IP and Ethernet: Master and Slave?

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Outline

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> Summary

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Developing regional and access networks
Case Tellabs Oy

Tellabs

> Tellabs worldwide
  > Turnover 980 MUSD in 2003, employees 3100
  > Headquarters in Naperville, Illinois, USA
  > Listed in NASDAQ
> Tellabs in Finland
  > 600 employees in Espoo and Oulu
  > Over 250 networks delivered in 100 countries
  > Products: Tellabs 8100 and 8600 telecommunication networks
Tellabs 8100 networks

Concepts in regional and access networks
Basic Terminology

MPLS (Multiprotocol Label Switching)
- Hard QoS
- Traffic Engineering
- Reliability and Protection

Ethernet Header | MPLS Label | Layer 3 Header | Data
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Ethernet Header | MPLS Label | Ethernet Header | Layer 3 Header | Data

Virtual Private Network Types (VPNs)

VPN Types
- Network Based VPN
- Customer Equipment Based VPN

VPN Types
- L2 VPN
  - VPWS
  - VPLS
- L3 VPN
  - RFC 2547bis
  - IPSec

VPWS = Virtual Private Wire Service
VPLS = Virtual Private LAN Service

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Application types

- IP/VPN
  - RFC 2547bis

- Ethernet Services
  - Point-to-point VPWS
  - Multipoint-to-multipoint VPLS

- Broadband service aggregation
  - MTU access
  - DSLAM access

MTU = Multi-Tenant Unit
SOHO = Small Office, Home Office
DSLAM = DSL Access Multiplexer

Ethernet services

- Virtual Private Wire (PWE3) Service
- Virtual Private LAN Service
Virtual Private Wire Service (PWE3)

More Detailed

L2 PDU, e.g., Native Ethernet or VLAN Service

PSN Tunnel LSP

Penultimate Hop Popping

L2 PDU = Layer 2 Protocol Data Unit
PSN = Packet Switched Network
PE = Provider Edge
CE = Customer Edge

IP VPN services

Standard RFC 2547bis model

Distributed RFC 2547bis model
Broadband service aggregation
DSLAM, MTU and WiFi access

IP/Ethernet/MPLS
Regional/Access network

MTU and WiFi access

ISP = Internet Service Provider
CSP = Content Service Provider
ASP = Application Service Provider
MTU = Multi-Tenant Unit
DSLAM = DSL Access Multiplexer

Trends in regional and access networks
Traffic Trends

> Traffic growth 100% annually. This is due to residential broadband access.
> Digital media content and media convergence to accelerate
> Enterprise data has modest growth figures
> Cell based mobile traffic very limited compared to residential broadband
  > Mobile vs fixed
  > One or several handsets
> Pricing models are hard to change

Current Metro Ethernet Networks

> Benefits for Operator
  > Well known technology
  > Ease of use
    > Plug-and-play
  > Cost-efficiency
    > Low-cost interface for the customer located equipment
    > On-demand bandwidth
  > Flexibility
    > One interface for many services
    > Bandwidth available incrementally
> Pain points
  > How to provide QoS
  > Scalability
  > Carrier-class quality
MPLS in Regional and Access Networks

- Guaranteed service level
- Management of service
- Fast recovery operations
- Enabling management of capacity

VRF = Virtual Routing and Forwarding (table)
VSI = Virtual Switching Instance
PW = Private Wire / Pseudo Wire

Common Infrastructure

- The driver is cost efficiency
- Packet based
- Ethernet interface
- Fiber to home
- Intelligence – routing – closer to customer
Implementation case
Tellabs 8600 managed network solution

Tellabs 8600 Network Components

- IP
- MPLS (Multiprotocol Label Switching)
- Ethernet

- Best-In-Class network management enabling operational efficiency
- Hardware based forwarding
- Sophisticated Quality of Service (QoS) features

Tellabs 8600 is a managed network solution for regional and access networks that cost-efficiently brings:
- MPLS in the regional network level
- Ethernet or MPLS in the access
- Optimizes the capex (capital expenses) and opex (operational expenses)
  - Pay-as-you grow model in network growth phase
  - Each network element and service managed through integrated Network Management System
- Facilitates migration from existing services to new packet based services

Virtual Private Wire Service
- Ethernet p2p as wholesale or retail service
- DSLAM aggregation to Internet over MPLS network (ATM/Ethernet)
- Implemented as PWE3 connections

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VPLS – Virtual Private LAN Service

- U-PE-rs and N-PE-rs are switching capable network provider edge routers

Router Roles in Distributed IP VPN Implementation

- N-PE Router
  - Network Provider Edge
  - Edge of the core network (PE router)
  - Full IP/MPLS capability

- U-PE Router
  - User-facing provider edge
  - Local exchange or POP (Point of Presence)
  - Full IP/MPLS capability
  - Also in customer premises

- P-a
  - IP/MPLS capable LSR in access network
  - No service end-points
**Distributed IP VPN Implementation**

- Customer routing across core → BGP (Border Gateway Protocol)
- Customer routing across access → BGP for all customers in one BGP session

VRF = Virtual Routing and Forwarding (table)

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**IP VPN Implementation with Tellabs 8600**

- Tellabs 8600 Solution benefits
  - Hard quality of service in access
  - Network scalability
    - Routing
    - Operational efficiency
    - Cost-efficiency
Tellabs 8600 - Easy and automated network and service management

- Main operational advantages
  - Point-and-click service provisioning
  - Automated VPN testing even with SLA (Service Level Agreement) parameters
  - Service level fault and performance monitoring

- Values
  - First time right
  - Fast service delivery
  - Proactive response to changes or faults
  - Automatic documentation of network configuration

Tellabs 8600 Managed Edge System
User friendly management of service

- Extensive use of CLI (Command line based)
- Management on element level
- Graphical and centralized network building
- Fully documented network

Easier and cost efficient way of building networks and services
Summary: IP, Ethernet and MPLS

- Ethernet has grown from office to public telecom network
- Ethernet interface, transmission and switching
- Proven, flexible and cost-efficient technology
- Challenges in scalability, carrier-class quality and QoS

IP
- IP provides
- Scalability
- Basis for applications
- Basis for interoperability

Ethernet
- Ethernet has grown from office to public telecom network
- Ethernet interface, transmission and switching
- Proven, flexible and cost-efficient technology
- Challenges in scalability, carrier-class quality and QoS

MPLS
- Network enabled VPNs
- MPLS enables QoS and traffic engineering

Both IP and Ethernet have their roles

Our Vision
Deliver to customers technology that transforms the way the world communicates™