Ethernet Virtual Private Line (EVPL): Technician Detail

SERVICE DESCRIPTION

IFN Ethernet Virtual Private Line (EVPL) Service provides an Ethernet Virtual Connection (EVC) between two customer locations similar to Ethernet Private Line service but supports the added flexibility to multiplex multiple services (EVCs) on a single UNI at a customer's hub or aggregation site. The service is a reliable, more flexible, higher bandwidth and cost-effective alternative to traditional TDM Private Lines, Frame Relay or ATM Layer 2 VPNs and IP VPNs.

The service is offered with 10Mbps, 100Mbps, 1Gbps or 10Gbps Ethernet User-to-Network Interfaces (UNI) and is available in speed increments from 10Mbps to 10Gbps.

IFN's Ethernet Network Service is MEF Compliant.

TECHNICAL SPECIFICATIONS

Ethernet User-to-Network Interface. The service provides bidirectional, full-duplex transmission of Ethernet frames using a standard IEEE 802.3 Ethernet interface. Figure 1 lists the available UNI physical interfaces, their associated Committed Information Rate (CIR) bandwidth increments and the Committed Burst Sizes (CBS). CIR increments of less than 10Mbps are not available with Off-Net Services.

UNI Speed	UNI Physical Interface
10Mbps	10Base-T
100Mbps	100Base-T
1Gbps	1000Base-T 1000Base-SX 1000Base-LX 1000Base-SR 1000Base-LR
10Gbps	10GBase-SX 10GBase-SR 10GBase-LR

CIR Increments	CBS (bytes)
1Mbps	25,000
10Mbps	250,000
100Mbps	2,500,000
1000Mbps	25,000,000

Figure 1: *Available UNI interface types and CBS values for different CIR increments*

Service Multiplexing. The service enables customers to multiplex multiple services (EVCs) on a given UNI. A typical application for EVPL is to upgrade a hub and spoke topology where several remote (spoke) sites need to connect to a regional or central (hub) site. The hub site can have all remote site EVCs multiplexed on a single UNI eliminating the need for multiple ports on the customer's router or Ethernet switch. Note that when service multiplexing is used, the sum of CIR bandwidth for all EVCs multiplexed at the UNI cannot exceed the UNI port speed.

Frame Performance Metrics. Frame Performance Metrics apply to Ethernet Service as set forth in Table 1 "Table for SLAs". The definitions of the Frame Performance Metrics are:

- One-way Frame Delay (FD) is defined as the time elapsed (in milliseconds) for a Service Frame entering the ingress UNI until fully transmitted through the egress UNI
    1. Frame Delay includes link insertion delays, propagation delays and queuing delays within the Supplier's network
    2. One-way Frame delay will be approximated from two-way measurement
- One-way Inter-Frame Delay Variation (IFDV) is defined as the variance in frame delay (in milliseconds) between a pair of selected Service Frames.
- Frame Loss Ratio (FLR) is defined as the ratio of Service Frames successfully transmitted through the egress UNI versus Qualified Service Frames entering the ingress UNI.

For these Frame Performance Metrics performance is determined on a "Met" or "Missed" calculation.

Traffic Management. IFN's network traffic-policing policies restrict traffic flows to the intended CIR for each service class. If the customer-transmitted bandwidth rate exceeds the subscription rate (CIR) and burst size (CBS), IFN will discard the non-conformant packets. For packets marked with a non-conformant CoS marking, the service will transmit them using the Basic service class without altering the customer's CoS markings.

Maximum Frame Size. The service supports a Maximum Transmission Unit (MTU) frame size of 9000 bytes to support untagged or 802.1Q tagged frame sizes. Jumbo Frame sizes can be supported on an Individual Case Basis (ICB). For On-Net Services delivered via the IFN Last Mile Partner Network, frame sizes may not exceed 1518 MTU size (1522 with a single VLAN tag). All frames that exceed specifications shall be dropped.

VLAN Tag Preservation. The service supports IEEE 802.1Q VLAN-tagged customer frames. All customer VLAN IDs and priority code points (IEEE 802.1p) for CoS conforming to the C-VLAN/EVC map are transmitted and received unaltered by the service. If a native VLAN is specified by the customer in the C-VLAN/EVC map, untagged frames are mapped to the native VLAN and transmitted over the corresponding EVC. Customers must coordinate their C-VLAN add/move/delete/changes with IFN. IFN may reserve one VLAN for network management purposes.

Standard number of EVCs per UNI: up to 20 for Off-Net Services and On-Net Services delivered via fiber. Additional EVCs are available, charges may apply. Only one EVC is permitted for On-Net Services delivered via the IFN Last Mile Partner Network.

Standard number of VLAN IDs per EVC: up to 20. Additional VLAN IDs are available, charges may apply. Only 1 VLAN ID is permitted for On-Net Services delivered via the IFN Last Mile Partner Network.

Ethernet Service Frame Disposition. All Frames are delivered conditionally through the network based on which EVCs they are sent to as specified in the VLAN ID to EVC map provided by the customer. Refer to Figure 4 for IFN's service frame disposition for each service frame type.

Service Frame Type	Service Frame Delivery
Unicast	Frames delivered conditionally
Multicast	Frames delivered conditionally
Broadcast	Frames delivered conditionally

Figure 4: *Service Frame Delivery Disposition*

One-way Performance Metrics	PT0.3	PT1	PT2	PT3	PT4
PT Max Distance (km/miles)	75 km / 50 miles	250 km / 150 miles	1200 km / 750 miles	7000 km / 4350 miles	27500 km / 17000 miles
One-way Frame Delay - FD (ms)	≤ 6	≤ 20	≤ 75	≤ 115	≤ 250
One-way Inter-Frame Delay Variaton - IFDV (ms)	≤ 2.5	≤ 8	≤ 40	≤ 40	≤ 40
One-way Frame Loss Ratio - FLR (percent)	≤ .001% ie, 10-5	≤ .01% ie, 10-4	≤ .01% ie, 10-4	≤ .025% ie, 2.5x10-4	≤ .05% ie, 5x10-4

Table 1: *Table for SLAs*

Layer 2 Control Protocol (L2CP) Processing. Certain L2CP frames are discarded at the UNI, tunneled across the IFN network or peered at (processed by) the UNI. Refer to Figure 5 for IFN's L2CP disposition. For L2CPs with multiple disposition possibilities, the customer must specify to IFN which disposition should be taken. The default disposition is to discard these L2CP service frames.

Destination MAC Address	Layer 2 Control Protocol	L2CP Frame Behavior
01-80-C2-00-00-00	STP, RSTP, MSTP	Peer or Discard (all UNIs)
01-80-C2-00-00-01	PAUSE	Discard (all UNIs)
01-80-C2-00-00-02	LACP, LAMP	Peer or Discard (disposition specified per UNI)
01-80-C2-00-00-02	Link OAM	Peer or Discard (disposition specified per UNI)
01-80-C2-00-00-03	Port Authentication	Peer or Discard (disposition specified per UNI)
01-80-C2-00-00-07	E-LMI	Peer or Discard (disposition specified per UNI)
01-80-C2-00-00-0E	LLDP	Discard (all UNIs)
01-80-C2-00-00-20 through 01-80-C2-00-00-2F	GARP, MRP	Peer or Tunnel (all UNIs)

Figure 5: *L2CP Frame Behaviors*

MONITORING, TECHNICAL SUPPORT AND MAINTENANCE

Network Monitoring. IFN monitors all IFN Services purchased by a customer on a 24x7x365 basis.

Technical Support. IFN provides customers a toll-free trouble reporting telephone number to the customer Network Operations Center (NOC) that operates on a 24x7x365 basis. IFN provides technical support for service- related inquiries. Technical support will not offer consulting or advice on issues relating Customer Premise Equipment (CPE) not provided by IFN.

Escalation. Reported troubles are escalated within the IFN NOC to meet the standard restoration interval described in the Service Level Objectives. Troubles are escalated within the NOC as follows: Tier 2after 30 minutes, tier 3 after 2.5 hours and Tier 4 after 4 hours. The Service Operations Manager is notified with an escalation to Tier 3.

Maintenance. IFN's standard maintenance window is Sunday to Saturday from 10:00am to 6:00am EST (Eastern Time). Scheduled maintenance is performed during the maintenance window and will be coordinated between IFN and customer. IFN provides notification no less than ten (10) business days prior to starting work for planned maintenance activity. Emergency maintenance is performed as needed.

SERVICE LEVEL OBJECTIVES

IFN provides Service Level Objectives for the service, including network availability, mean time to respond, and mean time to restore. The service objectives are measured monthly from the IFN point of demarcation.

Availability. Availability is a measurement of the percentage of total time that the service is operational when measured over a 30 day period. Service is considered "inoperative" when either of the following occurs: (i) there is a total loss of signal for the service, (ii) output signal presented to the customer by IFN does not conform to the technical specifications in Section 1.

Mean Time to Respond. Mean Time to Respond is the average time required for the NOC to begin troubleshooting a reported fault. The Mean Time to Respond objective is thirty (30) minutes upon receipt of a fault notification or from the time a trouble ticket is opened with the NOC.

Mean Time to Restore. Mean Time to Restore is the average time required to restore service to an operational condition as defined by the technical specifications in Section 1 of this document. The Mean Time to Restore objective is four (4) hours for electronic equipment failure or twelve (12) hours for facilities failure from the time a trouble ticket is opened with the NOC.

CUSTOMER RESPONSIBILITIES

IFN provides CPE for provisioning its services and the delivery of the UNI. IFN will retain ownership and management responsibility for this CPE. As a result, the CPE must only be used for delivering IFN services. Customers are required to shape their egress traffic to the contracted CIR.

Customers have the following responsibilities related to the installation, support, and maintenance of the Service.

Provide an operating environment with temperatures not below fifty-five (55) or above eighty-five (85) degrees Fahrenheit. Humidity shall not exceed ninety (90) percent at eighty-five (85) degrees Fahrenheit.

Provide secure space sufficient for access to one (1) standard, freestanding, equipment cabinet at each of the customer facilities, no further than fifty feet from the customer router or switch interface.

Provide outside cable entry conduit(s), entry cable ground point, and internal building conduit to allow IFN the ability to rod/rope a fiber optic cable to the point of demarcation.

Locate and mark all private underground utilities (Water, Electric, etc.) along the path of new underground placement not covered by utility companies.

Provide a pull rope in any existing duct that IFN is to use and ensure the existing duct is serviceable for IFN use.

Obtain 'right-of-way' entry easement for IFN facilities and equipment from property owners at each customer location.

The customer is responsible for coring of the building's outside wall and internal walls. Upon request, IFN can perform this activity on an 'as needed' basis for an additional one-time fee.

Provide UPS AC power equipment, circuit sizing to be determined, if applicable.

Emergency local generator backup service, if applicable.

Provide access to the buildings and point of demarcation at each customer location to allow IFN and its approved Contractors to install fiber for service installation. Provide access to each location for regular (8 am - 5 pm) and emergency (24 hour) service and maintenance of IFN's equipment and facilities.

Provide, install and maintain a device that is capable of routing network traffic between the Service and the customer's Local Area Network (LAN).

Customer must provide a point of contact (POC) for installation, service activation, and any maintenance activities.

DEFINITIONS

Latency. Latency, also known as Frame Delay, is defined as the maximum delay measured for a portion of successfully delivered service frames over a time interval.

Jitter. Jitter, also known as Frame Delay Variation, is defined as the short- term variations measured for a portion of successfully delivered service frames over a time interval.

Packet Loss. Packet Loss, also known as Frame Loss, is the difference between the number of service frames transmitted at the ingress UNI and the total number of service frames received at the egress UNI.