Cisco Expo 2008

Connecting T-Mobile Core Network Using Cisco R4 Architecture

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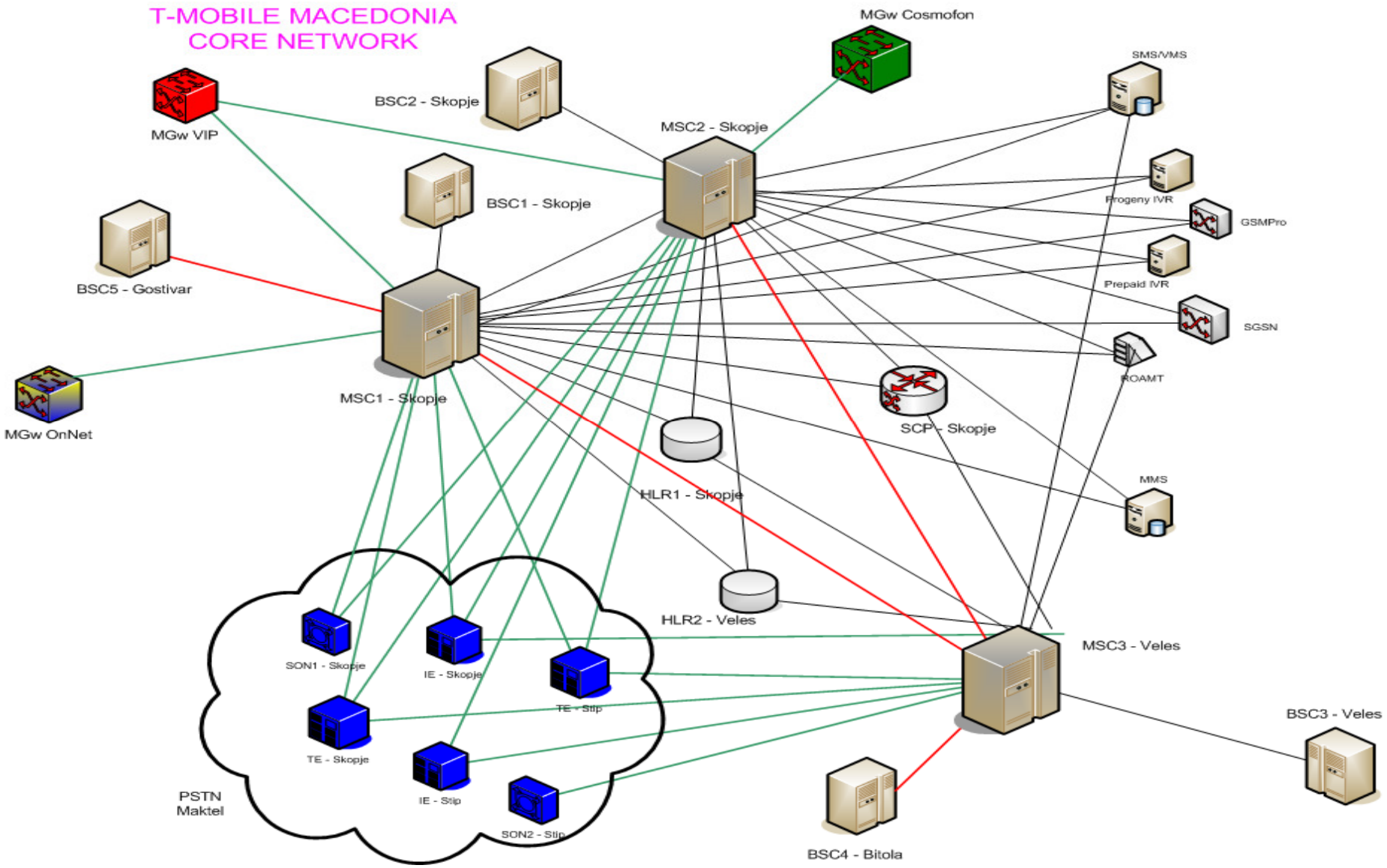
T-Mobile Old Core Network



- T-Mobile MK new generation core network R4/5 must meet all the requirements regarding quality, availability, reliability as well existing TDM based core network and ensure future evolution to all-IP. It's a fundamental step for T-Mobile MK to migrate voice services from traditional TDM transport and Monolithic architecture to the more cost-effective and flexible IP transport launching new distributed switching subsystem architecture.

- T-mobile MK core network involves 4 sites (Skopje, Veles, Bitola and Strumica) which have to be connected in presented configuration (see Figure 1).

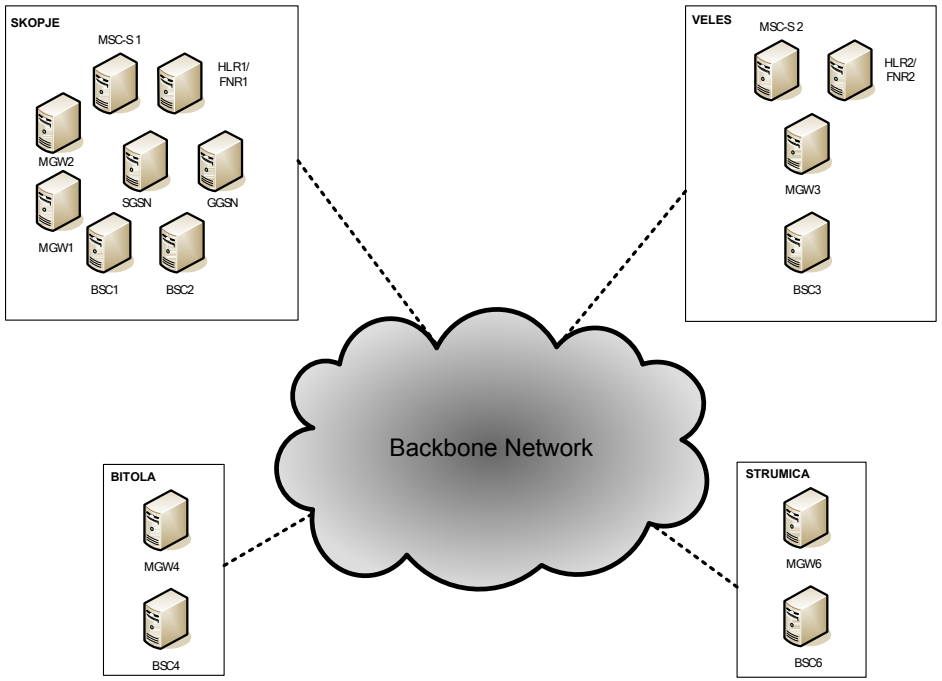
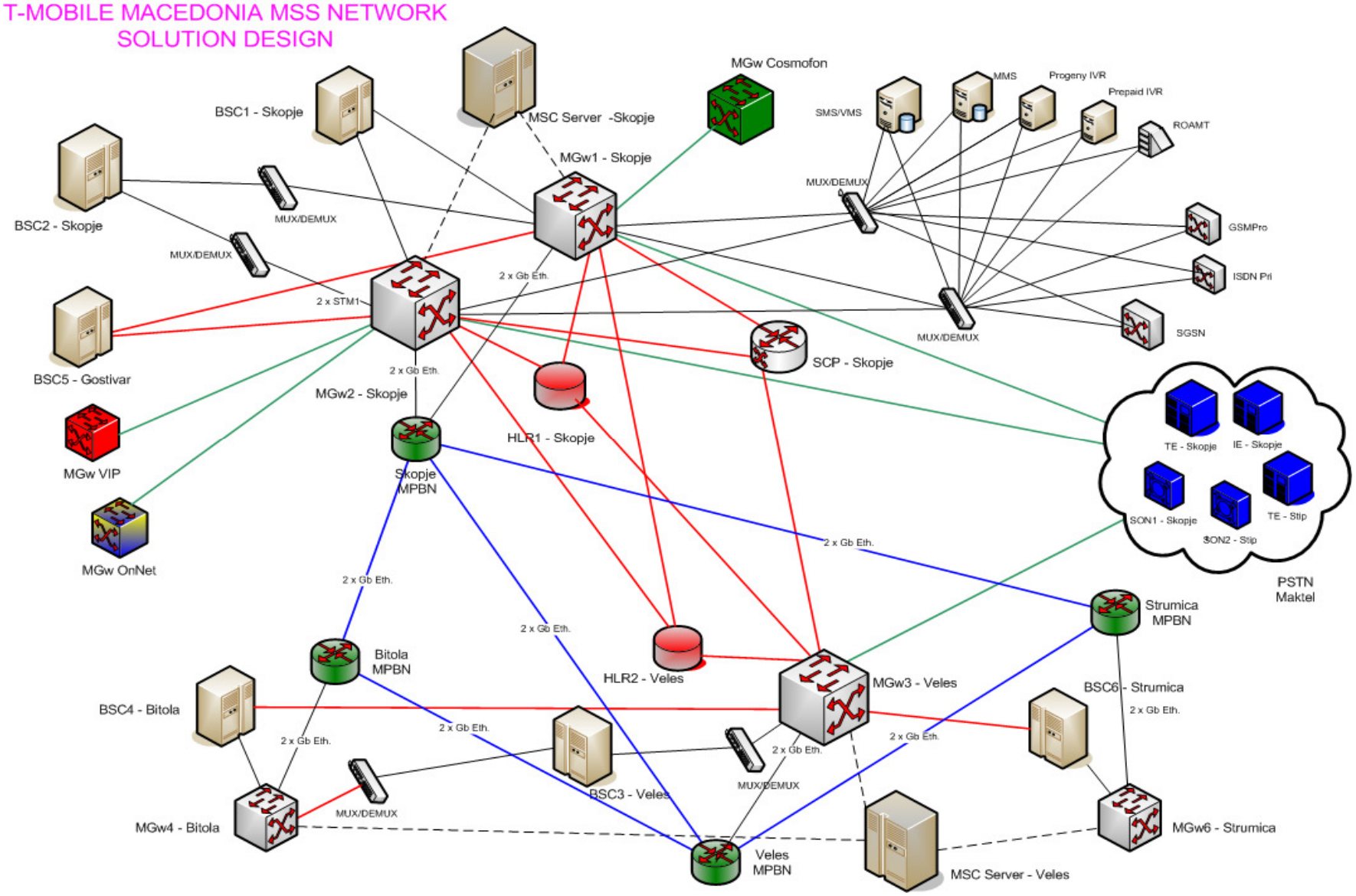


Figure 1. TM MK Network

T-Mobile New Core Network

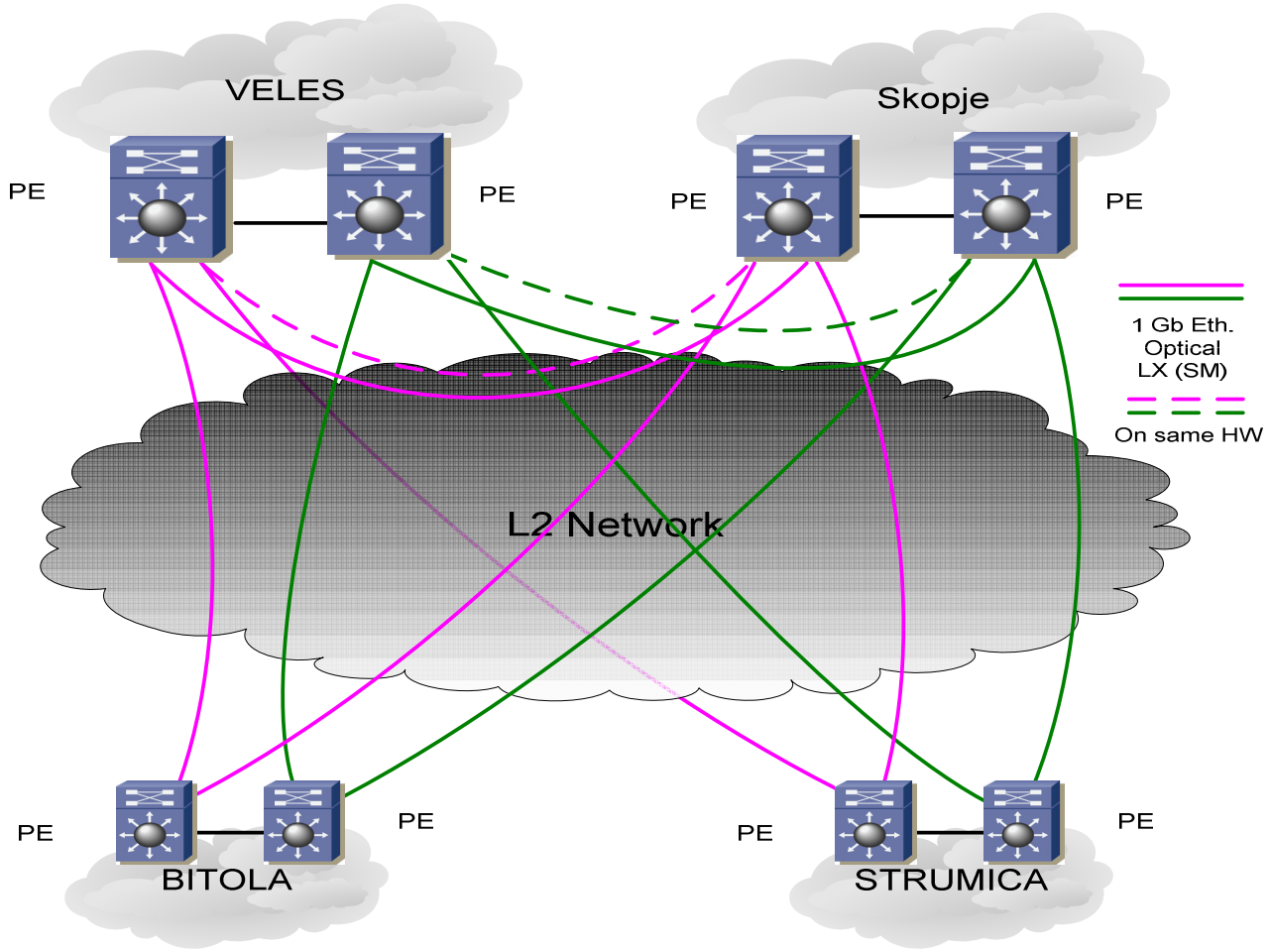


Network Requirements

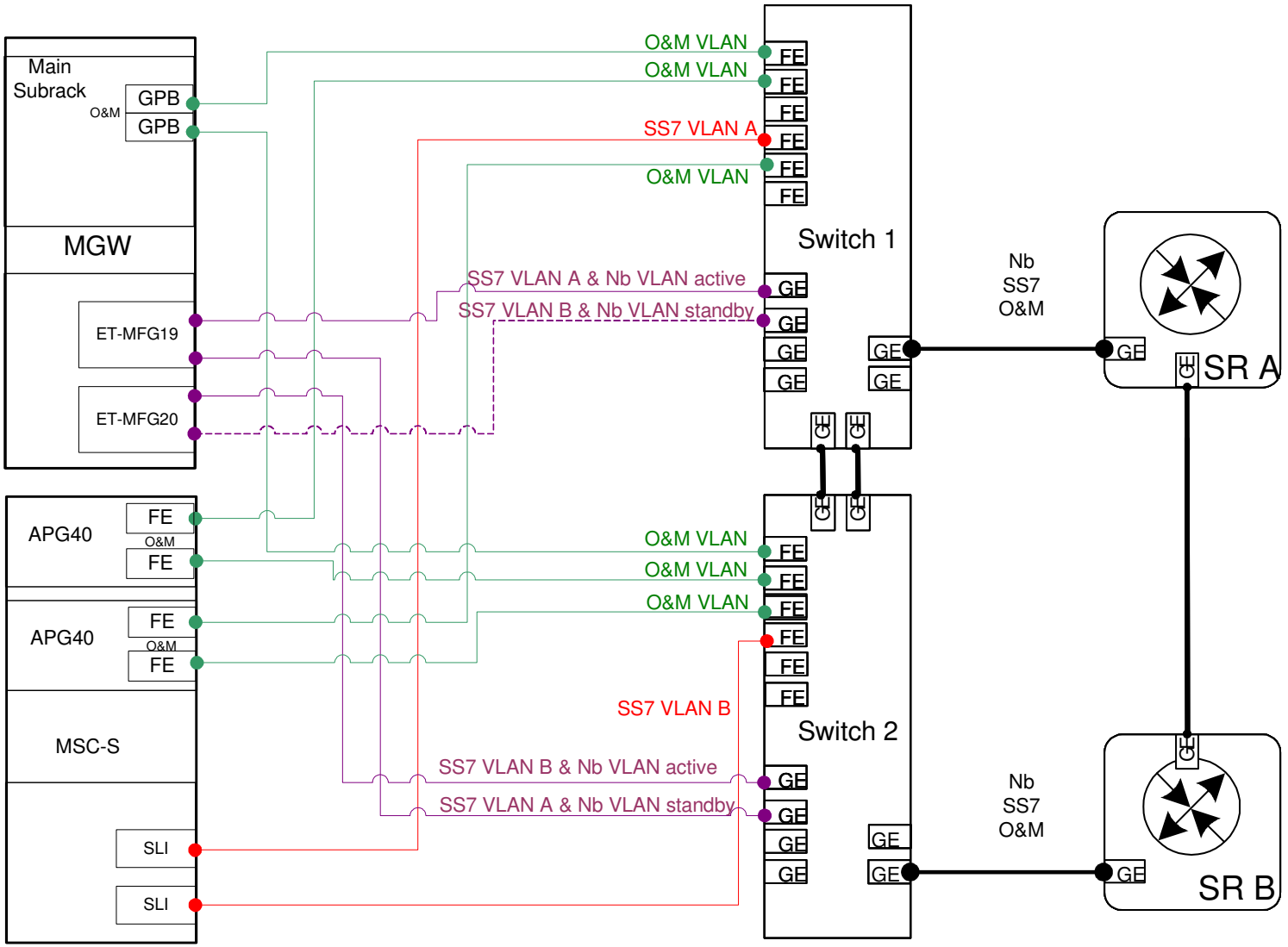
- Due to the constraints of the production traffic that will be carried, it is necessary to engineer the entire network to provide for the highest possible availability (99.999%). This is defined as network connectivity (i.e. an active path with sufficient capacity) between any two TMMK locations being available not less than 99.999% of the time. The allowable outage figures **include** downtime for planned, service affecting work.
- The network must also be capable of supporting IP QoS using both differentiated services and MPLS traffic engineering in order to ensure that the individual needs of all services can be met.
- The target time for fault detection and re-routing is <50ms.
- As the new network will be required to carry different services, with different traffic characteristics and requirements, it is essential that a workable QoS model be deployed on the network from the beginning

Type of traffic	Average Delay	Max Delay	Jitter	Failover Time	Packet Discarding
Voice	15 ms	<100 ms	<5 ms	1s	0,01%
Signalling	15 ms	<100 ms	<5 ms	Path Diversity	0,001%
O&M	No target	No target	No target	1 s	0.05%

- Primary sites have been chosen as they have high data / voice requirements and for redundancy reasons .
- It is also important that the WAN design is created so that in the event of a failure, the extra distance that traffic has to travel does not mean that latency budgets for the core network are exceeded.
- Physical layer for WAN connections will be based on point-to-point links 1 Gbps Ethernet with availability of 99,99%, connecting PE routers between primary sites. The distance of Ethernet links will be max. 300 km and delay of less than 2 ms.



Typical MSS Core Network Site

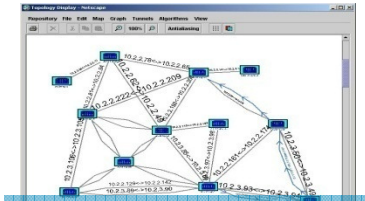


Cisco IP NGN Transport Products

Low Bandwidth Aggregation
PE

High Bandwidth Aggregation
PE

Core
P



IP Solution Center
Management

Cisco 7200 **Cisco 7304**

Cisco 7600 Series

Cisco XR 12000 Series

Cisco CRS-1 4/S

Cisco CRS-1 MC

2 Mpps **3.5 Mpps** **30+ Mpps** **300+ Mpps** **1+ Tpps**

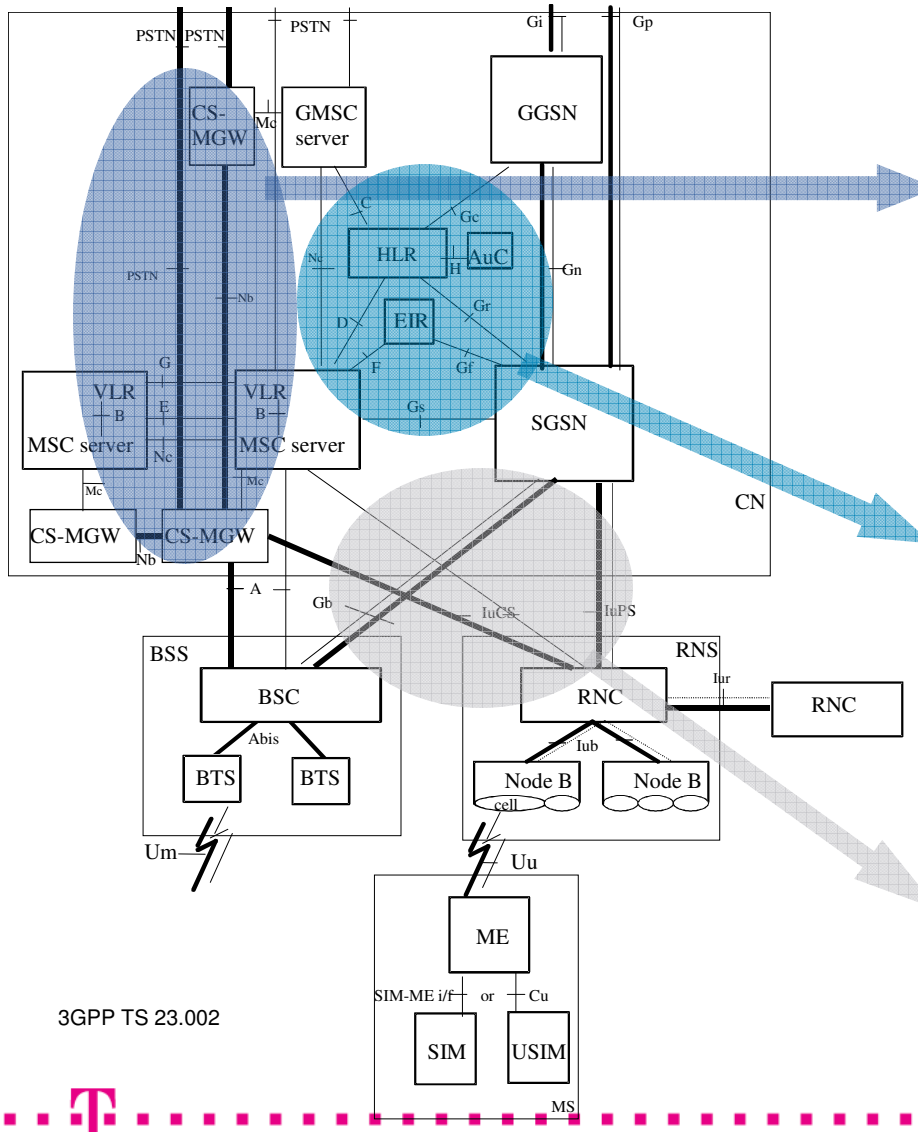
Cisco IP NGN Transport Features
Solving All-IP Challenges

- **Reliability (99.999%, <200ms failover, delay, jitter)**
  - High-availability features – SSO, NSF
  - Fast convergence features – IGP-FRR, TE-FRR, BFD
  - Flexible QoS for delay and jitter requirements
- **Resource reservation**
  - MPLS-TE – based on Traffic Class reservations can be made
  - Strict QoS features ensure quality for voice traffic
- **Call admission**
  - Cisco participates in standardization efforts for Bandwidth Manager (controlled by MSC-S)
  - However, the limitation is mostly on the MGWs
- **Clock distribution**
  - Circuit Emulation over Packet enables clock distribution over MPLS

Cisco IP NGN Transport Added Value

- IPv6
  - Support for IPv6 VPNs
- Multicast
  - Support for multicast over MPLS
  - Enables new services
- Integration of existing corporate network
  - Use common MPLS core for corporate traffic
  - Use QoS to avoid impact on customer traffic
- Cisco 7600 platform for other applications
  - ITP
  - GGSN
  - Load-balancing

3GPP Release 4 – Main Changes



Changes

Circuit Core Split Architecture

- signaling separated from user traffic
- Media Gateways responsible for transcoding and transporting voice traffic
- MSC Servers are responsible for signaling and control of MGWs
- IP as option for transport

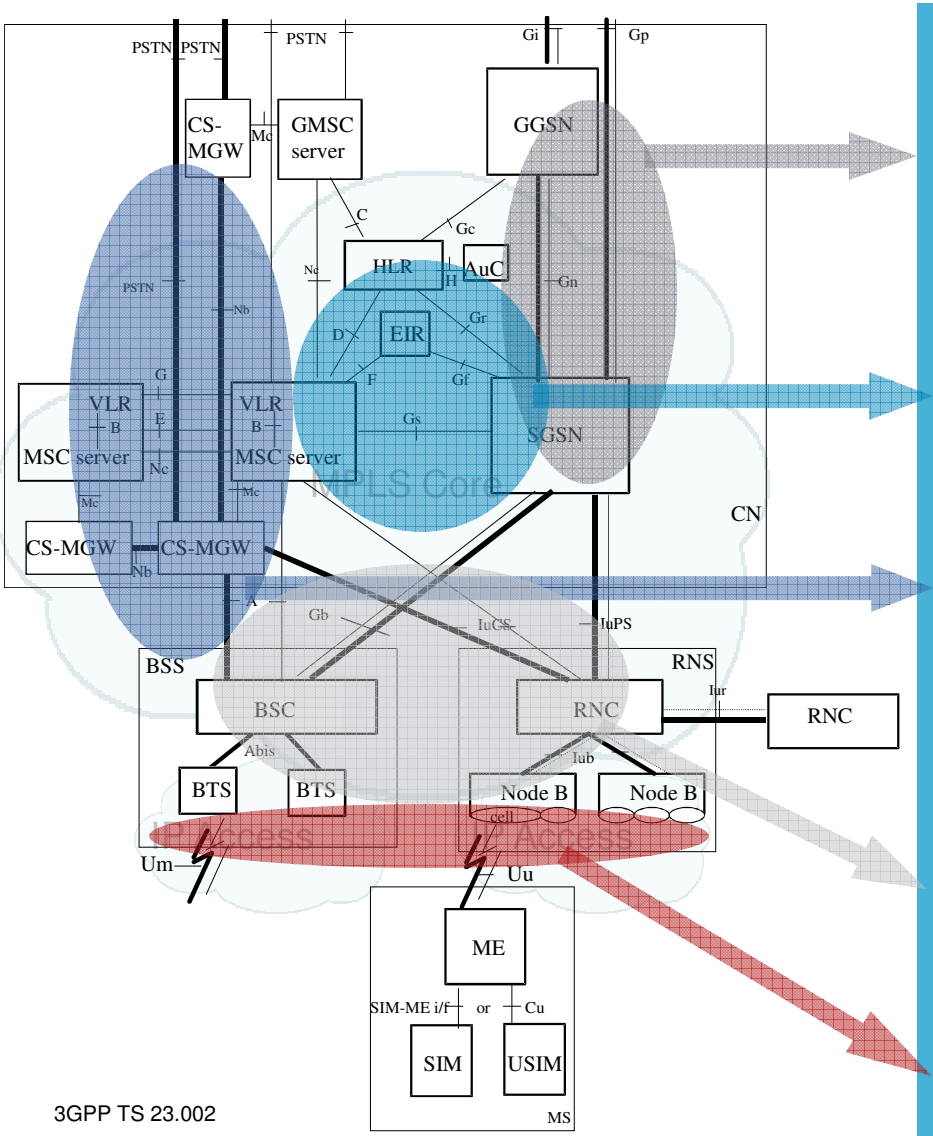
Signaling over IP

- IP as option for SS7 transport
- Signaling Gateways introduced between legacy SS7 and SS7oIP networks

IP option for *Iu-PS/Iu-CS/Gb*

- IP as option between RNC/RNC and SGSN
- IP as option between RNC and MGW
- *A* remains TDM

IP NGN Transport for 3GPP Release 4



3GPP TS 23.002

Transport

Gn/Gp/Gi (GPRS User Plane)
- classical IP interfaces
- Map to appropriate VRFs on the MPLS Core

C/D/F/Gf/Gr/Gs (SS7 Interfaces)
- Classical SS7 Option
  - use CEoP (Circuit Emulation over Packet) or ATMoMPLS
- SIGTRAN Option
  - use Cisco ITPs as SS7 to SIGTRAN gateways(1
  - map SIGTRAN traffic to VRF

Nb/Nc/Mc (CS User and Control Plane)
- Transport Option IP:
  - Mapped to VRFs on the MPLS Core
  - Ethernet Access Interfaces
- Transport Option ATM:
  - ATMoMPLS PWs
  - ATM Access Interfaces

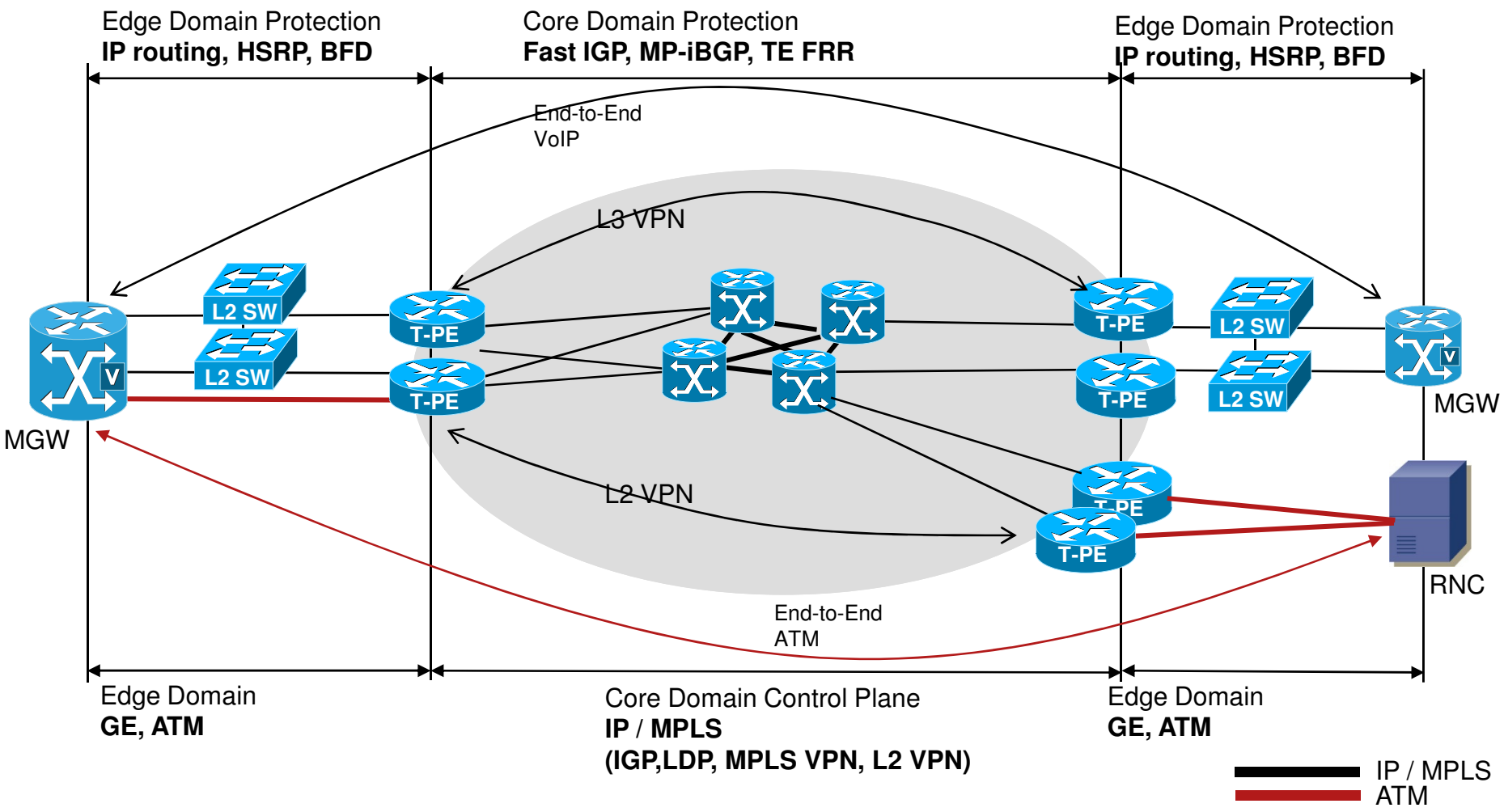
Iu-CS/Iu-PS/A/Gb (User and Control Plane)
- ATMoMPLS PWs for ATM based interfaces
- FRoMPLS for Frame-Relay based interfaces
- CEoP for SDH/PDH based interfaces
- Native IP for IP option of Iu-PS, Iu-CS or Gb

Abis/Iu (User and Control Plane)
- RAN-Optimization portfolio
- ATMoMPLS PWs for ATM based interfaces
- FRoMPLS for Frame-Relay based interfaces
- CEoP for SDH/PDH based interfaces and clocking

(1 some components can support SIGTRAN directly

R4 Site structure and IP / MPLS Core Connectivity

CS domain interconnection at L2 or L3



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Summary

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- As voice revenues are decreasing we have to offer more and more data services to our subscribers
- Voice increase YoY is 40 – 50 %
- Data increase is even more significant
- The trend in the industry is to implement native IP interfaces for transmission on all core network elements
- It is too expensive to build 2 independent transmission networks (one for DATA and one for VOICE)
- Having in mind the transmission capacities needed in future it is more adequate to build IP network for the transmission
- As VOICE is still responsible for biggest part of the revenue it is necessary to build the IP network in such a way that the voice as such will not suffer in any way