. Avaya made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Avaya One-X Communicator and Avaya Aura Presence Services families of products that include advanced presence information capabilities (collectively, "accused products"):



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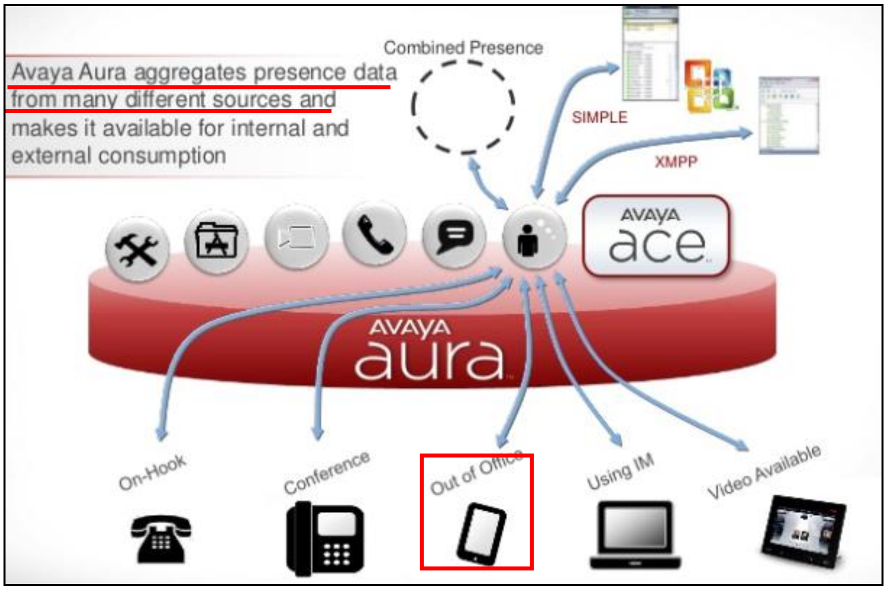

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Avaya Aura® Presence Services provides the presence of a user through the presence states. For example, busy, away, or Do Not Disturb. The presence is an indication of the availability of a user and the readiness to communicate across services, such as telephony, instant messaging (IM), and video.

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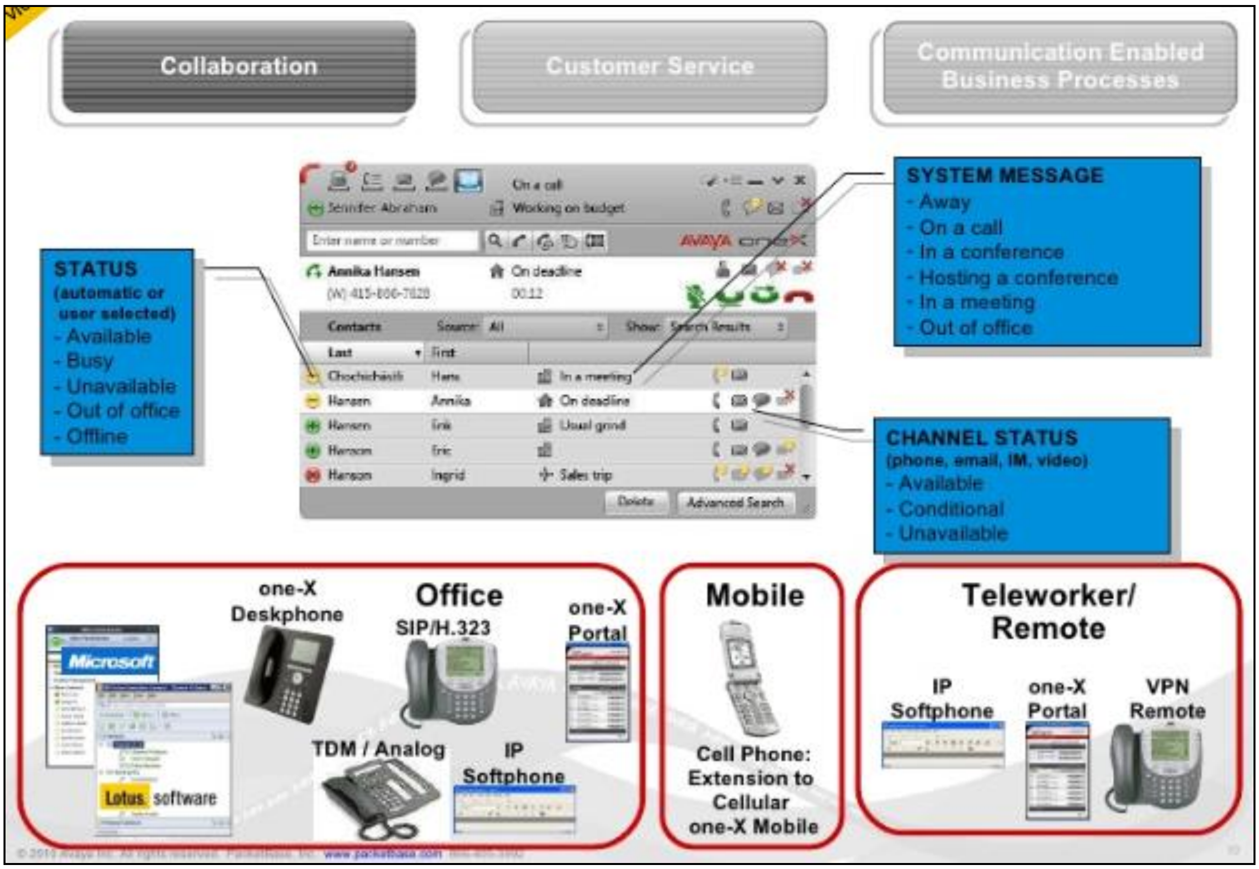

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Avaya one-X Mobile Preferred Video

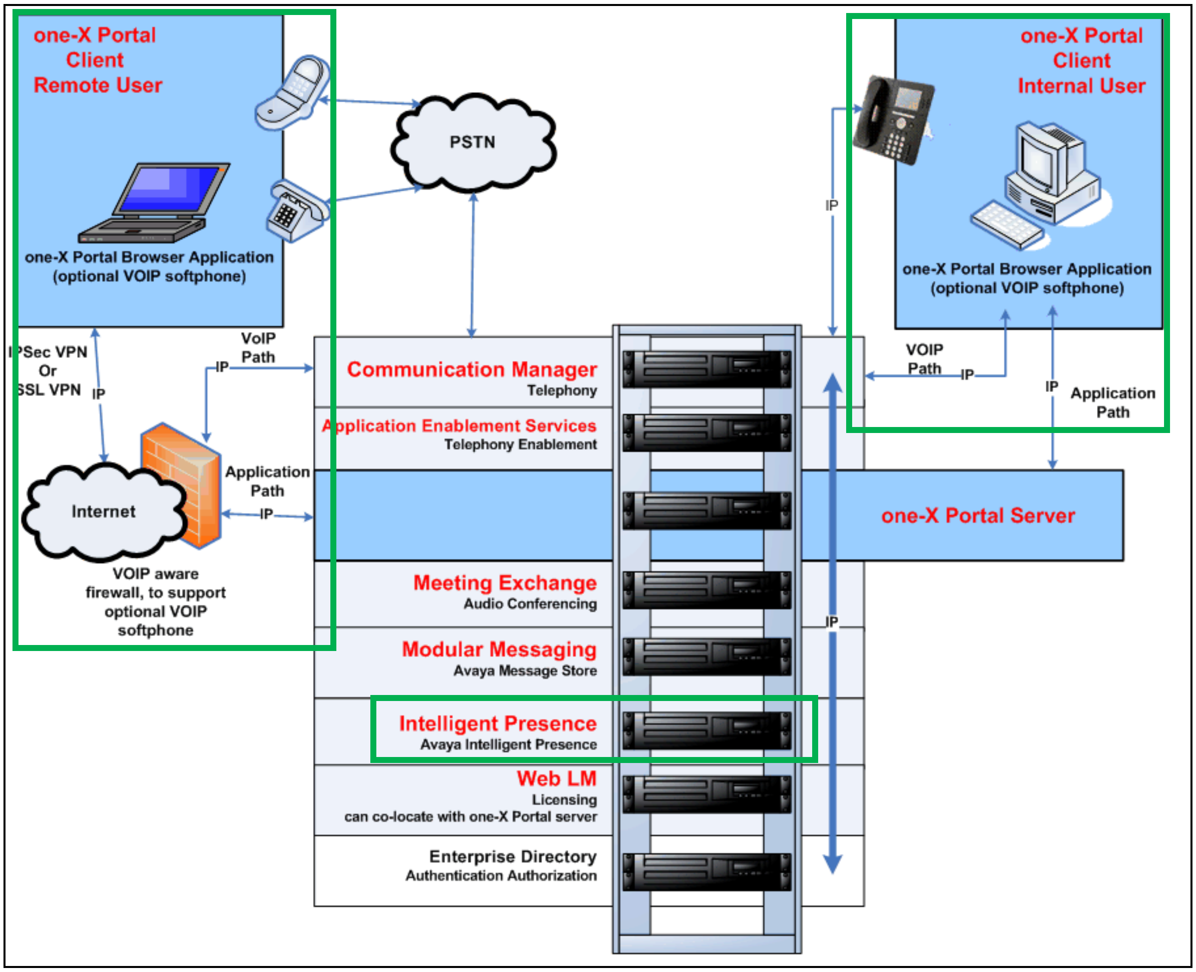
(Source : screenshot from video available at

https://www.youtube.com/watch?v=ywraoVaCtdA)

71. By doing so, Avaya has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 5 of the ‘802 Patent.

72. Avaya has infringed the ‘802 Patent by using the accused products and thereby practicing a process for determining wireless telecommunication device status including accessing a wireless telecommunication device status file associated with a called party over a network. For example, the accused products provide and have provided a collaboration system for organizations. They provide and have provided a communication path to a Private Branch Exchange (PBX) system, a collaboration server

and other integrated applications. The accused products enable and have enabled mobile users to use Avaya Aura presence feature. By enabling the mobile presence visibility in a mobile device using One-X Mobile client app, the presence/availability status of the mobile device can be seen by other One-X Mobile client users. And, the presence server component is responsible for presence features including telephony presence status. This indicates that the mobile device is present in the presence server, to enable other users to see the mobile device presence status. Further, the server (including presence server) exchanges information with mobile users via internet, indicating that the status file is accessed via internet.



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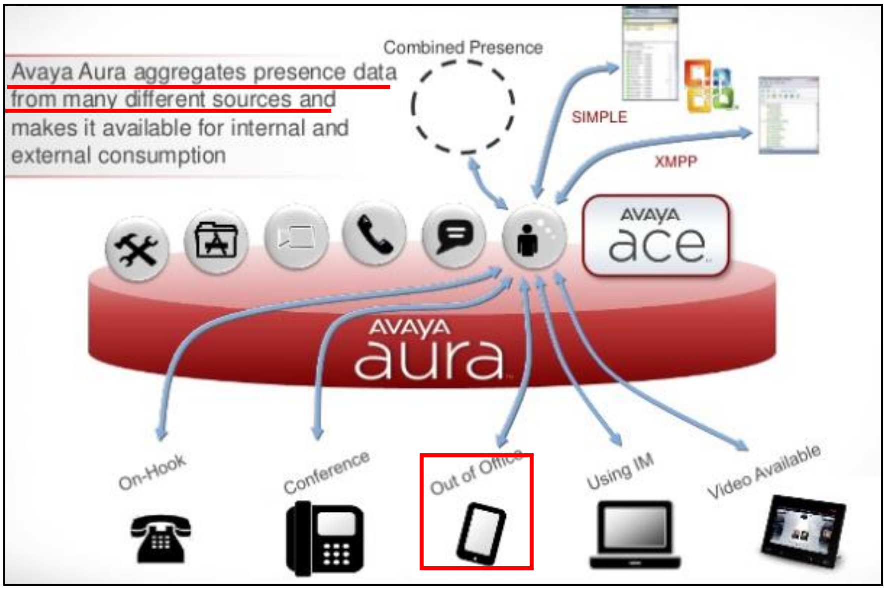

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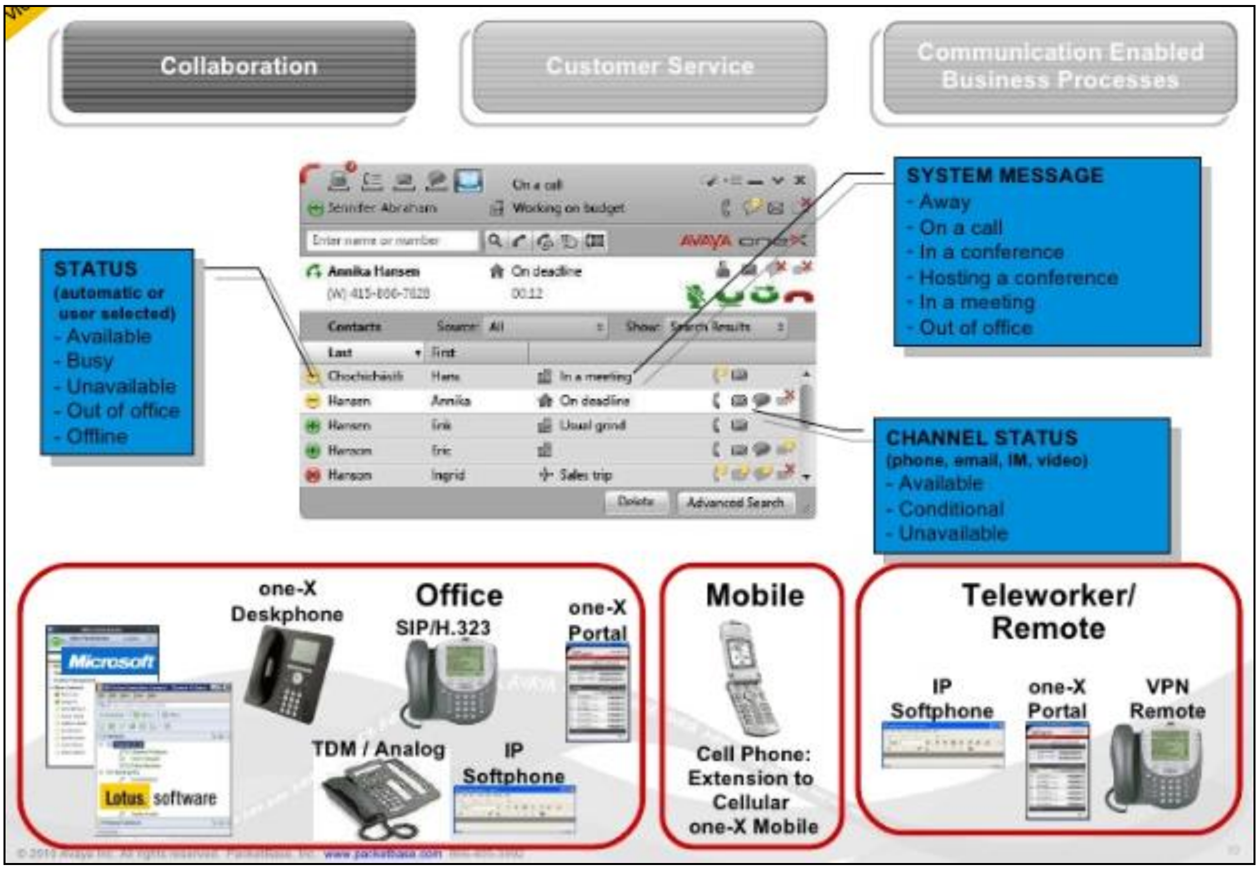

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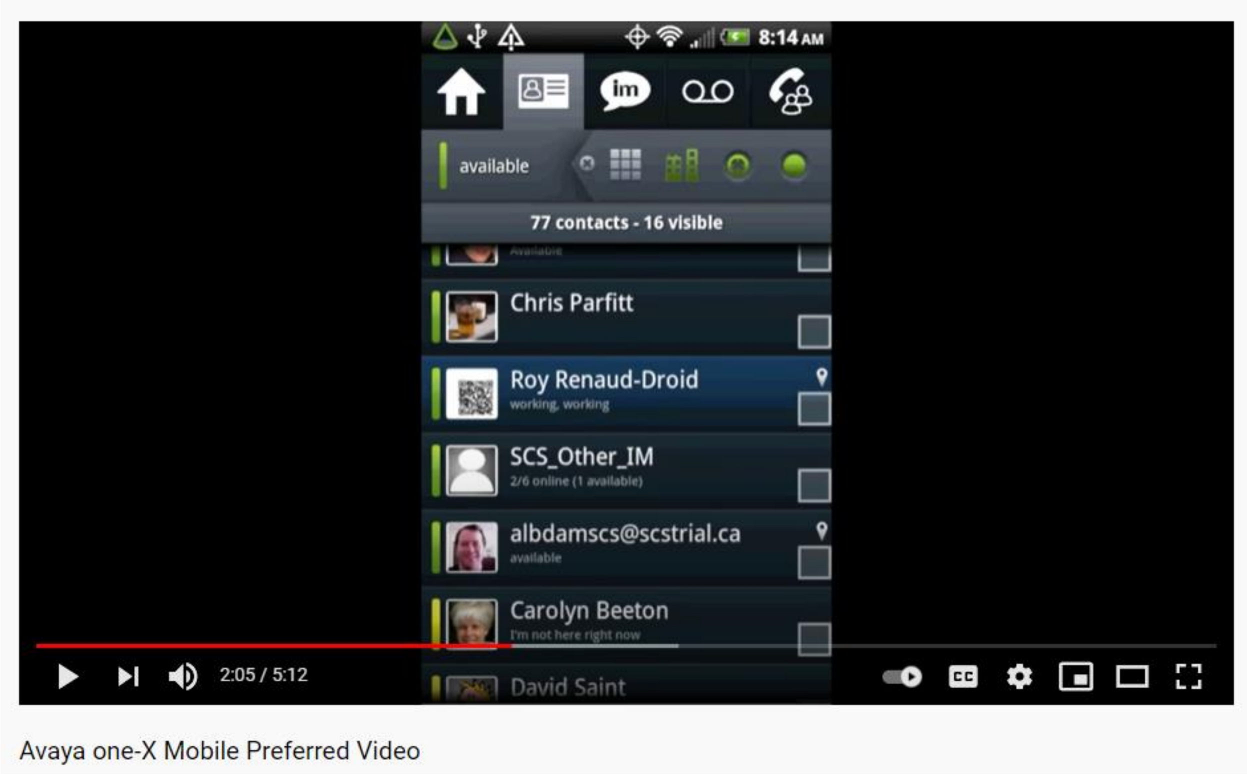


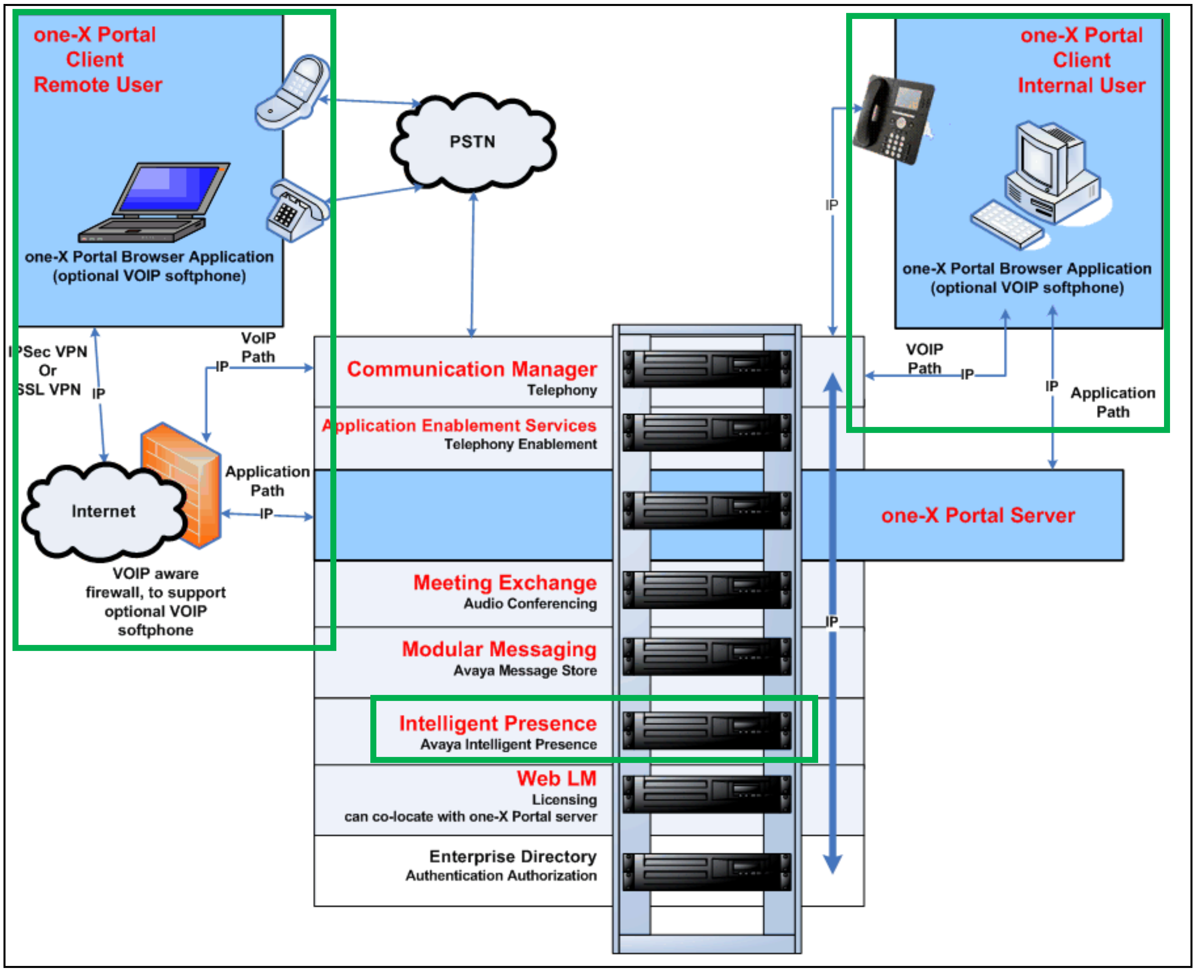
Avaya one-X Mobile Preferred Video

(Source : screenshot from video available at

https://www.youtube.com/watch?v=ywraoVaCtdA)

73. The processes practiced by Avaya's use of the accused products include monitoring the status of the called party's wireless telecommunication device and providing that device status to the device status file. For example, because users of the accused products can see and have seen the presence status of mobile devices using the accused products, the presence status of the mobile devices is and has been monitored. The presence server enables and has enabled the users to see the presence/availability status of other users, indicating that the monitored presence status is and has been

provided to a presence server, for other users to see the presence status of the mobile phone.



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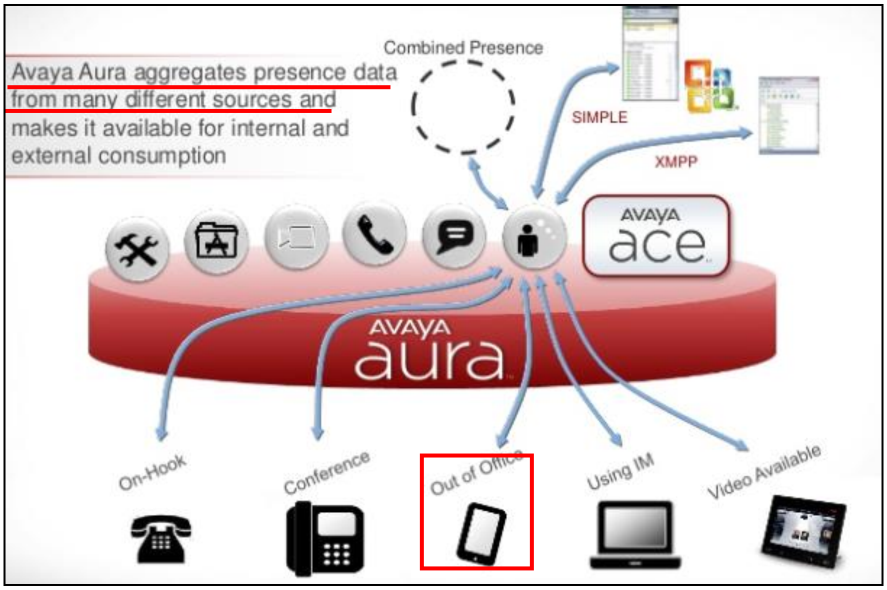

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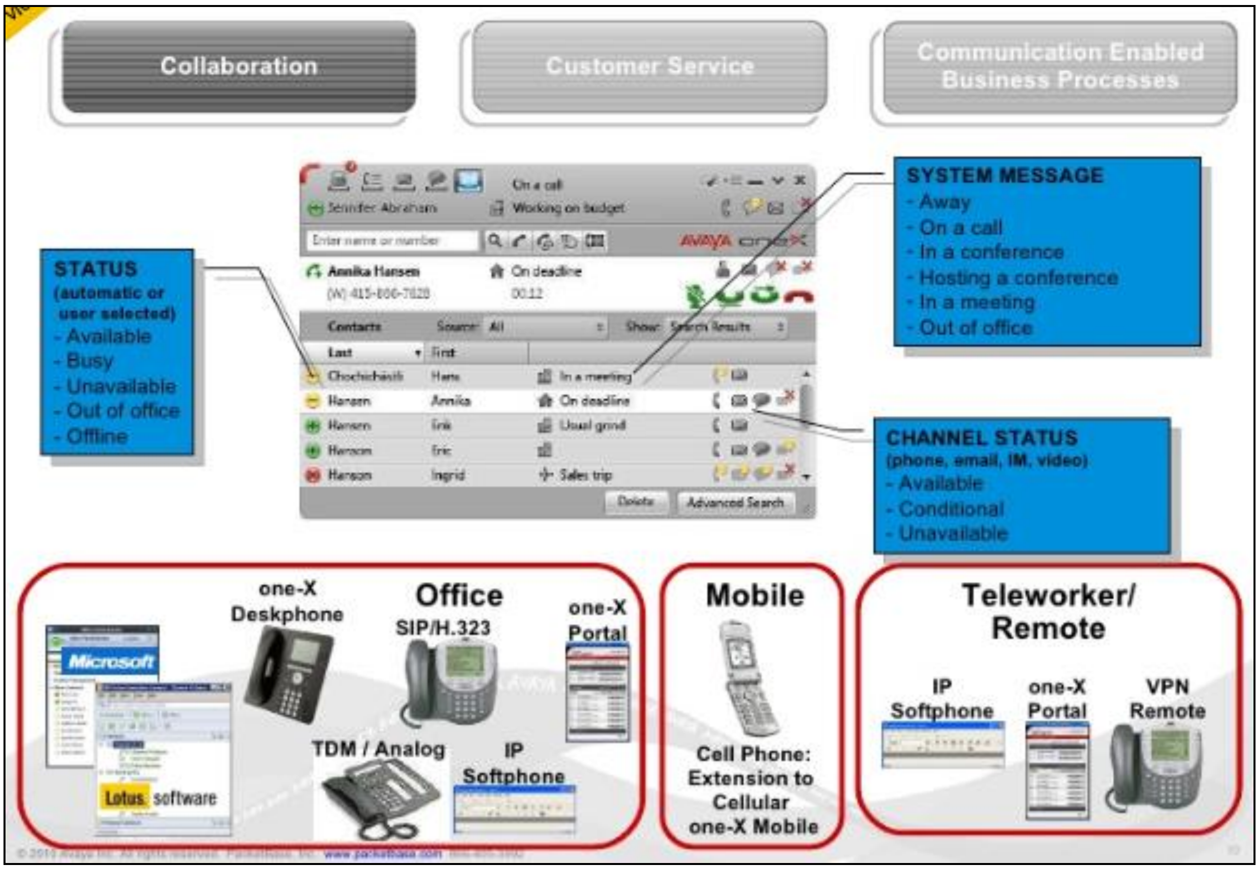

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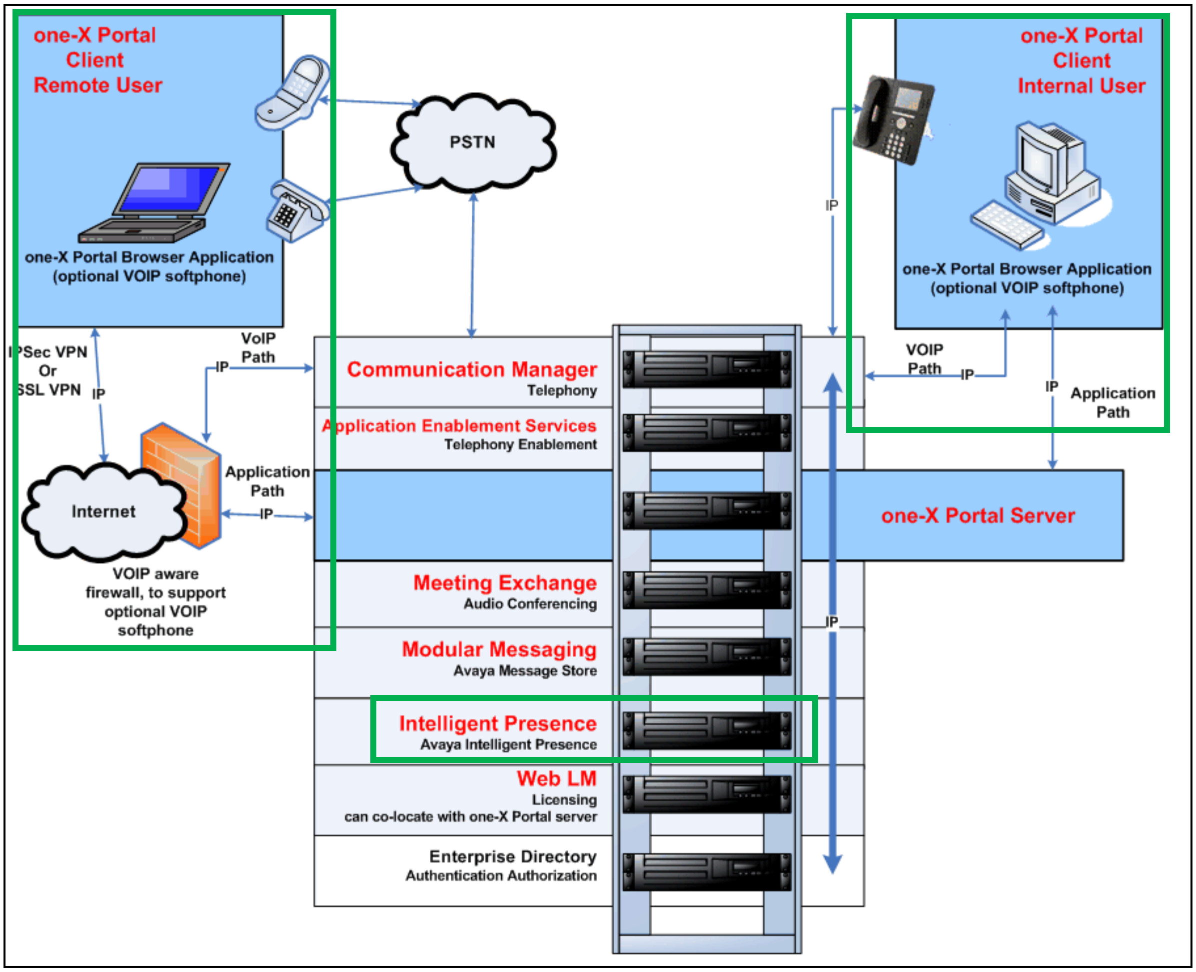
74. The processes practiced by Avaya's use of the accused products include sending a calling party a status message comprising the status of the called party's wireless telecommunication device, wherein the status message is sent via a pager. For example, when a user of the accused products tries to call a mobile user (called party), the status representation of the called party can be seen below the user's avatar, indicating that the status of the called party is and has been sent to the calling party. The status is also presented on a display on a cellular phone, indicating that the status is and has been sent via a pager.



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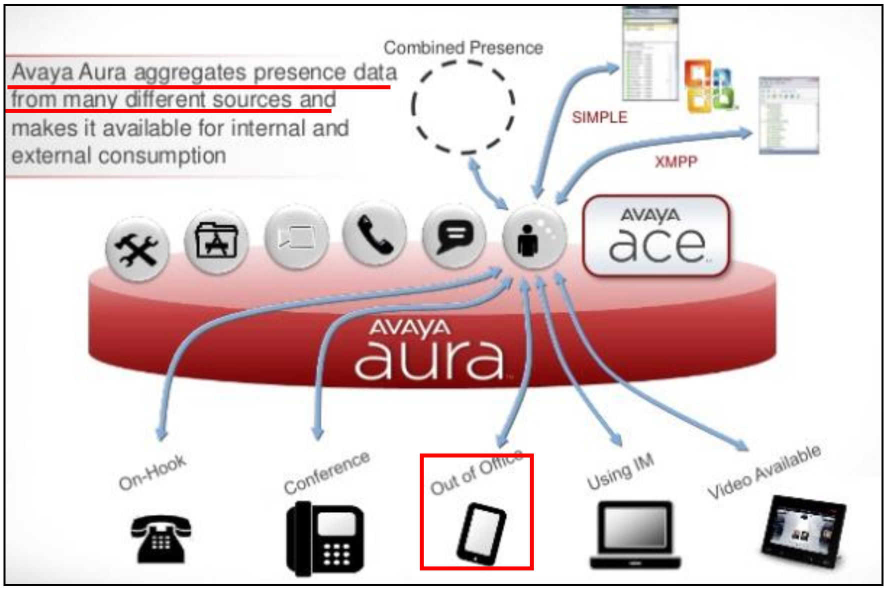

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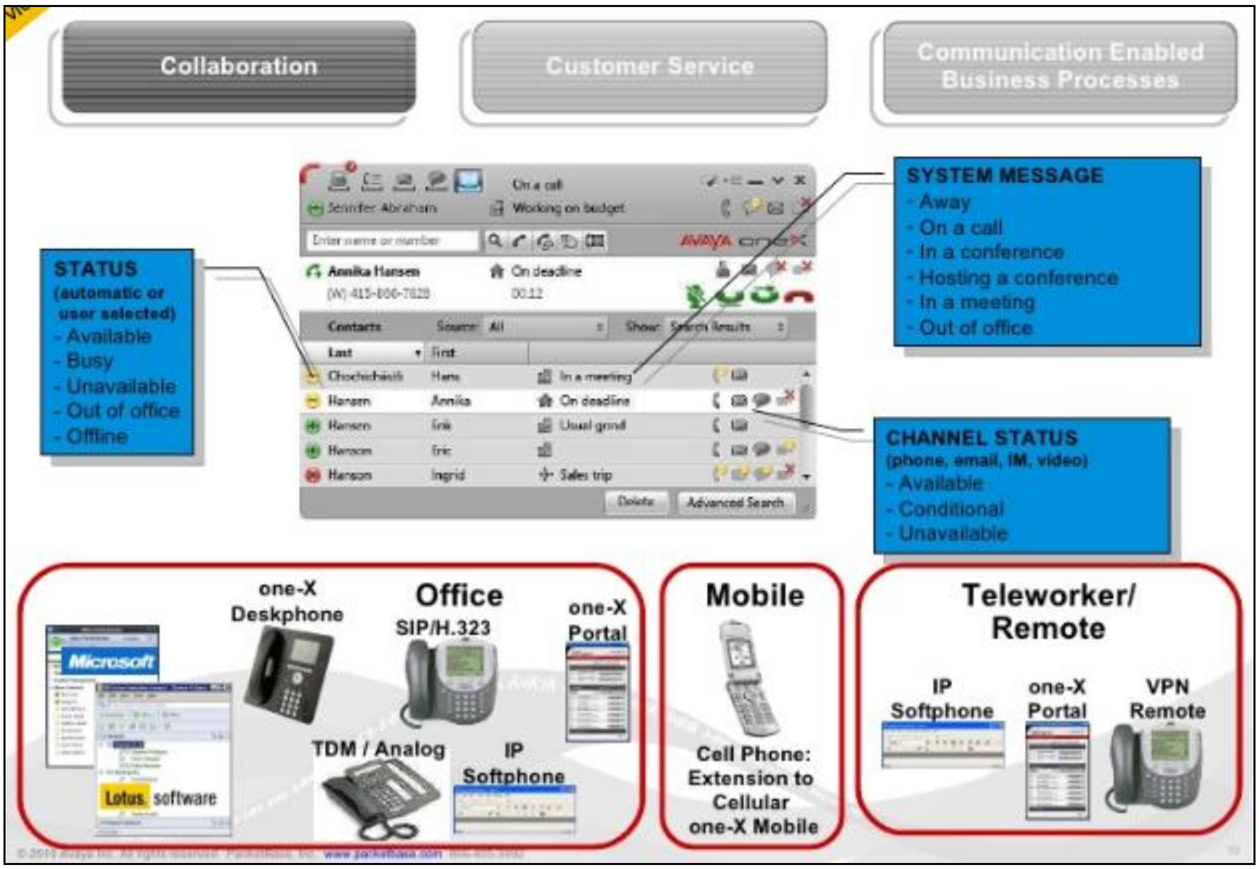

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75. Far North Patents only asserts method claims from the '802 Patent.

76. Avaya has had knowledge of the '802 Patent at least as of its issuance on August 8, 2006. For example, Avaya has had knowledge of patents related to the '802 Patent at least as of June 24, 2004, when the '616 Patent, which is the parent of the '802 Patent, and U.S. Patent Application Publication No. 2001/0005412, which is the published application of the '802 Patent, was cited by Avaya in an Information Disclosure Statement during the prosecution of U.S. Patent Application No. 10/805,887 ("the '887 application"), titled "Personal Location Information Management." Later

during the prosecution of the ‘887 application, Avaya cited U.S. Patent Application Publication No. 2006/0078101, which is the published application of a grandchild of the ‘802 Patent. The ‘887 application, and the patent that issued therefrom, was originally assigned to Nortel Networks Limited, a predecessor in interest to Avaya, and then ultimately assigned, prior to issuance, to Avaya Inc. Avaya employee John H. Yoakum, who is listed as an inventor on U.S. Patent Application No. 10/805,887, and others involved in the prosecution of the patent, including Jaspreet K. Harit, Russell W. Binns, Jr., Benjamin S. Withrow, John R. Witcher, III, Anthony J. Josephson, and Steven Terranova, have had knowledge of the ‘802 Patent at least as of its issuance on August 8, 2006.

77. Avaya has also indirectly and willfully infringed the ‘802 Patent, as explained further below in the “Additional Allegations Regarding Infringement” section.

78. Far North Patents has been damaged as a result of the infringing conduct by Avaya alleged above. Thus, Avaya is liable to Far North Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

79. Far North Patents and/or its predecessors-in-interest have satisfied all statutory obligations required to collect pre-filing damages for the full period allowed by law for infringement of the ‘802 Patent.

ADDITIONAL ALLEGATIONS REGARDING INFRINGEMENT

80. Avaya has also indirectly infringed the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent by inducing others to directly infringe the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent. Avaya has induced the end-users, Avaya's customers, to directly infringe (literally and/or under the doctrine of equivalents) the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent by using the accused products.

81. Avaya took active steps, directly and/or through contractual relationships with others, with the specific intent to cause them to use the accused products in a manner that infringes one or more claims of the patents-in-suit, including, for example, Claims 1 and 23 of the '105 Patent, Claim 9 of the '437 Patent, Claim 1 of the '230 Patent, Claim 1 of the '770 Patent, and Claim 5 of the '802 Patent.

82. Such steps by Avaya included, among other things, advising or directing customers and end-users to use the accused products in an infringing manner; advertising and promoting the use of the accused products in an infringing manner; and/or distributing instructions that guide users to use the accused products in an infringing manner.

83. Avaya has performed these steps, which constitute induced infringement, with the knowledge of the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent and with the knowledge that the induced acts constitute infringement.

84. Avaya was and is aware that the normal and customary use of the accused products by Avaya's customers would infringe the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent. Avaya's inducement is ongoing.

85. Avaya has also induced its affiliates, or third-party manufacturers, shippers, distributors, retailers, or other persons acting on its or its affiliates' behalf, to directly infringe (literally and/or under the doctrine of equivalents) the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent by importing, selling or offering to sell the accused products.

86. Avaya has at least a significant role in placing the accused products in the stream of commerce in North Carolina and elsewhere in the United States.

87. Avaya directs or controls the making of accused products and their shipment to the United States, using established distribution channels, for sale in North Carolina and elsewhere within the United States.

88. Avaya directs or controls the sale of the accused products into established United States distribution channels, including sales to nationwide retailers.

89. Avaya's established United States distribution channels include one or more United States based affiliates (e.g., at least Avaya Holdings Corp., Avaya Management L.P., Avaya Cloud Inc., Avaya Cala Inc., Avaya Emea Ltd., Avaya Federal Solutions, Inc., Avaya Holdings LLC, Avaya Integrated Cabinet Solutions LLC, Avaya Management Services Inc., Avaya World Services Inc., Hyperquality, Inc., Sierra Asia

Pacific Inc., Ubiquity Software Corporation, VPNet Technologies, Inc., Hyperquality II, LLC, Intellisist, Inc., and CAAS Technologies, LLC).

90. Avaya directs or controls the sale of the accused products nationwide on its own website and in nationwide retailers such as CDW, including for sale in North Carolina and elsewhere in the United States, and expects and intends that the accused products will be so sold.

91. Avaya took active steps, directly and/or through contractual relationships with others, with the specific intent to cause such persons to import, sell, or offer to sell the accused products in a manner that infringes one or more claims of the patents-in-suit, including, for example, Claims 1 and 23 of the '105 Patent, Claim 9 of the '437 Patent, Claim 1 of the '230 Patent, Claim 1 of the '770 Patent, and Claim 5 of the '802 Patent.

92. Such steps by Avaya included, among other things, making or selling the accused products outside of the United States for importation into or sale in the United States, or knowing that such importation or sale would occur; and directing, facilitating, or influencing its affiliates, or third-party manufacturers, shippers, distributors, retailers, or other persons acting on its or their behalf, to import, sell, or offer to sell the accused products in an infringing manner.

93. Avaya performed these steps, which constitute induced infringement, with the knowledge of the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent and with the knowledge that the induced acts would constitute infringement.

94. Avaya performed such steps in order to profit from the eventual sale of the accused products in the United States.

95. Avaya's inducement is ongoing.

96. Avaya has also indirectly infringed by contributing to the infringement of the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent. Avaya has contributed to the direct infringement of the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent by the end-user of the accused products.

97. The accused products have special features that are specially designed to be used in an infringing way and that have no substantial uses other than ones that infringe the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent, including, for example, Claims 1 and 23 of the '105 Patent, Claim 9 of the '437 Patent, Claim 1 of the '230 Patent, Claim 1 of the '770 Patent, and Claim 5 of the '802 Patent.

98. As described above, the special features include advanced quality monitoring capabilities and advanced presence information capabilities, used in a manner that infringes the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent.

99. The special features constitute a material part of the invention of one or more of the claims of the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent and are not staple articles of commerce suitable for substantial non-infringing use.

100. Avaya's contributory infringement is ongoing.

101. Furthermore, Avaya has a policy or practice of not reviewing the patents of others (including instructing its employees to not review the patents of others), and thus has been willfully blind of Far North Patents' patent rights. *See, e.g.*, M. Lemley, "Ignoring Patents," 2008 Mich. St. L. Rev. 19 (2008).

102. Avaya's actions are at least objectively reckless as to the risk of infringing valid patents and this objective risk was either known or should have been known by Avaya.

103. Avaya has knowledge of the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent.

104. Avaya's customers have infringed the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent.

105. Avaya encouraged its customers' infringement.

106. Avaya's direct and indirect infringement of the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent is, has been, and/or continues to be willful, intentional, deliberate, and/or in conscious disregard of Far North Patents' rights under the patents.

107. Far North Patents has been damaged as a result of the infringing conduct by Avaya alleged above. Thus, Avaya is liable to Far North Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

CLARIFICATION REGARDING PATENT EXPIRATION

108. For the avoidance of doubt, Far North Patents does not seek relief under any asserted patent for acts occurring after the expiration of that patent.

JURY DEMAND

Far North Patents hereby requests a trial by jury on all issues so triable by right.

PRAYER FOR RELIEF

Far North Patents requests that the Court find in its favor and against Avaya, and that the Court grant Far North Patents the following relief:

a. Judgment that one or more claims of the '105 Patent, the '437 Patent, the '230 Patent, the '770 Patent, and the '802 Patent have been infringed, either literally and/or under the doctrine of equivalents, by Avaya and/or all others acting in concert therewith;

b. A permanent injunction enjoining Avaya and its officers, directors, agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and all others acting in concert therewith from infringement of the '105 Patent; or, in the alternative, an award of a reasonable ongoing royalty for future infringement of the '105 Patent by such entities;

c. Judgment that Avaya account for and pay to Far North Patents all damages to and costs incurred by Far North Patents because of Avaya's infringing activities and other conduct complained of herein, including an award of all increased damages to which Far North Patents is entitled under 35 U.S.C. § 284;

d. That Far North Patents be granted pre-judgment and post-judgment interest on the damages caused by Avaya's infringing activities and other conduct complained of herein;

e. That this Court declare this an exceptional case and award Far North Patents its reasonable attorney's fees and costs in accordance with 35 U.S.C. § 285; and

f. That Far North Patents be granted such other and further relief as the Court may deem just and proper under the circumstances.

Dated: September 3, 2021

Respectfully submitted,

/s/ *Andrew H. Brown*
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