ELECTRONIC FRONTIER FOUNDATION
CINDY COHN (145997)
cindy@eff.org
LEE TIEN (148216)
tien@eff.org
KURT OPSAHL (191303)
kurt@eff.org
KEVIN S. BANKSTON (217026)
bankston@eff.org
CORYNNE MCSHERRY (221504)
corynne@eff.org
JAMES S. TYRE (083117)
jstyre@eff.org
454 Shotwell Street
San Francisco, CA 94110
Telephone: 415/436-9333
415/436-9993 (fax)

TRABER & VOORHEES
BERT VOORHEES (137623)
bv@tvlegal.com
THERESA M. TRABER (116305)
tmt@tvlegal.com
128 North Fair Oaks Avenue, Suite 204
Pasadena, CA 91103
Telephone: 626/585-9611
626/ 577-7079 (fax)

LAW OFFICE OF RICHARD R. WIEBE
RICHARD R. WIEBE (121156)
wiebe@pacbell.net
425 California Street, Suite 2025
San Francisco, CA 94104
Telephone: 415/433-3200
415/433-6382 (fax)

Attorneys for Plaintiffs

[Additional counsel appear on signature page.]

UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

TASH HEPTING, GREGORY HICKS, CAROLYN JEWEL and ERIK KNUTZEN, on Behalf of Themselves and All Others Similarly Situated,, Plaintiffs, v. AT&T CORP., et al., Defendants.	No. C-06-0672-VRW CLASS ACTION **DECLARATION OF J. SCOTT MARCUS IN SUPPORT OF PLAINTIFFS' MOTION FOR PRELIMINARY INJUNCTION** Date: June 8, 2006 Courtroom: 6, 17th Floor Judge: Hon. Vaughn Walker

FILED UNDER SEAL PURSUANT TO CIVIL LOCAL RULE 79-5

TABLE OF CONTENTS

LIST OF EXHIBITS

A	Curriculum vitae of J. Scott Marcus
B	Eric Lichtblau and James Risen, Spy Agency Mined Vast Data Trove, Officials Report, The New York Times, Dec. 24, 2005
C	Barton Gellman, Dafna Linzer and Carol D. Leonnig, Surveillance Net Yields Few Suspects: NSA's Hunt for Terrorists Scrutinizes Thousands of Americans, but Most Are Later Cleared, Washington Post, Feb. 5, 2006
D	Marcus et al, "Internet interconnection and the off-net-cost pricing principle"
E	Marcus, "Call Termination Fees: The U.S. in global perspective"
F	Marcus, "What Rules for IP-enabled NGNs?"
G	"Evolving Core Capabilities of the Internet"
H	http://en.wikipedia.org/wiki/Modulation
I	http://en.wikipedia.org/wiki/Attenuation
J	http://en.wikipedia.org/wiki/Decibel
K	ADC brochure (Value-Added Module System: LGX Compatible)
L	http://www.narus.com/solutions/IPanalysis.html
M	http://www.ist-scampi.org/events/workshop-2004/poell.pdf
N	http://www-03.ibm.com/industries/telecom/doc/content/bin/tc_using_narus_ip_sept_2005.pdf
O	http://www.narus.com/platform/index.html
P	http://www.narus.com/solutions/NarusForensics.html
Q	In the Matter of AT&T Petition for Declaratory Ruling that AT&T's Phone-to-Phone IP Telephony Services are Exempt from Access Charges, FCC WC Docket 02-361, Petition of AT&T
R	Report of the NRIC V Interoperability Focus Group, "Service Provider Interconnection for Internet Protocol Best Effort Service"
S	Ch. 14, Marcus, Designing Wide Area Networks and Internetworks: A Practical Guide (1999)
T	http://www.broadbandweek.com/newsdirect/0208/direct020802.htm, August 2, 2002
U	http://www.narus.com/solutions/IPsecurity.html
V	http://www.fcw.com/article90916-09-26-05-Print
W	http://www.att.com/news/2004/03/22-12972

X	http://www.eweek.com/print_article2/0,1217,a=139716,00.asp
Y	Lehman Brothers analysis of AT&T (Jan. 24, 2003)

I, J. Scott Marcus, declare under the penalty of perjury that the following is true and correct:

1. The Electronic Frontier Foundation (EFF) has asked me to render an expert opinion[1] on the implications of a declaration by Mark Klein ("Klein Declaration"), and on a series of documents alleged to have been generated by AT&T (Exhibits A, B and C to the Klein Declaration) ("Klein Exhibits"), in conjunction with Plaintiffs' Motion for a Preliminary Injunction.

2. I am strongly of the opinion that the Klein Exhibits are authentic, and I find Mr. Klein's declaration to be fully consistent with the documents and entirely plausible.

3. The EFF specifically requested that I assess whether the program described in the Klein Declaration and Klein Exhibits is consistent with media reports about a program authorized by the President of the United States, under which the National Security Agency ("NSA") engages in warrantless surveillance of communications of people inside the United States ("the Program").

4. I was asked to review the following two news articles: Eric Lichtblau and James Risen, *Spy Agency Mined Vast Data Trove, Officials Report*, The New York Times, Dec. 24, 2005 (attached as Exhibit B), and Barton Gellman, Dafna Linzer and Carol D. Leonnig, *Surveillance Net Yields Few Suspects: NSA's Hunt for Terrorists Scrutinizes Thousands of Americans, but Most Are Later Cleared*, Washington Post, Feb. 5, 2006 at A01 (attached as Exhibit C).

5. I was asked to focus on the following claims in these two news articles, with respect to AT&T Corp.: that major U.S. telecommunications companies are assisting the government in carrying out the Program; that these companies have given the government direct access to telecommunications facilities physically located on U.S. soil; that by virtue of this access, the government can now monitor both domestic and international communications of persons in the United States; and that surveillance under the Program is conducted in several stages, with the early stages being computer-controlled collection and analysis of communications and the last stage being actual human scrutiny.

6. In the sections that follow, I present my qualifications, and provide an overview of

[1] Attached hereto as Exhibit A is my curriculum vitae.

the implications of the Klein Declaration and Klein Exhibits. I present my conclusions in regard to the scope of the program, and the volume of data that was captured. I also explain why I find credible Mr. Klein's allegation that the room described was a secure facility, intended to be used for purposes of surveillance on a very substantial scale.

QUALIFICATIONS

7. For more than 30 years, I have worked in a wide range of positions involving computers, data communications, economics, and public policy. This declaration draws on my experience in several of these positions, and in several different academic disciplines.

8. From March 1990 to July 2001, I held a series of responsible positions with Bolt, Beranek and Newman (which was renamed BBN Corp.) and with its successor companies, GTE Internetworking and Genuity, culminating in my work as Chief Technology Officer (CTO) of Genuity.

9. BBN Corp. was acquired by GTE Corp. in 1997. The portion of BBN that functioned as an Internet Service Provider (ISP)[2] became GTE Internetworking, a wholly owned subsidiary of GTE.

10. In 2000, at the time of the Bell Atlantic – GTE merger (which formed Verizon), GTE Internetworking was spun out into an independent company in order to satisfy regulatory obligations relevant to the merger. The independent firm was called Genuity.

11. My primary engineering competence is as a designer of large scale IP-based[3] data networks.

12. Immediately following BBN's acquisition by GTE, I headed the team of systems architects and network engineers who developed the overall architectural design for GTE Internetworking's new data network. The team, comprising of as many as 50 senior engineers at various times, translated general business and marketing requirements into a comprehensive set of

---

[2] An *Internet Service Provider (ISP)* is an organization that enables other organizations to connect to the global Internet. ISPs often provide additional supporting services to enable electronic mail (e-mail) and to permit domain names (such as www.fcc.gov) to be recognized.

[3] All Internet traffic is *IP-based, i.e.* based on the Internet Protocol. I expand on this discussion in the section in which I discuss "Traffic captured".

high level engineering designs. This was a project of substantial scope and scale. The new network transformed 13,000 miles of dark fiber[4] into a single integrated network providing nationwide (and ultimately global) high speed Internet access services, and support for consumer Internet access via broadband and dial-up, and high speed data services for large enterprises. In terms both of scope and of technology, this network was at the state of the art of the day. The network was viewed as a technical and economic success, and became in short order one of the largest Internet backbone networks in the world – in terms of traffic carried, it could be viewed as the fourth largest Internet *backbone*[5] in the world for much of the time that I was there.

13. I have some experience with AT&T's network at its inception. When AT&T initially entered the Internet business in 1995, they contracted with my firm, BBN, to provide the underlying service. In effect, they "private labeled" a BBN service. They provided connections to their customers over dedicated circuits, which were cross-connected to BBN's Internet network. The customer perceived an AT&T-branded service, but BBN provided the acual ISP services. I was BBN's lead technical person for this endeavor.

14. BBN and AT&T conducted exploratory, but ultimately unsuccessful, discussions about building an Internet backbone together. AT&T ultimately decided to implement their own Internet backbone network (the Common Backbone [CBB],[6] which is the same name used in these documents), and thus to assume the ISP functions that had previously been provided by BBN. The initial design of the CBB reflected AT&T's experience in working with BBN.

15. In addition to the GTE Internetworking's own Internet backbone, and the work with AT&T, I designed a number of networks for commercial and government customers. I did the initial design work and cost analysis for a very large dial-up network for America Online in 1995.

---

[4] Fiber optics are discussed later in this declaration. Dark fiber is fiber optic cable that is not yet carrying traffic.

[5] The term *backbone* is widely used in the industry, but not precisely defined. An Internet backbone can be thought of as a large ISP, many of whose customers may themselves be smaller ISPs. There is no single network that is *the Internet*; rather, the Internet backbones collectively form the core of the global Internet. The term backbone is also sometimes used to denote any large IP-based network, whether used to provide IP-based services to the public or not.

[6] The AT&T Common Backbone, like backbones generally, is a large IP-based network. The CBB is used for the transmission of interstate or foreign communications.

This network ultimately carried as much as 40% of America Online's dial-up traffic.

16. My experience as CTO at GTE Internetworking provides useful insights not only in network design, but also into operational procedures in a large Internet backbone operator associated with a large traditional telecommunications carrier. BBN's joint project with AT&T required me to work closely with AT&T's engineers as they deployed the service. In addition, much of BBN's Internet equipment was physically deployed into points of presence owned and operated by WorldCom and by MCI, which required that I be able to coordinate with their staffs as well. These insights into carrier operations enable me to assess the AT&T documents.

17. Many of my other duties at BBN, GTE Internetworking and Genuity are relevant to this declaration.

18. I created a network design and capacity planning function within BBN, and ran the function for several years. In the context of an ISP, capacity planning is the process whereby the ISP measures and interprets current service demands on the network, projects future demands (considering both current and projected future service offerings), and plans for necessary network enhancements to meet those demands. Capacity planning required constant interaction with the company's financial planners, as well as marketing and engineering. It also required an in-depth understanding of traffic flows within and between Internet providers. After the merger with GTE, I received a GTE Chairman's Leadership Award for that work.

19. I am the author of a textbook on data network design: *Designing Wide Area Networks and Internetworks: A Practical Guide*, Addison Wesley, 1999. The book largely reflects my experience with capacity planning and network design in the large at BBN, GTE Internetworking and Genuity.

20. I held a number of sales and marketing positions at BBN, and in those roles (and also subsequently as Genuity's CTO) frequently participated in the assessment of the costs and the potential revenues associated with new services.

21. Many of my outside consulting assignments at BBN involved elements of data security and network security. Later, as CTO, the company's senior security expert was a direct report. I thus had a general oversight role with respect to the company's performance of lawful

intercept.

22. As CTO, I also had primary responsibility for the company's strategic approach to peering[7] with other Internet Service Providers (including AT&T). I personally chaired the firm's peering policy council, where the company's various stakeholders (engineering, financial and marketing) established strategic direction in regard to peering.

23. I supported GTE's General Counsel in raising concerns about the MCI-WorldCom merger (1998) and the proposed MCI-Sprint merger (2000), arguing that the network externality effects resulting from the mergers would make anticompetitive practices as regards Internet backbone peering both feasible and profitable. These arguments hinged to a substantial degree on my ability to estimate peering traffic flows between the major Internet backbones in both real and hypothetical circumstances. This activity drew heavily on my experience with the measurement and analysis of traffic.

24. From July 2001 to July 2005, I was the Senior Advisor for Internet Technology at the Federal Communications Commission (FCC). In this role, I served as the FCC's leading technical expert on the Internet, and provided advice to the Chairman's office and to other senior managers as regards technology and policy issues.

25. I participated in numerous proceedings during my time at the FCC, including several that dealt generally with broadband and with Voice over IP (VoIP).[8]

26. I was a member of the FCC's Homeland Security Policy Council, with significant responsibilities as regards cybersecurity and infrastructure security. I held a top secret clearance. I frequently spoke on the FCC's behalf on lawful intercept (CALEA)[9] in connection with IP-based services. I was an active and significant participant in the FCC's proceedings related to CALEA in

---

[7] *Peering* is the process whereby Internet providers interchange traffic destined for their respective customers, and for customers of their customers. A more extensive definition appears later in this Declaration, under "Traffic Captured."

[8] *IP* is the Internet Protocol. All Internet data is IP-based. *Voice over IP* refers to the transmission of voice over IP-based networks – either private networks or the "public" Internet.

[9] Communications Assistance for Law Enforcement Act of 1994 (CALEA), Pub. L. No. 103-414, 108 Stat. 4279. CALEA is the statute that requires carriers to proactively instrument their networks in order to support law enforcement needs. The FCC has a role in its implementation.

connection with Voice over IP (VoIP) and with broadband.

27. From July 2005 to the present, I have been a Senior Consultant for the WIK, located in Bad Honnef, Germany. The WIK is a leading German research institute specializing in the economics of electronic communications, and the regulatory implications that flow from those economics. Much of my current work applies economic reasoning to policy problems in electronic communications.

28. I am a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), and have held several senior volunteer positions within the IEEE. I am currently co-editor for public policy and regulatory matters for *IEEE Communications Magazine*. I have also served as a trustee of the American Registry of Internet Numbers (ARIN).

29. I do not consider myself an economist, but I have a good working knowledge of economics as it applies to the aspects of telecommunications that I deal with. Several of my professional papers over the past few years are economics papers, and a number of them have been cited by recognized economists.[10] Other recent papers apply economic reasoning to problems in the regulation of electronic communications.[11]

BACKGROUND –DOCUMENTS REVIEWED

30. In forming my expert opinions in this Declaration, I reviewed the following documents: the Klein Declaration; *SIMS Splitter Cut-In and Test Procedure*, Issue 2, 01/13/03

---

[10] See, for instance, my paper with Jean-Jacques Laffont, Patrick Rey, and Jean Tirole, IDE-I, Toulouse, "Internet interconnection and the off-net-cost pricing principle," *RAND Journal of Economics*, Vol. 34, No. 2, Summer 2003, available at http://www.rje.org/abstracts/abstracts/2003/rje.sum03.Laffont.pdf (Exhibit D). An earlier version of the paper appeared as "Internet Peering," *American Economics Review*, Volume 91, Number 2, May 2001. See also "Call Termination Fees: The U.S. in global perspective," presented at the 4th ZEW Conference on the Economics of Information and Communication Technologies, Mannheim, Germany, July 2004, available at: ftp://ftp.zew.de/pub/zew-docs/div/IKT04/Paper_Marcus_Parallel_Session.pdf (Exhibit E). Another paper that deals primarily with economics has been commissioned by the International Telecommunications Union (ITU-T) for presentation at their ITU New Initiatives Workshop on "What Rules for IP-enabled NGNs?," March 23-24, 2006: "Interconnection in an NGN environment," available at http://www.itu.int/osg/spu/ngn/documents/Papers/Marcus-060323-Fin-v2.1.pdf (Exhibit F).

[11] *See*, for instance, "Evolving Core Capabilities of the Internet," *Journal on Telecommunications and High Technology Law*, 2004 (Exhibit G).

(Klein Decl. Exh. A); *SIMS Splitter Cut-In and Test Procedure: OSWF Training*, Issue 2, January 24, 2003 (Klein Decl. Exh. B); and *Study Group 3 LGX/Splitter Wiring: San Francisco*, Issue 1, 12/10/02 (Klein Decl. Exh. C).

31. I have also reviewed publicly available data on the Internet – wherever I have relied on such data, I have so indicated in the text.

32. The Klein Exhibits use terms such as "SG3 equipment" and "SG3 room." I believe *SG3* to be an acronym for *Study Group 3*, which is used consistently to describe the project. Consistent with this terminology, I will refer to the *SG3 Configuration* throughout this declaration.

33. I interpret *OSWF* as a reference to the *On Site Work Force*. These documents represent directions to technicians who must "cut" the new facilities into the network, *i.e.* install them with as little impact as possible on AT&T's ongoing network operations.

34. Based on my experience in working with AT&T, I consider the documents to be written with the meticulous attention to detail that is typical of AT&T operations. Highly skilled central engineering staff provided unambiguous and highly detailed directions in order to enable implementation by multiple on site field crews at a lower skill level. Any operations that could be done in advance were dealt with prior to the cut. The cut was designed to be as fast and as painless as possible, so as to minimize the risk of network disruption. The cut was to take place during the maintenance window (presumably during the early morning hours, *e.g.* 2:00 AM) so as to further minimize possible disruption.[12]

35. It is clear that these plans relate to real deployments, and not just to a theoretical or hypothetical exercise. The last page of Klein Exhibit B makes clear that the San Francisco deployment was already in full swing when the document was published on January 24, 2003. Of sixteen large peering circuits that were to be diverted, (1) circuit engineering was complete for eight, (2) actual change orders had already been issued for four, and were scheduled to be issued for four more within the subsequent week (i.e. by 1/30/2003), and (3) request dates had been established for the completion of the remaining circuit engineering, for splitter pre-test and for

[12] *See* Klein Exh. A, page 4.

putting the splitters into the circuits, all in 1/2003 and 2/2003.

36. Klein Exhibit B and Klein Exhibit C are specific to AT&T's San Francisco facility, but Klein Exhibit A is generic – it is relevant to all sites where this cut was to take place.

OVERVIEW AND SUMMARY OF PRINCIPAL OPINIONS

37. My expert assessment is based on the Klein Declaration, the AT&T documents collectively designated as the Klein Exhibits, my extensive and varied experience in the industry, and various publicly available documents. Where I have relied on such documents, I have so indicated in the text.

38. Based on these documents, other publicly available documents, and my general knowledge of the industry, I conclude that AT&T has constructed an extensive – and expensive – collection of infrastructure that collectively has all the capability necessary to conduct large scale covert gathering of IP-based communications information, *not only for communications to overseas locations, but for purely domestic communications as well.*[13]

39. In terms of the media claims I was asked to evaluate with respect to AT&T, I conclude that: the infrastructure described by the Klein Declaration and Klein Exhibits provides AT&T Corp. with the capacity to assist the government in carrying out the Program; that the infrastructure deployed included a data network (the *SG3 backbone*) that apparently provided third party access to the SG3 room or rooms; that, if the government is in fact in communication with this infrastructure, AT&T Corp. has given the government direct access to telecommunications facilities physically located on U.S. soil; that, by virtue of this access, the government would have the capacity to monitor both domestic and international communications of persons in the United States; and that surveillance under the Program is conducted in several stages, with the early stages being computer-controlled collection and analysis of communications and the last stage being actual human scrutiny.

40. A key question is whether the infrastructure that AT&T deployed – which I refer to for purposes of this declaration as the *SG3 Configurations* – is being used solely for legitimate or

[13] Later in this Declaration, I provide my assessment of the volume of domestic and international traffic captured.

innocuous purposes, or for interception that violates consumer privacy and U.S. law. The SG3 Configurations could be used for a number of legitimate purposes; however, the scale of these deployments is, in my opinion and based on my experience, vastly in excess of what would be needed for any likely application, or any likely combination of applications other than surveillance.

41. The SG3 Configurations that were deployed are not routine for Internet backbone operators, and they are emphatically not required (nor, apparently, are they being used) for the transmission of Internet data between customers.

42. I consider other possible alternative hypotheses for AT&T's deployments later in this Declaration, under "Alternative reasons why AT&T might have deployed the SG3 Configurations." For instance, the SG3 Configurations could be used in support of routine lawful intercept, and are possibly being used in that way, but lawful intercept requirements could not account for AT&T's deployment of the SG3 deployments. As another example, the SG3 Configurations could be used in support of AT&T commercial security offerings, and it appears that AT&T is using either the SG3 Configurations or, more likely, similar technology deployed elsewhere in support of their Internet Protect commercial offering. In my judgment, and based on my experience, it is highly unlikely that benign applications, either individually or collectively, provided the rationale for the deployment. The information at hand suggests, rather, that AT&T has attempted after the fact to find ways to realize additional commercial value out of a very substantial deployment that had already been made primarily in order to conduct (presumably warrantless) surveillance. Public statements by AT&T officials over the years tend to support this view – AT&T only belatedly realized that customers might be interested in certain of these capabilities.[14]

43. Prior to seeing the Klein Declaration, I would have expected the Program to involve a modest and limited deployment, targeted solely at overseas traffic, and likely limited in the information captured to traffic measures (except pursuant to a warrant). The majority of international IP traffic enters the United States at a limited number of locations, many of them in the areas of northern Virginia, Silicon Valley, New York, and (for Latin America) south Florida.

[14] Supporting detail appears later in this Declaration, in "Alternative reasons why AT&T might have deployed the SG3 Configurations."

This deployment, however, is neither modest nor limited, and it apparently involves considerably more locations than would be required to catch the majority of international traffic.

44. The SG3 Configurations are fully capable of pattern analysis, pattern matching and detailed analysis at the level of *content*, not just of addressing information. One key component, the NARUS 6400, exists primarily to conduct sophisticated rule-based analysis of content. It is also well suited to high speed data reduction – to the "winnowing down" of large volumes of data, in order to identify only events of interest.

45. Klein Exhibit C speaks of a private SG3 backbone network, which appears to be partitioned from AT&T's main Internet backbone, the CBB.[15] This suggests the presence of a private network. The most plausible inference is that this was a covert network that was used to ship data of interest to one or more central locations for still more intensive analysis. I return to the capabilities of the SG3 Configurations later in this Declaration, under "Capabilities of the SG3 Configuration."

46. Given the probable cost of these configurations, and the likely limited commercial return, I find it exceedingly unlikely a financially troubled AT&T[16] would have made these investments at that time on its own initiative. I can envision no commercial reason, nor any combination of commercial reasons, that would render that investment likely. I therefore conclude that it is highly probable that funding came from an outside source, and consider the U.S. Government to be the most likely source. This supports Mr. Klein's assertion that the room was an NSA secure room, accessible only to NSA-cleared personnel.

47. I also find that the components that were chosen are exceptionally well suited to a massive, distributed surveillance activity (*see* "Capabilities of the SG3 Configuration" later in this Declaration). No other application provides as good an explanation for the combination of engineering choices that were made.

48. In addition, the private SG3 backbone network referred to in Klein Exhibit C,

[15] Klein Exh.C, pp 6, 12, 42. Again, *see* "Capabilities of the SG3 Configuration" later in this Declaration.

[16] I return to the topic of AT&T's financial condition later in this Declaration, under "AT&T's Financial Condition in 2003."

appears to be partitioned from AT&T's main Internet backbone, the CBB.[17] This is perfectly consistent with the notion of massive, covert distributed surveillance system. It is not consistent with normal AT&T practice – they have been working for years to try to reduce the number of networks in use, in the interest of engineering and operational economy.

49. For all of these reasons, I am persuaded that the SG3 Configurations were deployed primarily in order to perform surveillance on a massive scale, and not for any other purpose.

BACKGROUND – FIBER OPTICS

50. The Klein Declaration speaks (at ¶ 24 and in the sections following) of *splitting* the light signal, so as to divert a portion of the signal to the SG3 Secure Room. It may be helpful to review (at an informal level suitable for a non-specialist) some of the characteristics of fiber optic transmission before proceeding.

51. Historically, electronic communications were carried over copper wires, or were broadcast through the air. In both instances, it was often economically and technically advantageous to *modulate*[18] the signal onto a higher frequency wave. Doing so enables the recipient to select from among multiple signals transmitted over the same physical medium. You do this every time that you tune your television or radio to a particular channel.

52. More recently, fiber optics have supplanted the use of copper wire for many applications, especially those involving long distances. Instead of modulating signals onto electrical waves or radio waves, they are modulated onto light waves. Because light waves have a much higher frequency than the waves used in copper wires, it is possible to modulate far more information onto them.

53. Fiber optics have an additional advantage over copper wires: They do not generate electrical interference, nor are they vulnerable to it. In addition, it is difficult to "tap" into a fiber

---

[17] Klein Exh.C, pp 6, 12, 42. Again, *see* "Capabilities of the SG3 Configuration" later in this Declaration.

[18] *Modulation* is ". . . the process of varying a carrier signal, typically a [signal in the shape of a sine wave], in order to use that signal to convey information . . . . There are several reasons to modulate a signal before transmission in a medium. These include the ability of different users sharing a medium (multiple access), and making the signal properties physically compatible with the propagation medium." *See* http://en.wikipedia.org/wiki/Modulation (Exhibit H).

optic cable without detection. All of these characteristics are felt to make fiber more reliable and more secure than copper.

54. At the same time, these characteristics mean that law enforcement has to work harder to implement lawful intercept. The Hollywood image of an FBI agent with a pair of alligator clips is a thing of the past.

55. This is one of the main reasons why CALEA obligates carriers to instrument their networks in order to support requests for lawful intercept. Lawful intercept in today's world depends on the cooperation of the carrier.

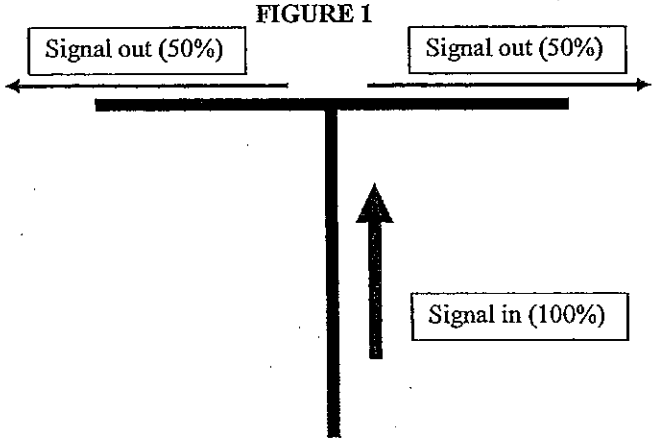
56. In this case, the splitter (described below) provides an equivalent function to that of the alligator clips. However, instead of capturing traffic to a single target, these splitters collectively transferred all or substantially all of AT&T's off net IP-based traffic[19] (so-called Internet *peering*[20] traffic to other Internet backbones) to a secure room.

57. A splitter is a standard bit of optical gear. The simplest form is a "T" – one signal comes in, two signals go out. The splitters in this case were 50/50 splitters, which is to say that they split the signal such that 50% went to each output fiber. *See* the figure immediately below.

[19] The basis for this statement is developed over the balance of this Declaration. Traffic from one AT&T customer to another AT&T customer is *on net* traffic; traffic from an AT&T customer to a customer of some other ISP is in general *off net* traffic. As previously noted, all Internet traffic is *IP-based*, *i.e.* based on the Internet Protocol. I expand on this discussion in the section in which I discuss "Traffic captured."

[20] Again, peering is the process whereby Internet providers interchange traffic destined for their respective customers, and for customers of their customers.

FIGURE 1



58. To the layman, it may seem strange that one can split a signal and still use both portions. In everyday life, if we divide something in half, each half is in some sense less than the whole. It is important to remember that, in this case, what is important is the bits (the information carried), not the underlying medium. This is more akin to making a copy of an audio CD – the CD that has been copied is not harmed by being copied. The copy contains the same information as the original.

59. Opto-electronic equipment is routinely designed to recover as much information as possible from weakened signals in order to attempt to compensate for *attenuation*[21] (weakening, or loss of "punch") of the signals over distance.

60. The AT&T designers were well aware that splitting the signal would make it weaker. They expected a loss of 4 dB[22] as a direct result of splitting the signal in two, and a loss of an additional 2 dB due to possible inefficiencies in the process – think of this latter loss as being the equivalent of friction in a mechanical device. This makes for a combined loss of 6 dB. As long

[21] "In telecommunication, *attenuation* is the decrease in intensity of a signal, beam, or wave as a result of absorption of energy and of scattering out of the path to the detector, but not including the reduction due to geometric spreading." *See* http://en.wikipedia.org/wiki/Attenuation (Exhibit I).

[22] dB is the standard abbreviation for decibel. "The decibel (dB) is a measure of the ratio between two quantities, and is used in a wide variety of measurements in acoustics, physics and electronics. . . . It is a "dimensionless unit" like percent. Decibels are useful because they allow even very large or small ratios to be represented with a conveniently small number. This is achieved by using a logarithm." *See* http://en.wikipedia.org/wiki/Decibel (Exhibit J).

as the loss was less than 7 dB, they presumably expected it to be within the normal operating tolerances of the devices on both ends, so they apparently made no provision to correct for the loss. They required technicians to carefully record signal levels before and after the cut (the insertion of the splitters into the operating network), and to report any loss of signal great enough to cause problems to the Network Operations Center (NOC) in Bridgeton, New Jersey.[23]

61. For the work that was described in the Klein Exhibits, each high speed circuit was apparently comprised of multiple fiber optic cables. AT&T chose to connect the cables associated with certain circuits to the splitters, and thereby to divert or copy the signals carried on those circuits. They presumably chose not to connect the cables associated with other circuits to the splitters, and thereby to refrain from diverting or copying the signals associated with those circuits.

62. In the context of the SG3 Configurations, the new splitters and a collection of optical cross-connect cables directed 50% of the signal to complete the same path that the signal had previously taken (from the CBB router to the optical transmission equipment), and directed the other 50% of the signal to the SG3 Equipment.[24] This arrangement enabled the circuits to continue to function just as they previously had, but also made the signals available to the SG3 Equipment.

63. The splitter configuration that AT&T used is routinely available from a major supplier of equipment for electronic communications, ADC. *See* line 1 of page 4 of ADC's brochure "Value-Added Module System: LGX[25] Compatible," available at http://www.adc.com/Library/Literature/891_LGX.pdf (Exhibit K).

SUMMARY OF THE ARCHITECTURE OF THE SG3 CONFIGURATION AND ITS DATA CONNECTIVITY

64. In this section, I provide a summary overview of the architecture of the SG3 Configuration and its data connectivity, based on the Klein Declaration, the Klein Exhibits, and my professional expertise. More details are provided in later sections of this declaration.

---

[23] *See* Klein Exh. A, p. 10.

[24] See, for instance, Figure 5 on page 11 of Klein Exhibit A. Note, too, that the tables on pages 6 and 7 of Klein Exhibit C refers to "50/50 Dual Splitters."

[25] The LGX refers to the format of the physical rack into which the equipment is designed to be deployed. Lucent developed the LGX format. LGX stands for Light Guide Crossconnect.

65. The Klein Declaration refers to a "secret" room being constructed within AT&T Corp.'s Folsom Street Facility, called the "SG3 Secure Room." Klein Decl., ¶ 12.

66. While Mr. Klein worked at the Folsom Street Facility, where he oversaw its WorldNet Internet room,[26] his duties included the installation of new fiber-optic circuits with respect to AT&T's WorldNet Internet service.[27] Klein Decl., ¶¶ 15, 20.

67. In the course of his employment by AT&T, Mr. Klein reviewed the three documents collectively referred to as the Klein Exhibits. Klein Decl., ¶¶ 25-26, 28.

68. The SG3 Configuration, for purposes of my declaration and expert opinions, includes the following basic elements: a room referred to in the Klein Declaration as the "SG3 Secure Room," *id.*, ¶ 12 and Klein Exh. C, p. 46, "SG3 Room," *id.*, p. 45, "SG3 Room LGX," *id.*, p. 13, "SG3 Equipment Room," *id.*, p. 41, and "SG3 Equipment," *see* Klein Decl., Exh. A, p. 10, Fig. 4; sophisticated computers and other electronic devices located in or to be installed in this room; sophisticated routers and switches capable of switching traffic among the computing systems in the room, and also to other locations; and cables associated with data circuits entering and exiting this room.

69. The SG3 Secure Room that Mr. Klein describes in his declaration is fully consistent with the various SG3 rooms referred to in the Klein Exhibits.

70. The Klein Exhibits describe procedures for splitting or diverting peering communications traffic associated with AT&T Corp.'s Common Backbone (CBB) fiber-optic network by means of splitters[28] that fed into the SG3 Secure Room.

71. By following these procedures, all the communications carried on the associated fiber optic circuits were diverted or copied to the SG3 Secure Room and could be made available

---

[26] The WorldNet Internet room and its equipment as described by Mr. Klein is a facility for transmitting both domestic and international wire or electronic communications by electromagnetic, photoelectronic or photooptical means. Klein Decl., ¶¶ 15, 19, 22.

[27] The AT&T WorldNet Internet service provides its users with the ability to send or receive email, to browse the web, and to send or receive other wire or electronic communications.

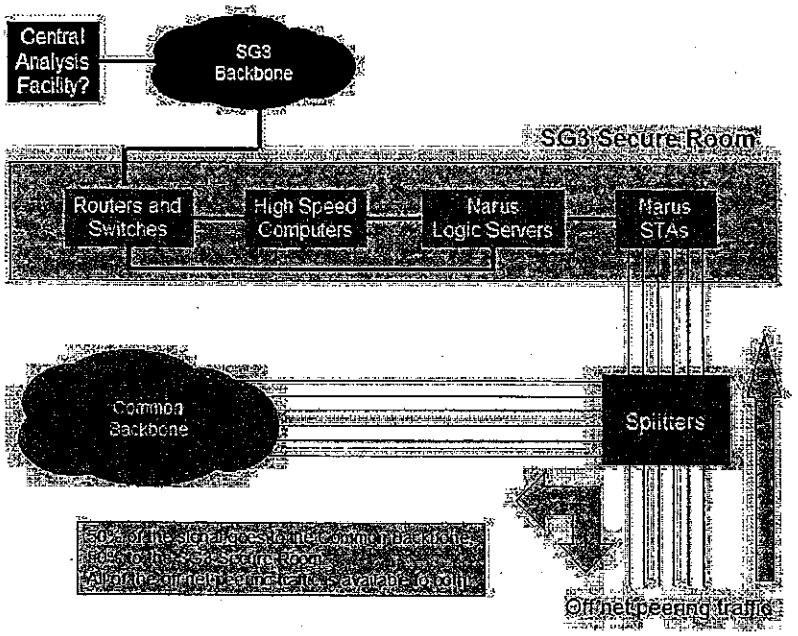
[28] I explained the function of a *splitter* earlier in this declaration, in the section on "Background – Fiber Optics". The T splitters used by AT&T apparently sent 50% of the input signal to each of two optic fiber cables, one of which conveyed the traffic to the SG3 Secure Room.

to any devices in that room.

72. With respect to the SG3 Secure Room in San Francisco, the process resulted in the diversion of all, or substantially all, of AT&T's peering traffic at the Folsom Street San Francisco facility to SG3 equipment, with no significant adverse impact on AT&T's continuously operating CBB Internet backbone.

73. The figure below helps to clarify these relationships. Splitters take the peering traffic from other networks ("off net" traffic) and route 50% of the signal to the CBB, and 50% of the signal to the SG3 Secure Room. Even though only 50% of the *signal* goes to each side of the split, all of the associated *traffic* is available both to the CBB and to the equipment in the SG3 Secure Room.

FIGURE 2



74. The Klein Exhibits also list equipment linked to or contained in the SG3 Secure Room. These include sophisticated computers and other electronic equipment. See Klein Exh. C, p. 3 ("cabinet naming"). At the same time, the Klein Exhibits do not indicate the quantities of

equipment, nor do they indicate the precise interconnections between them; consequently, the connections depicted within the SG3 Secure Room in Figure 2 should be considered to be suggestive but not necessarily exact.

75. An important group of devices in the SG3 Secure Room is the Narus STA 6400, which is a "semantic traffic analyzer," and the Narus Logic Server.[29] As I explain in more detail below, the Narus system is designed to apply logical tests to large volumes of data in real time. It is well suited to the initial screening function of a comprehensive surveillance system – in fact, surveillance is one of the system's primary functions.[30]

76. The Klein Exhibits also refer to the "SG3 backbone" and to the "SG3 backbone circuit[s]."[31] Klein Exh. C, pp. 6, 12, 42. As I explain in more detail below, it is highly likely that this SG3 backbone provides a fiber-optic network connected to the SG3 Secure Room, but separate and distinct from the CBB. In other words, while the SG3 Secure Room is connected to the CBB (from which it receives communications), it is also connected to another network, and signals can be sent out of or into the SG3 Secure Room over the SG3 backbone.

77. In sum, the general architecture of the SG3 Configuration is that communications on the CBB are split by means of splitters in a splitter cabinet, and that these communications feed into the SG3 Secure Room where they can be processed by the equipment in the SG3 Secure Room. At the same time, the SG3 backbone provides a separate, two-way channel of communication with the SG3 Secure Room. The documents reviewed do not, however, indicate what entities can receive signals or information from or send signals or information into the SG3 Secure Room via the SG3 backbone. I consider it highly probable that one or more Centralized Processing Facilities exist, as shown in Figure 2, but that belief is based on the nature of the job that the Narus system is designed to do, rather than being based on the Klein Exhibits themselves.

---

[29] See Klein Exh. C, p. 3 ("cabinet naming"). The Narus Logic Server is apparently implemented in conjunction with a Sun V880 computing system, possibly as software running on the Sun V880.

[30] See http://www.narus.com/solutions/IPanalysis.html (Exhibit L).

[31] In the text, both the SG3 backbone circuits and the peering circuits are referred to in the singular. I believe that these are grammar errors on the part of the author, and that both should have appeared in the plural.

CAPABILITIES OF THE SAN FRANCISCO SG3 CONFIGURATION

78. In this section, I explain my expert opinions about the activities likely to be occurring in the SG3 Secure Room in San Francisco.

79. In order to understand the capabilities of this configuration, it is particularly important to understand the capabilities of the Narus *Semantic Traffic Analyzer (STA)* and the Narus Logic Server. Narus's website provides singularly little information about their offerings, but a few public sources provide useful supporting detail, notably including a presentation that Narus made to the European SCAMPI project in May, 2004, and a Narus presentation available on the website of Narus's reseller IBM.[32]

80. These devices are designed to capture data directly from a network, apply a structured series of tests against the data, and respond appropriately. According to the Narus website, "One distinctive capability that Narus is known for is its ability to capture and collect data at true carrier speeds. Every second, every minute and everyday, Narus collects data from the largest networks around the world. To complement this capability, Narus provides analytics and reporting products that have been deployed by its customers worldwide. They involve powerful parsing algorithms, data aggregation and filtering for delivery to various upstream and downstream operating and support systems. They also involve correlation and association of events collected from numerous sources, received in multiple formats, over many protocols, and through different periods of time."[33]

81. Given the very high data rates that are supported, it is likely that many sophisticated techniques are used to accelerate the processing.

82. The Narus presentation on IBM's web site[34] makes it clear that the Narus system has the ability to inspect user application data (i.e. content), and not merely protocol headers. In this context, it is worth noting that references to layer numbers reflect the OSI Reference Model,

---

[32] *See* http://www.ist-scampi.org/events/workshop-2004/poell.pdf (Exhibit M), and http://www-03.ibm.com/industries/telecom/doc/content/bin/tc_using_narus_ip_sept_2005.pdf (Exhibit N).

[33] See http://www.narus.com/solutions/IPanalysis.html (Exhibit L).

[34] See http://www-03.ibm.com/industries/telecom/doc/content/bin/tc_using_narus_ip_sept_2005.pdf (Exhibit N).

where levels 5 through 7 correspond to the application[35]:

> The Narus solution is multi-tiered. Within the platform are the first two tiers; the third tier is the application that the platform is enabling. The two Narus tiers or layers are:
>
> • Collection
> • Processing
>
> **Collection**
> The collection layer in the Narus solution consists of High Speed Analyzers which connect to the network at the points where the traffic to be monitored can be most efficiently accessed. The Narus HSA's are passive and as such have zero impact on the service delivery. The HSA's analyse each and every IP packet looking at the OSI layer 2 to layer 7 data and extract layer 4 flows and ***layer 7 application data*** [emphasis added] for every IP session. Appropriate layer 4 and layer 7 data is packaged up and passed to the downstream processing layer as Narus vectors.
>
> **Processing**
> The processing layer in a Narus deployment is the LogicServer. The LogicServer process runs RuleSets which are programs that apply the business logic to the Narus vectors passed by the collection layer.

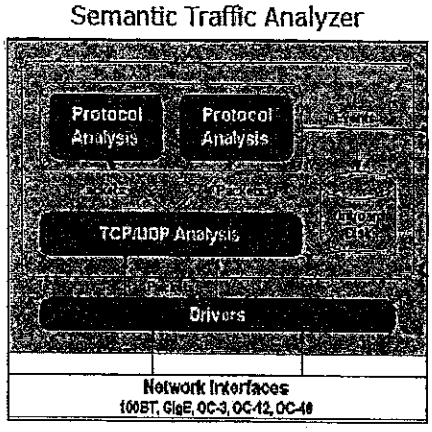
83. The statements in the IBM document make clear that the Narus system is well suited to process huge volumes of data, including user content, in real time. It is thus well suited to the capture and analysis of large volumes of data for purposes of surveillance.

84. The following figure, which is taken from the Narus presentation to SCAMPI, makes it clear that the system, in addition to its other capabilities, is designed to identify traffic of interest and to act on it. It has the ability to store interesting traffic to the onboard disk that is part of the system.

---

[35] The Narus website is consistent with this assessment. "Stateful, Real-Time analysis of all of the traffic, Layer 3 to Layer 7 stack". The reference is to the largely obsolete OSI Reference Model of Interconnection, where levels 5 through 7 correspond to the application. See http://www.narus.com/platform/index.html (Exhibit O). For a non-technical explanation of protocol layering in the context of the Internet, *see* section 2 of my paper "Evolving Core Capabilities of the Internet," *Journal on Telecommunications and High Technology Law*, 2004 (Exhibit G).

FIGURE 3



85. In addition to its real time capabilities, the Narus offering can subsequently analyze large volumes of data in order to reconstruct session content as needed from the captured collections of packets. This would include e-mail, web browsing, voice over IP (VoIP), and other common kinds of Internet communication.[36]

86. It would, in my judgment, be an error to evaluate the capabilities of this configuration – substantial though they are – solely on the basis of the equipment deployed by AT&T to the SG3 Room. The AT&T documents clearly indicate the presence of an SG3 *backbone* network, apparently operating at OC-3 speeds (155 Mbps).[37] This network, while much smaller than AT&T's CBB Internet backbone network, is nonetheless quite substantial.

87. The SG3 backbone was logically distinct from the AT&T Common Backbone (CBB), but this does not necessarily mean that it had dedicated physical transmission facilities. It most probably operated over AT&T's standard optical fiber-based transmission systems, but using different high speed services – in effect, different circuits – than the CBB. If this network were carrying nothing more than a subset of AT&T's normal commercial traffic, they might not have

[36] Narus forensics, for example, "[r]econstructs and renders IP data captured with NarusDA (Directed Analysis), NarusLI (Lawful Intercept) or obtained from other data sources: Visually rebuilds or renders web pages and sessions; Presents e-mail with the header, body and attachments; Plays back streaming video or a VoIP call web session or other interactive medium." *See* http://www.narus.com/solutions/NarusForensics.html (Exhibit P).

[37] Klein Exh. C, pp. 6, 12, 42.

felt the need to do more – it has long been considered permissible to transmit *Sensitive but Unclassified Information (SUCI)* over separate fiber-based transmission paths. Had there been greater sensitivity about the data, it might have been protected in other ways, for instance by means of link encryption.

88. The obvious and natural design for a massive surveillance system for IP-based data, and the one most cost-effective to implement, would in my judgment be comprised of the following elements: (1) massive data capture at the locations where the data can be tapped, (2) high speed screening and reduction[38] of the captured data at the point of capture in order to identify data of interest, (3) shipment of the data of interest to one or two central collection points for more detailed analysis, and (4) intensive analysis and cross correlation of the data of interest by very powerful processing engines at the central location or locations. The AT&T documents demonstrate that equipment that is well suited for the first three of these tasks was deployed to San Francisco and, with high probability, to other locations. I infer that the fourth element also exists at one or more locations.

89. Staff to analyze the data would probably be based at the central locations. There would be no need to station analysts (as distinct from field support personnel) in the SG3 rooms where the data was collected. It is likely that the data were directly available for analysis by staff of the agency that funded the SG3 deployment (which runs counter to normal practice in the case of CALEA); otherwise, there would have been no need for a private SG3 backbone, separate from the CBB.

90. The SG3 technology could potentially be used in a number of different ways, some of which could be welfare-enhancing. The concern that must be raised in this case is that, in conjunction with the diversion of large volumes of traffic described in the Klein Declaration and the Klein Exhibits, this configuration appears to have the capability to enable surveillance and analysis of Internet content on a massive scale, including both overseas and purely domestic traffic.

[38] The Narus STA appears to be ideally suited to this role. It is, as previously noted, designed to apply a large collection of tests against a huge volume of data at very high speed.

TRAFFIC CAPTURED AT SAN FRANCISCO SG3 ROOM

91. In this section, I explain my conclusions about the volume and type of communications traffic gathered by the SG3 Room in San Francisco.

92. The Klein Declaration and Klein Exhibits B & C describe traffic diversions associated with fiber-based circuits in the Folsom Street San Francisco facility.

93. All of the diverted data pertains to AT&T's Common Backbone (CBB), the IP-based network that supports AT&T's Internet access customers, and that also carries AT&T's VoIP services (voice over the Internet).[39] Nothing in the documents suggests that conventional telephony traffic was diverted to the SG3 Configuration.

94. The last page of Klein Exhibit B provides a list of CBB *peering* (defined below) links that were to be split and diverted to the San Francisco SG3 Configuration.

95. Nothing in the documents suggests that AT&T's *on net* traffic – traffic from one AT&T customer to another – was diverted at the time. AT&T may at some point in time have made some provision for its international customers (whose traffic to other AT&T customers would also be on net), but the documents provide no guidance. My assumption is that on net traffic was not diverted during the time frame to which the documents pertain.

96. Before proceeding, it is helpful to introduce and clarify some terms. *Peering* is the process whereby Internet providers interchange traffic destined for their respective customers, and for customers of their customers. The Network Reliability and Interoperability Council (NRIC), an advisory panel to the FCC, defined peering in this way:[40]

> *Peering* is an agreement between ISPs to carry traffic for each other and for their respective customers. Peering does not include the obligation to carry traffic to third

---

[39] See *In the Matter of AT&T Petition for Declaratory Ruling that AT&T's Phone-to-Phone IP Telephony Services are Exempt from Access Charges,* FCC WC Docket 02-361, Petition of AT&T, at 24 (filed Oct. 18, 2002), at http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6513386921 (Exhibit Q).

[40] Report of the NRIC V Interoperability Focus Group, an advisory panel to the FCC: "Service Provider Interconnection for Internet Protocol Best Effort Service," page 7, available at http://www.nric.org/fg/fg4/ISP_Interconnection.doc (Exhibit R). *See also* chapter 14 of Marcus, *Designing Wide Area Networks and Internetworks: A Practical Guide*, Addison Wesley, 1999 (Exhibit S).