1.4.20 Ethernet Services (EthS) [C.2.7.1]

Government Agencies will be able to interconnect their LANs across Metro Area Networks (MANs) or Wide Area Networks (WANs) simply and cost-effectively using high-capacity Ethernet Services (EthS).

1.4.20.a Reserved [L.34.1.4.6.a]

1.4.20.a.1 Reserved [C.2.7.1.1.4 (16)]

1.4.20.b Reserved [L.34.1.4.6.b]

1.4.20.b.1 Reserved

Through

1.4.20.b.12 Reserved

Pages 749 through 762 have been deleted in conformance with Amendment 5 revisions.

1.4.20.c Service Description [L.34.1.4.6.c]

(c) A technical description of how the service requirements (e.g., capabilities, features, interfaces) are satisfied for all proposed optional services. [L.34.1.4.6.c]

Agencies will leverage the ubiquity, simplicity, and flexibility of Ethernet to interconnect their geographically dispersed local area networks (LANs) using EthS (**Figure 1.4.20.c-1**). AT&T offers a wide range of capabilities, features, and interfaces to support Agency requirements for Ethernet services.

1.4.20.c.1 Capabilities

AT&T satisfies the Government's requested capabilities for Ethernet services. Two types of services will be offered:

- Ethernet Private Line (E-Line) is implemented as AT&T's Virtual Private Wire Service (VPWS). The E-LINE service comes as two different product offerings: Ethernet over MPLS and Ethernet over SONET service. The "Ethernet over MPLS" E-Line service is the same as the Ethernet-only VPWS L2VPNS service. They share common service interfaces and MPLS transport infrastructures. The "Ethernet over SONET" E-Line service is a non-shared Ethernet service that maps the Agency's Ethernet packet into a dedicated SONET transport facility. The Ethernet over SONET E-Line service is a metro E-LINE.
- Ethernet Private LAN (E-LAN) is implemented as AT&T's Virtual Private LAN Service (VPLS) and is based upon the IETF VPLS specifications. The Metro E-LAN service provides Ethernet access for the IP-based Networx transport services that offer Ethernet interfaces.

Figure 1.4.20.c-1: Representative E-Line and E-LAN Implementation Architecture. *Agency locations can leverage E-LAN and E-LINE services as well as additional features such as Internet access and other IP-based services*

E-Line provides point-to-point connectivity for Layer 2 services, such as Ethernet, frame relay, and ATM over the MPLS network (**Figure 1.4.20.c-2**).

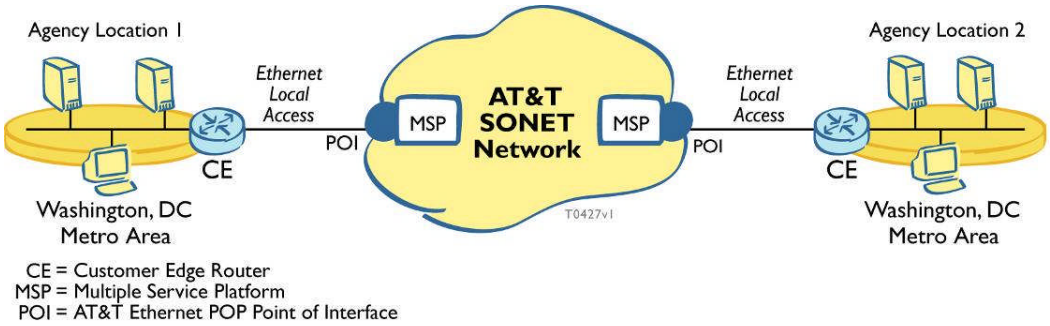


Figure 1.4.20.c-2: E-Line Implemented as a Virtual Private Wire Service (VPWS). *Point-to-point interconnection of Agency LANs.*

E-LAN provides multipoint-to-multipoint connectivity for Agencies' Ethernet LANs, as shown in **Figure 1.4.20.c-3.** VPLS provides Agencies with a scalable, cost-effective means of creating a fully meshed network in which all devices appear to be on the same LAN segment, using the Ethernet standards.

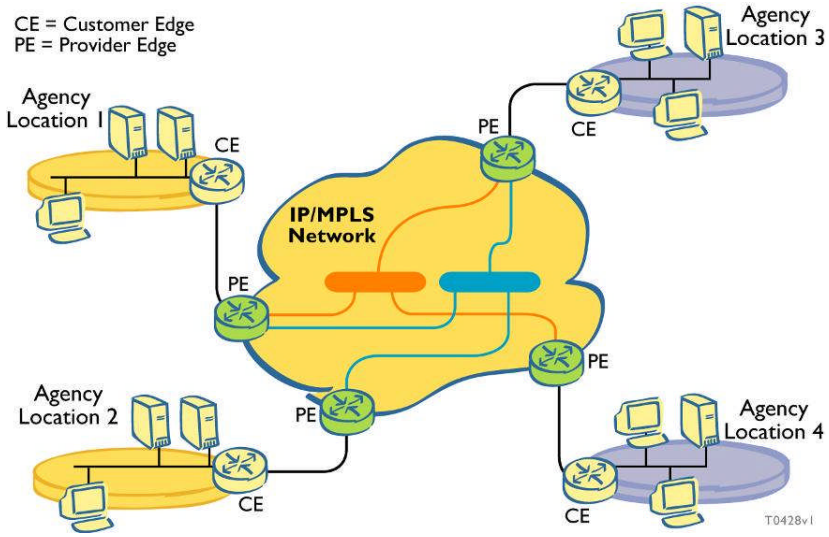


Figure 1.4.20.c-3: E-LAN Implemented as Virtual Private LAN Service (VPLS). *Multipoint-to-Multipoint interconnection of Agency locations provides scalable, any-to-any connectivity to Agencies.*

EthS provides connectivity on a Layer 2 basis. Therefore, Agencies do not have to share routing information with AT&T, providing additional convenience, flexibility, and security.

The capabilities offered by EthS are summarized in **Table 1.4.20.c-1**.

CAPABILITIES	DESCRIPTION	BENEFIT TO AGENCIES
Access and connectivity features	1. Service Types • *E-Line – Point-to-point connectivity* • *E-LAN – Fully meshed connectivity (Point-to-multi-point)* *2.* Topologies [redacted] 4. Full Port and VLAN Access Features [redacted] 5. Traffic contracts [redacted] 6. Supported Speeds: • EthS supports port and VLAN speeds from 1 Mbps to 10 Gbps (Table 1.4.20.c.3-1) [redacted]	• Flexibility to meet diverse Agency requirements in connectivity speeds • Scalability to allow Agencies to grow their networks over time, consistent with traffic demand from their users • Convenient connection to Internet from same access line reduces Agency access costs • Standards-based Ethernet service offers improves interoperability and leverages work done in standards bodies to include new features as they become available • Integration with other IP-based services improves service interoperability
Performance and reliability features	EthS is supported by many performance and reliability features, including: [redacted]	High quality and reliable service enables Agencies to fulfill their mission goals efficiently and without service interruption.

CAPABILITIES	DESCRIPTION	BENEFIT TO AGENCIES
Resiliency features	• Access Link Diversity – Agency site is connected to the network via two different access circuits, either from the same router or from two different routers. • Router Diversity – Agency connects to two different routers on AT&T's network to protect against PE (Provider Edge) router failure. • PoP Diversity – Agency connects to two separate PoPs on AT&T's network to protect against PoP failure, e.g. catastrophic event, such as severe fires, earthquakes, etc. • Network Geographic Diversity – Enabled by MPLS	• Increases service reliability and therefore Agency employee productivity • Protects against equipment and route failures
Privacy and Security	• Same level of privacy and security as other Layer 2 services (e.g. Frame Relay, ATM) • Agencies do not have to share routing information with AT&T, potentially providing additional privacy • MPLS network supported by many security features	Agency data is protected against eavesdropping and unauthorized access
Geographic Coverage	[redacted]	Enables Agencies to interconnect within metro area and/or around globe with the same ease.

Table 1.4.20.c-1: EthS Capabilities. *Agencies will benefit from a full-featured service suite offering simplicity, performance, reliability, and wide geographic coverage.*

These capabilities will offer Agencies a full-featured service suite that offers simplicity, performance, reliability, and wide geographic coverage.

1.4.20.c.2 Features

AT&T will satisfy all the service features requested by the Government for Ethernet services. These features and their associated benefits are summarized in **Table 1.4.20.c-2**.

FEATURES	DESCRIPTION	BENEFIT TO AGENCIES
Classes of service (CoS)	[redacted]	• Agencies are offered wide flexibility to prioritize their traffic, based on tolerance to delay, jitter, and packet loss • Real-time voice and video do not compete for network resources with noncritical data (e.g., email), resulting in enhanced performance for voice and video, resulting a higher quality service
Bandwidth-on-demand (BoD)	[redacted]	• Agencies only pay for the bandwidth that they need and can quickly upgrade or downgrade when their needs change

Table 1.4.20.c-2: EthS Features. *AT&T will satisfy all the features requested by the government for Ethernet services.*

Agencies can prioritize traffic [redacted] as listed in **Table 1.4.20.c-3.** CoS are available on [redacted]

CoS Package	Classes Available	Profiles Available	Profile Number	Bandwidth Allocation
[redacted]				

Table 1.4.20.c-3: EthS Classes of Service. *Agencies can prioritize their traffic into four classes of service and 24 profiles, providing optimum performance for each type of application.*

1.4.20.c.3 Interfaces

EthS supports a wide range of optical and electrical interfaces supporting speeds from 1 Mbps to 10 Gbps as listed in **Table 1.4.20.c-4**.

Port Speeds	Access Speeds Available Per VLAN
10 Gigabit Ethernet (10,000 Mbps)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 60, 80, 90, 100,150, 200,300,400,500,600,700,800,900,1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000, 10000 Mbps
Gigabit Ethernet (1000 Mbps)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 60, 80, 90, 100, 150, 200,300,400,500,600,700,800,900,1000 Mbps
Fast Ethernet (100 Mbps)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 60, 70, 80, 90,100 Mbps
Ethernet (10 Mbps)	1, 2, 3, 4, 5, 6, 7, 8, 9,10 Mbps

Table 1.4.20.c-4: EthS Supported Speeds. *Agencies will benefit from a scalable solution that provides port and VLAN speeds from 1 Mbps to 10Gbps.*

The speeds in the above table are available on a per VLAN basis, allowing the Agencies great flexibility and scalability in ordering the bandwidth that is most suited to their application, with an option of upgrading quickly and cost effectively when their traffic needs grow.

Rate Limiting and Shaping – Each interface can support multiple VLANs with different traffic contracts. Rate shaping and rate limiting enforced at the ingress to the network ensures that each VLAN sends traffic within its subscribed parameters. This will help to ensure quality of service and avoid situations where a VLAN bursting data at over its subscribed limits can block other VLANs from transmitting data into the network.

Access Methods – EthS supports all access methods specified in Section C.2.16, Access Arrangements, of Networx Universal RFP, as well as the following:

[redacted]

Physical Media – EthS supports service delivery in the first/last mile using the following physical media:

[redacted]

Agencies will be able to leverage the wide selection of access speeds, interfaces, and access methods offered by EthS to address their unique Ethernet connectivity needs in the metro and the wide area.

1.4.20.d Service Quality and Performance [L.34.1.4.6.d]

(d) A description of the quality of the services with respect to the performance metrics specified in Section C.2 Technical Requirements for each proposed optional service, and other performance metrics used by the offeror. [L.34.1.4.6.d]

Agencies are offered EthS that meets or exceeds the performance standards of the government defined KPI's. The proposed service quality levels

represent the minimum level of service that Agencies will be provided. Key Performance indicators for Ethernet service and AT&T's performance are shown in **Table 1.4.20.d-1**.

KEY PERFORMANCE INDICATOR (KPI)	SERVICE LEVEL	PERFORMANCE STANDARD (THRESHOLD)	PROPOSED SERVICE QUALITY LEVEL
Availability	Routine	99.5%	[redacted]
	Critical	99.99%	
Latency - CONUS	Routine	100 ms	
Latency - OCONUS	Routine	400 ms	
Time to Restore (TTR)	Without Dispatch	4 hours	
	With Dispatch	8 hours	
Jitter (Packet)	Routine	10 ms	
Grade of Service (Data Delivery Rate)	Routine	99.95%	
	Critical	99.99%	
Grade of Service (Fail Over Time)	Routine	1 minute	
	Critical	100 ms	
[redacted]			

Table 1.4.20.d-1: EthS Key Performance Indicators. *Agencies will receive high quality Ethernet services that meet or exceed GSA Networks requirements.*

Focusing on an Agency's service experience produces a high-quality solution, and service experience must be measured quantitatively through the KPIs. However, high quality is not necessarily attained through exceptional performance of a single KPI. For example, an inferior response to the Agencies' maintenance and support needs can quickly erase the benefits of exceptional network latency performance. Agencies will receive high-quality service through the combination of the six network and service attributes that ultimately directly affect the quality delivered to the end user: scale, global footprint, high availability, and data delivery, low-packet latencies, and quick-service restoration.

1.4.20.e Attributes and Values of Service Enhancements [L.34.1.4.6.e]

(e) If the offeror proposes to exceed the specified service requirements (e.g., capabilities, features, interfaces), a description of the attributes and value of the proposed service enhancements. [L.34.1.4.6.e]

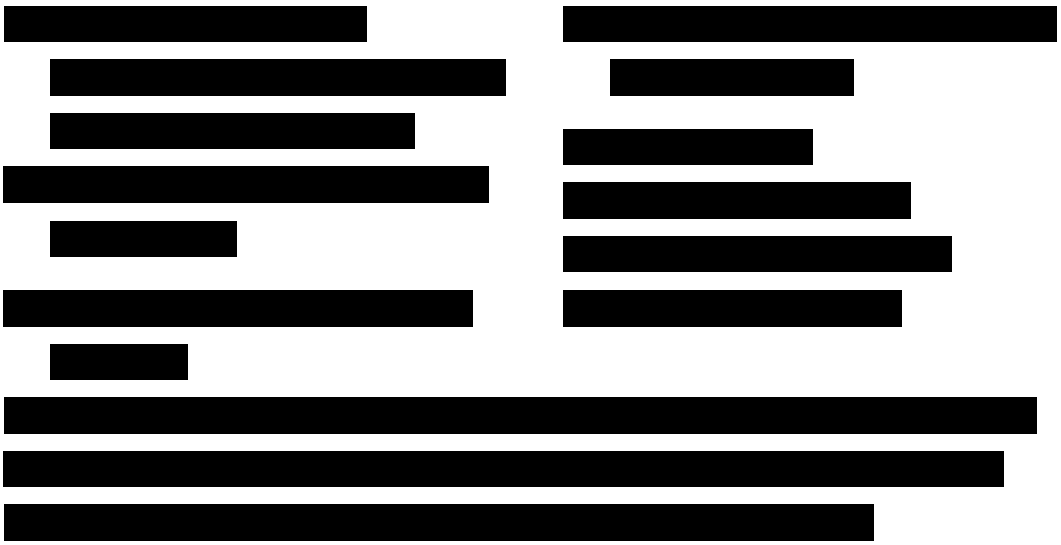
In addition to the standard services, Agencies can enhance their EthS with additional features and capabilities for an additional fee. **Table 1.4.20.e-1**

highlights additional service features and capabilities available with EthS

AT&T proposes the attributes in **Table 1.4.20.e-1** as service enhancements.

SERVICE ENHANCEMENT	DESCRIPTION	BENEFITS
[redacted]	[redacted]	[redacted]

Table 1.4.20.e-1: Service Enhancements. [redacted]



1.4.20.f Service Delivery Experience [L.34.1.4.6.f]

(f) A description of the offeror's experience (including major subcontractors) with delivering each proposed optional service. [L.34.1.4.6.f]

AT&T has a proven track record of delivering high-quality, and cost effective Ethernet solutions to a large number of Government and commercial organizations. Three typical examples are summarized in **Table 1.4.20.f-1**.

Client Need	Solution	Created Value
Client Need	Solution	Created Value
Client Need	Solution	Created Value

Table 1.4.20.f-1: Experience Delivering Managed Services. *Success is measured by the ability to deliver solutions to Agencies that create value to their business. .*

AT&T's experience, along with established methods and procedures in providing Ethernet solutions to a large number of Government and

commercial organizations, will provide Agencies a risk-free means of deploying Ethernet services.

1.4.20.g Approach to Perform Service Verification [L.34.1.4.6.g]

(g) A description of the offeror's approach to perform verification of individual services delivered under the contract, in particular the testing procedures to verify acceptable performance and Key Performance Indicator (KPI)/Acceptable Quality Level (AQL) compliance. [L.34.1.4.6.g]

The first time the service is provided through the Networx contract, the service performance must be verified; KPIs will be monitored to certify that the service performance complies with the AQL. **Table 1.4.20.g-1** summarizes the verification and testing procedures for the Ethernet KPIs.

KEY PERFORMANCE INDICATOR (KPI)	APPROACH TO MONITORING AND MEASURING
Availability	[redacted]
Latency – CONUS	
Latency – OCONUS	
Jitter (Packet)	
Grade of Service (Data Delivery Rate)	
Time to Restore (TTR)	

Table 1.4.20.g-1: Monitoring and Measuring KPIs. *Agencies can easily manage EthS with easy-to-access and use data delivered through the AT&T* ***Business****Direct web portal.*

To simplify the verification process, AT&T has automated the process. [redacted] The service verification process is presented in greater detail in Section 1.3.2.d, Approach to Perform Service Delivery Verification.

[redacted]

1.4.20.h Optional Services Network Impact [L.34.1.4.6.h]

(h) A description of how the delivery of any optional services would impact the network architecture (e.g., security, quality and reliability, performance). [L.34.1.4.6.h]

[redacted]

1.4.20.i Approach to Incorporating Optional Services, Enhancements, or Improvements [L.34.1.4.6.i]

(i) A description of the approach for incorporating into the proposed optional services, technological enhancements and improvements that the offeror believes are likely to become commercially available in the timeframe covered by this acquisition, including a discussion of potential problems and solutions. [L.34.1.4.6.i]

The approach for incorporating into the proposed optional services, technological enhancements, and improvements is described in Section 1.3.3.d.

1.4.20.1 Narrative Requirements [L.34.1.4.6.b]

(b) Narrative responses to the requirements in Networx Hosting Center cross reference table

1.4.20.1.1 Geographic Coverage [C.2.7.1.1.4 (1)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
1. Geographical Coverage. A seamless end-to-end service shall be provided from the SDP Customer Premise Equipment (CPE) traversing the contractor's network (Metro Access/Core and the Long Haul) in order to minimize conversion of protocols.

[redacted] This wide reach will

address Agencies' EthS connectivity needs for intra-city, inter-city, CONUS, OCONUS, and non-domestic applications.

1.4.20.1.2 Geographic Coverage [C.2.7.1.1.4 (1a)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 1. Geographical Coverage. The contractor shall indicate if protocol conversions are required and how they impact the delay when delivering services end-to-end. The following geographical coverage shall be provided: a. Intra-City Ethernet Service – the contractor shall provide Ethernet connections to Agency sites located in the same city inside the US (CONUS and Metro) and outside the US (OCONUS and Non-Domestic).

[redacted]

1.4.20.1.3 Geographic Coverage [C.2.7.1.1.4 (1b)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 1. Geographical Coverage. The contractor shall indicate if protocol conversions are required and how they impact the delay when delivering services end-to-end. The following geographical coverage shall be provided: b. Inter-City Ethernet Service – Ethernet connections shall be delivered nationally and internationally (CONUS/Metro, OCONUS/Non-Domestic)

[redacted]

1.4.20.1.4 Ethernet UNI [C.2.7.1.1.4 (2)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 2. The contractor shall support Ethernet UNI (User-to-Network-Interface) to support Layer 2 and Layer 3 clients. Layer 3 clients are Agency devices which support Layer 3 protocol packets such as IPv4, IPv6.

[redacted]

1.4.20.1.5 Ethernet VC [C.2.7.1.1.4 (3)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 3. The contractor shall support Ethernet Virtual Connections (EVC), which are used to define the association of two or more User-to-Network Interfaces (UNIs).

[redacted]

1.4.20.1.6 Ethernet Delivery [C.2.7.1.1.4 (4)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 4. The contractor shall support delivery of the EthS at the Agency's Service Delivery Point (SDP) via a User-to-Network Interface (UNI).

[redacted]

1.4.20.1.7 Circuit Emulation [C.2.7.1.1.4 (5)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 5. The contractor shall support circuit emulation services for FR, ATM and TDM services [Optional]

[redacted]

1.4.20.1.8 Multipoint EVC [C.2.7.1.1.4 (6)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 6. The contractor shall support point-to-point, multi-point-to-multi-point, and point-to-multi-point EVCs.

[redacted]

1.4.20.1.9 EVC Multiplexing [C.2.7.1.1.4 (7)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 7. EVC multiplexing shall be supported in order to build more sophisticated services while minimizing the hardware UNIs required.

[redacted]

1.4.20.1.10 Bandwidth Profiles [C.2.7.1.1.4 (8)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:

8. The contractor shall describe the Ingress/Egress bandwidth profiles supported per UNI. This applies to electrical as well as optical ports.

EthS provides a wide range of access speeds and interfaces to meet Agency connectivity needs. The ingress/egress bandwidth profiles supported per User-to-Network Interface (UNI) are outlined in **Table 1.4.20.1.11-1**.

1.4.20.1.11 Bandwidth Profiles [C.2.7.1.1.4 (11)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
11. The contractor shall describe the Ingress/Egress bandwidth profiles per EVC. For example, for a 10 Mbps service, the bandwidth profiles available may be 5 and 10 Mbps. For 100 Mbps, the bandwidth profiles may be available in increments of 10 Mbps. For 1 Gbps, the bandwidth profiles may be available in increments of 100 Mbps.

THE INGRESS AND EGRESS BANDWIDTH PROFILES FOR ETHERNET VIRTUAL CONNECTIONS (EVCS) ARE OUTLINED IN TABLE 1.4.20.1.11-1.PORT SPEEDS	ACCESS SPEEDS AVAILABLE PER VLAN
10 Gigabit Ethernet (10000 Mbps)	1,2,3,4,5,6,7,8,9, 10, 20,30,40,50,60,80,90, 100,150, 200,300,400,500,600,700,800,900,1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000, 10000 Mbps
Gigabit Ethernet (1000 Mbps)	1,2,3,4,5,6,7,8,9, 10, 20,30,40,50,60,80,90, 100,150, 200,300,400,500,600,700,800,900,1000 Mbps
Fast Ethernet (100 Mbps)	1,2,3,4,5,6,7,8,9,10,20,30,40,50,60,70,80,90,100 Mbps
Ethernet (10 Mbps)	1,2,3,4,5,6,7,8,9,10 Mbps

Table 1.4.20.1.11-1: EthS EVC Bandwidth Profiles. *Agencies are offered speeds from 1 Mbps to 10, 000 Mbps (10 Gbps) – for both point-to-point and multipoint-to-multipoint services*

1.4.20.1.12 Proactive Performance Monitoring (PM) Capabilities [C.2.7.1.1.4 (14)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 14. The contractor shall indicate what proactive Performance Monitoring (PM) capabilities are supported. a. Signal failure; b. Signal degradation; c. Connectivity or Loss of connectivity; d. Frame loss; e. Errored frames; f. Looping; g. Denial of service (DoS); h. Misinserted frames; i. Maintenance parameters.

[redacted] In addition to reactive performance monitoring, path-level performance metrics are continuously monitored proactively to detect events that could impact service quality. Our system relies on the presentation of key metrics to the operational displays and maintaining a set of statistics for analyzing rare and unforeseen events. This timely information enables us to react quickly to performance

degradation, avoiding any sustained effect on customer applications. The service assurance architecture used for EthS is shown in **Figure 1.4.20.1.12-1**.

Figure 1.4.20.1.12 -1: Ethernet Services Service Assurance Architecture. *Proactive and reactive measures are in place to provide Agencies high-quality service, extensive reporting, and fast response in trouble resolution.*

[redacted] Correlated, analyzed, and filtered information is then converted to user-friendly reports and made available for viewing at secure user portals such as AT&T's **Business**Direct® by authorized Agency personnel.

[redacted] **(Figure 1.4.20.1.12-2)** [redacted]

Figure 1.4.20.1.12-2: Active Measurement Servers. *Probes continuously monitor path connectivity and quality to provide optimum performance for AT&T IP-based services, including EthS.*

More information on the service assurance architecture is presented in Section 1.3.2.d.1. The following sub-sections describe how AT&T's reactive and proactive performance monitoring capabilities address specific fault conditions associated with Ethernet Services.

1.4.20.1.12.1 Signal Failure [C.2.7.1.1.4 (14)(a)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
14. The contractor shall indicate what proactive Performance Monitoring (PM) capabilities are supported.
a. Signal failure

Signal failure (loss) is defined as loss of Layer 1 connectivity. [redacted]

[redacted]

1.4.20.1.12.2 Signal Degradation [C.2.7.1.1.4 (14)(b)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
14. The contractor shall indicate what proactive Performance Monitoring (PM) capabilities are supported.
b. Signal degradation

In traditional IP environment, network-layer recovery was thought to be sufficient (along with redundant network design). However, real-time applications are severely affected by outages of 2-10 seconds, while network layer recovery can take as long as 10-15 seconds under some conditions.

Industry standards have long recognized that periods of degraded transmission lasting 10 seconds or more correlate with unavailability from the user's perspective (found in various standards, e.g., ITU-T G.821 and G.826). Furthermore, today's intelligent end terminals and network equipment will only wait in a degraded reception state for a limited time before taking some action (as described in ANSI T1.522-2000), and keep-alive timeouts on the order of seconds or tens of seconds are sometimes taken as given.

[redacted]

[redacted]

1.4.20.1.12.3 Connectivity or Loss of Connectivity [C.2.7.1.1.4 (14)(c)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
14. The contractor shall indicate what proactive Performance Monitoring (PM) capabilities are supported.
c. Connectivity or Loss of connectivity

Connectivity is defined as data path connectivity between customer edge routers (CE-to-CE), as shown in **Figure 1.4.20.1.12.3-1**.

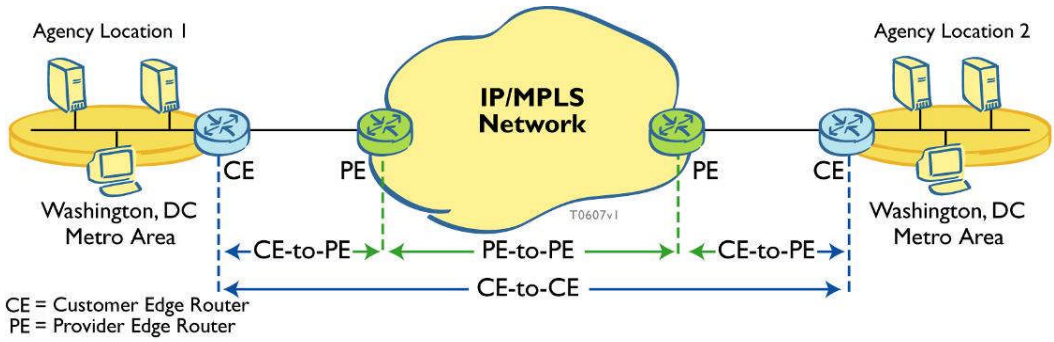


Figure 1.4.20.1.12.3-1: Data Path Connectivity between Customer Edge Routers. *Proactive performance monitoring involves measures to quickly detect, isolate, and remedy any loss of connectivity.*

[redacted]

[redacted] as described in Section 1.4.20.1.12.4.

1.4.20.1.12.4 Frame Loss [C.2.7.1.1.4 (14)(d)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
14. The contractor shall indicate what proactive Performance Monitoring (PM) capabilities are supported.
d. Frame loss

Frame Loss is defined as loss of an Ethernet frame between CE and CE. This is measured in two segments: CE-to-PE and PE-to-PE (**Figure 1.4.20.1.12.3-1**).

CE-to-PE Segment: [redacted]

PE-to-PE Segment: [redacted]

[redacted]

1.4.20.1.12.5 Errored Frames [C.2.7.1.1.4 (14)(e)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
14. The contractor shall indicate what proactive Performance Monitoring (PM) capabilities are supported.
e. Errored frames

[redacted]

Figure 1.4.20.1.12.3-1 [redacted]

1.4.20.1.12.6 Looping [C.2.7.1.1.4 (14)(f)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
14. The contractor shall indicate what proactive Performance Monitoring (PM) capabilities are supported.
f. Looping

Looping is a condition inside the core MPLS network where Layer 2 frames loop around the same equipment. Packet reordering is extremely infrequent in our network. [redacted]

1.4.20.1.12.7 Denial of Service [C.2.7.1.1.4 (14)(g)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
14. The contractor shall indicate what proactive Performance Monitoring (PM) capabilities are supported.
g. Denial of service (DoS)

[redacted] **Figure 1.4.20.1.12.7-1**. [redacted]

Figure 1.4.20.1.12.7-1: Proactive Measures Against Denial of Service. *AT&T's Inherent MPLS Network and Global Network Backbone Security provides a multitiered approach to Network Security to help protect against internal and external threats.*

1.4.20.1.12.8 Mis-inserted Frames [C.2.7.1.1.4 (14)(h)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
14. The contractor shall indicate what proactive Performance Monitoring (PM) capabilities are supported.
h. Mis-inserted frames

[redacted] measures are taken using AT&T's [redacted] Packet order is a property of successful packet transfer attempts, which preserve the sending packet order on its arrival at the destination. [redacted]

1.4.20.1.12.9 Maintenance Parameters [C.2.7.1.1.4 (14)(i)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional:
14. The contractor shall indicate what proactive Performance Monitoring (PM) capabilities are supported.
i. Maintenance parameters

AT&T uses the tools described in Section 1.4.20.1.12 [redacted] **Figure 1.4.20.1.12.9-1**.

Figure 1.4.20.1.12.9-1: EthS Management/Maintenance Architecture. [redacted]

[redacted]

1.4.20.1.13 Virtual Connection Sizes [C.2.7.1.1.4 (21)(a)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 21. The contractor shall indicate the Virtual Connection Sizes supported by its network. As a minimum, the following shall be supported: a. For point-to-point Ethernet connections – up to 1 Gbps, and 10 Gbps as optional. For mulit-point-to-multi-point Ethernet connections – up to 1 Gbps, and 10 Gbps as optional

The Virtual Connection sizes and associated bandwidth profiles for point-to-point Ethernet connections are shown in **Table 1.4.20.c-4**.

1.4.20.1.14 Transport Methods – Ethernet over CWDM/DWDM [C.2.7.1.1.4 (23)(a)(b)(c)(d)(e)]

The following Ethernet Services (EthS) capabilities are mandatory unless marked optional: 23. The contractor shall indicate whether the Ethernet services enabled by its networks use any of the following transport methods and Protocol Interworking: a. Ethernet over CWDM/DWDM – The contractor shall indicate limitations, if any, when transporting native Ethernet over WDM gear; b. Ethernet over SONET/SDH, ASTN/OTN – The contractor shall indicate limitations, if any, when using. Generic Framing Procedure (GFP), LCAS and Virtual Concatenation Technologies; c. Ethernet over ATM; d. Ethernet over FR; e. Ethernet over MPLS – The contractor shall indicate whether “c” and “d” are supported over the MPLS infrastructure and the approach for implementation.

EthS uses AT&T’s MPLS network as the underlying transport infrastructure. This architecture is shown in **Figure 1.4.20.1.14-1**.

[redacted]

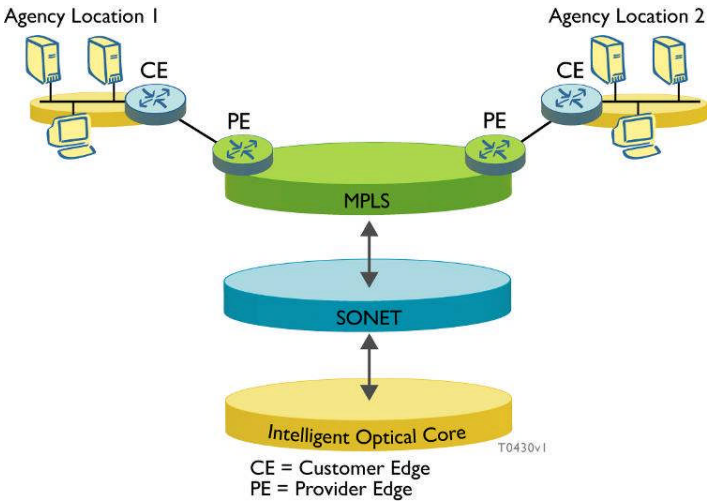


Figure 1.4.20.1.14-1: EthS Architecture. *Agencies benefit from a scalable architecture with robustness and resiliency features built into multiple layers.*

[redacted]

1.4.20.2 Stipulated Deviations [L.34.1.4.6.a]

AT&T takes neither deviation nor exception to the stipulated requirements.

1.4.21 <Reserved>