

VOLUME 1, SECTION 2.2: APPROACH TO ENSURE SERVICE QUALITY AND RELIABILITY



2.2 APPROACH TO ENSURE SERVICE QUALITY AND RELIABILITY [M.2.1.1 (C)]

Level 3 stresses quality in all aspects of our business. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Level 3 engineered and built its network from the ground up, creating a level of diversity, security, and survivability unique in the industry. Our solution extends the reliability of our core network to GSA and agency sites through trusted access partners and a mature field services team.

2.2.1 Access Arrangements (C.2.16.2)

Level 3 offers [REDACTED] flexible and dedicated access arrangements that allow Government agencies to interconnect to our backbone network. These access arrangements are: Wireline Access Arrangements (WLNA), Broadband Access Arrangements (BBAA), and Satellite Access Arrangements (SatAA). The characteristics and performance of each of these dedicated access arrangements are described below, followed by a discussion of Level 3's best commercial practices for ensuring high quality access service.

2.2.1.1 Characteristics and Performance of Dedicated Access Arrangements (C.2.16.2)

© 2007 Level 3 Communications, Inc. All rights reserved. Use or disclosure of data contained on this sheet is subject to the restrictions on the title page of this proposal.

2.2.1.1.1 Wireline Access Arrangements (C.2.16.2.1)

Level 3 provides the complete range of Wireline Access Arrangements including TDM, Synchronous Optical Network (SONET), Optical Wavelengths, and Dark Fiber. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



[REDACTED]

[REDACTED]

2.2.1.1.1.1 [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



[Redacted text block]

[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]

[Redacted text]

2.2.1.1.1.3 [Redacted]

[Redacted text block]



[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]



[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

Some features of Level 3's OWS offering are:

[Redacted text block]

[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]

[Redacted]

2.2.1.1.2 Broadband Access Arrangements (C.2.16.2.2)

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]

[Redacted]



[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

The Level 3 Team uses BBAS connectivity from all LECs, major CLECs, Independent Telcos, and other regionalized providers.

[Redacted]

[Redacted]

[Redacted]

[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]

[Redacted]

2.2.1.1.3 Satellite Access Arrangements (C.2.16.2.4)

Level 3 offers Satellite Access Arrangements (SatAA) as a Broadband Access Service. Our SatAA meets the requirements for SatAA as defined in Section C.2.16.2.4 of the RFP. [REDACTED]

Level 3's SatAA will connect Agency locations with dedicated and reliable satellite-based transmissions to Agency-designated network or Internet where landline access facilities and/or bandwidth may not be available. Connections from the satellite earth station to the Service Delivery Point (SDP) are also included in this service.

[REDACTED]

Some features of our SatAA offering include:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Level 3's SatAA complies with the following standards and satellite transponders' bands frequency allocations and channel bandwidth (FCC), as applicable:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Level 3's SatAA Teleport facilities are located in [REDACTED], [REDACTED] and [REDACTED]

[REDACTED] These facilities have visibility to the satellites listed in [REDACTED]

[REDACTED] Upon award of a contract with GSA, Level 3 will provide the Government with a satellite footprint map based on specific capacity requirements. Level 3 will design the access network to meet or exceed the requirements and will provide any supporting information such as the satellite coverage footprint when requested. As requirements change, we will provide updated [REDACTED] maps. Each Government Agency or SDP will have visibility to a different satellite or satellites based on

their requirements. [REDACTED]

[REDACTED]

[REDACTED] Upon selection of the satellite, we will provide the Government with a satellite footprint for that specific satellite.

[REDACTED]

[REDACTED]

[REDACTED]

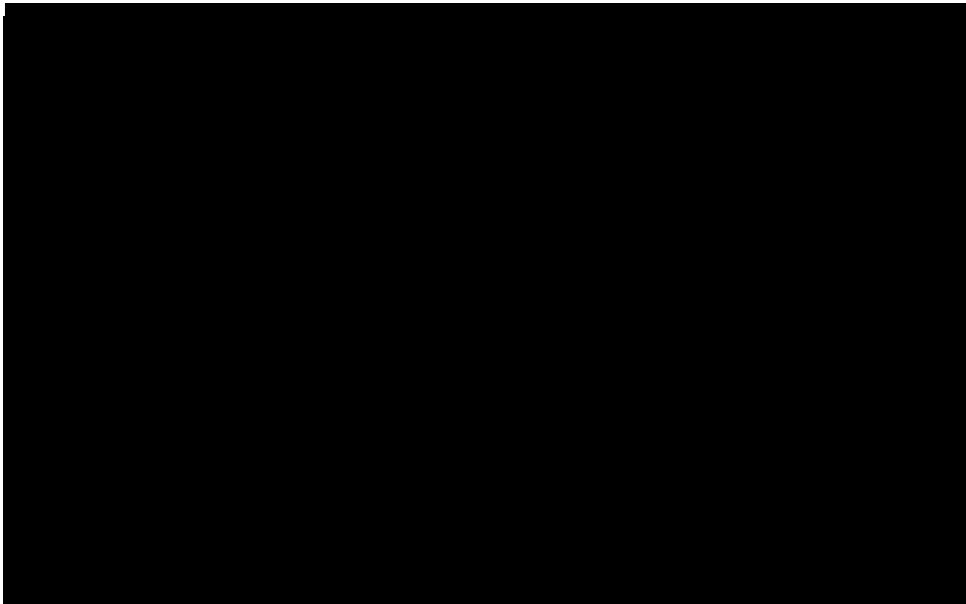


[Redacted text]

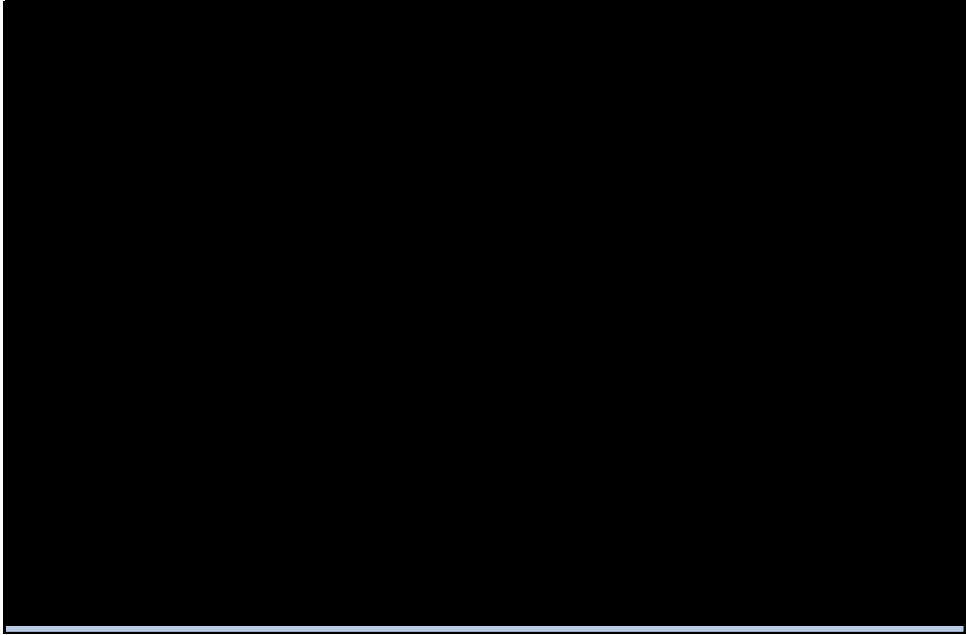
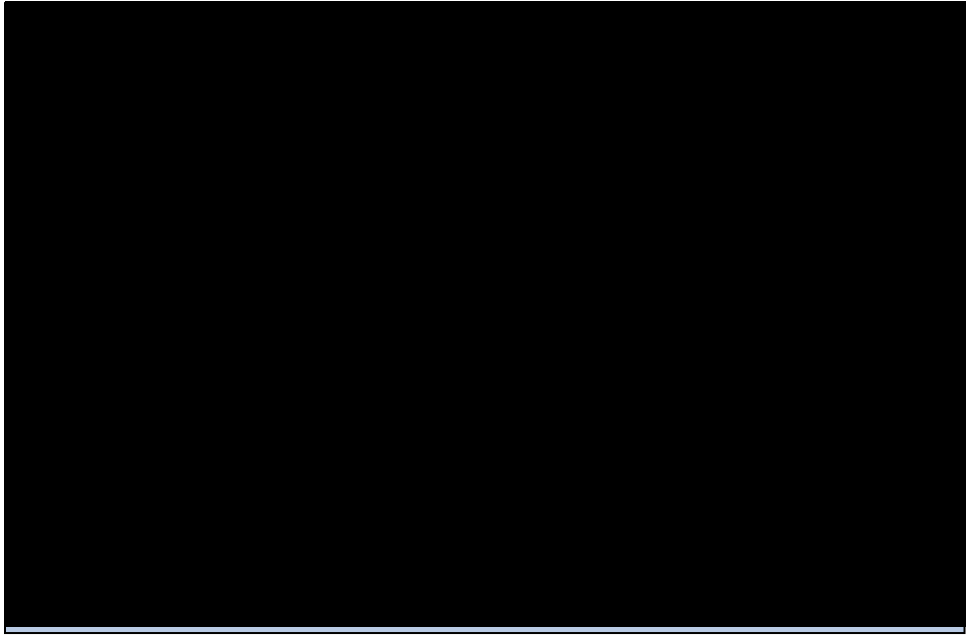
[Redacted text]

[Redacted text]

[Redacted text]



[Redacted text]



Details on Level 3's Satellite Access offering are provided in Section 6.2 of this Technical Volume [REDACTED]

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

2.2.1.2 ENSURING HIGH QUALITY PERFORMANCE OF ACCESS SERVICES

When access is provided by Level 3 (Level 3-facilitated access), we provide a rigorous screening [REDACTED] to ensure the Government receives high quality SDP-to-SDP service. Government agencies can access the Level 3 Network in the following ways:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

[Redacted text block]

Level 3 ensures that customers choosing an access option involving a third party receive high-quality service by implementing a rigorous vendor selection and management process. [Redacted text]

[Redacted text line]

[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]



[Redacted text block containing multiple paragraphs of blacked-out content]



[Redacted text block]

[Redacted text block]

[Redacted text block]

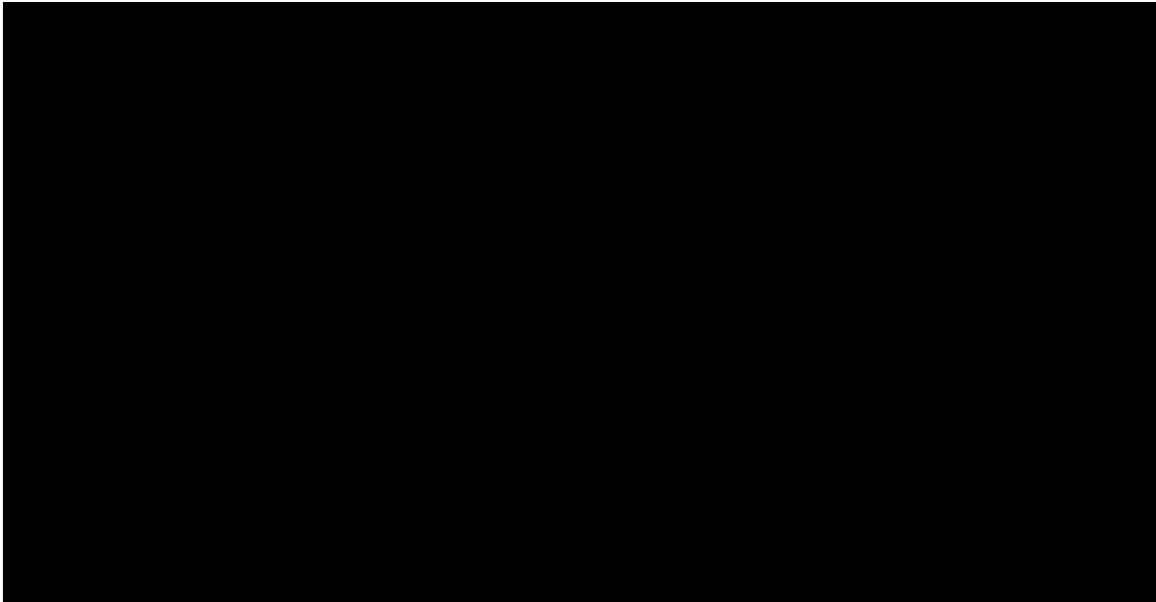
[Redacted text block]

2.2.2 Peering and Interconnections

The Internet is a collection of networks linked for the exchange of data traffic. No one group runs the Internet or pays for it. Rather, all networks participate in it. Due to the large number of networks participating in the

Internet, however, not all participating networks connect to each other. Instead, a hierarchy of network interconnections enables traffic to be exchanged efficiently and cost-effectively across the Internet. This hierarchy generally places the larger networks at the top with the smaller networks connecting to the Internet through one (or more) of the larger networks. For superior performance and reliability, it is important for the Government to use services from the largest and best connected of the networks to ensure quality and reliability of IP services. Level 3 is one of the largest Tier 1 carriers and provides the level of services that the Government expects.

Level 3 Peering Arrangements: Through Level 3, Network customers have the benefit of reliable, quality access using our comprehensive system of network interconnections. Level 3 provides interconnections to other providers in [REDACTED] cities in the United States, and eight cities in Europe [REDACTED]



Most of the interconnections are [REDACTED] providing a large and stable [REDACTED] network connectivity. Level 3 currently [REDACTED] connects to all of the Tier-1 ISPs in the world, including AT&T, MCI, Sprint, and Qwest. These connections are direct connections to the peer, with no third party in the middle, allowing for maximum reliability of the interconnection point. The Level 3 Network in [REDACTED] has in excess of [REDACTED] of capacity to our peering partners and terminates more than [REDACTED] of traffic daily to those partners. With multiple redundant [REDACTED] connections in [REDACTED] cities, no network can match Level 3's reliability and quality of access to the Internet.

In order to connect the thousands of networks in the Internet, two types of interconnection typically exist in the Internet hierarchy—transit relationships and peering relationships.

A transit relationship is a commercial relationship where an ISP provides its full Internet routing table to another network. A routing table consists of all routes known by a network, including routes directly connected to the network by customers (on-net routes) and routes connected to the network through partners (off-net routes). The full routing table gives customers access to all routes on the global Internet. On-net routes originate from customers like [REDACTED] and [REDACTED], while off-net routes originate from partner or “peer” networks like [REDACTED] and [REDACTED]

[REDACTED] Reliability of The Level 3 Network is enhanced, since it participates directly with all of the Tier 1 providers to reach the Internet. Carriers that use transit relationships are relying on the transit provider to reach portions of the Internet. [REDACTED]

Peering is a business relationship between two ISPs where the ISPs agree it is in their mutual interest to exchange a subset of their routing tables.

[REDACTED]

[REDACTED]

[REDACTED] Often, smaller ISPs claim that they are “peering” with a large network when, in actuality, what they are engaged in is a transit relationship that is not settlement-free. [REDACTED]

[REDACTED]

[REDACTED] This flexibility enables us to rapidly fix connectivity issues and meet customer requirements for bandwidth increases.

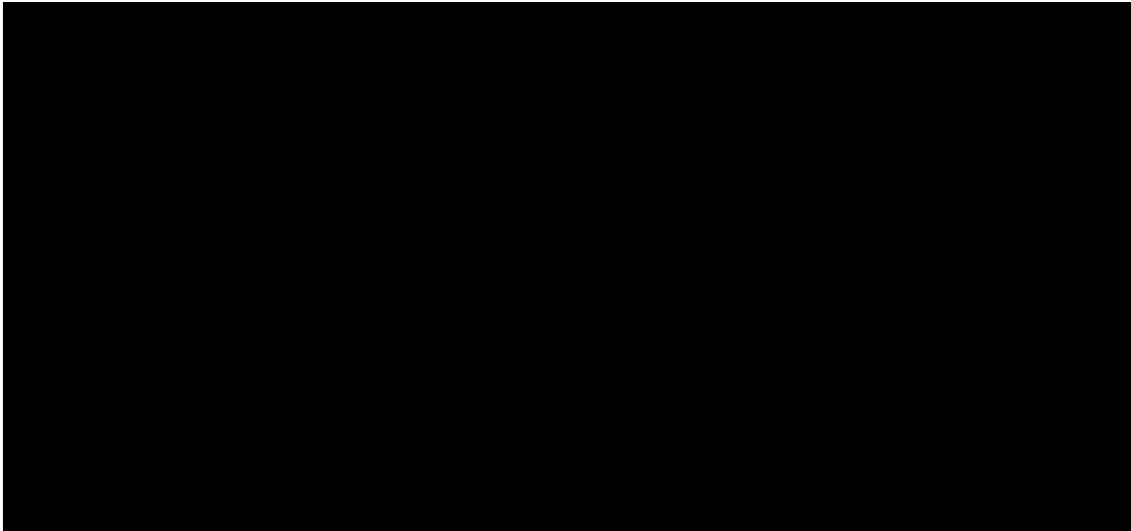
Public Versus Private Peering: Public peering occurs at a public exchange like a NAP, IX, or MAE using a central switch fabric operated by a neutral third party that connects many networks to each other through a single connection.

Private peering is a direct connection, typically a private line or cross-connect, between two networks. Relative to the shared switched fabric connecting networks in public exchanges, private peering provides improved performance and scalability.

Level 3 has moved exclusively to [REDACTED] peering in the United States. Private peering increases reliability by eliminating shared infrastructure not under the control of the two peering partners. The public peering infrastructure in the past has proven unreliable and is a security concern. Level 3 does still operate [REDACTED] peering in Europe, where this model is much

more prevalent. [REDACTED]
[REDACTED]

With the interconnection relationships defined, networks can be placed into “tiers” based on network size and interconnection status. Tier 1 networks top the hierarchy and have visibility to the entire Internet through their customer connections and peer networks [REDACTED] Tier 2 networks may provide or resell IP services purchased from their upstream (Tier 1) providers, and are typically not well interconnected with other Tier 2 providers. Cable multi-service operators (MSOs) fall into this Tier 2 category. Some Tier 2 players are now expressing an interest in peering with other Tier 1 and Tier 2 providers. Tier 3 players include small entities such as regional, consumer ISPs. Level 3 is a Tier 1 network, meaning that we connect directly with all of the other Tier 1 providers and have visibility to the entire Internet via our customers and Tier 1 peers.



Tier 1 ISPs: Level 3 is a Tier 1 network. Over [REDACTED] of the customer traffic that originates on The Level 3 Network also terminates with customers on the network (on-net traffic). The [REDACTED] balance of traffic transits off of The Level 3

Network and terminates on other networks. Transiting [REDACTED] of traffic off-net requires Tier 1 connectivity to the largest networks in the world.

The following are key features of a Tier 1 network:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

Equally important is **what does not constitute** a Tier 1 network, including the following:

- [REDACTED]
- [REDACTED]
- [REDACTED]

Approximately [REDACTED] of Level 3's interconnection traffic runs through [REDACTED]. [REDACTED], [REDACTED] provide the best possible performance between Level 3 and other Tier 1 backbones. We peer with an appropriate mix of large IP providers representing all major traffic regions. Therefore, not only can the Level 3 IP network easily support off-net customer traffic [REDACTED], but it provides excellent off-net transfers to global regions outside of its physical network presence, such as Asia or Pacific regions.

Peering Interconnection Capacity Planning: Capacity planning of interconnects is critical to the network's overall performance. Level 3's current network policies allow for the upgrade of peering circuits to aggressively meet

current and future customer demand. This ensures ample time to provision additional capacity. These practices ensure that scalability—the ability to grow—is preserved at all of our peering locations.

Level 3 has established a peering presence at several diverse neutral exchange sites [REDACTED]. These sites carry the majority of peering traffic between Tier 1 service providers. By entering into key programs here, we possess the ability to upgrade capacity with key peers in specific locations for the immediate needs of our largest customers. Level 3 has its own fiber-optic capacity into all of these facilities. This is a key feature that enables Level 3 to provision capacity quickly and at high capacities.

Level 3 was one of the first companies to publish its peering policy. We impose stringent requirements on our [REDACTED] peers to ensure that we maintain the highest quality of peering connections. This maintains optimum network performance.

[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED] Mutually beneficial interconnection imparts a roughly equitable balance of all-in costs to each party. Each party's relatively balanced level of infrastructure, traffic, process, and tools ensures the level of quality generally demanded by customers of both parties.

Level 3's peering principles represent an effort to express, through a limited and understandable set of guiding fundamentals, overall requirements that [REDACTED] may result in a successful, economically efficient mechanism for the exchange of traffic.

Level 3 will generally consider negotiating a peering agreement with any ISP meeting the following conditions:

[Redacted text block containing multiple lines of blacked-out content]

In all cases Level 3 reserves the right to determine whether or not to enter into a peering relationship with any particular entity. All peering relationships will be executed through a mutually acceptable peering agreement, the terms and conditions of which are subject to negotiation between the parties.

2.2.3 Key Performance Indicator and Acceptable Quality Level Compliance

Level 3 will meet the Government’s Key Performance Indicators (KPIs) and Acceptable Quality Levels (AQLs) through the use of our network

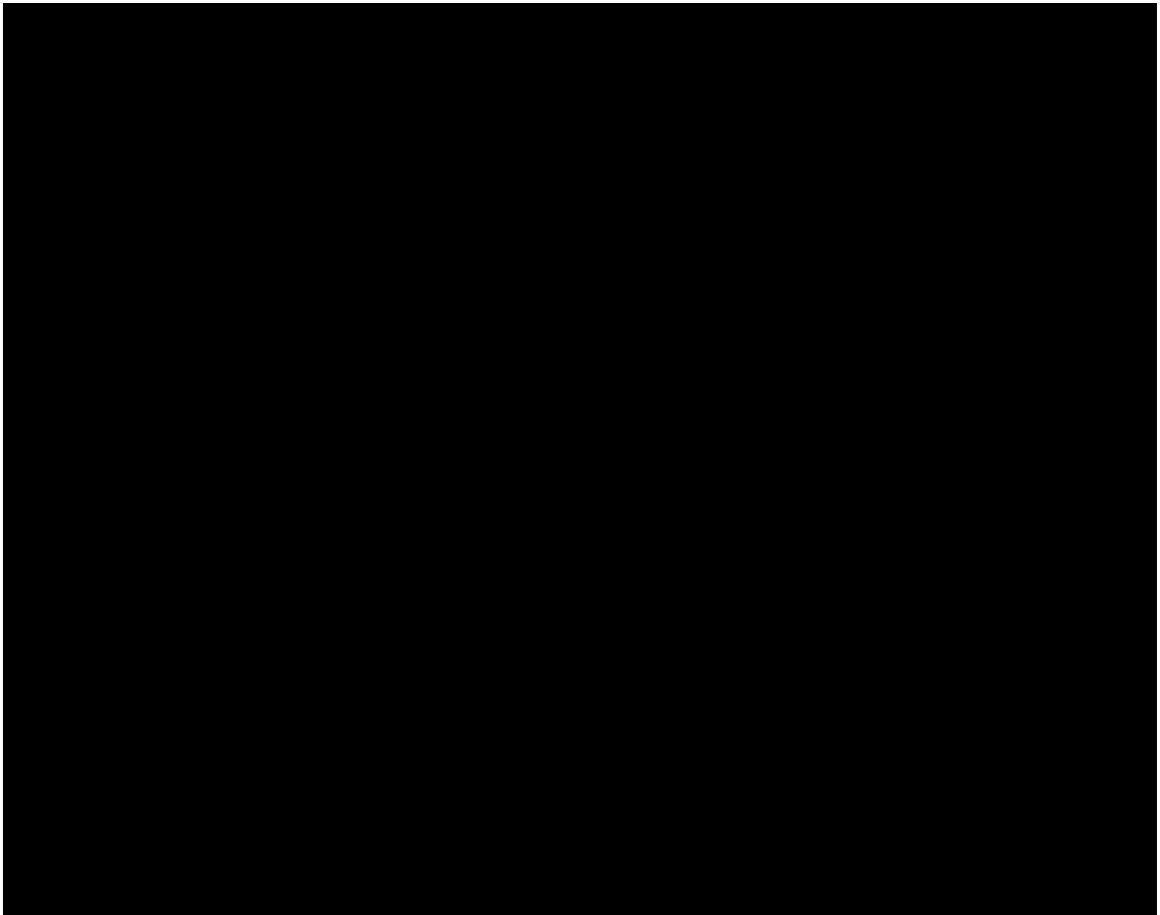
management team's expertise and tool-sets. Level 3 has deployed a number of automated tool sets to monitor the [REDACTED] network to ensure that it meets KPIs and AQLs. In addition, Level 3 operations staff has in-house, world-class expertise that runs one of the world's largest IP and transport backbones. When combined, our people and their tool-sets provide a management environment that ensures that the Government's requirements will be met.

[REDACTED]
[REDACTED]
[REDACTED]

Level 3's Network Operations Centers (NOCs) use an [REDACTED] [REDACTED] Network Management System (NMS). The NMS integrates network element managers, alarm aggregation, and network managers into one ubiquitous platform for greater network operations efficiency. Throughout the network, Level 3 has a dedicated [REDACTED] management communications network running on its own [REDACTED]. It provides a high capacity communications system completely independent of the transmission equipment. It supports [REDACTED], [REDACTED], [REDACTED], [REDACTED], and [REDACTED].

It can also provide connectivity services for customer equipment in remote sites. We are the single operator for our entire network from [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]



[Redacted]

[Redacted]

[Redacted]

[Redacted]

We use [Redacted]TM, a highly scaleable IP management infrastructure,
together with [Redacted]

[Redacted]

[Redacted]

[Redacted]

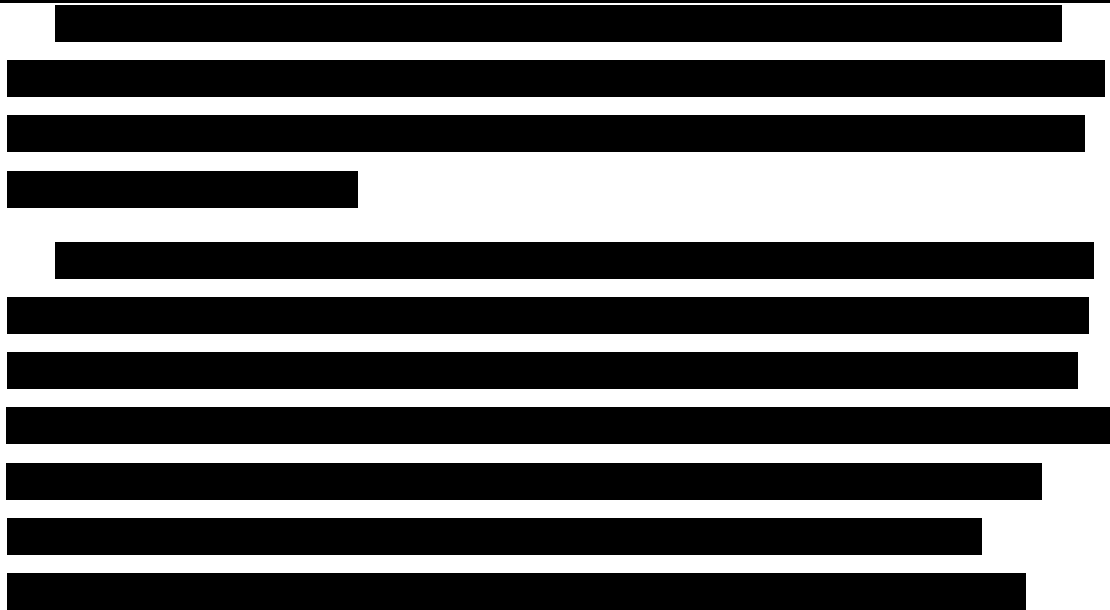
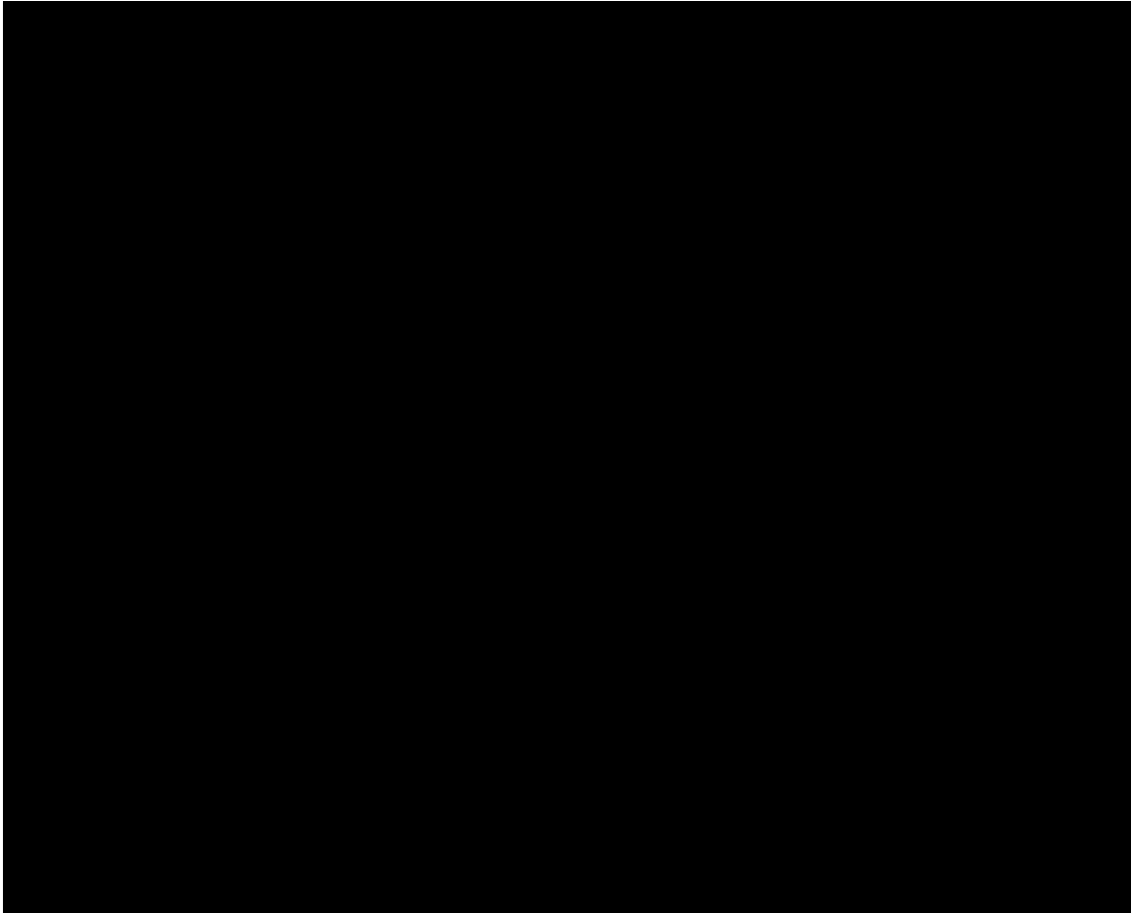
[Redacted]

[Redacted]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

The infrastructure currently collects and reports on an average of [REDACTED] events per day. This architecture allows for continual configuration and provides hot deployment, which eliminates the need to schedule maintenance outages for code upgrades.

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]



[REDACTED]

The Level 3 Transport operations team monitors and manages [REDACTED] [REDACTED] services for the Government. The Transport team manages a large and diverse network of telecommunications solutions. This team also works closely with the Internet and Voice teams to ensure that their underlying transport solutions meet the requirements of the Government.

The Level 3 Internet operations team monitors and manages the IP, PBIP-VPN, NBIP-VPN, Broadband Access, and Ethernet Private Local Area Network (E-LAN) services for the Government. The IP operations team manages one of the largest IP backbones in the world. They work closely with the Transport team to ensure that the underlying wavelength and SONETS circuits meet the standards required by the Government. [REDACTED]

The Level 3 Security operations team monitors and manages the Managed Tiered Security Services for the Government. This team is also responsible for assisting with managing and maintaining the security of the entire network. Level 3's partners [REDACTED] and [REDACTED] have an industry-leading expertise in managing large security implementations. [REDACTED]

The Level 3 Internet operations team monitors and manages the Voice over IP Transport (VOIPTS) services for the Government. The Level 3 Voice

team has extensive experience in managing the termination of several billion minutes of voice traffic a month. They work closely with the Internet team to ensure that the IP backbone provides the Voice over IP quality required by the Government.

The Level 3 Transport, IP, Security, and Voice teams work closely together to meet the Government KPIs and AQLs. These teams have a number of tool-sets that help them achieve the Government's requirements. Through our world-class people and processes, Level 3 provides [REDACTED] products that are reliable and available.

2.2.4 Managing Time-Sensitive Traffic

The first step to success in managing time-sensitive traffic is designing and building a [REDACTED] network from the ground up, with [REDACTED] and [REDACTED] in mind. Section 2.3.2 of Volume 1 describes this approach in detail.

Level 3 believes that time-sensitive traffic on an Internet Protocol (IP) network can only be protected through the use of [REDACTED]. Many providers will only provide [REDACTED] however, this approach does not adequately protect voice, video, and other applications.

Level 3's Network-Based IP Virtual Private Network (NBIP-VPN) product is the preferred product for Government agencies requiring the protection of [REDACTED]. The product offers [REDACTED] levels of service corresponding to the Government's requirements. Our [REDACTED] Service is appropriate for Premium traffic. Premium traffic is defined by the Government as time-critical traffic such as voice and video. The Level 3 [REDACTED] Service has a [REDACTED] Data Level for time-critical data, a [REDACTED] Voice Level for voice traffic, and a [REDACTED] Video Level for video traffic. Level 3's [REDACTED] Service is appropriate for the

Government's Enhanced traffic requirements. Enhanced data is suitable for business-critical traffic, such as transactions. Level 3's [REDACTED] Service is appropriate for the Government's Standard level of service. Standard traffic is used for non critical traffic such as email and Internet web browsing. Level 3's [REDACTED], [REDACTED], and [REDACTED] Service level offerings meet or exceed the Government's requirements for Premium, Enhanced, and Standard level [REDACTED] offerings.

Level 3 has an extensive history of protecting time-critical traffic over our IP backbone. Level 3 is currently one of the world's largest Voice over IP providers and transmits all of its voice traffic over the same backbone that is being proposed for the Government. [REDACTED] on this backbone ensures that [REDACTED] and [REDACTED] are maintained at levels acceptable to real-time applications, such as voice and video. Level 3 currently provides [REDACTED] capabilities in its Network-Based IP VPN product.

2.2.4.1 LEVEL 3 CLASS OF SERVICE

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



[Redacted text block]

2.2.4.2 [Redacted]

[Redacted text block]

2.2.4.3 [Redacted]

[Redacted text block]



[Redacted text block]

2.2.4.3.1 [Redacted]

[Redacted text block]

2.2.4.4 INBOUND TO LEVEL 3 PROVIDER EDGE (PE) ROUTER FROM CUSTOMER

[Redacted text block]



[Redacted text block]

2.2.4.4.1

[Redacted text block]

[Redacted text block]

[Redacted text]

2.2.4.4.2

[Redacted text]

[Redacted text]

2.2.4.5

[Redacted text]

[Redacted text]

[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]

[Redacted text]



2.2.4.5.1

[Redacted text block containing multiple paragraphs of obscured content]



[Redacted text block]

2.2.4.5.2

[Redacted text block]

[Redacted text block]

2.2.4.5.3

[Redacted text block]



[Redacted text block]

[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]

[Redacted text block]



[Redacted text block]

[Redacted text block]

[Redacted text block]

2.2.4.7.1 [Redacted]

[Redacted text block]



[Redacted text block containing multiple paragraphs of blacked-out content]



[Redacted text block]

[Redacted text block]



2.2.4.7.2

[Redacted text block]

[Redacted text block]

2.2.4.7.3 Video Traffic

[Redacted text block]



2.2.4.7.4 Network Control Traffic

[Redacted text block]

[Redacted text block]

2.2.4.7.5 [Redacted]

[Redacted text block]



[Redacted text block]

2.2.4.7.6 [Redacted]

[Redacted text block]

2.2.4.7.7 [Redacted]

[Redacted text block]



[Redacted text block]

[Redacted text block]

[Redacted text block]

[Redacted text block]

2.2.4.8 SUMMARY

Level 3 provides a full suite of [REDACTED] services between each set of routers in the IP network on its Network-Based IP VPN service. Level 3 recommends this product to the Government for all time-sensitive traffic requirements. From the CE to the PE and the backbone (P) router the Government's traffic is fully queued and protected based on its markings. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]