MPLS Management Case Studies

CCS-1004

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Cisco Networkers 2007

HOUSEKEEPING

- We value your feedback, don't forget to complete your online session evaluations after each session and complete the Overall Conference Evaluation which will be available online from Friday.

- Visit the World of Solutions on Level -01!

- Please remember this is a 'No Smoking' venue!

- Please switch off your mobile phones!

- Please remember to wear your badge at all times including the Party!

- Do you have a question? Feel free to ask them during the Q&A section or write your question on the Question form given to you and hand it to the Room Monitor when you see them holding up the Q&A sign.

Session Introduction

- This session presents two case studies:

  Vodafone Ireland – this describes the process VF went through to select and tool set for managing their MPLS Core network

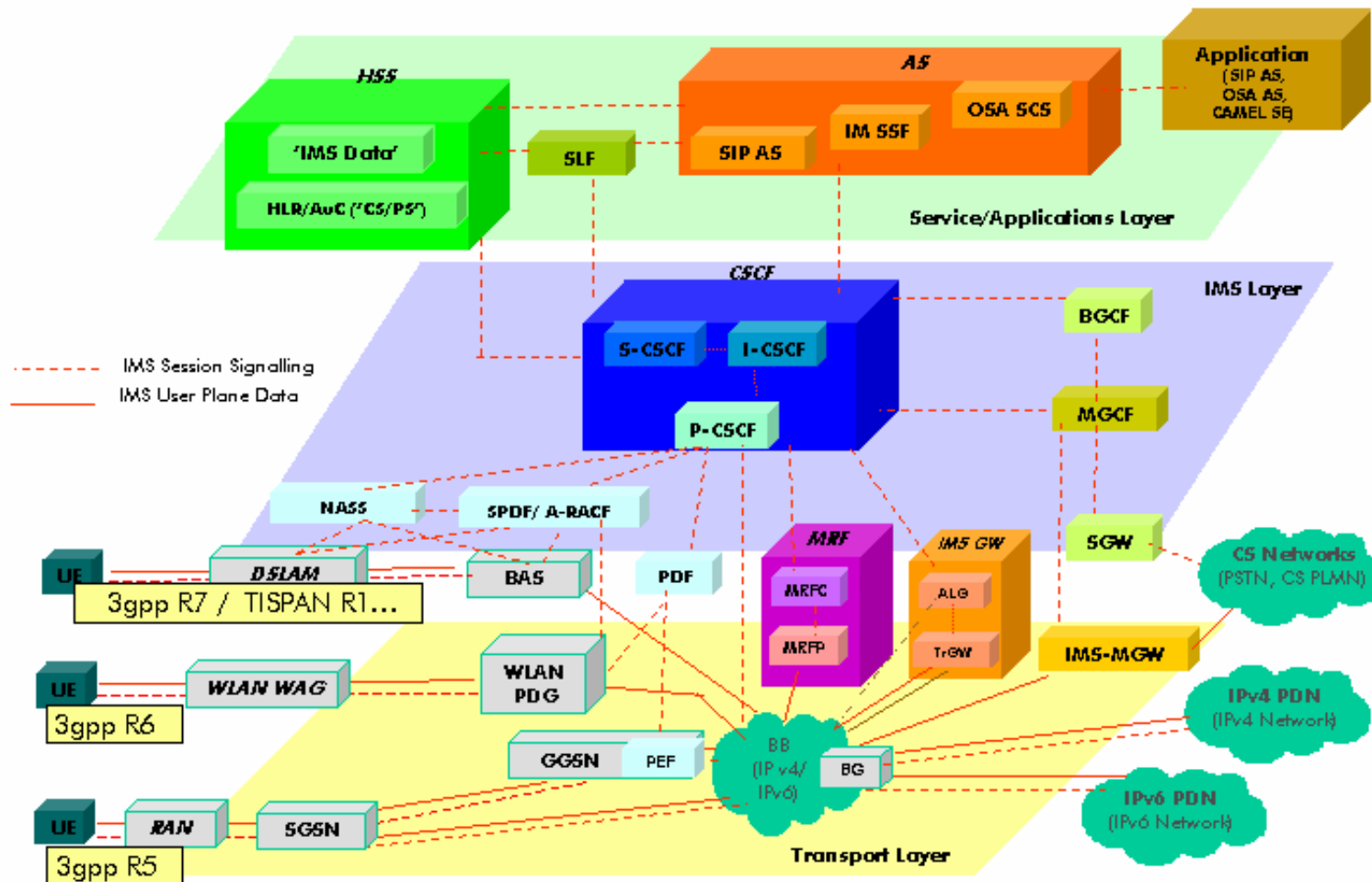 Telekom Austria – the roll-out of a country wide MPLS service will be discussed

- Many Thanks to

  Horace Burns, Vodafone Ireland

  Michael Loeffler, Telekom Austria

Case Study: Vodafone Ireland CPN OSS Solution

Presented by: Horace Burns

Mobile Network Evolution

Source Ref. 1

Service Delivery Over …

Consumer Services   **Corporate Services**

| **Commerce:** Banking, Payments, … | **Unified Messaging:** Voicemail, SMS, EMS, **MMS**, **Email,** … | **Customer Information (CRM)** |

| **Entertainment:** Gaming, Sports, Movies … | **Interactive Voice & Video** | **Ordering, Inventory, …** |

Radio

3G UMTS
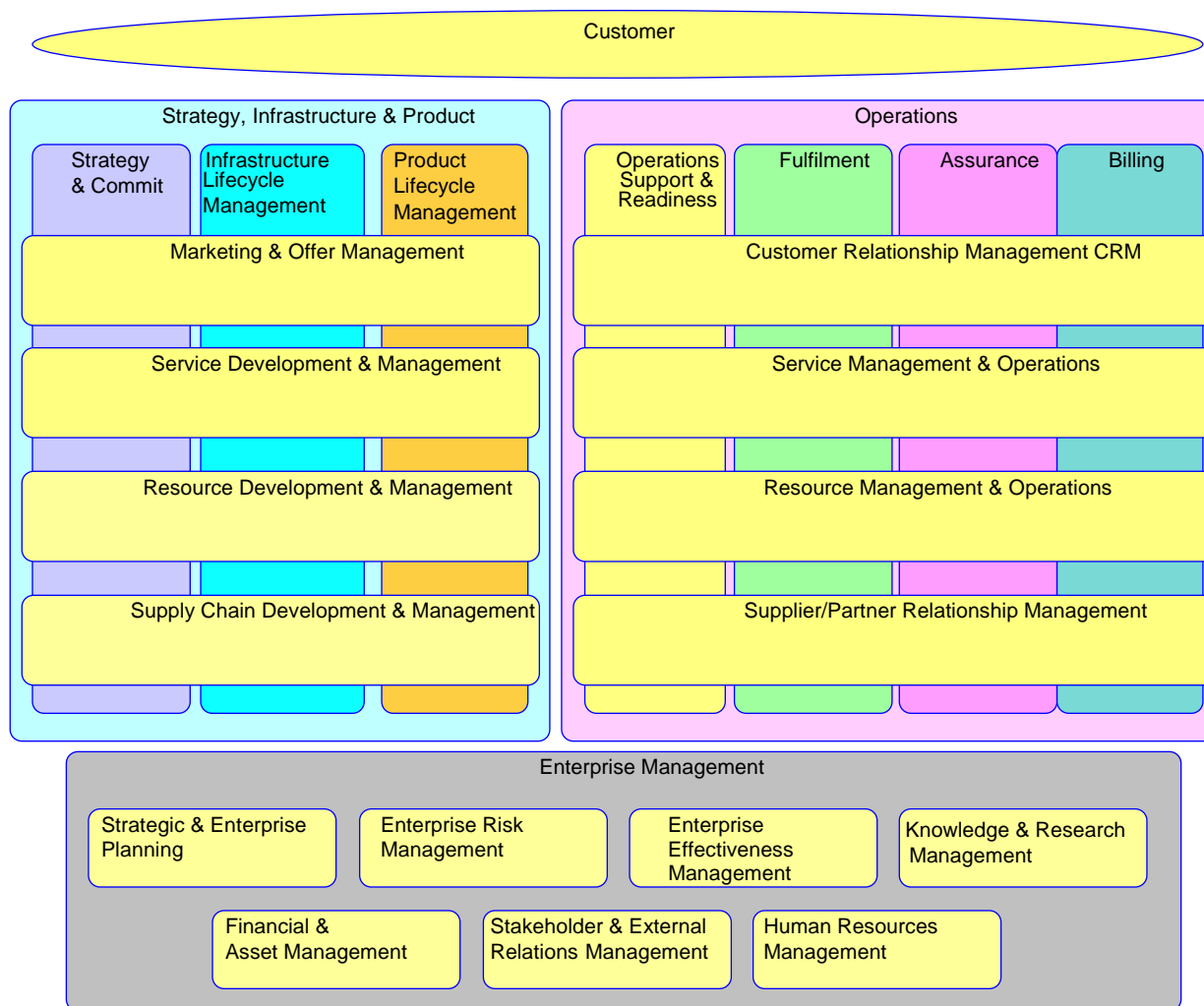## 2G GPRS
…,WiFi, …

Core

Converged Packet Network
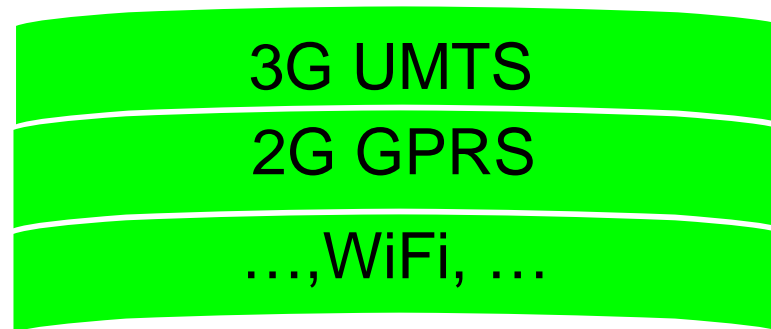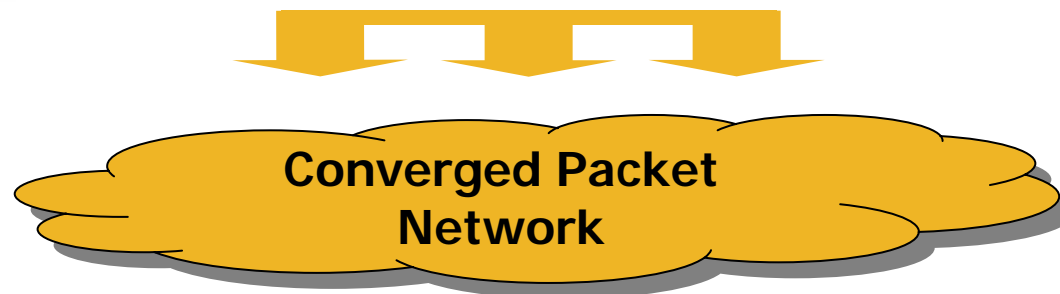
CPN Requirements

- MPLS L3 VPN

- MPLS L2 VPN PWE3

- QoS

- Traffic Engineering

- Diagnostic Support

A High Level OSS Framework (eTOM)

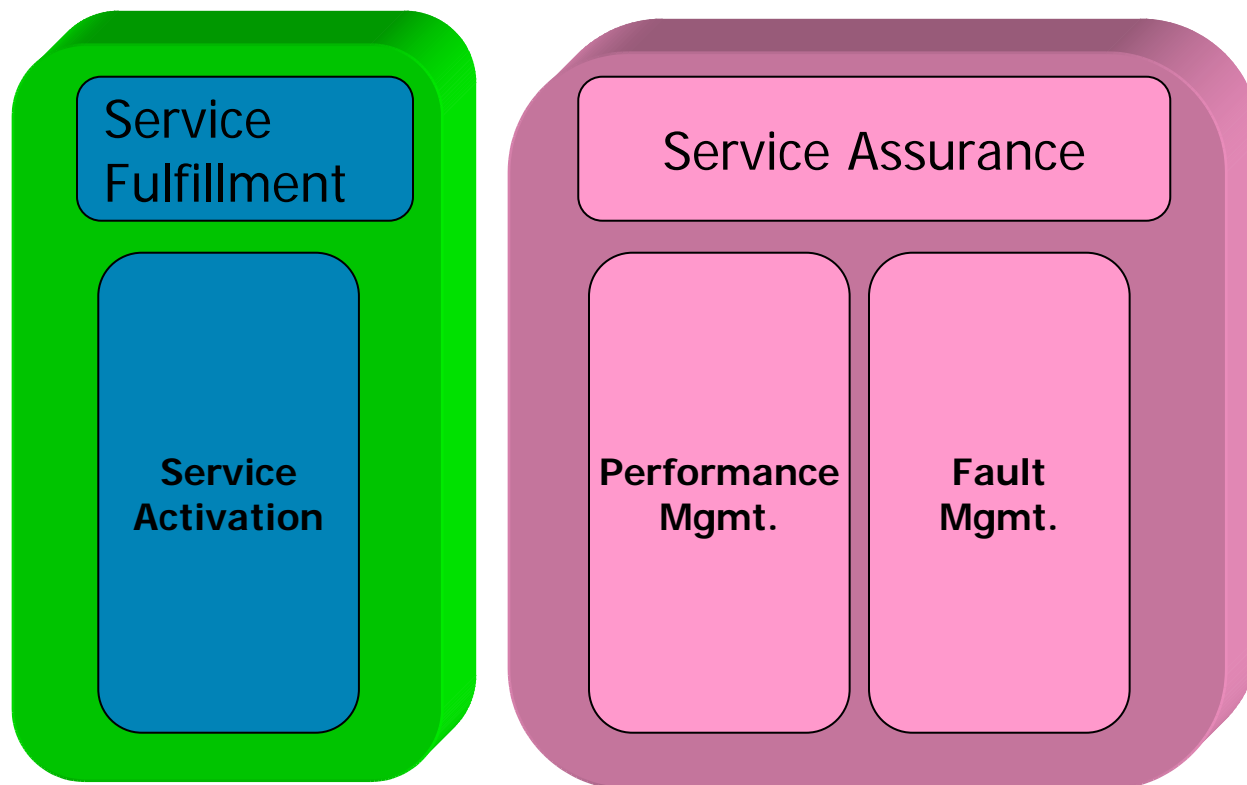**Customer**

Strategy, Infrastructure & Product

Strategy & Commit	Infrastructure Lifecycle Management	Product Lifecycle Management

Marketing & Offer Management

Service Development & Management

Resource Development & Management

Supply Chain Development & Management

Operations

Operations Support & Readiness	Fulfilment	Assurance	Billing

Customer Relationship Management CRM

Service Management & Operations

Resource Management & Operations

Supplier/Partner Relationship Management

Enterprise Management

Strategic & Enterprise Planning	Enterprise Risk Management	Enterprise Effectiveness Management	Knowledge & Research Management

Financial & Asset Management	Stakeholder & External Relations Management	Human Resources Management

Source Ref. 2

High Level to Low Level …

Service Fulfillment

Service Activation

Service Assurance

Performance Mgmt.

Fault Mgmt.

Functional Specification: Some Examples …

Functional Area	Requirement	Product
Assurance Fault	Perform alarm enrichment of CPN generated events to include VPN information where appropriate	?
Assurance Fault	Maintain an up to date topology model of the IP-VPN's deployed on the CPN	?
Assurance Fault	Display CPN IP-VPN events	?
Assurance-Performance	Provide performance information (platform, link and QoS) on CPN P & PE Nodes and CE's	?
Fulfilment	Activate L3 IP-VPN, L2 EoMPLS (Point to Point) and TE configuration	?
…	…	…
…	…	…

OSS Toolset Selected

Fulfilment

Assurance

Trap Generator:
- Data Normalisation
  - Trap Formatting
    - Trap Routing

Trap Generator

**Provisioning
Events (SNMP)**

ESB

**Provisioning
Events**

Layer 3 Topology

TeMIP

Fault Management

TNDL

NNM
AM

TeMIP:
- Network/Service Status
- Service Alarms

Topology

**Network
Alarms**

ISC

TE

L2 -
VPN

IP -
VPN

MDE

Concord

eHealth

SLA

Breaches

HP
**Network Node
Manager
Advanced
Edition**

Cisco
**Cisco
Works
2000**

Cisco
**Access
Control
Server**

ISC:
- Service Configuration
- Service Activation
- TE Activation
- Troubleshooting

eHealth:
- Network
Performance
- Service Performance
- SLA monitoring &
Reporting

NNM:
- Network Topology
- Network Polling
- Network Monitoring
- MPLS Correlation

CW2K:
- Device
Management
- Device
Inventory

ACS:
- Network login
authentication
- Command
authorisation
(TACACS+)

Fulfilment: ISC (1/2)

ISC implements IPVPN and L2VPN deployment logic

- L3 MPLS VPN (IP-VPN)
  - Automatically Manage VPN resources
    - IP address pools, route-targets, route-distinguishers, etc.
  - Create Different VPN Topologies
    - Mesh, Hub-and-Spoke
    - PE-CE Routing (BGP, RIP, OSPF, Static EIGRP)
  - Robust Provisioning Flow
    - Profile driven deployment
    - Pre-provisioning checks, Post-provisioning configuration audits
    - All provisioning information, including CLI stored in repository

- L2 MPLS VPN
  - VLAN Based Point to Point EoMPLS (ERS – Ethernet Relay Service)

Fulfilment: ISC (2/2)

- **QoS**

  2 QoS objects modelled

  Ethernet QoS Applied against L2 VPN service request

  IP QoS suitable for marking and classifying IP-VPN

- **Traffic Engineering**

  Protection of the Network Against Failure

  Provision Fast Reroute (FRR) backup tunnels to provide SONET like protection times

  Extend FRR to protect bandwidth against link, node, or SRLG (Shared Risk Link Group) failures

  Provision MPLS-TE Tunnels

  Provision MPLS-TE tunnels on the network to meet defined criteria

  ISC:TEM can be used to optimise the network utilisation

  Discover the TE network

  MPLS TE topology, visualisation of placed tunnels

- **Troubleshooting**

  MPLS Diagnostic Expert

  Problem diagnosis using test cases developed by TAC

Assurance: TeMIP and NNM Advanced Edition (1/3)
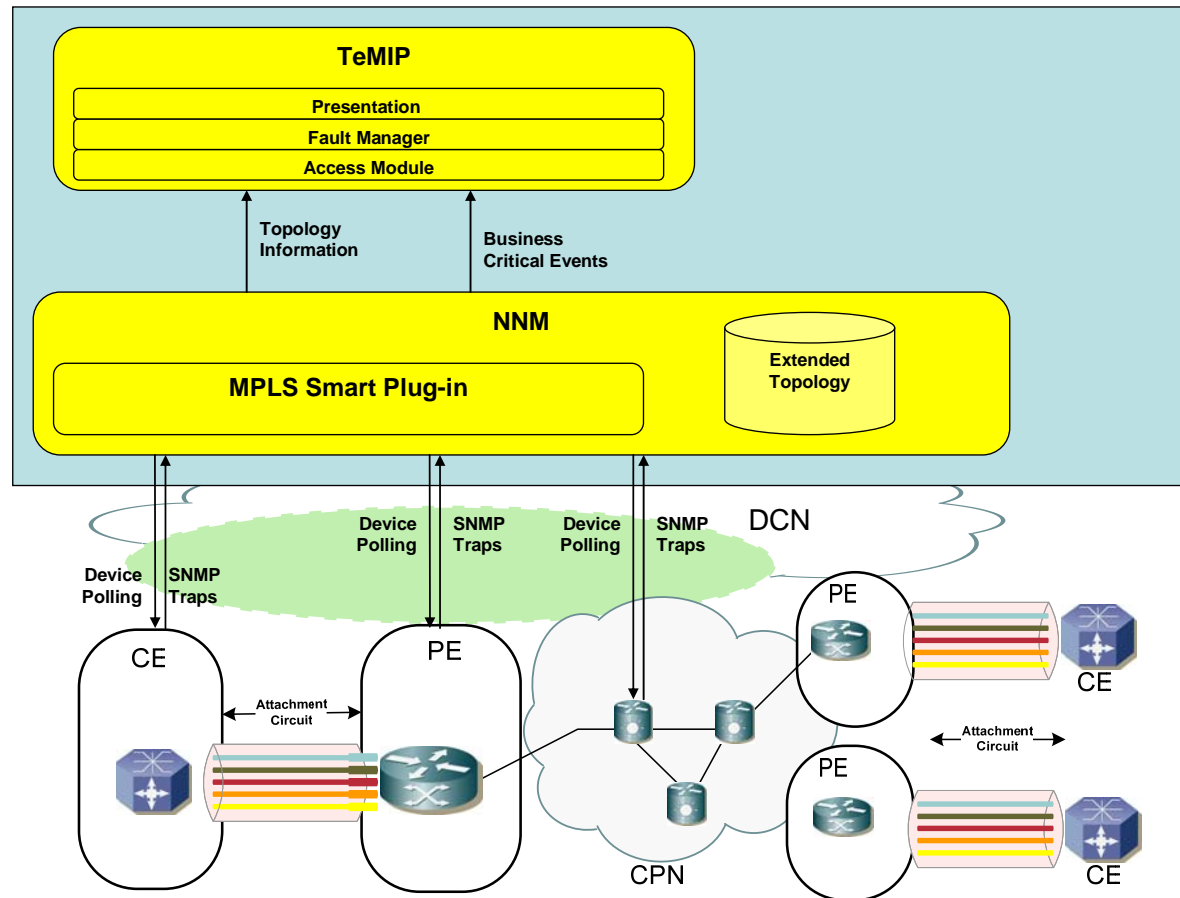
Assurance: TeMIP and NNM Advance Edition (2/3)

- **NNM Used as the domain manager for the CPN**

- **All events from the Network and other OSS systems forwarded and processed by NNM**

- **SNMP queries to discover and map the IP network.**

- **SNMP queries to populate the NNM topology and object databases - the databases contain Network, node and interface objects**

- **MPLS VPN Smart-Plug-in (SPI) is an extension to NNM AE**

  Adds detailed knowledge on MPLS and IP-VPN topologies to the basic NNM information model

  Performs a SNMP discovery of the router devices that support MPLS VPN's to determine the provider edge (PE) router configuration and virtual route forwarding (VRF) groupings

  The MPLS VPN SPI receives specific SNMP events from the NNM AE event subsystem. It then generates new, enriched SNMP events that relate the situation in the event to the virtual private networks for TeMIP reporting

Assurance: TeMIP and NNM Advance Edition (3/3)

- **HP TeMIP is the overlay fault manager**

    responsible for processing all equipment alarms and mapping them onto an internal data model.

    Events are forwarded to the NNM Access Module (AM) where they are processed and mapped onto specific entities.

    TeMIP entities may be created either through the AM or using a VF-IE system to take a topology file and translate it into TeMIP format and upload it into TeMIP using the TeMIP Network Data Loader (TNDL)

    First and Second line support monitor TeMIP event console
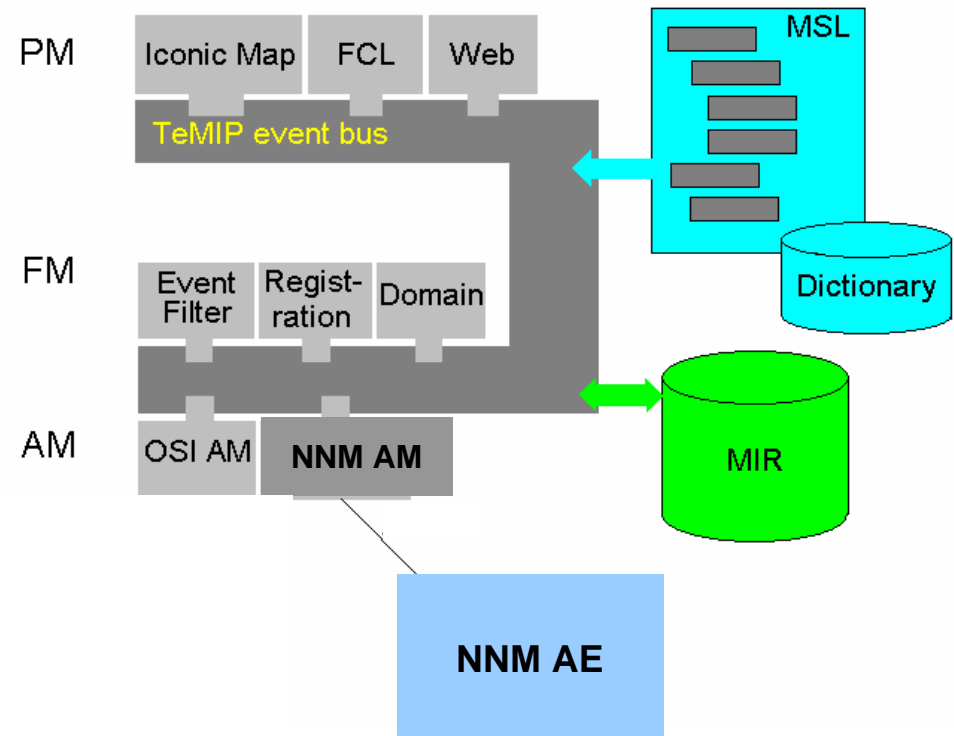
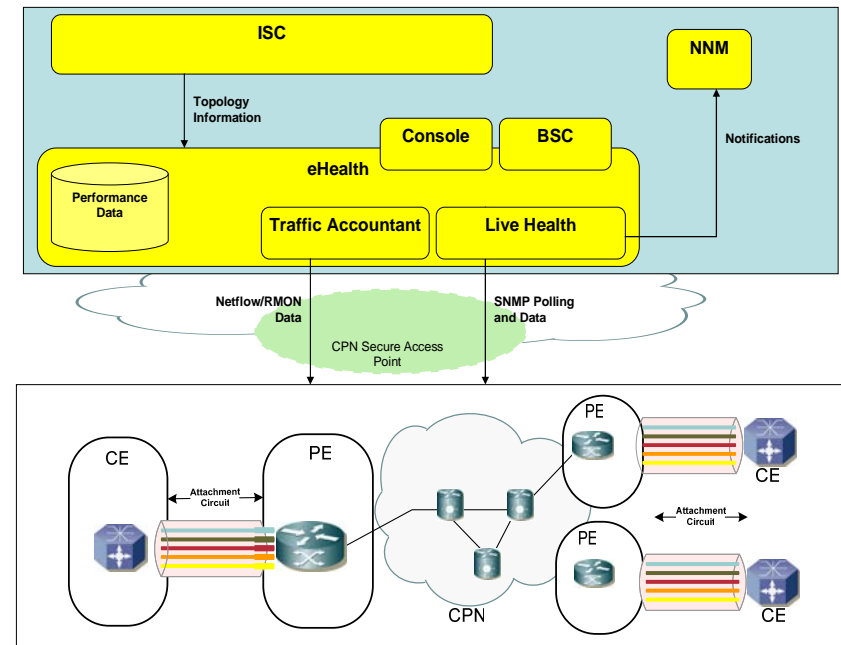# Assurance: eHealth

- EHealth components:

  LiveHealth responsible for monitoring and reporting on the performance of the Network

  Traffic Accountant: reporting on RMON/RMON II and Netflow Data.

  The *Business Service Console* providing a portal that will display the status of all VFi services

  The eHealth *Console* is the main administration application

- EHealth integrates with ISC to extract topology information and forward threshold breach exceptions to NNM

Assurance: Cisco Works

- Components Deployed

  Resource Manager Essentials (RME)

  Configuration Management

  Allows automatic upload and download new configurations and IOS images

  CiscoView (CV)

  CV gives a graphical view of Cisco devices

  EHealth performs IPM functionality

  ISC deployed instead of Campus Manager to manage VLAN allocation and deployment

Notes

- References:

    3GPP Specifications and
    http://en.wikipedia.org/wiki/IP_Multimedia_Subsystem

    TeleManagement Forum

Case Study: Telekom Austria eCard Rollout

Presented by: Stephen Mullaney

Customer Overview

- Telekom Austria is the incumbent service provider in Austria offering

    data and IT solutions,

    Internet access and media,

    value-added and wholesale services

    Mobile services

- The service being reviewed today is the "eCard" service for the Austrian national health service

eCard Technical Overview

- eCard provides IP connectivity from every doctor's surgery in Austria:

  - Secure access to the central health service and database

  - Secure multi - service network with Internet access

- It is a managed service with a Cisco 800 series ADSL based router in each site

  - 2 Ethernet ports available to customer, one for multi - service network , one for health service

  - Service separation is achieved by using multiVRF/VRF-lite on the CE. Traffic is then carried on different subinterfaces to the PE and are terminated in different VRFs

  - ADLS connectivity is provided back to a 7200 PE. In total there are approximately 40 PEs being used for the eCard service

eCard Technical Overview

- RIP and Static Routes are used for the PE-CE routing connectivity

- Management is provided through a 'grey' management VPN

    Management loopback on CPE (in one of the VRFs) is exported into a management VRF on the PE

    The NOC address is imported from the management VRF into the data VRF

    IP Solutions Center used for provisioning of services in combination with customer care system

"health service" VPN

ATM Access Network

MPLS Backbone

"multi - service network" VPN
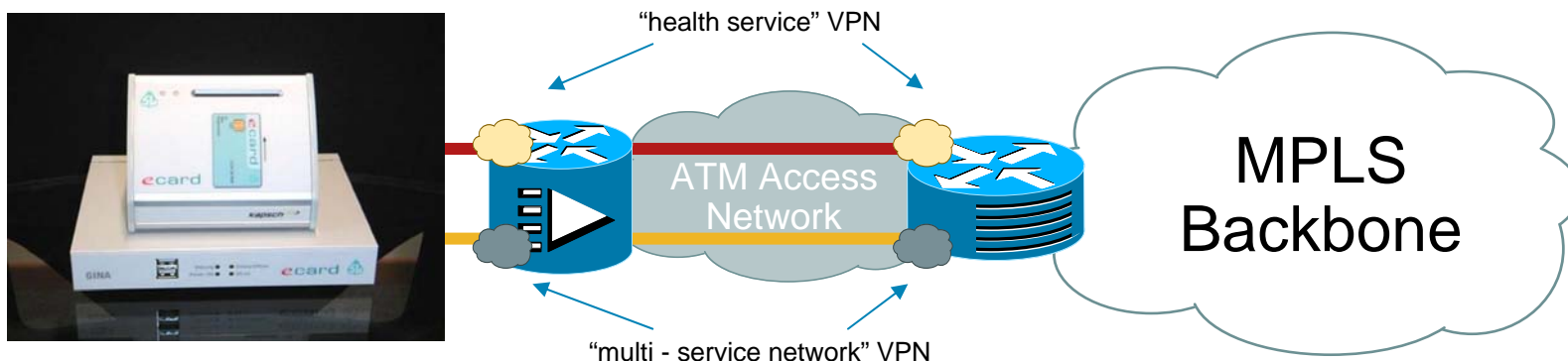
MPLS Management Challenges

- High rate of rollout. The service had to be rolled out to 9000 doctors surgeries across Austria in 6 months

  Each site required MPLS configuration, DSL provisioning, CPE installation and end-user training

- End-to-end provisioning system holding all the relevant details

  Matching attributes/objects in one provisioning system against those in another, eg MPLS Router object in MPLS tool; what to map against in DSL tool?

- Complexity of routing and CPE configuration

  CPE required multiple VRFs for traffic separation plus several static routes configured on the PE for each customer site

MPLS Management Challenges

- ## Unplanned changes during and after provisioning

    After rolling out services testing discovered a bad DSL link and required moving to another DSL link

- ## End user training

    Although not strictly related to the MPLS side of the rollout, end user training in the short period of time was a challenge. Non-tech savvy users such as doctors and receptionists had to be trained to use and perform basic diagnosis of the card reader system

MPLS Management Success

- Through a semi-automated provisioning process the rollout target and deadlines were met

  Through using an MPLS provisioning tool that was integrated with the existing DSL provisioning tool and customer database, an end-to-end service activation was possible from one console

  The complex CPE commands were generated by the management tool and given to the installation engineer. This reduced errors during the CPE installation along with speeding up the process

- Provisioning system integration

  A XML northbound interfaces was used to integrate the MPLS provisioning system with the existing DSL one

  The DSL system passed the customer site name, CPE name and service details (PE interface, etc) to be provisioned by the MPLS tool. Operators undertook review before committing to deployment

  As the number of CPEs managed through the MPLS tool grew, API performance became a problem. This required a change to the API in the way it queried for objects in the database

Recommended Reading

CCS - 1004

- Selecting MPLS VPN Services

- Comparing, Designing, and Deploying VPNs

- MPLS VPN Security

- MPLS Configuration on Cisco IOS Software

- Fault-Tolerant IP and MPLS Networks

- Building MPLS-Based Broadband Access VPNs

- MPLS and VPN Architectures, Volume II

- MPLS and VPN Architectures

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Thank you.