UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ServiceNow, Inc.
Petitioner

v.

BMC Software, Inc.
Patent Owner

U.S. Patent No. 8,674,992
Filing Date: July 14, 2010
Issue Date: March 18, 2014

TITLE: SPOTLIGHT GRAPHS

DECLARATION OF TAL LAVIAN, PH.D.

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I, Tal Lavian, Ph.D., declare as follows:

1. I have been retained by counsel for ServiceNow, Inc. ("Petitioner") in this case as an expert in the relevant art.

2. I have been asked to provide my opinions relating to claims 1 and 8 of U.S. Patent No. 8,674,992 to Ricky L. Poston et al. ("the '992 patent"), which I understand is owned by BMC Software, Inc. ("Patent Owner" or "BMC").

I. BRIEF SUMMARY OF MY OPINIONS

3. The '992 patent discloses a method and system for purportedly improving a display of a graph of nodes that represent information technology ("IT") services by replacing one method for graphically depicting attributes associated with the services with another method. In particular, claims 1 and 8 of the '992 patent are directed to displaying a graph of nodes representing services as taught in the prior art, but with "spotlights" that vary in size and color according to attributes associated with those services. The size of a spotlight corresponds to the importance of the service, and the color corresponds to the severity of an incident causing a service level agreement ("SLA") violation associated with the service. In my opinion, these claims do not describe anything that was new or non-obvious by June 2010, the earliest date listed on the face of the '992 patent.

4. As I explain in detail in **Part VI** of this Declaration, the features described in claim 1 were disclosed and suggested by U.S. Patent No. 7,600,007 to Lundy Lewis ("Lewis") in view of U.S. Patent Application Publication No. 2008/0295100 to John Ainsworth ("Ainsworth"), U.S. Patent Application No. 2006/0101347 to Maxym I. Runov et al. ("Runov"), and U.S. Patent No. 6,169,534 to Keith Raffel et al. ("Raffel"), each of which pre-dates the earliest application filing date of the '992 patent. The features described in claim 8 were disclosed and suggested by Lewis, Ainsworth, Runov and Raffel, in further view of International Application (PCT), WO 98/21668, to Kurt Schwem ("Schwem").

5. In broad overview, Lewis discloses a method and apparatus for defining service levels for services in an SLA, monitoring service parameters to determine the state of the services, and displaying a graph of icons representing the services and their respective states. Ainsworth discloses a system and method for monitoring services consistent with Lewis (in fact, Ainsworth incorporates Lewis by reference) and gives special emphasis to the ability to specify information about the value or importance of services. Runov discloses a general-purpose technique of using a spotlight effect to distinguish onscreen items from each other and provide alert indications in a graphical user interface. Raffel discloses a technique

of altering the size and color of a visual object in a display based on importance and severity attributes associated with underlying data. Schwem discloses a technique in which a first computer system (e.g. a web server) generates a user interface that is sent to a second computer system (e.g. a computer running a web browser) for display. As I explain in detail in **Part VI** below, it would have been obvious to a person of ordinary skill in the art to combine the relevant teachings of these references. The combination would have predictably resulted in a display of a graph of nodes representing services with spotlights that vary in size and color according to importance and severity attributes associated with those services.

II. INTRODUCTION AND QUALIFICATIONS

A. Qualifications and Experience

6. I possess the knowledge, skills, experience, training and the education to form an expert opinion and testimony in this case. A detailed record of my professional qualifications, including a list of patents and academic and professional publications, is set forth in my curriculum vitae attached to this declaration as **Exhibit A**.

7. I have more than 25 years of experience in the networking, telecommunications, Internet, and software fields. I received a Ph.D. in Computer Science from the University of California at Berkeley in 2006 and obtained a

Master's of Science ("M.Sc.") degree in Electrical Engineering from Tel Aviv University, Israel, in 1996. In 1987, I obtained a Bachelor of Science ("B.Sc.") in Mathematics and Computer Science, also from Tel Aviv University.

8. I am currently employed by the University of California at Berkeley and was appointed as a lecturer and Industry Fellow in the Center of Entrepreneurship and Technology ("CET") as part of UC Berkeley College of Engineering. I have been with the University of California at Berkeley since 2000 where I served as Berkeley Industry Fellow, Lecturer, Visiting Scientist, Ph.D. Candidate, and Nortel's Scientist Liaison, where some positions and projects were done concurrently, others sequentially.

9. I have more than 25 years of experience as a scientist, educator and technologist, and much of my experience relates to computer networking technologies. For eleven years from 1996 to 2007, I worked for Bay Networks and Nortel Networks. Bay Networks was in the business of making and selling computer network hardware and software. Nortel Networks acquired Bay Networks in 1998, and I continued to work at Nortel after the acquisition. Throughout my tenure at Bay and Nortel, I held positions including Principal Scientist, Principal Architect, Principal Engineer, Senior Software Engineer, and

led the development and research involving a number of networking technologies. I led the efforts of Java technologies at Bay network and Nortel Networks. In addition, during 1999-2001, I served as the President of the Silicon Valley Java User Group with over 800 active members from many companies in the Silicon Valley.

10. Prior to that, from 1994 to 1995, I worked as a software engineer and team leader for Aptel Communications, designing and developing mobile wireless devices and network software products. From 1990 to 1993, I worked as a software engineer and team leader at Scitex Ltd., where I developed system and network communications tools (mostly in C and C++).

11. I have extensive experience in the area of network communications and Internet technologies including design and implementation of computer-based systems for managing communications networks, including the ability to monitor and provision networks. While with Nortel Networks and Bay Networks (mentioned above) my work involved the research and development of these technologies. For example, I wrote software for Bay Networks and Nortel Networks Web based network management for Bay Networks switches. I developed Simple Network Management Protocol (SNMP) software for Bay

Network switches and software interfaces for Bay Networks' Optivity Network Management System. I wrote software for Java based device management including software interface to the device management and network management for the Accelar routing switch family network management system.

12. I have extensive experience in network communications, including control and management of routing and switching architectures and protocols in layers 1-7 of the OSI model. Much of my work for Nortel Networks (mentioned above) involved the research and development of network communications technologies. For example, I wrote software for Bay Networks and Nortel Networks switches and routers, developed network technologies for the Accelar 8600 family of switches and routers, the OPTera 3500 SONET switches, the OPTera 5000 DWDM family, and the Alteon L4-7 switching product family. In my lab, I installed, configured, managed and tested many network communications equipment of competitors such as Cisco Systems, Juniper Networks, Extreme Networks, Lucent and Alcatel.

13. I am named as a co-inventor on more than 80 issued patents and I co-authored more than 25 scientific publications, journal articles, and peer-reviewed papers. Furthermore, I am a Senior Member of the Institute of Electrical and

Electronics Engineers ("IEEE").

14. I currently serve as a Principal Scientist at my company Telecomm Net Consulting Inc., where I develop network communication technologies and provide research and consulting in advanced technologies, mainly in computer networking and Internet technologies. In addition, I serve as a Co-Founder and Chief Technology Officer (CTO) of VisuMenu, Inc., where I design and develop architecture of visual IVR technologies for smartphones and wireless mobile devices in the area of network communications. The system is based on cloud networking and cloud computing utilizing Amazon Web Services.

15. Additional details of my background are set forth in my curriculum vitae, attached as **Exhibit A** to this Declaration, which provides a more complete description of my educational background and work experience. I am being compensated for the time I have spent on this matter. My compensation does not depend in any way upon the outcome of this proceeding. I hold no interest in the Petitioner (ServiceNow, Inc.) or the patent owner (BMC Software, Inc.).

B. Materials Considered

16. The analysis that I provide in this Declaration is based on my education and experience in the field of computer systems and networks, as well as

the documents I have considered including U.S. Patent No. 8,674,992 ("'992 patent") **[Ex. 1001]**, which states on its face that it issued from an application filed on July 14, 2010 and claims priority to a provisional application filed on June 24, 2010 ('992, 1:6-9).

17. I reviewed various documents dated prior to June 2010 (in some cases, several years before 2010) describing the state of the art at the time of the alleged invention of the '992 patent. As explained below, some of these documents are relied upon as actually disclosing the limitations of the '992 patent, while others are being relied upon primarily for background purposes. The prior art documents that I rely upon in this Declaration as actually disclosing the limitations of the claims are:

Exhibit No.	Description of Document
1003	U.S. Patent No. 7,600,007 to Lundy Lewis ("Lewis")
1004	U.S. Patent Application Publication No. 2008/0295100 to John Ainsworth ("Ainsworth")
1005	U.S. Patent Application Publication No. 2006/0101347 to Maxym I. Runov et al. ("Runov")
1006	U.S. Patent No. 6,169,534 to Keith Raffel et al. ("Raffel")
1007	International Published Patent Application WO 98/21668 to Kurt Schwem ("Schwem")

This Declaration also cites the following additional prior art documents for purposes of describing the relevant technology, including the relevant state of the art at the time of the alleged invention of the ’992 patent:

Exhibit No.	Description of Document
1008	U.S. Patent Application Publication No. 2009/0076992 A1 to Rob Goris (“Goris”)
1009	Microsoft Computer Dictionary (5th ed. 2002)

III. PERSON OF ORDINARY SKILL IN THE ART

18. I understand that an assessment of claims of the ’992 patent should be undertaken from the perspective of a person of ordinary skill in the art as of the earliest claimed priority date, which I understand is June 24, 2010 (the date of the earliest application listed on the face of the ’992 patent).

19. As I explain in more detail in **Parts IV-V** below, the ’992 patent relates generally to graphically displaying information regarding IT services, and more specifically to using a “spotlight” effect to convey information associated with the state of a service. (’992, e.g., 2:24-27 (“the color of the spotlight indicates a severity status associated With [sic] the corresponding node, as illustrated with–shaded spotlights indicating a higher severity status than diagonal line shaded

spotlights.”).)

20. This field of technology was well developed by 2010. In fact, in the “Background” section, the ’992 patent references the larger, preexisting field of “Business Service Management (BSM)” and describes “service models in today’s IT environment” showing graphs of services “used to monitor the status of the objects in the service model” including “status, importance rating, events information, and whether an SLA is being violated, among others.” (’992, 1:17-60.) As I explain in **Part VI** below, graphical interface techniques involving a “spotlight” effect, as well as varying graphical objects by size and color to reflect importance and severity, were also known years before 2010.

21. In my opinion, a person of ordinary skill in the art as of June 2010 would possess at least a bachelor’s degree in electrical engineering or computer science (or equivalent degree or experience) with at least four years of computer programming experience. This experience would have provided such a person with familiarity with designing and implementing graphical user interfaces. Such a person would also have had an understanding of computer systems and networks, software for monitoring the operation and performance of those systems and networks, such as Network Management Systems (NMS) and Business

Processes/Systems Management software, and the tools for creating such software.

22. My opinions regarding the level of ordinary skill in the art are based on, among other things, the disclosure, technology and background of the ’992 patent as I describe in **Parts IV** and **V** below, my experience in the field as described in **Part II** above, and my understanding of the basic qualifications that would be relevant to an engineer or computer programmer tasked with creating a software program for displaying the status of services associated with a computer system and/or network.

23. Although my qualifications and experience exceed those of the hypothetical person having ordinary skill in the art defined above, my analysis and opinions regarding the ’992 patent have been based on the perspective of a person of ordinary skill in the art as of June 2010.

IV. RELEVANT BACKGROUND

24. The ’992 patent, entitled “Spotlight Graphs,” pertains generally to graphically displaying information regarding IT services, and more specifically to using a “spotlight” effect to convey information associated with the state of a service:

> In <u>a computer-displayed graph</u>, indications of multiple <u>attributes or states of an object represented by a node of the</u>

> graph are displayed using a spotlight, in which attributes of the spotlight correspond to attributes of the object represented by the node. The attributes of the spotlight each correspond to an attribute of the object and may include the color, brightness, and size of the spotlight. The spotlight may be positioned with the node, including overlaying the spotlight on the node and positioning the spotlight relative to the node.

('992, Abstract (emphasis added).)

25. In this section, I provide a brief background of relevant technology prior to June 2010 as it pertains to the '992 patent.

A. Network Management

26. By the 1980s, businesses and enterprises frequently used computers that were connected to a network (commonly known as a "Local Area Network" (LAN)), which allowed the computers to communicate with each other using a network communications technology such as Ethernet. As the number of devices connected to a network increased, so did the need for software tools to monitor and manage those devices and their associated services. An entire field referred to as "network management" grew out of this need and by 2010 was well-established. For example, U.S. Patent No. 7,600,007 to Lundy Lewis ("**Lewis**") **[Ex. 1003]**, whose filing pre-dates the '992 patent by a decade, discloses a system for

monitoring devices on a computer network and associated services. (Lewis, e.g., 3:1-19.)

B. Service Level Agreements (SLAs)

27. "Service level agreements" ("SLAs") are another key concept of the '992 patent. The patent refers to "service level agreements" and "SLA violations," but does not elaborate on the subject in any detail. This is presumably because SLAs were well-known to persons of ordinary skill in the art by June 2010.

28. The concept of an SLA is straightforward. One definition of an SLA, is provided in U.S. Patent Application Pub. No. 2009/0076992 A1 to Rob Goris ("Goris") and published on March 19, 2009. Goris was cited on the face of the '992 patent. Goris explains that:

> A Service Level Agreement or SLA is a contractual agreement between two parties on one or more service level objectives. An SLA has business impact for both, the provider of a service and the consumer using the service. A service provider usually has more than one active SLA, either for the same consumer or for a set of consumers.

(Goris, Ex. 1008, ¶ 0002.)

29. The description in Goris is generally consistent with the understanding of a person of ordinary skill in the art as of June 2010. As Goris

confirms, an SLA is an agreement between an IT service provider and a customer that defines the level of service that is expected from the service provider. For example, the Lewis prior art reference that I discuss in detail below describes one example of an SLA in which IT service provider provides a website service to a customer. An SLA associated with that service may specify that the website service must be available 99% of the time, as measured by total minutes that the website is available to the public. (Lewis, Ex. 1003, e.g., 43:44-48, 43:61-63, 44:5-16.) If the 99% availability mark is not met, the SLA has been violated and monetary penalties for the IT service provider may result. (Lewis, e.g., 44:22-30 ("The monthly bill depends on the extent to which the service agreement is met or violated. . . . If the agreement is not met, the provider may be penalized.").)

C. Techniques for Highlighting or Distinguishing Information in Graphical User Interfaces (GUIs)

30. As I explain in more detail in **Part V** below, the '992 patent acknowledges that graphical user interfaces for displaying the status of computer-based services were known to persons of ordinary skill in the art by 2010. ('992, 1:36-40, 1:53-60.) One specific example is Lewis, which discloses a graphical user interface for "service level management" that displays icons representing services and their respective statuses as well as the relationships between the services.

(Lewis, e.g., Fig. 35, 7:38-45, 46:9-18.)

31. One challenge associated with graphical displays of information that was obvious and well-recognized by persons of ordinary skill in the art was how to efficiently convey information to a user. U.S. Patent Application No. 2006/0101347 to Maxym I. Runov et al. **[Ex. 1005]** ("**Runov**"), which dates from 2004, explains, for example, that a user of a graphical interface can have a difficult time finding what he or she is looking for, and that searching can be "frustrating" and "time-consuming." (Runov, ¶ 0010.) U.S. Patent No. 6,169,534 to Keith Raffel et al. **[Ex. 1006]** ("**Raffel**"), which issued in 2001, similarly observes that "it is desirable to maximize the information presented to a decision maker while presenting the information in such a way as to be readily understood by the decision maker." (Raffel, 1:19-22.) Runov discloses a "spotlight" effect that can vary in size and color to "visually distinguish one (or more) onscreen item from other onscreen items" as a way to address that challenge. (Runov, e.g., ¶¶ 0042-43, 0067-68.) Raffel discloses a similar technique of using visual objects that vary in size and color according to importance and severity of data related to the object. (Raffel, e.g., 2:12-14, 4:27-32, 9:44-50, Fig. 2a.)

V. THE ’992 PATENT’S TECHNIQUE FOR DISPLAYING GRAPHS OF SERVICES

A. The Specification

32. The ’992 patent, entitled “Spotlight Graphs,” generally describes a method and system for displaying a computer-generated graph representing information technology (“IT”) services and associated visual objects, referred to as “spotlights.” The spotlights reflect certain attributes related to those services, such as service importance, the occurrence service level agreement (“SLA”) violations, and the severity of incidents associated with the SLA violations. (’992, Abstract, 1:13-16, 3:65-4:19.)

33. As mentioned in **Part IV** above, the ’992 patent admits that systems for displaying computer-generated graphs of IT services and their attributes were already known in the art. (’992, 1:36-40 (“[R]epresentation of these services and IT components is typically done using directed acyclic graphs (DAGs), where each component of a service model, whether a business user, a service component, or an IT infrastructure component, is represented as a node in the graph.”), 1:53-60 (“[M]onitoring data is typically shown by placing multiple smaller icons . . . these icons may show status, importance rating, events information, and whether an SLA is being violated, among others.”).)

34. Figure 1 of the '992 patent, below, depicts such a computer-generated graph according to the prior art:

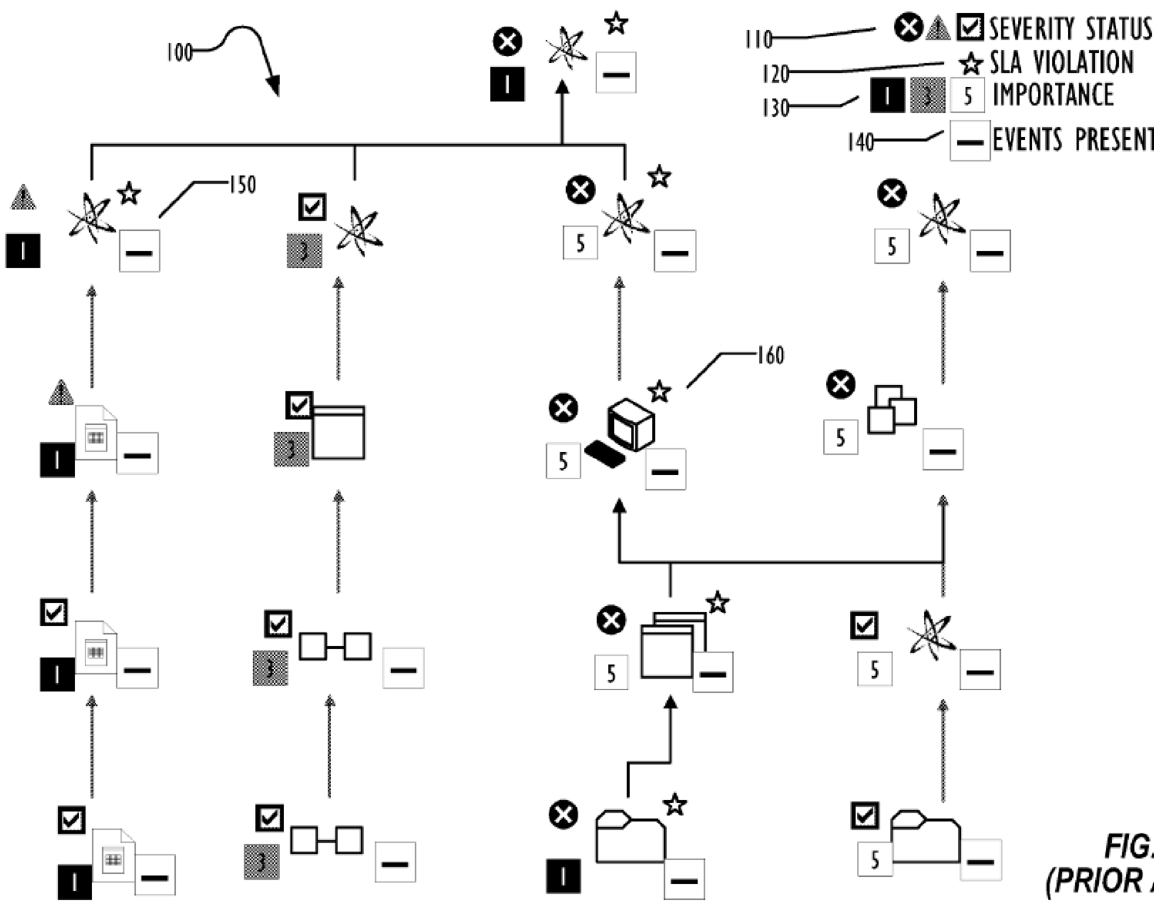


FIG. 1
(PRIOR ART)

('992, Fig. 1; *see also id.*, 2:48-49 ("FIG. 1 illustrates, in graph form, an example of a service model graph according to the prior art.").) In the figure above, prior art graph (**100**) includes nodes representing IT services (such as nodes **150** and **160**) with visual indicators of "importance" (**130**), "SLA violation" (**120**), and "severity status" (**110**). ('992, Fig. 1, 2:26-38, 3:26-34 ("For example, node **150** is illustrated with 4 associated icons, as is node **160**, indicating that node **150** has attributes or states corresponding to those associated icons.”).)

35. However, the ’992 patent criticizes the prior art graphs as being “very large and difficult to navigate and view” for enterprise IT departments attempting to monitor increasingly complex IT service models. (’992, 1:34-36, 1:50-51.) “As the amount of data shown by the graph . . . increases,” the ’992 patent asserts, “the graph objects can get very complex with the addition of the [sic] all the surrounding indicator icons.” (’992, 2:2-5.) Thus, according to the ’992 patent, IT professionals using such prior art systems to prioritize their work would be forced to “scan many different icons,” “memorize what all the different metric icons mean,” and “then mentally compare in their minds the importance of all of the different objects.” (’992, 2:5-14.)

36. To simplify this purportedly “difficult, memory intensive task,” the ’992 patent proposes “a technique for improving usability of IT service models” that consists essentially of “replac[ing] some or all of the metric indicator icons with a single colored spotlight that appears behind the [service] object, reducing the mental workload of determining the relative importance of multiple objects in the graph view.” (’992, 1:14-16, 2:13-14, 3:21-25.) Figure 2 of the ’992 patent,

below, depicts a representative embodiment:

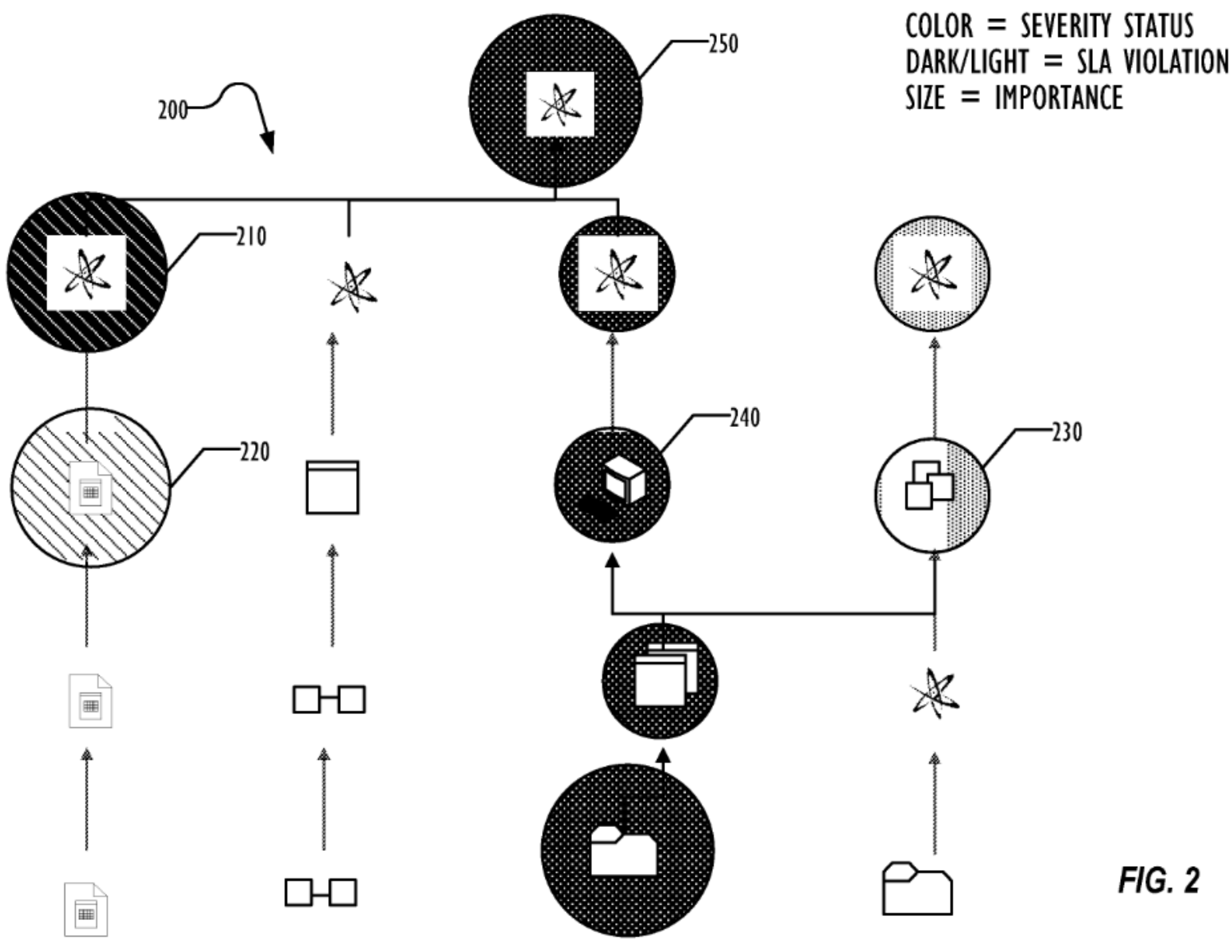


FIG. 2

('992, Fig. 2; *see also id.*, 2:50-51 ("FIG. 2 illustrates, in graph form, a service model graph using spotlights according to one embodiment.").)

37. Figure 2 above depicts the purportedly improved graph of nodes representing services, apparently depicting the same underlying IT service model as depicted in prior art Figure 1 (each node icon (such as the folder icon) is identical in image and relative position between Figures 1 and 2). However, the

severity status, SLA violation, and importance metric indicator icons have been replaced by a single "spotlight" (such as **210**). (*Compare* '992, Figs. 1 & 2.) For example, "the color of the spotlight indicates a severity status associated with the corresponding node, as illustrated with—shaded spotlights indicating a higher severity status than diagonal line shaded spotlights." ('992, 3:59-62.) Also, "[t]he <u>size of the spotlight</u> may correspond to an <u>importance</u> of the node, as illustrated, with more important nodes having a larger spotlight than less important nodes." ('992, 3:67-4:3 (emphasis added).) The '992 patent further explains that the "spotlights may be implemented using <u>any</u> graphical technique known to the art for placing a graphical image over or below another image on a screen." ('992, 5:49-51 (emphasis added).)

B. The Claims of the '992 Patent

38. This Declaration addresses the two independent claims of the '992 patent—claims 1 and 8. Independent claim 1 recites a method for displaying a graph of services with spotlights:

> 1. A method, comprising:
>
> **[a]** displaying a graph on a display screen, the graph including a plurality of nodes, each of the plurality of nodes representing a service of a plurality of services;
>
> **[b]** determining a metric for each of a plurality of attributes associated with a service level agreement (SLA) for each of the

> plurality of services, the plurality of attributes including at least one SLA violation, a severity of the incident causing the SLA violation and an importance of the corresponding service; and
>
> **[c][1a]** displaying a spotlight with each of the nodes of the plurality of the nodes,
>
> **[c][1b]** the spotlight including a plurality of characteristics, each of the plurality of characteristics corresponding to one of the attributes of the service of the plurality of services represented by the node, the displayed spotlight being graphically varied based on the determined metric such that,
>
> **[c][2]** a size of the spotlight varies based on the importance of the corresponding service, and
>
> **[c][3]** a color of the spotlight varies based on the severity of the incident causing the SLA violation.

('992, 7:9-29 (Claim 1).) I added the bracketed notations (*e.g.*, "[a]," "[c][1a]," etc.) to facilitate identification of these limitations in my Declaration.

39. Independent claim 8 is similar to claim 1 but instead recites a system for displaying a graph of services with "variable graphical images":

> 8. A networked computer system, comprising:
>
> **[a]** a first computer system configured to generate a graph including a plurality of nodes, each node of the plurality of nodes modeling a service of a plurality of services;
>
> **[b]** a second computer system, communicatively coupled to the first computer system, configured to display the graph generated by the first computer system; and
>
> **[c][1]** a first software configured to,
>
> **[c][2]** determine a metric for each of a plurality of states associated with a service level agreement (SLA) for each of the plurality of

> services, the plurality of states including at least one SLA violation, a severity of the incident causing the SLA violation and an importance of the corresponding service, and
>
> **[c][3a]** represent the plurality of states with a variable graphical image positioned with the node, the graphical image having a plurality of attributes, each attribute representing a state of the plurality of states and an importance of the node, each of the attributes being varied based on the determined metric for each associated state such that,
>
> **[c][3b]** a size of the variable graphical image varies based on the importance of the corresponding service, and
>
> **[c][3c]** a color of the variable graphical image varies based on the severity of the incident causing the SLA violation.

('992, 8:1-23 (Claim 8).)

C. Claim Construction

40. I have been informed by counsel that invalidity involves a two-step analysis. In the first step, the scope and meaning of a claim is determined by construing the terms of that claim. In the second step, the claim as interpreted is compared to the prior art. Thus, before I address the application of the prior art to the claims of the '992 patent in **Part VI** below, I will provide proposed constructions for certain terms in the claims addressed in this Declaration, from the perspective of a person of ordinary skill in the art.

41. I have been informed by counsel that a claim in an unexpired patent subject to *inter partes* review must be given its broadest reasonable construction

that is consistent with the specification of the patent in which it appears, which is different from the manner in which the scope of a claim is determined in litigation. I have applied this standard in my analysis below.

1. "SLA violation"

42. Both independent claims of the '992 patent recite the term "SLA violation," with the term "SLA" being an acronym for "service level agreement." In my opinion, the broadest reasonable interpretation of "**SLA violation**" is a "**failure to achieve a service level objective specified in an SLA**."

43. As I explained in **Part IV.B** above, the concept of a service level agreement (SLA) was well-known to persons or ordinary skill in the art long before the '992 patent. Generally speaking, an SLA is an agreement between at least two parties defining one or more service level objectives. For example, an SLA can specify that a particular service (such as a Web server) must be available 99% of the time, and failure to meet that percentage would result in a failure to meet the objective and, thus, an SLA violation.

44. This view is consistent with U.S. Patent Application Pub. No. 2009/0076992 A1 to Rob Goris ("Goris"), published on March 19, 2009 and cited on the face of the '992 patent. (I am informed that patents and patent applications

cited on the face of the ’992 patent, such as Goris, qualify as “intrinsic” evidence for purposes of claim construction.) Goris describes a technique for identifying and ranking SLA violations. (Goris, Ex. 1008, ¶ 0001.) Goris further explains that “[a] Service Level Agreement or SLA is a contractual agreement between two parties on one or more service level objectives.” (*Id.* ¶ 0002 (underlining added).)

45. This explanation is contained in the “Background” section of Goris, and is generally consistent with the understanding of a person of ordinary skill in the art. A violation of an SLA, in turn, would have been understood as a failure to meet one or more of those “service level objectives.” In my opinion, therefore, the term “SLA violation” under its broadest reasonable interpretation is a “**failure to achieve a service level objective specified in an SLA**.”

2. “variable graphical image”

46. The term “**variable graphical image**” appears in independent claim 8, and does not appear in the specification. Based on my analysis of the specification, however, the term “variable graphical image” appears to be roughly synonymous with the term “spotlight” described in the specification and recited in claim 1. Claim 8 recites that the “variable graphical image” may vary in size and color based on, respectively, the “importance of the corresponding service” and the

"severity of the incident that caused the SLA violation." This is consistent with the specification's description of a spotlight. ('992, 3:39-42 ("FIG. 2 is a block diagram of a service model graph **200** using spotlights according to one embodiment. In this embodiment, <u>this spotlight may vary in three dimensions: color, size, and brightness</u>.") (emphasis added).)

47. Based on the specification and the way in which the term is used in the claim, therefore, in my opinion, a "**variable graphical image**" is a "**graphical image whose appearance may vary based on one or more states associated with a service level agreement (SLA)**."

48. The following table identifies the above claim constructions:

Claim Term	Broadest Reasonable Construction
"SLA violation"	"failure to achieve a service level objective specified in an SLA"
"variable graphical image"	"graphical image whose appearance may vary based on one or more states associated with a service level agreement (SLA)"

VI. APPLICATION OF PRIOR ART TO CLAIMS 1 AND 8 OF THE ’992 PATENT

49. I have reviewed and analyzed the prior art references and materials listed in **Part II.B** above. In my opinion, each limitation of claim 1 is disclosed and suggested by U.S. Patent No. 7,600,007 to Lundy Lewis **[Ex. 1003]** (“**Lewis**”) in view of U.S. Patent Application Publication No. 2008/0295100 to John Ainsworth **[Ex. 1004]** (“**Ainsworth**”), U.S. Patent Application Publication No. 2006/0101347 to Maxym I. Runov et al. **[Ex. 1005]** (“**Runov**”), and U.S. Patent No. 6,169,534 to Keith Raffel et al. **[Ex. 1006]** (“**Raffel**”). For claim 8, I have also relied on International Patent Application WO 98/21668 A1 to Kurt Schwem **[Ex. 1007]** (“**Schwem**”). As I explain below, a person of ordinary skill in the art at the relevant time would have been motivated to combine the teachings of these references.

50. Counsel has informed me that these references properly qualify as prior art to the ’992 patent. Lewis was filed on May 23, 2000. Ainsworth was published on November 27, 2008. Runov was published on May 11, 2006. Raffel was filed on June 26, 1997 and issued January 2, 2001. Schwem was published on May 22, 1998. Each of these dates is more than one year (in some cases more than a decade) before the earliest application filing date on the face of the ’992 patent

(June 24, 2010).

51. Before applying the prior art to claims 1 and 8, I will provide a brief summary of Lewis, Ainsworth, Runov, Raffel, and Schwem.

A. Summary of Prior Art References Applied in this Declaration

1. Lewis (Ex. 1003)

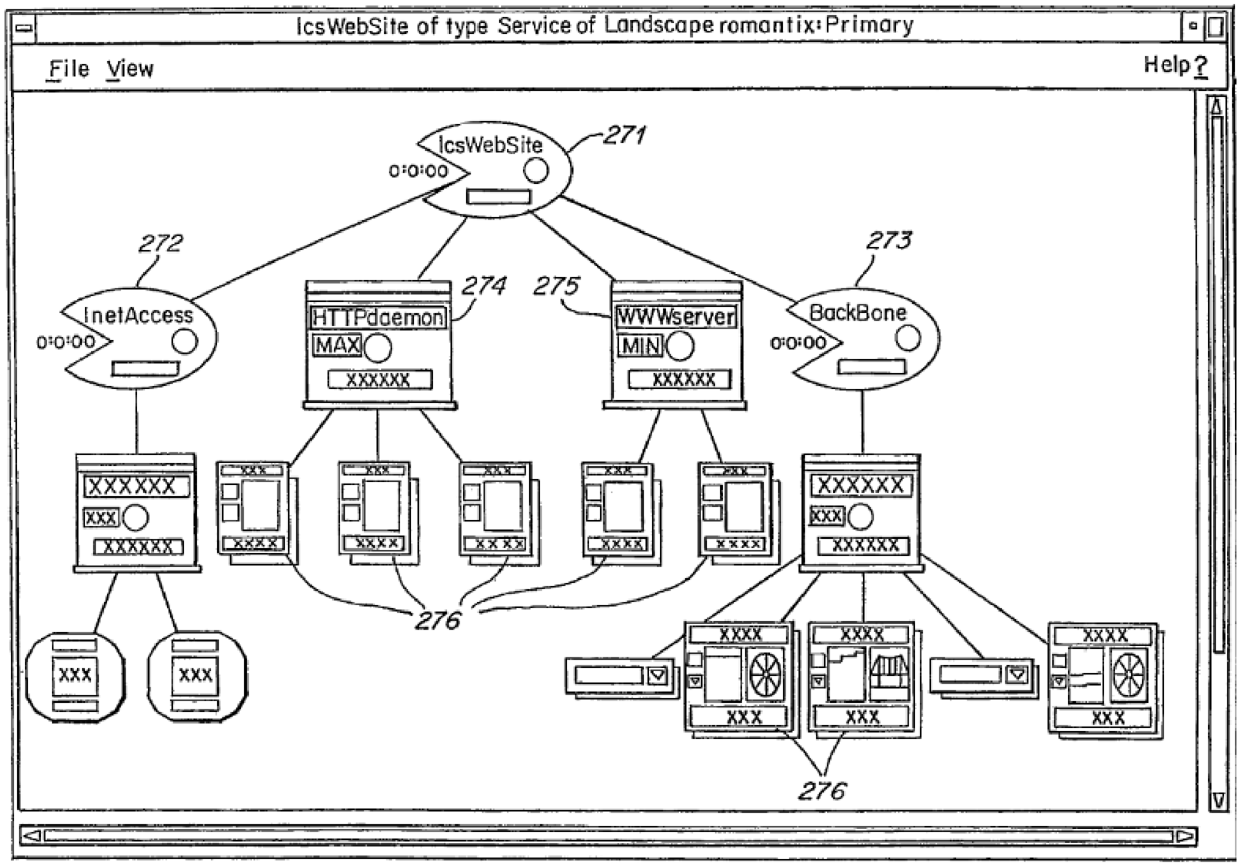
52. Lewis, entitled "Method and Apparatus for Event Correlation in Service Level Management (SLM)," discloses a system for monitoring the status of computer-based services associated with service level agreement. (Lewis, Ex. 1003, e.g., 1:42-2:7, 3:1-46, 7:38-53.) Lewis explains:

> The present invention is directed to various aspects of <u>service level management (SLM)</u>, whereby an entity (such as a company, university, Internet service provider (ISP), electronic commerce (EC) provider, etc.) may, for example, map components of a network (i.e., network devices, transmission media, computer systems, and applications) into services in order to <u>assess the state of those services</u>. The state of those services, referred to herein as <u>service parameters</u>, may include availability, response time, security, and integrity.
>
> . . .
>
> <u>Service levels are designated for accepted levels of the service parameters</u>. <u>The service levels may be incorporated in a service</u>

> level agreement.
>
> . . .
>
> [A] method and apparatus are provided for display of service level management (SLM). In one embodiment, a display comprises an identification of one or more services, a location of the one or more services, a state of the one or more services . . . . In various embodiments, the state may comprise one or more of availability, reliability, performance, fault, configuration, integrity and security.

(Lewis, 1:42-50, 3:15-17, 7:38-47 (emphasis added to all).)

53. Figure 35 of Lewis depicts an exemplary graphical user interface (GUI) for displaying the status of services (and their components):



(Lewis, Fig. 35.) In the figure above, the three icons **271**, **272**, **273** at the top of Figure 35, which look like left-facing "Pac-Man" characters, represent services – in particular, ICS Web Site service **271**, Internet access service **272**, and backbone service **273**. (Lewis, 46:11-14.) When an incident occurs that affects a service, the icon for the service may change color. (Lewis, 46:23-25 ("For example, suppose a BMC patrol agent <u>detects a fault in a server, which in turn affects the service. In this case, both icons might turn red, indicating an alarm</u>.") (emphasis added).)

54. As I explain in my analysis in **Part VI** below, Lewis discloses or

suggests nearly all aspects of claims 1 and 8 of the ’992 patent, except for limitations related “spotlights” (or, in claim 8, the “variable graphical images”).

2. Ainsworth (Ex. 1004)

55. Ainsworth, entitled “System and Method for Diagnosing and Managing Information Technology Resources,” incorporates Lewis by reference (Ainsworth, ¶ 0008) and provides further teachings regarding monitoring services and SLAs associated with those services. (Ainsworth, ¶ 0003.) I rely on Ainsworth for its disclosures regarding specifying the value or importance of an IT service in an SLA. (Ainsworth, e.g., ¶ 0017 (“Enterprises and IT vendors often enter into contracts for IT services, designating certain services to be critical or otherwise prioritized. These contracts, often referred to as service level agreements (SLAs), may include penalties for when services become unavailable or when service levels degrade below various thresholds.”) (emphasis added); *see also id.*, ¶¶ 0016-20.)

3. Runov (Ex. 1005)

56. Runov, entitled “Highlighting Icons for Search Results,” discloses a general-purpose technique for using a “spotlight effect” to facilitate the presentation of graphical displays of information. Runov explains the technique in the context of highlighting icons that match a search query:

> As the user enters query text **201**, and concurrently with the display of menu **202**, certain icons **101** are highlighted to indicate that they represent preference panes **500** that contain controls **504** referenced in menu **202**. In one embodiment, a distinctive type of highlighting is used, as depicted for icons **101A** in FIG. 2. <u>This highlighting takes the form of a spotlight effect</u>, in which most of window **100** is darkened slightly, except for a circular area immediately surrounding each icon **101A**.

(Runov, Ex. 1005, ¶ 0042 (underlining added); *see also id.* ("In alternative embodiments, the spotlight effect can be accomplished by brightening the area surrounding the highlighted icons **101A** and leaving the remainder of window 100 at the same brightness as before.").) Runov makes clear, however, that the technique is generally applicable "<u>in any situation where it is desirable to visually distinguish one (or more) onscreen item from other onscreen items</u>," such as "<u>which item(s) have alerts to be brought to the attention of the user</u>." (Runov, ¶¶ 0067, 0068.) Runov further teaches that the spotlight can be varied in size and color. (Runov, ¶ 0069 ("[T]he <u>spotlight effect can be implemented using any shape</u> and size for the area immediately surrounding each icon **101A** . . .") (underlining added), ¶ 0043 ("[T]he term 'highlighting' is intended to refer to any form of effect by which some resources or items are distinguished from others. Examples of such effects include changing the size, shape, color, contrast, and/or other visual features of an associated name, icon, or other item.") (emphasis added).)

4. Raffel (Ex. 1006)

57. Raffel, entitled "Graphical User Interface for Customer Information Management," discloses a method of presenting event data on a graphics display. (Raffel, Ex. 1006, 1:6-8.) The event data is displayed as an "event object" whose size and color are indicative of the associated underlying event. (Raffel, 2:1-14.) I rely on Raffel chiefly for its teachings that the size of the displayed object may vary based on importance (Raffel, 4:28-32, 8:65-67; *see also id.*, claims 12, 62, 77, 86, 97), while its color may vary based on severity (Raffel, 9:44-50; *see also id.*, claims 27, 28).

5. Schwem (Ex. 1007)

58. Schwem, entitled "Web-Based Network Management System," describes a technique for creating a Web interface for accessing network management features. My Declaration relies on Schwem solely in connection with claim 8, which recites a "first computer system" for creating a graph, and "second computer system" for displaying the created the graph. As I will explain in my

discussion of claim 8 below, Schwem discloses a technique in which a first computer system (e.g. a web server) generates a user interface that is sent to a second computer system (e.g. a computer running a web browser) for display.

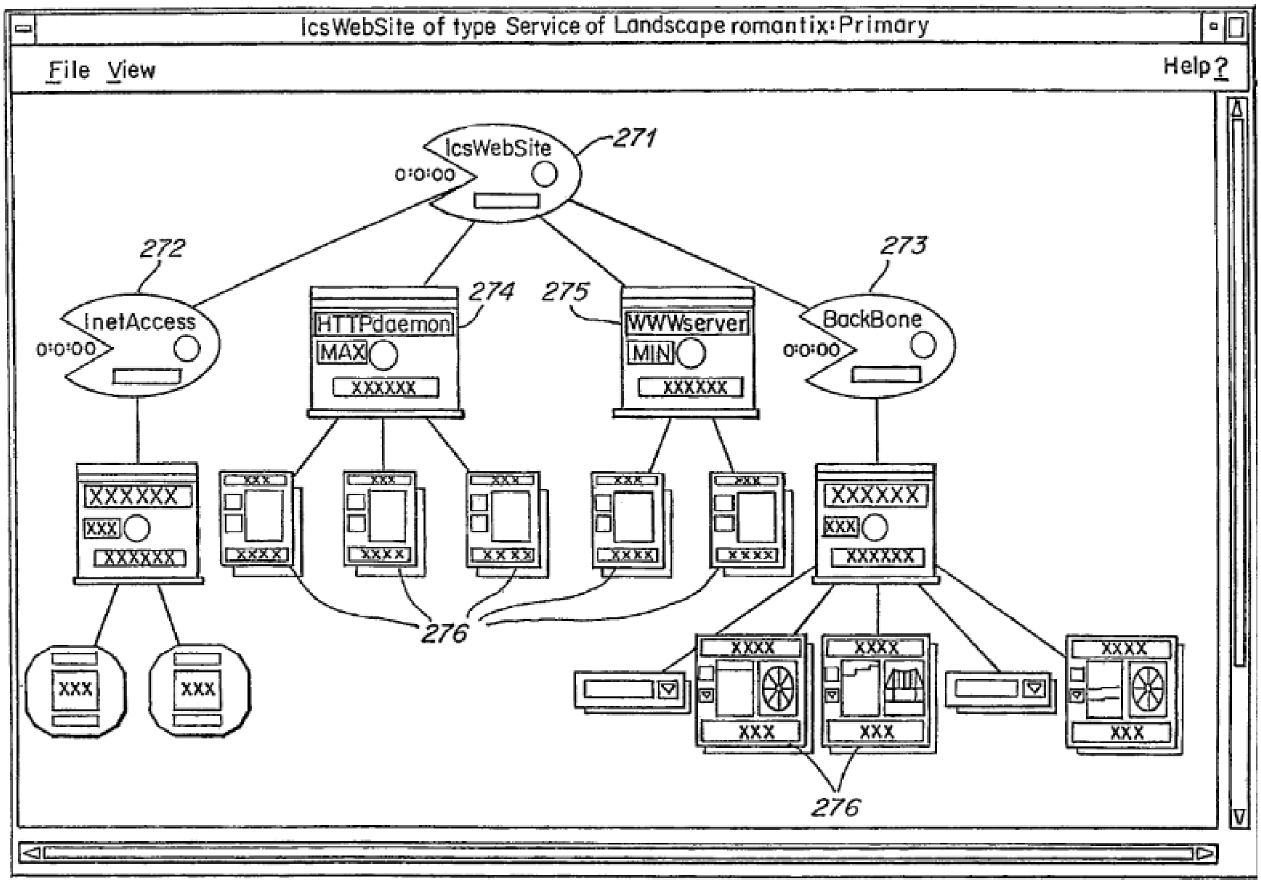
B. Claims 1 and 8 of the '992 Patent are Disclosed and Suggested by Lewis in view of Ainsworth, Runov and Raffel

1. Claim 1

59. Independent claim 1 recites "[a] method, comprising" a number of limitations. As explained in detail below, Lewis in view of Ainsworth, Runov and Raffel discloses the claimed method.

(a) "displaying a graph on a display screen, the graph including a plurality of nodes, each of the plurality of nodes representing a service of a plurality of services" (Claim 1[a])

60. Lewis fully discloses claim 1**[a]**. Lewis discloses monitoring IT services using a graphical user interface ("GUI") that displays a plurality of connected icons representing those services and their relationships. That graphical user interface is depicted in Figure 35 of Lewis, shown below:

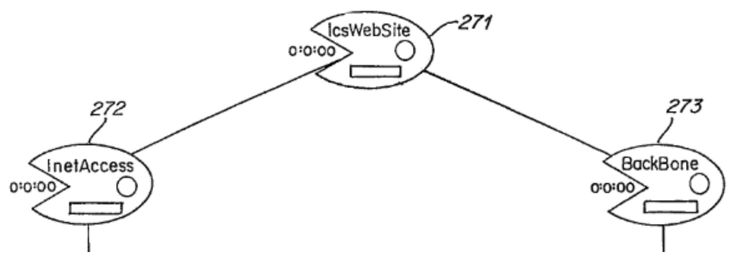


(Lewis, Fig. 35.)

61. Turning to first portion of claim 1**[a]**, "**displaying a graph on a display screen, the graph including a plurality of nodes**," Lewis explains that Figure 35 "is a <u>graphical user interface screen shot</u> of a <u>service</u> <u>decomposed</u> into supporting network devices, computer systems and applications." (Lewis, 10:50-52 (emphasis added).) The well-known term "screen shot" refers to an image captured from a display on a computer display screen. (*See, e.g.*, Microsoft Computer Dictionary (5th Ed. 2002), Ex. 1009, at 467 (defining "screen shot" as

"[a]n image that shows all or part of a computer display.").) As I explain below, that "screen shot"—i.e., "computer display"—displays a "graph" and "nodes," as claimed.

62. The "**graph**" in Lewis takes the form of the visual representation of at least icons **271**, **272**, and **273** in Figure 35 and the connections between them (excerpted at right). Each of icons **271**, **272** and **273** qualifies as a "**node**" because it is a visual object and has a relationship with another icon. For example, IcsWebSite icon **271** is shown as connected to icons **272** and **273**, representing the fact that the service represented by icon **271** is composed of the services represented by icons **272** and **273**. (Lewis, 46:13-18 ("The three icons **271**, **272**, **273** at the top of the hierarchy represent services. <u>The ICS Web site service **271** is decomposed into two services (Internet access **272**, and the backbone **273**)</u>, an HTTP daemon **274**, and a Web server **275**.") (underlining added).) Lewis thus discloses the first portion of claim 1**[a]**.



63. Turning to the second portion of claim 1**[b]**, "**each of the plurality of nodes representing a service of a plurality of services**," Lewis explains that the

three icons **271**, **272**, **273** at the top of Figure 35 each represents a service – in particular, ICS Web site service **271**, Internet Access service **272**, and Backbone service **273**. (Lewis, Fig. 35, 46:13-16 ("<u>The three icons **271, 272, 273** at the top of the hierarchy represent services</u>. The ICS Web site service **271** is decomposed into two services (Internet access **272**, and the backbone **273**), an HTTP daemon **274**, and a Web server **275**.") (underlining added).) Lewis thus entirely discloses claim 1**[a]**.

(b) "determining a metric for each of a plurality of attributes associated with a service level agreement (SLA) for each of the plurality of services, the plurality of attributes including at least one SLA violation, a severity of the incident causing the SLA violation, and an importance of the corresponding service" (Claim 1[b])

64. Lewis in combination with Ainsworth discloses or suggests each limitation recited in claim 1**[b]**. Claim 1**[b]** is a convoluted limitation that first recites "determining a metric for each of a plurality of attributes," but goes on to identify three "attributes" in particular. The limitation further requires that each of those attributes be "associated with a service level agreement (SLA)" "for each of the plurality of services" identified in claim 1**[a]**. Thus, for convenience and ease of understanding, I will first explain how the prior art discloses or suggests

"determining a metric" for each of the three identified attributes: **(i)** "one SLA violation"; **(ii)** "a severity of the incident causing the SLA violation"; and **(iii)** "an importance of the corresponding service." The following table shows how I mapped each of these three attributes to the teachings of Lewis and Ainsworth:

"Attribute" Associated with an SLA	**Disclosure in the Prior Art of the Attribute and its Associated "Metric"**
"at least one SLA violation"	Lewis discloses a "service level" specifying an acceptable quality of service that, if not met, results in an SLA violation
"a severity of the incident causing the SLA violation"	Lewis discloses a "severity" value in indicating the severity of the incident (such as unavailability of a server) that results in the failure to meet the specified service level
"an importance of the corresponding service"	Ainsworth discloses ability to designate that a service is "critical" to the organization

65. I will explain each of these attributes, and the rationale for combining Ainsworth with Lewis with respect to the third attribute, below. As noted above, the claim language requires that each of these attributes be associated with a Service Level Agreement (SLA), and accordingly, I will address that aspect of the claim first. Lewis expressly discloses the existence of an SLA:

> A service level agreement (SLA) is a contract between a

> supplier and a customer that identifies (1) services supported by a network, (2) service parameters for each service, (3) service levels for each service parameter, and (4) (optionally) penalties/rewards on the part of the supplier and/or customer when service levels are not met or exceeded.

(Lewis, 12:57-62 (emphasis added).) As Lewis states in the excerpt above, an SLA is an agreement between two parties that identifies a "service level" for each "service parameter" of a service. Lewis further explains that a "service parameter" is "a variable having a state (value) which represents the performance of some service provided by a network." (Lewis, 12:40-42.) A "service level," in turn, is "some value of a service parameter used to indicate acceptable service qualities." (Lewis, 12:55-56 (emphasis added).) Because a "service level" indicates an acceptable service quality —i.e., a "service level objective"—Lewis discloses a "service level agreement" as claimed. Each of the attributes recited in claim 1**[b]**, as I will show below, is associated with an SLA.

(i) "determining a metric for each of a plurality of attributes associated with a service level agreement (SLA) for each of the plurality of services, the plurality of attributes including at least one SLA violation. . . ."

66. The step of "**determining a metric for . . . at least one SLA violation**" in Lewis takes the form of specifying an acceptable or threshold

value—what Lewis calls a "service level"—for a particular "service parameter" in an SLA. As I explained in **Part V.C.1** above, an "SLA violation" is a failure to achieve a service level objective specified in an SLA.

67. This step is clearly illustrated in the treatment of an exemplary service parameter called "availability," which is specified in the SLA. (Lewis, 12:19-22 ("Three examples of service parameters are availability, reliability, and usability . . . ."), 43:44-48 ("The following service parameters may be included in an embodiment of a service level agreement, for example where the service is providing EC (commerce)—a Web site: availability: customers want their Web sites to be available at all times.") (emphasis added).) Lewis provides an example of an electronic commerce provider that enters into an SLA with a customer that specifies a service level of 100% for the "availability" service parameter. The agreement is violated if this level of availability is not achieved:

> The monthly bill depends on the extent to which the service agreement is met or violated. For example, 100% availability is hard to achieve. If an agreement specifies 100% availability for an entire month and the provider demonstrates that the server has been available 100%, the supplier may receive a bonus of x$ in addition to the regular fee. If the agreement is not met, the provider may be penalized. The provider can publicize such

policies in the "policies" section of the Agreement.

(Lewis, 44:22-30 (emphasis added).)

68. Lewis discloses that the final agreed-upon value (i.e., "metric") of the availability service level in the SLA can be input into the disclosed system through a graphical user interface ("GUI"). An exemplary GUI for SLA input is reproduced below:

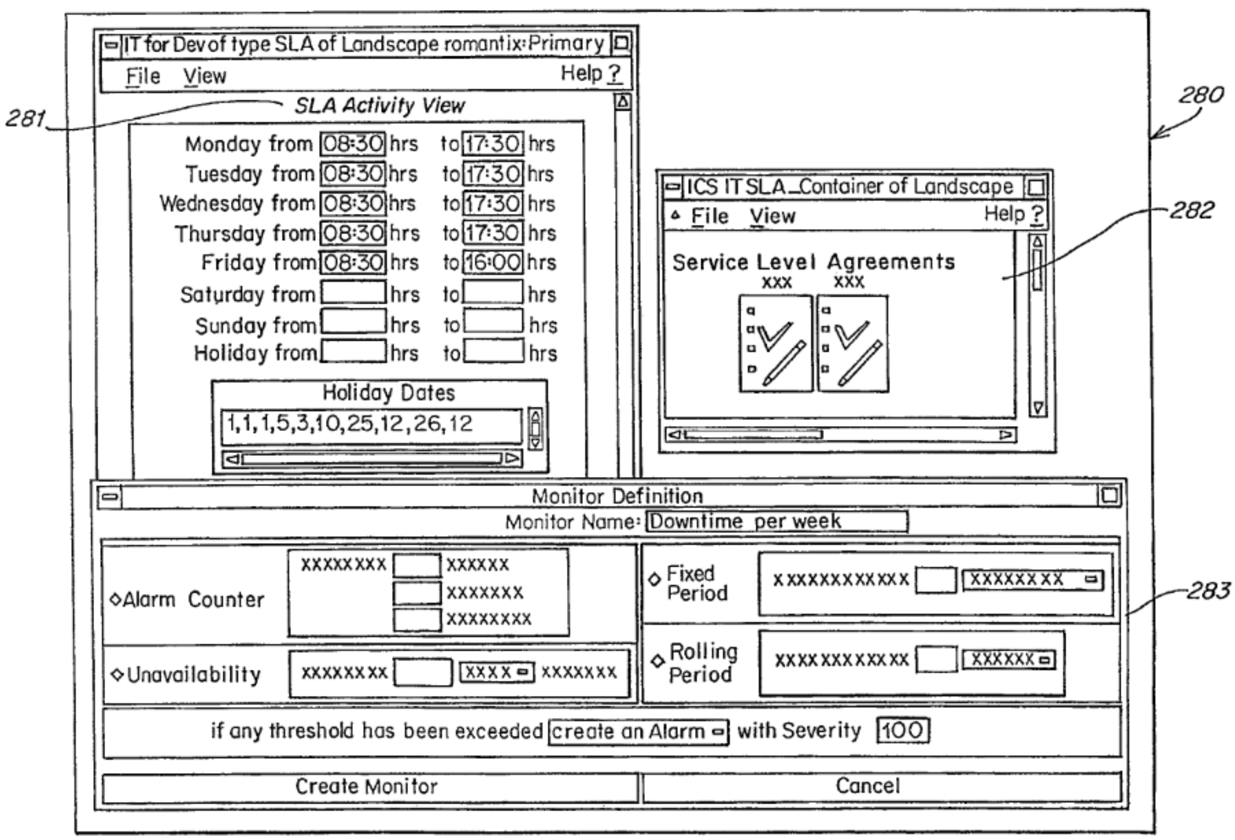


Fig. 36

(Lewis, Fig. 36, 10:54 ("FIG. **36** is a GUI display of a service level agreement.").)

69. In this particular example, the availability service level is represented by the "Unavailability" row in box **283**, and the specific agreed-upon service level value is input in the corresponding field in that row, as shown in the enlarged excerpt to the right. Because Lewis discloses inputting a

specific value (i.e., "metric") for a service level, such as an "availability" service level, that define when an acceptable threshold is exceeded (i.e., when a "SLA violation" would occur), Lewis discloses "determining a metric for . . . one SLA violation."

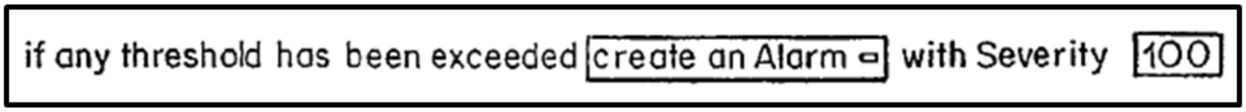
(ii) "determining a metric for each of a plurality of attributes associated with a service level agreement (SLA) for each of the plurality of services, the plurality of attributes including . . . <u>a severity of the incident causing the SLA violation</u>"

70. The step of "**determining a metric for . . . a severity of the incident causing the SLA violation**" occurs in Lewis by specifying a value for a severity variable associated with a failure to meet a service level. As with the previous step, it is useful to consider Lewis's disclosure of this limitation through the example of the "availability" service parameter.

71. The "**incident**" in Lewis takes the form of an event or occurrence

causing the service level to not be met. For the "availability" service level, the "incident" can take the form of determining that a Web server is not available to the public based on attempts to reach that server through polling. (Lewis, 43:61-63, 44:22-45 ("Availability here may be defined as the total minutes that the Web server is actually available to the public . . . Report on service <u>availability as determined by polling the service port</u> (e.g., HTTP, FTP, SMTP POP3, SSL) at regular intervals to determine total time in minutes that service is not available during a given period of time.") (emphasis added).) The term "polling" refers to a common technique in network communications in which one device or component periodically attempts to communicate with a second device or component to obtain its current state or other operational information.

72. Returning to Figure 36 of Lewis, after specifying a value for the availability service level in the "unavailability" row in box **283** (see previous limitation), a user may also enter a value for the <u>severity</u> to be reported should an incident occur—such as a Web server being polled and found to not be available—that results in the SLA violation. The excerpt of Figure 36 reproduced below shows the severity field (i.e., "severity") which accepts a specific severity value (i.e., "metric") for a resulting alarm, in this case "100":



(Lewis, excerpt of Fig. 36.) As the image above shows, if any threshold is exceeded—including a specified "unavailability" value—the system of Lewis would create an alarm with a severity value of 100. Thus, because a specified severity value is associated with an incident causing the failure to meet the "availability" service level, Lewis discloses or suggests the step of "determining a metric for . . . a severity of the incident causing the SLA violation."

(iii) "determining a metric for each of a plurality of attributes associated with a service level agreement (SLA) for each of the plurality of services, the plurality of attributes including . . . <u>an importance of the corresponding service</u>"

73. For the step of "**determining a metric for . . . an importance of the corresponding service**," I rely on Ainsworth. As I explained in **Part VI.A.2** above, Ainsworth discloses a system for monitoring IT services to ensure compliance with an SLA.

74. The step of determining a metric for "an importance of the corresponding service" in Ainsworth occurs by specifying the importance of a service. As I will explain below, the system in Ainsworth can designate that a particular service is "mission critical" or "prioritized in order of criticality" (i.e. a

metric of importance), and this designation may be derived from the SLA itself or calculated based on cost or value information in the SLA.

75. Ainsworth explains that parties to an SLA can agree to designate certain services as more important than others:

> As another example, certain business processes or services could be designated as mission critical, or prioritized in order of criticality, or according to other parameters. As such, when faulty or outdated infrastructure resources have been mapped to the critical business processes or services, the rules may prioritize replacement or repair of those resources, or may suggest changes to infrastructure resource allocations or organizations to improve support for the critical business processes or services, even if doing so would impact other business processes or services at lower levels of criticality.
> Enterprises and IT vendors often enter into contracts for IT services, designating certain services to be critical or otherwise prioritized. These contracts, often referred to as service level agreements (SLAs), may include penalties for when service becomes unavailable or when service levels degrade below various thresholds.

(Ainsworth, ¶¶ 0016, 0017 (emphasis added to both).) Augmenting the related disclosure of Lewis (which Ainsworth incorporates by reference[1]), Ainsworth explains that network issues affecting such "critical" services should be repaired first "even if doing so would impact other business processes or services." (*Id.*)

76. Ainsworth also describes a methodology for determining the significance of the impact (i.e. importance) of the IT service:

> For example, the rules may retrieve information from any suitable data repository regarding <u>projected costs for repairing or replacing various infrastructure resources</u>. Likewise, the information source may include data relating to <u>the value of a business process to an enterprise</u>, or <u>the value of an IT service to the enterprise</u> (e.g., <u>as defined in an SLA</u>, or otherwise), or other information, as will be apparent.

(Ainsworth, ¶ 0018 (emphasis added).) Ainsworth discloses setting services as "critical" as determined by, for example, the "value of an IT service to the enterprise" as that value may be "defined in an SLA." The criticality of a service as determined in Ainsworth, therefore, is clearly associated with an SLA as recited

[1] *See* Rationale and motivation to combine Lewis and Ainsworth, below.

in the claim.

77. The "critical" status of a service as disclosed in Ainsworth therefore qualifies as a metric associated with an SLA of an "importance of the corresponding service." Ainsworth's "rules" explicitly consider the "potential cost" and "value" (i.e., impact) of an IT service on a customer's business, which can be directly specified in the SLA or otherwise calculated based on information specified in the SLA.

78. **Rationale and motivation to combine Lewis and Ainsworth.** It would have been obvious to a person of ordinary skill in the art to combine Lewis with Ainsworth, no change in their respective functions. This would have predictably resulted in the system of Lewis with the additional ability to further determine, in addition to the unavailability thresholds and severity values in Lewis, a metric reflecting criticality or importance of the service. In the context of the unavailability of a Web server as described in Lewis the further teachings of Ainsworth would permit the Lewis system to determine a metric reflecting how important or critical the Web server service is to the customer's business.

79. A person of ordinary skill in the art would have found Lewis and Ainsworth to be readily combinable. To begin with, Ainsworth was filed by the

same assignee as Lewis (Computer Associates Think, Inc.) and expressly incorporates by reference the entirety of Lewis. (Ainsworth, ¶ 0008 ("Interrelationships among IT infrastructural resources, business processes, and services may be modeling [sic] using techniques described in co-pending U.S. patent application Ser. No. 09/578,156, filed May 23, 200 [sic], entitled 'Method and Apparatus for Event Correlation in Service Level Management (SLM),' which is hereby incorporated by reference in its entirety.") (emphasis added); *see also* Lewis, cover page (matching application number, filing date and title).) This confirms that a person of ordinary skill in the art reviewing Ainsworth would have been specifically directed to the teachings of Lewis. The fact that Ainsworth specifically incorporates Lewis by reference and shares the same assignee, moreover, further confirms that the two references are analogous and in the same field of IT management and SLAs.

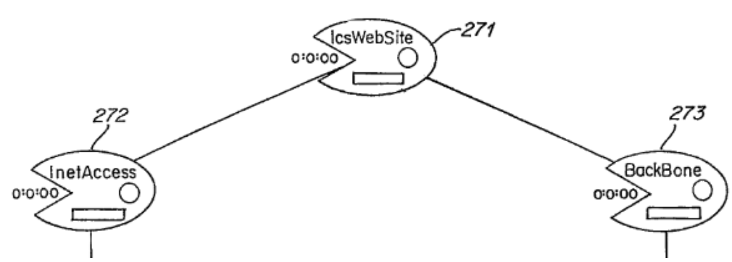
80. In addition, Ainsworth provides additional express motivations to provide information about the importance of the service. Ainsworth explains that information about the criticality or importance of a service in the SLA enables better decision-making for prioritizing repairs, or determining whether a repair should be undertaken in the first place. (Ainsworth, ¶¶ 0016-17.) Indeed, in any

large IT organization, there may be dozens or even hundreds of computing devices that, at any given time, may be experiencing problems or failures. The IT department, depending on its size and the number of issues that simultaneously arise, may need to triage and prioritize repairs based on a number of factors. It would have been apparent to a person of ordinary skill in the art that the "importance" of the service affected by the SLA violation would have been a relevant factor in making those prioritization decisions.

(iv) "for each of the plurality of services"

81. As noted above, the claim language further recites the step of "determining a metric for each of a plurality of attributes associated with a service level agreement (SLA) <u>for each of the plurality of services</u>…"

82. As I explained in my discussion of claim 1**[a]** above, the system of Lewis clearly discloses a "plurality of services" including ICS Web site service **271**, Internet access service **272** and backbone service **273** shown in Figure 35. (Lewis, 46:11-14 ("FIG. **35** [excerpted at right] shows a simple Spectrum/ICS screen shot



270 of a service decomposed into supporting network devices, computer systems, and applications. The three icons **271**, **272**, **273** at the top of the hierarchy represent services.") (underlining added).)

83. As I explained above, Lewis provides a specific example involving the availability of a Web server. It would have been obvious to a person of ordinary skill in the art to determine the three metrics recited in the claim for each of the plurality of services disclosed in Lewis. To begin with, a person of ordinary skill in the art would have recognized that the three services shown in Figure 35 work together to provide the underlying web site service to the customer. Lewis confirms, in fact, that the web site service **271** is made up of the two subservices of Internet access **272** and backbone **273**. (*See* Lewis, 46:15-16 ("The ICS Web site service **271** is decomposed into two subservices (Internet access **272** and the backbone **273**) . . .").) The Internet access **272** and backbone **273** services, in turn, serve distinct purposes in providing the overall web service to the customer. It would therefore have been obvious that the metrics recited in the claim could be determined with respect to each service.

84. In fact, Lewis explains that each of the icons representing services in Figure 35 can be clicked on to view an associated SLA. (Lewis, 46:30-32 ("The user can click on a service icon to view or modify the SLA for the service.").)

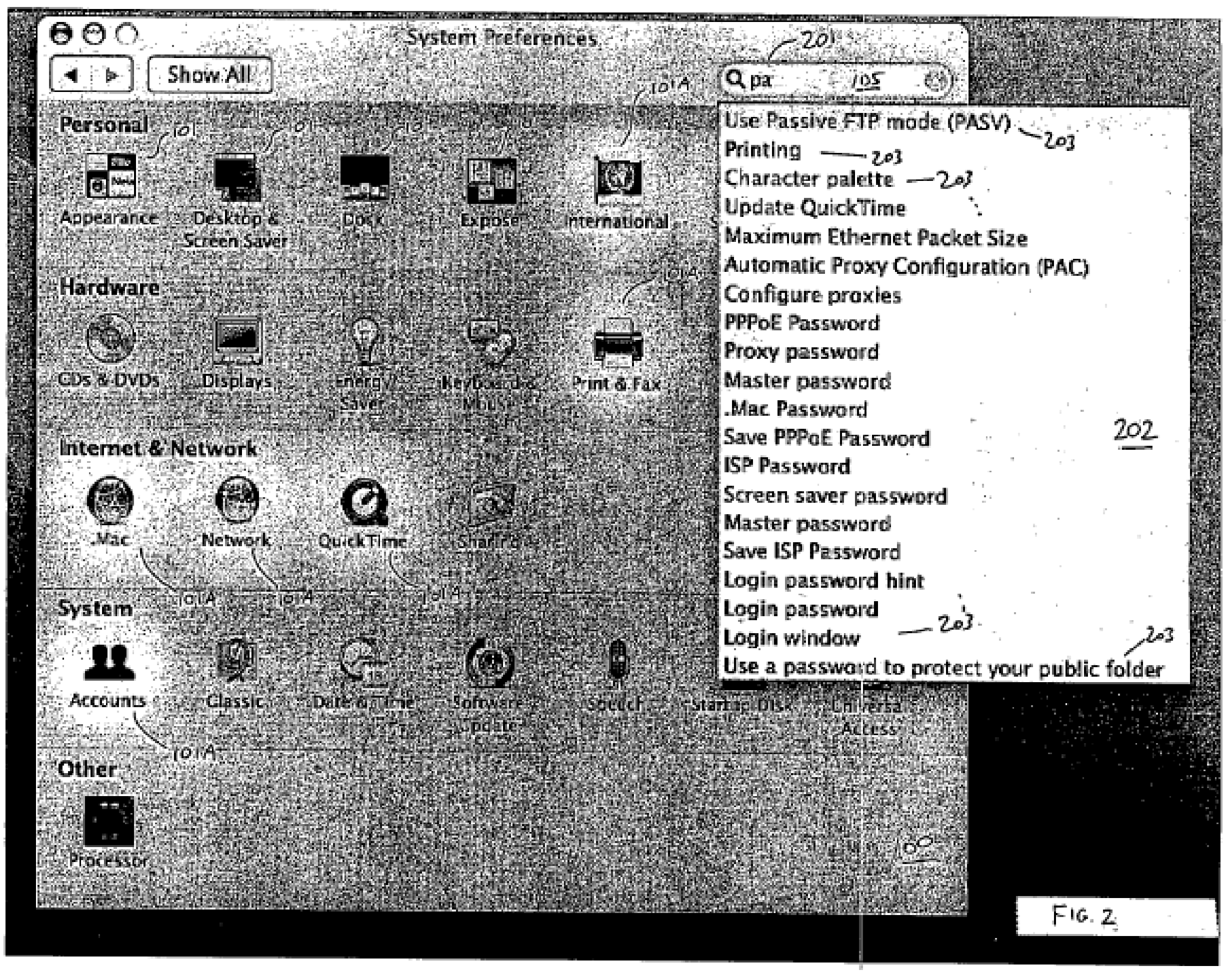
Lewis further confirms that an SLA can be associated with multiple services. (Lewis, e.g., 15:11-12 ("SLA is made up of a list of services and their corresponding service parameters and service levels.").) It would therefore have been obvious to a person of ordinary skill in the art to determine the three claimed metrics, with respect to <u>each</u> of the plurality of services. A person of ordinary skill in the art would have accordingly appreciated the benefit of having additional service level management information for improved monitoring and management of its service offerings. Thus, Lewis in combination with Ainsworth discloses or suggests claim 1**[b]**.

(c) "displaying a spotlight with each of the nodes of the plurality of nodes" (Claim 1[c][1a])

85. Lewis in view of Runov discloses or suggests each and every limitation recited in claim 1**[c][1a]**. As I explained for claim 1**[a]** above, Lewis discloses displaying a plurality of nodes. As explained below, Runov discloses a "spotlight" effect to highlight icons on a display screen that would have been obvious to combine with Lewis.

86. As I explained above, Runov discloses a graphical user interface technique for creating a "spotlight effect" to visually highlight particular information displayed to the user. Runov explains that "the spotlight effect can be

accomplished by brightening the area surrounding the highlighted icons **101A** and leaving the remainder of window **100** at the same brightness as before." (Runov, ¶ 0042.) Figure 2 from Runov, below, shows the spotlight effect (in this case, darkening the screen except for areas around icons) displayed with various icons of an exemplary GUI:



(Runov, Fig. 2, ¶ 0023 ("FIG. 2 is a screen shot depicting a first type of highlighting of icons after the user has entered a two-character query string, according to one embodiment of the present invention.").) As Figure 2 above shows, Runov discloses displaying spotlight effects for a plurality of icons on the exemplary GUI.

87. **Rationale and motivation to combine Lewis and Runov.** It would have been obvious to a person of ordinary skill in the art to combine Runov with Lewis. This would have predictably resulted in the system of Lewis in which the displayed nodes (such as the node icons shown in Figure 35) could be displayed with a "spotlight," as disclosed in Runov.[2]

88. Runov provides several express motivations to make this combination. Although Runov discloses an example of creating a spotlight effect to highlight search results, Runov makes clear that the spotlight technique is more

[2] As noted in the text, the claim language recites "displaying a spotlight ***with*** each of the nodes of the plurality of nodes," but does not specify the spatial relationship between the node and the spotlight is displayed "with." It is not clear, for example, how much distance (if any) may separate the spotlight from the node and still meet the claim language. Nevertheless, this ambiguity is irrelevant to my Declaration because, as shown in the text, Lewis and Runov disclose a "spotlight" that physically accompanies and overlaps the highlighted icon, thus satisfying the claim language under any conceivable definition.

broadly applicable: "The above-described spotlight effect can be used in any situation where it is desirable to visually distinguish one (or more) onscreen item from other onscreen items." (Runov, ¶ 0067.) Runov further explains that "the highlighting techniques described herein <u>can be used in any application, situation, or context</u>, regardless of whether the highlighting is performed in response to entry of a search term." (Runov, ¶ 0019 (underlining added).)

89. A person of ordinary skill in the art would have found the teachings of Runov directly applicable to the system of Lewis. Lewis specifically discloses that the visual appearance of the icons in Figure 35 may change to indicate an alert or alarm. (Lewis, 46:12-13 ("In this case, both icons might turn red, indicating an alarm.").) Runov provides a specific example of using a spotlight effect to bring an alert to the user's attention:

> Examples of contexts for highlighting onscreen items in this manner are: to indicate which item(s) have been selected by a user, or which item(s) is/are relevant to an operation being performed, or which item(s) is/are newly added to a set, or which item(s) is/are newly installed or updated, or <u>which item(s) have alerts to be brought to the attention of the user</u>.

(Runov, ¶ 0068 (emphasis added).)

90. As such, a person of ordinary skill in the art would have found it natural to apply Runov's highlighting techniques and spotlight effects to the service node graph in Lewis to visually distinguish onscreen items from each other and to alert the user to those nodes that have an alarm.

91. My opinions are further supported by the fact that persons of ordinary skill in the art generally found graphical user interface (GUI) techniques to be broadly applicable in software applications, regardless of the underlying purpose of the software. Graphical user interfaces in software programs are designed to present information to users in the most comprehensible manner possible. It is common in the design of graphical user interfaces to encounter the same presentation problem, even among software programs that serve different purposes or are targeted to different markets or customers. One example of this is the widespread adoption of "back" and "forward" navigation buttons as part of the graphical user interfaces across many distinct types of software applications such as web browsers, photo viewers, presentation software, database management software, media players, and many other types of programs. Another example is the widespread use of "drag-and-drop" manipulation techniques to move information from one location to another. This technique has been used in

operating systems to directly manipulate files and folders for more than three decades, and is also widely used in application programs such as word processors to move data from one location to another. The types of graphical presentation problems encountered by persons of ordinary skill in the art are so common and overlapping, in fact, that a number of reusable "widgets" are available to enable adding a particular GUI feature to any type of application software. In my 25 years of experience with software development as detailed in **Part II.A** above, I have personally observed the well-known practice of borrowing GUI features and paradigms from one application-specific context to another.

92. Thus, Lewis in view of Runov discloses or suggests claim 1**[c][1a]**.

(d) "the spotlight including a plurality of characteristics, each of the plurality of characteristics corresponding to one of the attributes of the service of the plurality of services represented by the node, the displayed spotlight being graphically varied based on the determined metrics such that" (Claim 1[c][1b])

93. Lewis, Ainsworth and Runov, in further view of Raffel, disclose or suggest each and every limitation recited in claim 1**[c][1b]**. Due to the length of claim 1**[c][1b]**, I will address the main limitations one at a time in order.

(i) "the spotlight including a plurality of characteristics"

94. As explained above, Runov discloses a "spotlight" effect. Runov

further discloses that a "spotlight" includes a plurality of characteristics. For purposes of this limitation, the "plurality of characteristics" corresponds to the size and color of a spotlight in Runov. With respet to "size," Runov discloses:

> One skilled in the art will recognize that the <u>spotlight effect can be implemented using any</u> shape and <u>size</u> for the area immediately surrounding each icon **101A**, and is not limited to circular areas.

(Runov, ¶ 0069 (underlining added).) Runov further discloses that the spotlight effect can also have (among other characteristics) color. (*Id.*, ¶ 0042 ("[T]he term 'highlighting' is intended to refer to any form of effect by which some resources or items are distinguished from others. Examples of such effects include changing the <u>size</u>, shape, <u>color</u>, contrast, and/or other visual features <u>of an associated name, icon, or other item</u>."); *id.* ("This highlighting takes the form of a spotlight effect . . . .") (emphasis added).) Runov thus discloses or suggests this portion of claim 1**[c][1b]**.

(ii) "each of the plurality of characteristics corresponding to one of the attributes of the service of the plurality of services represented by the node"

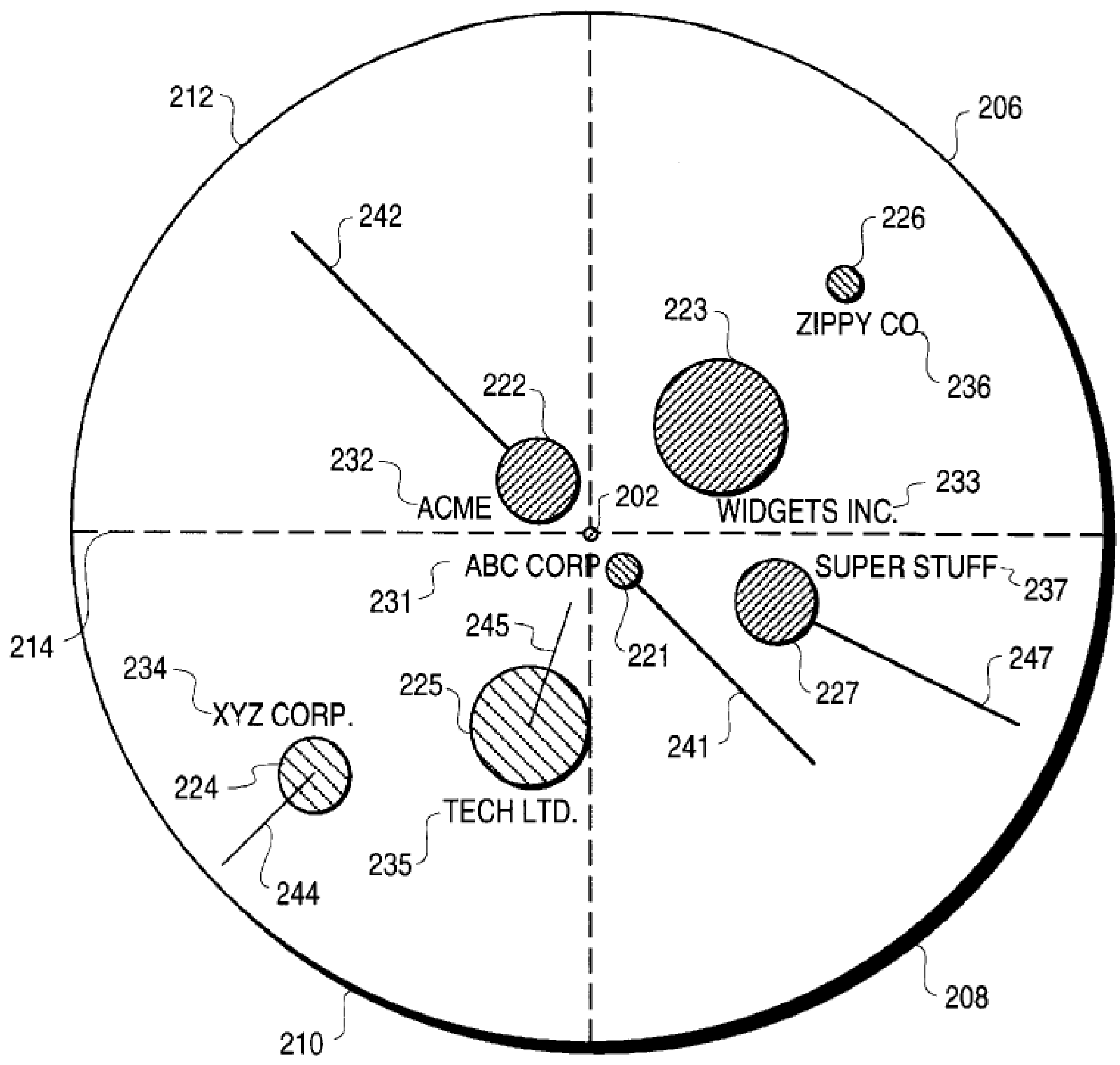
95. As explained above, Runov discloses a spotlight effect as a general-purpose GUI technique for highlighting information, and as such, does not

specifically pertain to the SLA context. However, Lewis, Ainsworth and Runov, in further view of Raffel, disclose or suggest that each of the plurality of spotlight characteristics—i.e., size and color—"**correspond[s] to one of the attributes of the service of the plurality of services represented by the node**."

96. As I explained in my analysis of claim 1**[a]** above, the "plurality of services" recited in this claim corresponds in Lewis to ICS Web site service **271**, Internet access service **272**, and backbone service **273**. These services are represented by icons—i.e., "nodes"—**271**, **272** and **273** shown in Figure 35. I also explained for claim 1**[b]** above that Lewis in combination with Ainsworth teaches that each of these services has associated attributes, including "an importance of the service" and "a severity of the incident causing an SLA violation" of an SLA for the service.

97. The combination of Lewis, Ainsworth and Runov, however, does not disclose that the size and color of a spotlight in Runov corresponds to these service attributes. However, as explained below, this correspondence would have been obvious to a person of ordinary skill in the art in view of the teachings of Raffel. In brief overview, Raffel teaches associating the size of a graphical object with an importance attribute, and the color of a graphical object with a severity attribute.

98. In particular, Raffel discloses a graphical user interface ("GUI") that displays "event objects" on a graph, called a Radar Screen Opportunity Display ("RSOD"), where the event objects can be graphically altered. An exemplary RSOD is shown below:



(Raffel, Fig. 2A, 2:39-40 ("**FIG. 2***a* illustrates an embodiment of a Radar Screen

Opportunity Display implemented by the present invention.”).) The event objects have visual features (i.e., “characteristics”) of at least size and color. (Raffel, 2:12-14 (“The size, color, and shape of the event objects are each indicative of characteristics of a corresponding event.”) (emphasis added).)

99. The characteristics of an event object correspond to underlying data: “FIG. 2a illustrates an embodiment of a Radar Screen Opportunity Display (RSOD) 200 implemented by the present invention. . . . The RSOD 200 displays event objects 221-227 which correspond to events of the CIMS database or user input.” (Raffel, Fig. 2, 5:27-31 (emphasis added).) Raffel further explains that “Each event object represents an event from the database. . . . The display characteristics of each event object are determined by the event characteristics of the corresponding event.” (Raffel, 4:28-30 (emphasis added).) Thus, Raffel discloses that characteristics “correspond” to event data.

100. **Rationale and motivation to combine Lewis, Ainsworth and Runov with Raffel.** It would have been obvious to a person of ordinary skill in the art that visual characteristics of event objects associated with underlying event data of Raffel could be combined with spotlight effect of Runov and service level management system of Lewis and Ainsworth. This would have predictably

resulted in the system of Lewis in which the node icons (as shown in Figure 35) include a spotlight effect as disclosed in Runov, and that the size and color of the spotlight could correspond to one of the attributes of the service of the plurality of services represented by the node, as recited in the claim.

101. As to Runov and Raffel, as discussed above, Runov discloses or suggests that a spotlight can be varied in size and color to visually distinguish icons from each other or to indicate alerts associated with the icons. (Runov, ¶¶ 0067-68.) A person of ordinary skill in the art would have found the teachings of Raffel associating visual characteristics of graphical objects—such as size and color—with attributes underlying data—such as importance and severity—naturally combinable with the spotlight effect of Runov. To begin with, the combination of these teachings would have predictably resulted in a spotlight that could be varied in size and color according to importance and severity of associated underlying data. Moreover, a person of ordinary skill in the art, for example, would have recognized the benefit varying the size and color of a spotlight according to the importance and severity of an alert in Runov to further Runov's objective of visually distinguishing items from each other and providing a more efficient presentation of information. In short, a person of ordinary skill in

the art would have found nothing inventive about varying the size and color of a spotlight in order to make the highlighted information more visually prominent.

102. A person of ordinary skill in the art would have further recognized that such a benefit was applicable to the graphical user interface display of Lewis. As explained above, Lewis and Runov are readily combinable and the benefits of such a combination would have been appreciated by a person of ordinary skill in the art. A person of ordinary skill in the art would have further appreciated the additional benefits that the teachings of Raffel would bring to this combination. For example, Lewis asserts that "SLA management is crucial" and that one requirement is to "monitor real-time events" and "make real-time SLA compliance risk assessments." (Lewis, 44:34, 44:65-67.) Raffel teaches that "it is desirable to maximize the information presented to a decision maker while presenting the information in such a way as to be readily understood by the decision maker." (Raffel, 1:19-22.) A person of ordinary skill in the art would have therefore been motivated to incorporate the teachings of Raffel to further the service level management monitoring and decision-making objectives of Lewis.

103. Thus, Lewis, Ainsworth and Runov, in further view of Raffel, disclose or suggest this limitation.

(iii) "the displayed spotlight being graphically varied based on the determined metrics such that"

104. As explained in more detail below, Lewis, Ainsworth and Runov, in further view of Raffel, disclose or suggest varying the spotlights "based on" the "importance of the corresponding service" (claim 1**[c][2]**) and the "severity of the incident causing the SLA violation" (claim 1**[c][3]**).

105. Raffel discloses that the relevant "variations" of spotlights are "graphical variations." Raffel discloses an exemplary GUI in Figure 2a where, as detailed below, "event objects" are rendered and displayed on a computer monitor. Raffel explains that those visual features are modified in response to changes in the underlying data. (Raffel, e.g., 3:44-49 ("Each event object represents an event from the database. . . . The display characteristics of each event object are determined by the event characteristics of the corresponding event.") (emphasis added).) A person of ordinary skill in the art would have understood that such changes to visual features on a GUI are "graphical variations."

106. As I explained in my discussion of claim 1**[b]** above, Lewis discloses "determining a metric for each of a plurality of attributes" in the form of quantifying a variable associated with a "service parameter" set in a service level

agreement ("SLA"). As I describe below, one of ordinary skill in the art would naturally combine Lewis and Raffel to effect a wide array of graphical variations (as disclosed by Raffel) based on quantified IT service values (as disclosed by Lewis).

107. Thus, Lewis and Runov, in further view of Raffel, disclose or suggest claim 1**[c][1b]**. The rationale and motivation to combine Lewis, Runov and Raffel is provided in my discussion of this claim above.

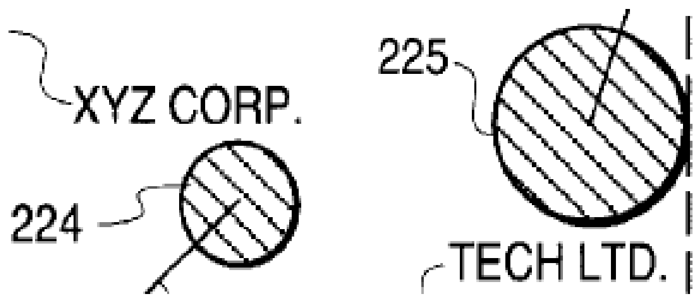
(e) "a size of the spotlight varies based on the importance of the corresponding service" (Claim 1[c][2])

108. Lewis, Ainsworth and Runov, in further view of Raffel, disclose or suggest each and every limitation recited in claim 1**[c][2]**.

109. As I discussed previously, Lewis in view of Ainsworth discloses the claimed "importance of the corresponding service" and a graphical user interface. (Lewis, e.g., Fig. 35, 46:12-18; Ainsworth, e.g., ¶¶ 0016-20.) Runov discloses or suggests a graphical user interface having a spotlight effect whose size can be varied. (Runov, e.g., ¶¶ 0042, 0069.) Lewis, Ainsworth and Runov do not expressly disclose that the size of the spotlight varies <u>based on</u> the importance of the corresponding service, but this would have been obvious to a person of ordinary skill in the art in view of the teachings of Raffel. As noted above, Raffel

teaches that size of a graphical object can reflect "importance."

110. More specifically, Raffel discloses a graphical user interface ("GUI") that displays "event objects" that can graphically altered. In particular, Raffel discloses that the size of an event object is varied based on the importance of a corresponding event:



(Raffel, Excerpt of Fig. 2A, 2:39-40 ("**FIG. 2***a* illustrates an embodiment of a Radar Screen Opportunity Display implemented by the present invention."), 6:48-56 ("Using this example . . . the XYZ Corporation event [] is represented by a <u>0.50 inch diameter event object</u> **224**, the Tech Ltd. event [] is represented by a <u>1.0 inch diameter event object</u> **225**") (underlining added).) In the above excerpt of Figure 2a, the two event objects, the circles **224** and **225**, are varied in size based on the relative value (i.e., "importance") of the corresponding events they represent. (*See* Raffel, Figs. 2A & 2C, 2:44-60.) Raffel explains further:

> The <u>size of an event object</u> on the RSOD generally represents, but is not limited to, <u>the relative importance of the</u>

> corresponding event. As such, the size of the event object represents the size of the potential deal, in revenue or units, or the strategic importance of the deal. The size of the transaction object may also represent the qualitative value of a particular event.

(Raffel, 8:65-9:4 (emphasis added).) Raffel discloses varying the size of an event object (i.e., "spotlight") based on various forms of importance (*e.g.*, "relative importance," "strategic importance," and "qualitative value"), which all qualify as the "importance" recited in claim 1**[c][2]**.

111. As I explained above, it would have been obvious to combine the teachings of Lewis, Ainsworth, Runov and Raffel, which would have predictably resulted in a spotlight whose size varied based on the importance of the corresponding service.

112. Thus, Lewis, Ainsworth and Runov, in further view of Raffel, disclose or suggest claim 1**[c][2]**.

(f) "a color of the spotlight varies based on the severity of the incident causing the SLA violation" (Claim 1[c][3])

113. Lewis and Runov, in further view of Raffel, disclose or suggest claim 1**[c][3]**.

114. As I discussed previously, Lewis discloses varying the color of an icon, but does not appear to disclose a "spotlight" (Lewis, 46:12-14), and Runov discloses or suggests a spotlight effect whose color can be varied. Raffel further teaches that color can reflect "severity":

> As an example, <u>the color of an event object may be red for an event having a highest level of severity</u> with regards to a particular characteristic, <u>blue for an event having a medium level of severity</u> with regards to the particular characteristic, and <u>yellow for an event having a lowest level of severity</u> with regards to the particular characteristic.

(Raffel, 9:44-50 (emphasis added).)

115. It would have been obvious to a person of ordinary skill in the art that a "spotlight" of Runov could be varied in color based on the severity of the "associated event" as disclosed in Raffel. The rationale and motivation to combine Lewis, Runov and Raffel is provided in my discussion of claim 1**[c][1b]** above. Thus, Lewis and Runov, in further view of Raffel, disclose or suggest claim 1**[c][3]**.

116. For all of the foregoing reasons, Lewis in view of Ainsworth, Runov and Raffel disclose or suggest each and every limitation of claim 1.

2. Claim 8

117. Claim 8 is an independent claim that is similar to claim 1 in substance but differs mainly in that it is a system claim that requires some of the functionality to be distributed across at least two computers. Claim 8 also differs in that it recites a "variable graphical image," which as I explained above, is for purposes of my Declaration synonymous with the "spotlight" of claim 1. The preamble of claim 8 recites "[a] networked computer system, comprising" without providing additional description or limitations.

118. Assuming the preamble is limiting, Lewis discloses a networked computer system that includes a distributed network management system. (*See* Lewis, 2:20-27 ("One aspect of service level management is <u>monitoring of the various computer systems, network devices and software applications</u> for both real-time display and historical reporting. A management system should provide visibility into component operational parameters that provide meaningful information to the IT staff for maintaining network availability and performance."), 46:11-13 ("FIG. 35 shows a simple Spectrum/ICS screen shot **270** of a service decomposed into supporting <u>network devices, computer systems</u>, and applications.") (underlining added).)

(a) "a first computer system configured to generate a graph including a plurality of nodes, each node of the plurality of nodes modeling a service of a plurality of services" (Claim 8[a])

119. As I explained in connection with claim 1 above, Lewis discloses the step of generating a graph with a plurality of nodes, each node modeling a service of a plurality of services. This graph is shown in Figure 35, discussed above, that shows graphical icons **271**, **272**, and **273**, each icon representing a node modeling a particular service. (Lewis, 46:11-14 ("FIG. **35** [excerpted at right] shows a simple Spectrum/ICS screen shot **270** of a service decomposed into supporting network devices, computer systems, and applications. The three icons **271**, **272**, **273** at the top of the hierarchy represent services.") (underlining added).)

120. The "**first computer system**" in Lewis takes the form of a computing device that executes the software that generates the graph of nodes shown in Figure 35. Lewis explains that the screen shot **270** in Figure 35 was generated using the Spectrum/ICS software. One of ordinary skill in the art would have understood that running this software would have required a computer system including at least a processor and other components required for the software's execution.

121. Other than the recitation of a "first computer system," the differences between this limitation and the corresponding claim 1**[a]** are immaterial. In claim

1**[a]** each node is "representing" a service instead of "modeling" it, but the '992 patent uses the two words interchangeably. (*E.g.*, '992, 1:21-24 (". . . service models that **model** the IT services of the enterprise, with component elements of the service model **representing** business users, services, and IT infrastructure components . . . On a high level, a service **model** is a collection of components that **represent** a business service.") (emphasis added).) Lewis therefore discloses the claimed generation of a graph for the same reasons as claim 1**[a]** above.

(b) "a second computer system, communicatively coupled to the first computer system, configured to display the graph generated by the first computer system" (Claim 8[b])

122. The "**second computer system**" in Lewis takes the form of a second computer that displays the output of the Spectrum/ICS software as shown in Figure 35. As I will explain below, that second computer system could be a computer running a web browser that communicates with a web server (the "first computer system") over a network.

123. Lewis explains that the enterprise management system (EMS) that generates screen shot **270** from Figure 35 can "[p]rovide both traditional GUI interfaces <u>and Web interfaces</u>." (Lewis, 45-64-65.) The term "Web interface" generally refers to the ability to access the user interface of the EMS through a web

browser. In a Web-based system, a first computer generally known as a "Web server" generates an HTML document (web page), and transmits it over a network connection to a second computer. That second computer, in turn, executes a "Web browser" such as Internet Explorer that displays the received web page.

124. This is confirmed by Schwem, which discloses a web-based network management system. Schwem discloses a system that allows "an administrator of a relatively complex network to manage the network remotely, obtain network data in real time from any combination of sub-networks within the network using customized HTML documents, and have the retrieved data displayed in a graphical user interface." (Schwem, Ex. 1007, at 2:12-15.) The system in Schwem includes a web server **14** and a network control device **30**, the latter including any network device having web browser capability. (*Id.* at 3:25-29.) Schwem explains that the web server **14** generates a graphical user interface that is transmitted to the web browser for display. (*Id.*, e.g., at 5:25-29.)

125. It would have been obvious to a person of ordinary skill in the art to provide the claimed "second computer system" in order to support the "Web interface" of Lewis. This would have predictably resulted in the system of Lewis in which the "first computer system" discussed above is a web server that produces

screen shot **270** of Figure 35 and sends it as a web page to a "second computer system" for display using a conventional web browser. Lewis specifically discloses a web interface for the EMS, and Schwem confirms that this technique was known more than a decade before the '992 patent filing date.

126. One of ordinary skill in the art would have had many reasons to make this combination. As explained in Schwem, using a Web interface to access a network management system allows "[a]ny network device having a web browser capability, regardless of location, [to] be used as a network control device." (Schwem, 4:2-3.) Schwem further emphasizes that by allowing access from any computer that has a standard web browser capability, the user interface can be presented on devices of many different platforms, increasing the convenience of the system. (*Id.* at 11:17-19 ("Thus, it will be appreciated from the foregoing description that the present invention enables a network administrator to conveniently monitor a large network which can include devices of different platforms, using a standard web browser.").) One of ordinary skill in the art would have appreciated a key advantage of using a Web interface, namely, obviating the need for the developer to write a software program for the client computer to display the network management data. For example, a software developer would

no longer need to develop separate software programs for Windows, Macintosh or Linux, because the display is handled by a standard web browser widely available for each of those operating systems.

(c) "a first software configured to" (Claim 8[c][1])

127. The "**first software**" in Lewis takes the form of the enterprise management software (EMS) running on the "first computer system," including the Spectrum/ICS software that generates Figure 35. (Lewis, 46:11-13 ("FIG. 35 shows a simple <u>Spectrum/ICS screen shot **270**</u> of a service decomposed into supporting network devices, computer systems, and applications."), 18:4-8 ("A commercially-available service management application is Continuity, developed by ICS GmbH of Germany. Continuity may be integrated with Cabletron's Spectrum, which in turn is integrated with the products mentioned previously.").) As I explain below, Lewis discloses the first software being "**configured to**" perform the functions recited in the claim.

(d) "determine a metric for each of a plurality of states associated with a service level agreement (SLA) for each of the plurality of services, the plurality of states including at least one SLA violation, a severity of the incident causing the SLA violation and an importance of the corresponding service" (Claim 8[c][2])

128. As shown in the table below, claim 8**[c][2]** is nearly identical to claim

1**[b]**, except that claim 1**[b]** recites "attributes" while claim 8**[c][2]** recites "states" (as indicated with underlining):

Claim 1[b]	Claim 8[c][2]
"determining a metric for each of a plurality of <u>attributes</u> associated with a service level agreement (SLA) for each of the plurality of services, the plurality of <u>attributes</u> including at least one SLA violation, a severity of the incident causing the SLA violation, and an importance of the corresponding service"	"determine a metric for each of a plurality of <u>states</u> associated with a service level agreement (SLA) for each of the plurality of services, the plurality of <u>states</u> including at least one SLA violation, a severity of the incident causing the SLA violation and an importance of the corresponding service"

129. As I explained above, Lewis in view of Ainsworth discloses or suggests each limitation of claim 1**[b]**. Based on my review of the '992 patent, I see no material distinction for purposes of my Declaration between the term "attributes" and the term "states." (*See* '992, e.g., 3:31-34 ("For example, node **150** is illustrated with 4 associated icons, as is node **160**, indicating that node **150** has <u>attributes or states</u> corresponding to those associated icons.").) Thus, for all of the reasons discussed above regarding claim 1**[b]**, Lewis in view of Ainsworth discloses or suggests claim 8**[c][2]**.

(e) "represent the plurality of states with a variable graphical image positioned with the node, the graphical image having a plurality of attributes, each attribute representing a state of the plurality of states and an importance of the node, each of the attributes being varied based on the determined metric for each associated state such that" (Claim 8[c][3a])

130. The only material difference between this claim and claim 1 is that this claim recites "a variable graphical image positioned with the node," and claim 1 recites a "spotlight." As I explained in **Part V.C.2**, however, this distinction is immaterial to the analysis in my Declaration. The broadest reasonable construction of "variable graphical image" is, as I noted in **Part V.C.2** above, a graphical image whose appearance may vary based on one or more states associated with a service level agreement. As I explained for claim 1 above, it would have been obvious to provide a spotlight whose size and color varies based on attributes associated with the SLA, as described below.

(f) "a size of the variable graphical image varies based on the importance of the corresponding service" (Claim 8[c][3b])

131. As explained for claim 1**[c][2]** above, it would have been obvious for the size of the variable graphical image (or spotlight) to vary based on the importance of the corresponding service. I refer above to my discussion of claim 1**[c][2]**.

(g) "a color of the variable graphical image varies based on the severity of the incident causing the SLA violation" (Claim 8[c][3c])

132. As explained for claim 1**[c][3]** above, it would have been obvious for the color of the variable graphical image (or spotlight) to vary based on the severity of the incident causing the SLA violation. I refer above to my discussion of claim 1**[c][3]**.

3. Enablement

133. Finally, in my opinion, the disclosures of Lewis, Ainsworth, Runov, Raffel and Schwem were sufficiently detailed to have allowed a person of ordinary skill in the art to implement the method of claim 1 and the system of claim 8 without undue experimentation. As I explained in my discussion of the technology background in **Part IV** above, the technological underpinnings of claims 1 and 8 were firmly in place long before June 2010. The techniques recited in claims 1 and 8 of the '992 patent would have merely involved applying known graphical user interface technologies as described in Runov and Raffel, and Schwem with respect to Web interfaces, to known techniques of determining SLA violation attributes for nodes in a network. Moreover, I note that the '992 patent has a June 2010 filing date, many years after most of the prior art references described in this Declaration. In my opinion, therefore, one of ordinary skill in the art could have implemented a

system satisfying each limitation of claims 1 and 8 based on the disclosures of Lewis in view of Ainsworth, Runov, Raffel and Schwem without undue experimentation.

VII. CONCLUSION

134. As explained above, claims 1 and 8 of the ’992 patent are directed to displaying a graph of nodes representing services as taught in the prior art, but with “spotlights” that vary in size and color according to attributes associated with those services. The size of a spotlight corresponds to the importance of the service, and the color corresponds to the severity of an incident causing a service level agreement (“SLA”) violation associated with the service. These claims do not describe anything that was new or non-obvious by June 2010, the earliest date listed on the face of the ’992 patent.

135. As explained in detail above, the features described in claim 1 were disclosed and suggested by Lewis in view of Ainsworth, Runov and Raffel, each of which pre-dates the earliest application filing date of the ’992 patent. The features described in claim 8 were disclosed and suggested by Lewis, Ainsworth, Runov and Raffel, in further view of Schwem.

136. Lewis discloses a method and apparatus for defining service levels for services in an SLA, monitoring service parameters to determine the state of the services, and displaying a graph of icons representing the services and their respective states. Ainsworth discloses a system and method for monitoring

services consistent with Lewis and gives special emphasis to the ability to monitor and report information about the value or importance of services. Runov discloses a general-purpose technique of using a spotlight effect to facilitate information presentation using a graphical user interface. Raffel discloses a technique of altering the size and color of a visual object in a display based on importance and severity attributes associated with underlying data. Schwem discloses a technique in which a first computer system (e.g. a web server) generates a user interface that is sent to a second computer system (e.g. a computer running a web browser) for display. As I explained in detail above, a person of ordinary skill in the art would have found it obvious to combine the relevant teachings from these references.

137. In signing this Declaration, I recognize that the Declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in this proceeding. If required, I will appear for cross-examination at the appropriate time. I reserve the right to offer opinions relevant to the invalidity of the ’992 patent claims at issue and/or offer testimony in support of this Declaration.

138. I hereby declare under penalty of perjury that all statements made

herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 28 U.S.C. § 1001.

Dated: July 28, 2015

Respectfully submitted,

Tal Lavian
July 28/2015

Tal Lavian, Ph.D.

EXHIBIT A

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Research and Consulting: Telecommunications, Network Communications, and Mobile Wireless technologies

- Scientist, educator, and technologist with over 25 years of experience
- Co-author on over 25 scientific publications, journal articles, and peer-reviewed papers
- Named inventor on over 80 issued and filed patents
- Industry fellow and lecturer at UC Berkeley Engineering – Center for Entrepreneurship and Technology (CET)

EDUCATION

- **Ph.D.**, Computer Science specializing in networking and communications, UC Berkeley
- **M.Sc.**, Electrical Engineering, Tel Aviv University
- **B.Sc.**, Mathematics and Computer Science, Tel Aviv University

EXPERTISE

Network communications, telecommunications, Internet protocols and mobile wireless:

- **Communication networks:** Internet Protocols; TCP/IP suite; TCP; UDP; IP; VoIP; Ethernet; network protocols; network software applications; Data Link, Network, and Transport Layers (L2, L3, L4)
- **Internet Software:** Internet software applications; distributed computing; cloud computing; Web applications; FTP; HTTP; Java; C; C++; client server; file transfer; multicast; streaming media
- **Routing/switching:** LAN; WAN; VPN; routing protocols; RIP; BGP; MPLS;OSPF; IS-IS;DNS; QoS; switching; packet switching; network infrastructure; network communication architectures
- **Mobile Wireless:** Wireless LAN; 802.11; cellular systems; mobile devices; smartphone technologies

LITIGATION SUPPORT SERVICES

- Expert witness in numerous USPTO PTAB – Inter Partes Review (IPR) and CBM cases
- Expert witness in Federal courts and the ITC (over 30 cases)
- Expert reports, depositions, and courtroom testimonies
- Skilled articulation of technical material for both technical and non-technical audiences
- Product and technology analysis, patent portfolios, claim charts, patentability research
- Litigation support and technology education in patent disputes
- Past cases involved Cisco, Juniper, HP, Ericsson, Microsoft, Google, Samsung and Apple

ACCOMPLISHMENTS

- Selected as Principal Investigator for three US Department of Defense (DARPA) projects
- Led research project on networking computation for the US Air Force Research Lab (AFRL)
- Led and developed the first network resource scheduling service for grid computing
- Led wireless research project for an undisclosed US federal agency
- Managed and engineered the first demonstrated transatlantic dynamic allocation of 10Gbs Lambdas as a grid service
- Spearheaded the development of the first demonstrated wire-speed active network on commercial hardware
- Invented over 80 patents; over 50 prosecuted *pro se* in front of the USPTO
- Created and chaired Nortel Networks' EDN Patent Committee
- Current IEEE Senior Member

PROFESSIONAL EXPERIENCE

University of California, Berkeley, Berkeley, CA 2000-Present

Berkeley Industry Fellow, Lecturer, Visiting Scientist, Ph.D. Candidate, Nortel's Scientist Liaison

Some positions and projects were concurrent, others sequential

- Serves as an Industry Fellow and Lecturer at the Center for Entrepreneurship and Technology (CET).
- Studied network services, telecommunication systems and software, communications infrastructure, and data centers
- Developed long-term technology for the enterprise market, integrating communication and computing technologies
- Conducted research projects in data centers (RAD Labs), telecommunication infrastructure (SAHARA), and wireless systems (ICEBERG)
- Acted as scientific liaison between Nortel Research Lab and UC Berkeley, providing tangible value in advanced technologies
- Earned a Ph.D. in Computer Science with a specialization in communications and networking

Telecomm Net Consulting, Inc. (Innovations-IP) Sunnyvale, CA 2006-Present

Principal Scientist

- Consulting in the areas of network communications, telecommunications, Internet protocols, and smartphone mobile wireless devices

- Providing architecture and system consultation for software projects relating to computer networks, mobile wireless devices, Internet web technologies
- Acting as an expert witness in network communications patent infringement lawsuits

VisuMenu, Inc. – Sunnyvale, CA 2010-Present

Co- Founder and Chief Technology Officer (CTO)

- Design and develop architecture of visual IVR technologies for smartphones and wireless mobile devices in the area of network communications
- Design crawler/spider system for IVR / PBX using Asterisk, SIP and VoIP
- Deploy the system as cloud networking and cloud computing utilizing Amazon Web Services (EC2, S3, VPC, DNS, and RDS)

Ixia, Santa Clara, CA 2008-2008

Communications Consultant

- Researched and developed advanced network communications testing technologies:
  • IxNetwork/IxN2X — tests IP routing and switching devices and broadband access equipment. Provides traffic generation and emulation for the full range of protocols: routing, MPLS, layer 2/3 VPNs, Carrier Ethernet, broadband access, and data center bridging.
  • IxLoad — quickly and accurately models high-volume video, data, and voice subscribers and servers to test real-world performance of multiservice delivery and security platforms.
  • IxCatapult — emulates a broad range of wireless access and core protocols to test wireless components and systems. When combined with IxLoad, provides an end-to-end solution for testing wireless service quality.
  • IxVeriWave — employs a client-centric model to test Wi-Fi and wireless LAN networks by generating repeatable large-scale, real-world test scenarios that are virtually impossible to create by any other means.
  • Test Automation — provides simple, comprehensive lab automation to help test engineering teams create, organize, catalog, and schedule execution of tests.

Nortel Networks, Santa Clara, CA 1996 - 2007

Originally employed by Bay Networks, which was acquired by Nortel Networks

Principal Scientist, Principal Architect, Principal Engineer, Senior Software Engineer

- Held scientific and research roles at Nortel Labs, Bay Architecture Labs, and in the office of the CTO

Principal Investigator for US Department of Defense (DARPA) Projects

- Conceived, proposed, and completed three research projects: Active Networks, DWDM-RAM, and a networking computation project for Air Force Research Lab (AFRL)
- Led a wireless research project for an undisclosed US federal agency

Academic and Industrial Researcher

- Analyzed new technologies to reduce risks associated with R&D investment
- Spearheaded research collaboration with leading universities and professors at UC Berkeley, Northwestern University, University of Amsterdam, and University of Technology, Sydney
- Evaluated competitive products relative to Nortel's products and technology
- Proactively identified prospective business ideas, which led to new networking products
- Predicted technological trends through researching the technological horizon and academic sphere
- Developed software for switches, routers and network communications devices
- Developed systems and architectures for switches, routers, and network management
- Researched and developed the following projects:
  - Data-Center Communications: network and server orchestration 2006-2007
  - DRAC: SOA-facilitated L1/L2/L3 network dynamic controller 2003-2007
  - Omega: classified wireless project for undisclosed US Federal Agency 2006
  - Open Platform: project for the US Air Force Research Laboratory (AFRL) 2005
  - Network Resource Orchestration for Web Services Workflows 2004-2005
  - Proxy Study between Web/Grids Services and Network Services 2004
  - Streaming Content Replication: real-time A/V media multicast at edge 2003-2004
  - DWDM-RAM: US DARPA-funded program on agile optical transport 2003-2004
  - Packet Capturing and Forwarding Service on IP and Ethernet traffic 2002-2003
  - CO2: content-aware agile networking 2001-2003
  - Active Networks: US DARPA-funded research program 1999-2002
  - ORE: programmable network service platform 1998-2002
  - JVM Platform: Java on network devices 1998-2001
  - Web-Based Device Management: network device management 1996-1997

Technology Innovator and Patent Leader

- Created and chaired Nortel Networks' EDN Patent Committee
- Facilitated continuous stream of innovative ideas and their conversion into intellectual property rights
- Developed intellectual property assets through invention and analysis of existing technology portfolios

Aptel Communications, Netanya, Israel 1994-1995

Software Engineer, Team Leader

Start-up company focused on mobile wireless CDMA spread spectrum PCN/PCS

- Developed a mobile wireless device using an unlicensed band [Direct Sequence Spread Spectrum (DSSS)]
- Designed and managed a personal communication network (PCN) and personal communication system (PCS), the precursors of short text messages (SMS)
- Designed and developed network communications software products (mainly in C/C++)
- Brought a two-way paging product from concept to development

Scitex Ltd.,Herzeliya, Israel 1990-1993

Software Engineer, Team Leader

Software and hardware company acquired by Hewlett Packard (HP)

- Developed system and network communications (mainly in C/C++)
- Invented Parallel SIMD Architecture
- Participated in the Technology Innovation group

Shalev, Ramat-HaSharon, Israel 1987-1990

Start-up company

Software Engineer

- Developed real-time software and algorithms (mainly in C/C++ and Pascal)

PROFESSIONAL ASSOCIATIONS

- IEEE Senior Member
- IEEE CNSV co-chair Intellectual Property SIG (2013)
- President Next Step Toastmasters (an advanced TM club in the Silicon Valley) (2013)
- Technical Co-Chair, IEEE Hot Interconnects 2005 at Stanford University
- Member, IEEE Communications Society (COMMSOC)
- Member, IEEE Computer Society
- Member, IEEE Systems, Man, and Cybernetics Society
- Member, IEEE-USA Intellectual Property Committee
- Member, ACM, ACM Special Interest Group on Data Communication (SIGCOM)
- Member, ACM Special Interest Group on Hypertext, Hypermedia and Web (SIGWEB)
- Member, IEEE Consultants' Network (CNSV)
- Global Member, Internet Society (ISOC)
- President Java Users Group – Silicon Valley Mountain View, CA,1999-2000
- Toastmasters International

ADVISORY BOARDS

- Quixey (present) – search engine for wireless mobile apps
- Mytopia – mobile social games
- iLeverage – Israeli Innovations

PROFESSIONAL AWARDS

- Top Talent Award – Nortel
- Top Inventors Award – Nortel EDN
- Certified IEEE-WCET - Wireless Communications Engineering Technologies
- Toastmasters International - Competent Communicator (twice)
- Toastmasters International - Advanced Communicator Bronze

Patents and Publications

(Not an exhaustive list)

Patents Issued:

- **US 8,688,796** Rating system for determining whether to accept or reject objection raised by user in social network
- **US 8,572,303** Portable universal communication device
- **US 8,553,859** Device and method for providing enhanced telephony
- **US 8,548,131** Systems and methods for communicating with an interactive voice response system
- **US 8,537,989** Device and method for providing enhanced telephony
- **US 8,341,257** Grid proxy architecture for network resources
- **US8,161,139** Method and apparatus for intelligent management of a network element
- **US 8,146,090** Time-value curves to provide dynamic QoS for time sensitive file transfer
- **US 8,078,708** Grid proxy architecture for network resources
- **US 7,944,827** Content-aware dynamic network resource allocation
- **US7,860,999** Distributed computation in network devices
- **US 7,734,748** Method and apparatus for intelligent management of a network element
- **US 7,710,871** Dynamic assignment of traffic classes to a priority queue in a packet forwarding device
- **US 7,580,349** Content-aware dynamic network resource allocation
- **US 7,433,941** Method and apparatus for accessing network information on a network device
- **US 7,359,993** Method and apparatus for interfacing external resources with a network element
- **US 7,313,608** Method and apparatus for using documents written in a markup language to access and configure network elements
- **US 7,260,621** Object-oriented network management interface

- **US 7,237,012** Method and apparatus for classifying Java remote method invocation transport traffic
- **US 7,127,526** Method and apparatus for dynamically loading and managing software services on a network device
- **US7,047,536** Method and apparatus for classifying remote procedure call transport traffic
- **US7,039,724** Programmable command-line interface API for managing operation of a network device
- **US6,976,054** Method and system for accessing low-level resources in a network device
- **US6,970,943** Routing architecture including a compute plane configured for high-speed processing of packets to provide application layer support
- **US6,950,932** Security association mediator for Java-enabled devices
- **US6,850,989** Method and apparatus for automatically configuring a network switch
- **US6,845,397** Interface method and system for accessing inner layers of a network protocol
- **US6,842,781** Download and processing of a network management application on a network device
- **US6,772,205** Executing applications on a target network device using a proxy network device
- **US6,564,325** Method of and apparatus for providing multi-level security access to system
- **US6,175,868** Method and apparatus for automatically configuring a network switch
- **US6,170,015** Network apparatus with Java co-processor
- **US 8,619,793** Dynamic assignment of traffic classes to a priority queue in a packet forwarding device
- **US 8687,777** Systems and methods for visual presentation and selection of IVR menu
- **US 8,681,951** Systems and methods for visual presentation and selection of IVR menu

- **US 8,625,756** Systems and methods for visual presentation and selection of IVR menu
- **US 8,594,280** Systems and methods for visual presentation and selection of IVR menu
- **US 8,548,135** Systems and methods for visual presentation and selection of IVR menu
- **US 8,406,388** Systems and methods for visual presentation and selection of IVR menu
- **US 8,345,835** Systems and methods for visual presentation and selection of IVR menu
- **US 8,223,931** Systems and methods for visual presentation and selection of IVR menu
- **US 8,160,215** Systems and methods for visual presentation and selection of IVR menu
- **US 8,155,280** Systems and methods for visual presentation and selection of IVR menu
- **US 8,054,952** Systems and methods for visual presentation and selection of IVR menu
- **US 8,000,454** Systems and methods for visual presentation and selection of IVR menu
- **EP 1,905,211** Technique for authenticating network users
- **EP 1,142,213** Dynamic assignment of traffic classes to a priority queue in a packet forwarding device
- **EP 1,671,460** Method and apparatus for scheduling resources on a switched underlay network
- **CA 2,358,525** Dynamic assignment of traffic classes to a priority queue in a packet forwarding device

Patent Applications Published and Pending:
(Not an exhaustive list)

- **US 20140105025** Dynamic Assignment of Traffic Classes to a Priority Queue in a Packet Forwarding Device
- **US 20140105012** Dynamic Assignment of Traffic Classes to a Priority Queue in a Packet Forwarding Device
- **US 20140012991** Grid Proxy Architecture for Network Resources
- **US 20130080898** Systems and Methods for Electronic Communications
- **US 20130022191** Systems and Methods for Visual Presentation and Selection of IVR Menu
- **US 20130022183** Systems and Methods for Visual Presentation and Selection of IVR Menu
- **US 20130022181** Systems and Methods for Visual Presentation and Selection of IVR Menu
- **US 20120180059** Time-Value Curves to Provide Dynamic QOS for Time Sensitive File Transfers
- **US 20120063574** Systems and Methods for Visual Presentation and Selection of IVR Menu
- **US 20110225330** Portable Universal Communication Device
- **US 20100220616** Optimizing Network Connections
- **US 20100217854** Method and Apparatus for Intelligent Management of a Network Element
- **US 20100146492** Translation of Programming Code
- **US 20100146112** Efficient Communication Techniques
- **US 20100146111** Efficient Communication in a Network
- **US 20090313613** Methods and Apparatus for Automatic Translation of a Computer Program Language Code
- **US 20090313004** Platform-Independent Application Development Framework
- **US 20090279562** Content-aware dynamic network resource allocation
- **US 20080040630** Time-Value Curves to Provide Dynamic QoS for Time Sensitive File Transfers
- **US 20070169171** Technique for authenticating network users
- **US 20060123481** Method and apparatus for network immunization
- **US 20060075042** Extensible Resource Messaging Between User Applications and Network Elements in a Communication Network

- **US 20050083960** Method and Apparatus for Transporting Parcels of Data Using Network Elements with Network Element Storage
- **US 20050076339** Method and Apparatus for Automated Negotiation for Resources on a Switched Underlay Network
- **US 20050076336** Method and Apparatus for Scheduling Resources on a Switched Underlay Network
- **US 20050076173** Method And Apparatus for Preconditioning Data to Be Transferred on a Switched Underlay Network
- **US 20050076099** Method and Apparatus for Live Streaming Media Replication in a Communication Network
- **US 20050074529** Method and apparatus for transporting visualization information on a switched underlay network
- **US 20040076161** Dynamic Assignment of Traffic Classes to a Priority Queue in a Packet Forwarding Device
- **US 20020021701** Dynamic Assignment of Traffic Classes to a Priority Queue in a Packet Forwarding Device
- **WO 2007/008976** Technique for Authenticating Network Users
- **WO 2006/063052** Method and apparatus for network immunization
- **WO2000/0054460** Method and apparatus for accessing network information on a network device

Publications

(Not an exhaustive list)

- "R&D Models for Advanced Development & Corporate Research" Understanding Six Models of Advanced R&D - Ikhlaq Sidhu, Tal Lavian, Victoria Howell - University of California, Berkeley. Accepted paper for 2015 ASEE Annual Conference and Exposition- June 2015
- "Communications Architecture in Support of Grid Computing",Tal Lavian,Scholar's Press 2013ISBN 978-3-639-51098-0.
- "Applications Drive Secure Lightpath Creation across Heterogeneous Domains, Feature Topic Optical Control Planes for Grid Networks: Opportunities, Challenges and the Vision." Gommans L.; Van Oudenaarde B.; Dijkstra F.; De Laat C.; Lavian T.; Monga I.; Taal A.; Travostino F.; Wan A.; IEEE *Communications Magazine*, vol. 44, no. 3, March 2006, pp. 100-106.
- *Lambda Data Grid: Communications Architecture in Support of Grid Computing*. Tal I. Lavian, Randy H. Katz; Doctoral Thesis, University of California at Berkeley. January 2006.
- "Information Switching Networks." Hoang D.B.; T. Lavian;*The 4th Workshop on the Internet, Telecommunications and Signal Processing, WITSP2005*, December 19-21, 2005, Sunshine Coast, Australia.
- "Impact of Grid Computing on Network Operators and HW Vendors." Allcock B.; Arnaud B.; Lavian T.; Papadopoulos P.B.; Hasan M.Z.; Kaplow W.; *IEEE Hot Interconnects at Stanford University 2005*, pp.89-90.
- *DWDM-RAM: AData Intensive Grid Service Architecture Enabled by Dynamic Optical Networks*. Lavian T.; Mambretti J.; Cutrell D.; Cohen H.J; Merrill S.; Durairaj R.; Daspit P.; Monga I.; Naiksatam S.; Figueira S.; Gutierrez D.; Hoang D.B., Travostino F.; CCGRID 2004, pp. 762-764.
- *DWDM-RAM: AnArchitecture for Data Intensive Service Enabled by Next Generation Dynamic Optical Networks*. Hoang D.B.; Cohen H.; Cutrell D.; Figueira S.; Lavian T.; Mambretti J.; Monga I.; Naiksatam S.; Travostino F.; Proceedings IEEE Globecom 2004, Workshop on High-Performance Global Grid Networks, Houston, 29 Nov. to 3 Dec. 2004, pp.400-409.
- *Implementation of a Quality of Service Feedback Control Loop on Programmable Routers*. Nguyen C.; Hoang D.B.; Zhao, I.L.; Lavian, T.; Proceedings, 12th IEEE International Conference on Networks 2004. (ICON 2004) Singapore, Volume 2, 16-19 Nov. 2004, pp.578-582.
- *A Platform for Large-Scale Grid Data Service on Dynamic High-Performance Networks*. Lavian T.; Hoang D.B.; Mambretti J.; Figueira S.; Naiksatam S.; Kaushil N.; Monga I.; Durairaj R.; Cutrell D.; Merrill S.; Cohen H.; Daspit P.; Travostino F; GridNets 2004, San Jose, CA., October 2004.
- *DWDM-RAM: Enabling Grid Services with Dynamic Optical Networks*. Figueira S.; Naiksatam S.; Cohen H.; Cutrell D.; Daspit, P.; Gutierrez D.; Hoang D. B.; Lavian T.; Mambretti J.; Merrill S.; Travostino F; Proceedings, 4th IEEE/ACM International Symposium on Cluster Computing and the Grid, Chicago, USA, April 2004, pp. 707-714.
- *DWDM-RAM: Enabling Grid Services with Dynamic Optical Networks*. Figueira S.; Naiksatam S.; Cohen H.; Cutrell D.; Gutierrez D.; Hoang D.B.; Lavian T.; Mambretti J.; Merrill S.; Travostino F.; 4th IEEE/ACM International Symposium on Cluster Computing and the Grid, Chicago, USA, April 2004.

- *An Extensible, Programmable, Commercial-Grade Platform for Internet Service Architecture*. Lavian T.; Hoang D.B.; Travostino F.; Wang P.Y.; Subramanian S.; Monga I.; IEEE Transactions on Systems, Man, and Cybernetics on Technologies Promoting Computational Intelligence, Openness and Programmability in Networks and Internet Services Volume 34, Issue 1, Feb. 2004, pp.58-68.
- *DWDM-RAM: An Architecture for Data Intensive Service Enabled by Next Generation Dynamic Optical Networks*. Lavian T.; Cutrell D.; Mambretti J.; Weinberger J.; Gutierrez D.; Naiksatam S.; Figueira S.; Hoang D. B.; Supercomputing Conference, SC2003 Igniting Innovation, Phoenix, November 2003.
- *Edge Device Multi-Unicasting for Video Streaming*. Lavian T.; Wang P.; Durairaj R.; Hoang D.; Travostino F.; Telecommunications, 2003. ICT 2003. 10th International Conference on Telecommunications, Tahiti, Volume 2, 23 Feb.-1 March, 2003 pp. 1441-1447.
- The SAHARA Model for Service Composition Across Multiple Providers. Raman B.; Agarwal S.; Chen Y.; Caesar M.; Cui W.; Lai K.; Lavian T.; Machiraju S.; Mao Z. M.; Porter G.; Roscoe T.; Subramanian L.; Suzuki T.; Zhuang S.; Joseph A. D.; Katz Y.H.; Stoica I.; Proceedings of the First International Conference on Pervasive Computing. ACM Pervasive 2002, pp. 1-14.
- *Enabling Active Flow Manipulation in Silicon-Based Network Forwarding Engines*. Lavian T.; Wang P.; Travostino F.; Subramanian S.; Duraraj R.; Hoang D.B.; Sethaput V.; Culler D.; Proceeding of the Active Networks Conference and Exposition, 2002.(DANCE) 29-30 May 2002, pp. 65-76.
- *Practical Active Network Services within Content-Aware Gateways*. Subramanian S.; Wang P.; Durairaj R.; Rasimas J.; Travostino F.; Lavian T.; Hoang D.B.; Proceeding of the DARPA Active Networks Conference and Exposition, 2002.(DANCE) 29-30 May 2002, pp. 344-354.
- *Active Networking on a Programmable Network Platform.* Wang P.Y.; Lavian T.; Duncan R.; Jaeger R.; Fourth IEEE Conference on Open Architectures and Network Programming (OPENARCH), Anchorage, April 2002.
- *Intelligent Network Services through Active Flow Manipulation*. Lavian T.; Wang P.; Travostino F.; Subramanian S.; Hoang D.B.; Sethaput V.; IEEE Intelligent Networks 2001 Workshop (IN2001), Boston, May 2001.
- Intelligent Network Services through Active Flow Manipulation. Lavian T.; Wang P.; Travostino F.; Subramanian S.; Hoang D.B.; Sethaput V.; Intelligent Network Workshop, 2001 IEEE 6-9 May 2001, pp.73 - 82.
- *Enabling Active Flow Manipulation in Silicon-based Network Forwarding Engine*. Lavian, T.; Wang, P.; Travostino, F.; Subramanian S.; Hoang D.B.; Sethaput V.; Culler D.; Journal of Communications and Networks, March 2001, pp.78-87.
- *Active Networking on a Programmable Networking Platform*. Lavian T.; Wang P.Y.; IEEE Open Architectures and Network Programming, 2001, pp. 95-103.
- *Enabling Active Networks Services on a Gigabit Routing Switch*. Wang P.; Jaeger R.; Duncan R.; Lavian T.; Travostino F.; 2nd Workshop on Active Middleware Services, 2000.

- *Dynamic Classification in Silicon-Based Forwarding Engine Environments*. Jaeger R.; Duncan R.; Travostino F.; Lavian T.; Hollingsworth J.; Selected Papers. 10th IEEE Workshop on Metropolitan Area and Local Networks, 1999. 21-24 Nov. 1999, pp.103-109.
- *Open Programmable Architecture for Java-Enabled Network Devices*. Lavian, T.; Jaeger, R. F.; Hollingsworth, J. K.; IEEE Hot Interconnects Stanford University, August 1999, pp. 265-277.
- *Open Java SNMP MIB API*. Rob Duncan, Tal Lavian, Roy Lee, Jason Zhou, Bay Architecture Lab Technical Report TR98-038, December 1998.
- *Java-Based Open Service Interface Architecture*. Lavian T.; Lau S.; BAL TR98-010 Bay Architecture Lab Technical Report, March 1998.
- *Parallel SIMD Architecture for Color Image Processing*. Lavian T. Tel – Aviv University, Tel – Aviv, Israel, November 1995.
- *Grid Network Services, Draft-ggf-ghpn-netservices-1.0*.George Clapp, Tiziana Ferrari, Doan B. Hoang, Gigi Karmous-Edwards, Tal Lavian, Mark J. Leese, Paul Mealor, Inder Monga, Volker Sander, Franco Travostino, Global Grid Forum(GGF).
- *Project DRAC: Creating an applications-aware network.*Travostino F.; Keates R.; Lavian T.; Monga I.; Schofield B.; Nortel Technical Journal, February 2005, pp. 23-26.
- *Optical Network Infrastructure for Grid, Draft-ggf-ghpn-opticalnets-1.*Dimitra Simeonidou, Reza Nejabati, Bill St. Arnaud, Micah Beck, Peter Clarke, Doan B. Hoang, David Hutchison, Gigi Karmous-Edwards, Tal Lavian, Jason Leigh, Joe Mambretti, Volker Sander, John Strand, Franco Travostino, Global Grid Forum(GGF) GHPN Standard GFD-I.036 August 2004.
- *Popeye - Using Fine-grained Network Access Control to Support Mobile Users and Protect Intranet Hosts.*Mike Chen, Barbara Hohlt, Tal Lavian, December 2000.

Presentations and Talks

(Not an exhaustive list)

- Lambda Data Grid: An Agile Optical Platform for Grid Computing and Data-intensive Applications.
- Web Services and OGSA
- WINER Workflow Integrated Network Resource Orchestration.
- Technology & Society.
- Abundant Bandwidth and how it affects us?
- Active Content Networking(ACN).
- DWDM-RAM:Enabling Grid Services with Dynamic Optical Networks .
- Application-engaged Dynamic Orchestration of Optical Network Resources .
- A Platform for Data Intensive Services Enabled by Next Generation Dynamic Optical Networks .
- Optical Networks.
- Grid Optical Network Service Architecture for Data Intensive Applications.
- Optical Networking & DWDM.
- OptiCal Inc.
- OptiCal & LUMOS Networks.
- Optical Networking Services.
- Business Models for Dynamically Provisioned Optical Networks.
- Business Model Concepts for Dynamically Provisioned Optical Networks.
- Optical Networks Infrastructure.
- Research Challenges in agile optical networks.
- Services and Applications' infrastructure for agile optical networks.
- Impact on Society.
- TeraGrid Communication and Computation.
- Unified Device Management via Java-enabled Network Devices.
- Active Network Node in Silicon-Based L3 Gigabit Routing Switch.
- Active Nets Technology Transfer through High-Performance Network Devices.
- Programmable Network Node: Applications.
- Open Innovation via Java-enabled Network Devices.
- Practical Considerations for Deploying a Java Active Networking Platform.
- Open Java-Based Intelligent Agent Architecture for Adaptive Networking Devices.
- Java SNMP Oplet.
- Open Distributed Networking Intelligence: A New Java Paradigm.
- Open Programmability.
- Active Networking On A Programmable Networking Platform.
- Open Networking through Programmability.
- Open Programmable Architecture for Java-enabled Network Devices.

- Integrating Active Networking and Commercial-Grade Routing Platforms.
- Programmable Network Devices.
- To be smart or not to be?