TITAN

SRv6 uSID and IPM at Swisscom

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Swisscom is the Leader in the Swiss Telco Market

Swisscom is…

the **market leader** in Switzerland
- 6.3 Mio Mobile access
- 2.0 Mio Internet access
- 1.5 Mio TV access
- 0.7 Mio Wholesale access

serving the residential, enterprise, SME and wholesale market

an **innovation** leader

the most **sustainable** telco in the world

Swisscom has…

the **best** mobile and fixed services and products

Swiss telco market is…

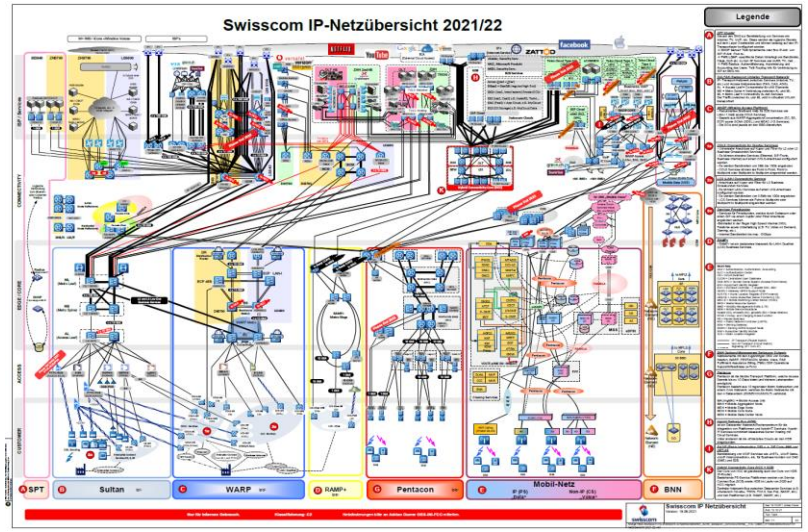
small in size
- 9 Mio population
- 4 Mio households

a **quality sensitive market**
- not only speed, coverage, cost
- but also
  - availability & stability
  - simplicity
  - support

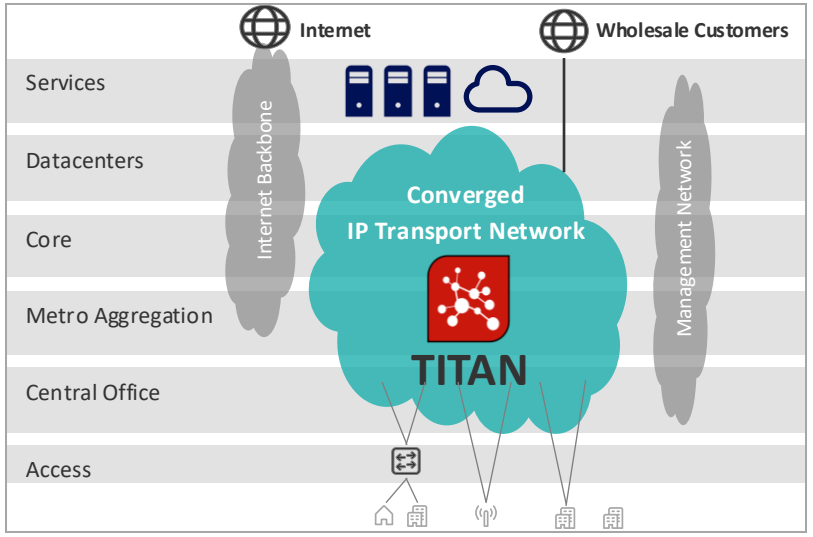
Swisscom's converged IP Network Vision

simplification – standardization – automation – stabilization – cost reduction

Swisscom IP Transport Network Landscape 2021



Network Vision 2026



Painpoints

- **Complexity** (20 networks, 4 vendors, specialized knowhow)
- **Stability** (outages of critical services)
- **Highly customized** (networks optimized for single service)
- **Manually operated** (CLI, CLI-scripts, SNMP, ..)
- **No service monitoring** (SNMP based resource monitoring)
- **High cost** (CAPEX, O&M, energy, ..)

Key Objectives

- **Consolidation** (1 network, 1 partner)
- **Simplification** (reduced protocol stack: SRv6/uSID, ISIS, BGP)
- **Standardized** services (L3VPN, L2VPN, Multicast)
- **Full Automation** (Orchestration, NaaS API, Telemetry)
- **Telemetry** based **Service Monitoring**
- **Cost reduction**

TITAN Physical Network Topology

Greenfield SRv6/uSID network with a dual plane core

SRv6/uSID

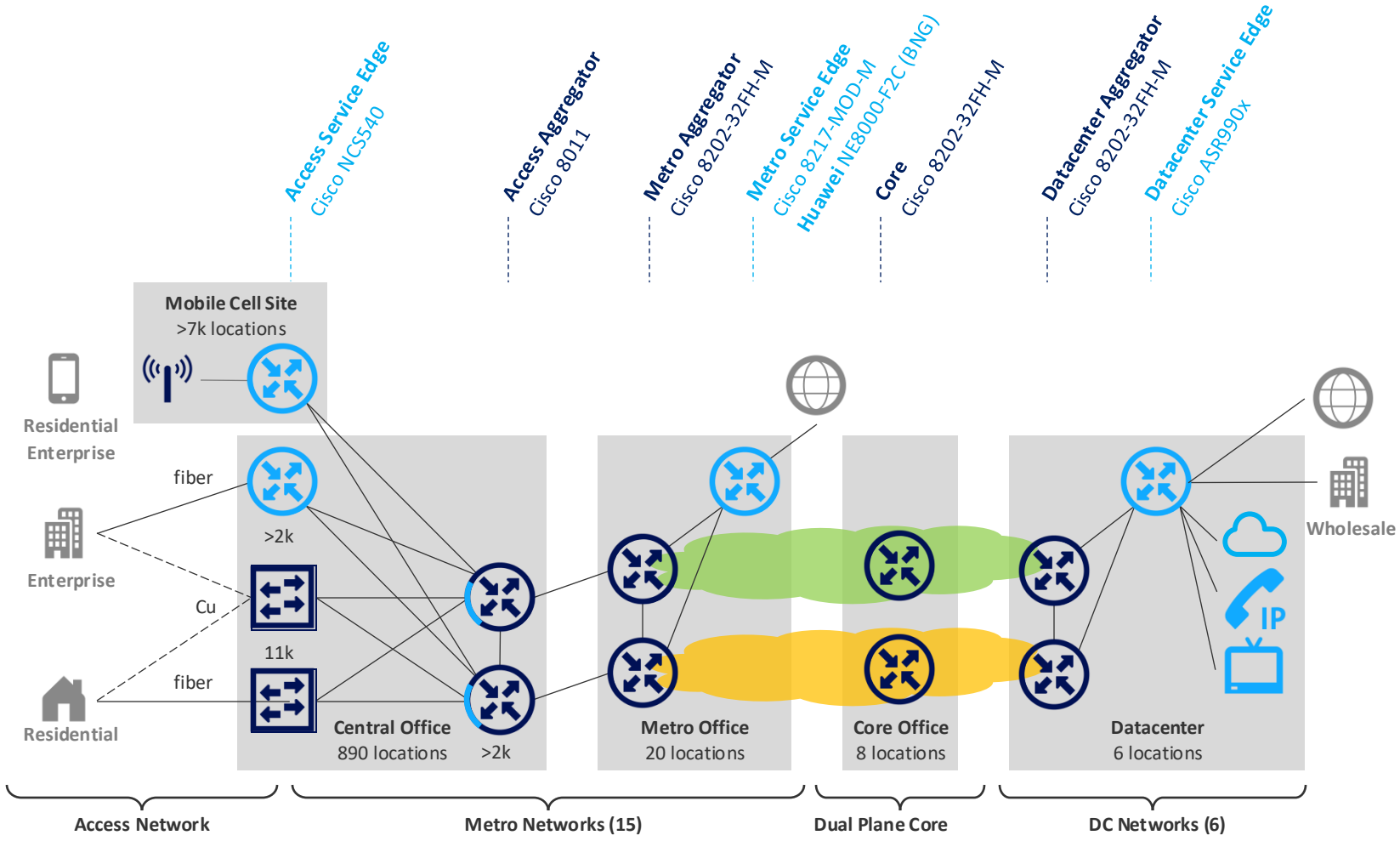
- Simplest SP technology
  - ISIS + BGP (no other protocols)
  - Scalability (uSIDs inside aggregatable IPv6 address)
  - Standardized / multi-vendor
- TI-LFA fast convergence
- Traffic-engineering support

Dual Plane Core

- **Objective: highest availability**
- 2 independent core "planes"
  - each fully redundant
  - not interconnected
  - each its own IGP domain
- traffic load-balanced over both planes

Fixed Chassis Routers

- Sufficient performance
- Reduced HW/SW complexity
- Low power consumption
- "Clean" failure



TITAN Logical Network Topology

Address Summarization: the beauty of SRv6 ! Keeping the IGP tables small and clean.

IGP Design

- Core Planes, Metros and Datacenters are ISIS Level-2 domains
- Redistribution between ISIS processes at ABR

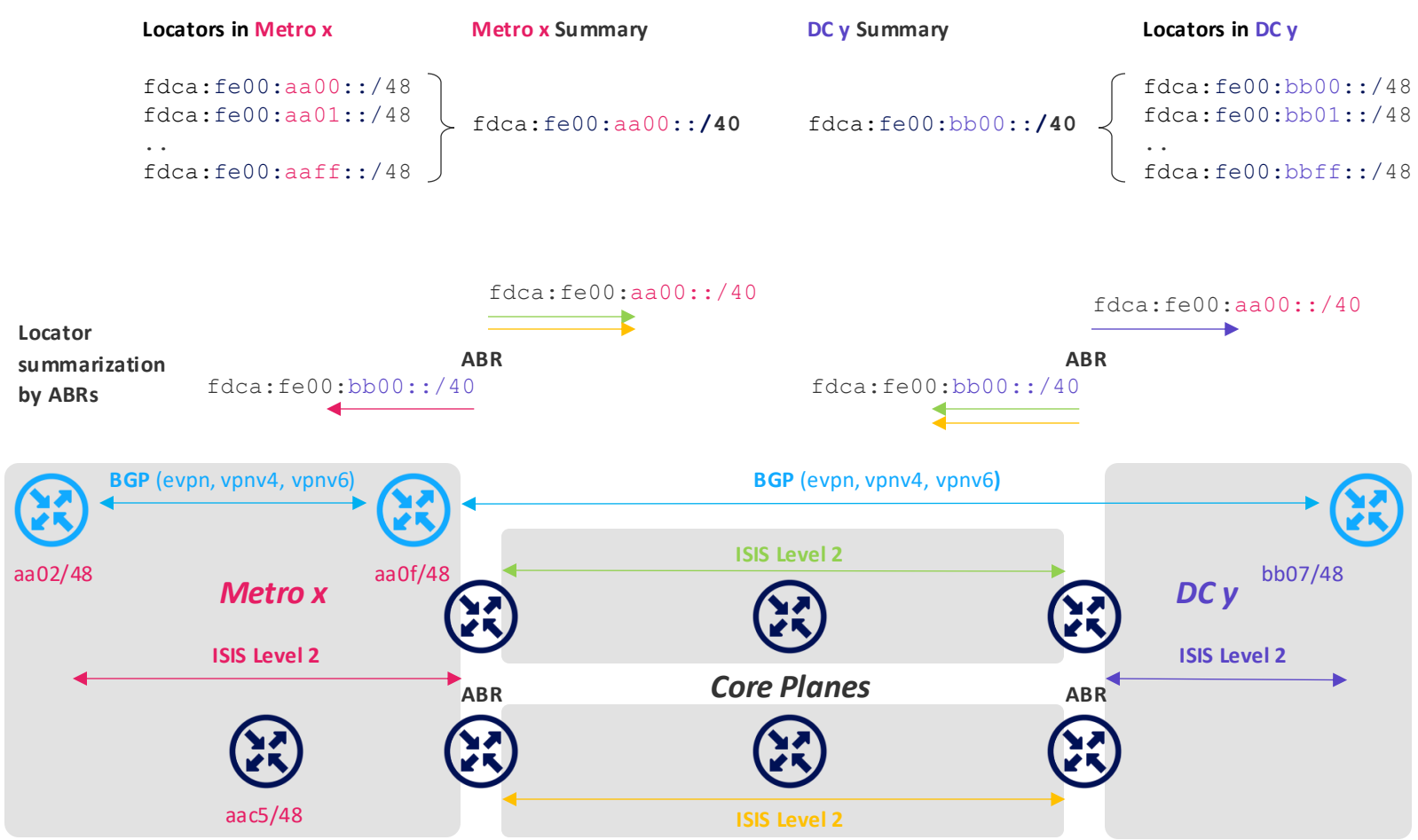
Address Summarization

- Locator summarization at ABR
  - 15k /48 locators summarized to <100 /40 summaries

=> Small IGP tables and fast convergence

Traffic Engineering

- Supported routing options
  - ECMP load-balanced
  - Low-latency (Flex-Algo)
  - Single-plane (SR-TE)
    - combine two to disjoint-path service

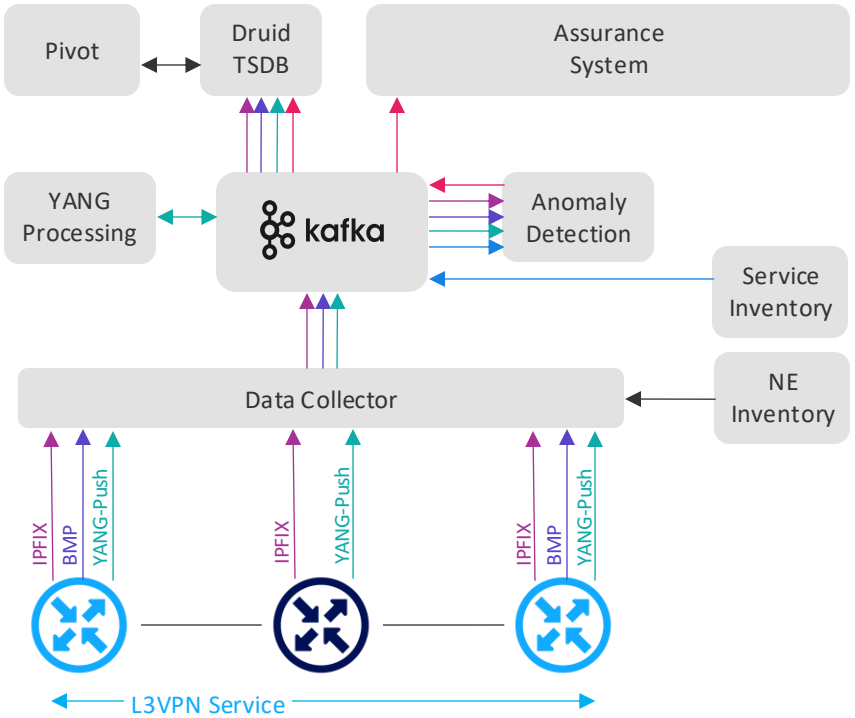


Network Analytics in TITAN

Cisco IPM yields interesting information about path performance

Network Analytics / Anomaly Detection

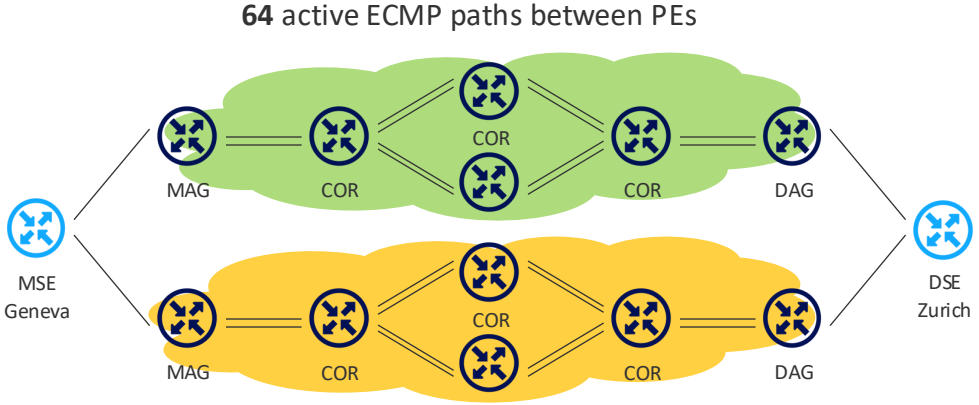
Data sources
- IPFIX: forwarding-plane data
- BMP: control-plane data
- YANG-Push: device metrics
- Inventories (NE / Service)



Path Performance Monitoring required to monitor Transport SLA

- Traffic load balanced over many ECMP paths in TITAN
- High number of Service Edges

=> highly scalable & ECMP aware solution required



IPM looks promising

- NPU based (Silicon-One)
- scalability 14 Mio probes/sec
- ECMP aware
- measure latency / loss / liveness

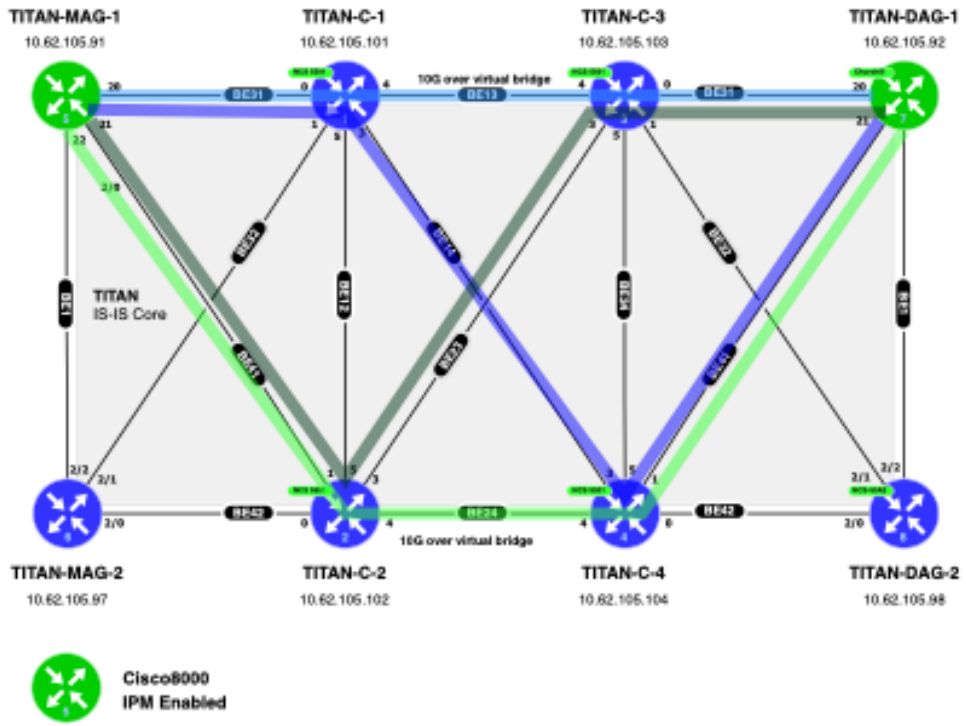
Alternative solutions

- IPSLA/CFM (does not scale, does not support ECMP)
- STAMP appliance (extra device ..)
- IOAM (not supported ..)

IPM Testing

SRv6/uSID + IPM = path control + path monitoring

Lab Setup with IPM enabled Cisco 8000



IPM provides nice measurement capabilities

- Latency histogram to study the latency over time and across paths.
- Absolute loss using standard IETF Alternate Marking method
- Spray mode for aggregate measurements across all ECMP Paths.
- Specific flow label for individual ECMP Paths.
- SRv6 SID list for deterministic ECMP path
- GRT and Customer VRF
- DSCP support to measure a given traffic class/type

The power of SRv6 uSID and IPM

- IPM Session with SRv6 SID list for deterministic per ECMP path measurement.
- Measure all SR Traffic Engineering Policies

Next step: Trial in TITAN production network


TITAN
Thank you !