

Operational Changes and Enhancements resulting from INFINERA Deployment in GEANT

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Summary



- 2012 & 2013 GEANT undertakes significant procurement exercise
- 'Life and shift' of entire European Backbone Network over 12 month period
- Transmission system replaced : ALCATEL LMS → INFINERA DTNX
- GEANT+ service platform: ALCATEL MCC → JUNIPER MX
- Subsequently GEANT IP Services to MX and full IP Convergence
- Huge Operational savings & Operational efficiencies

Our Approach to Migration



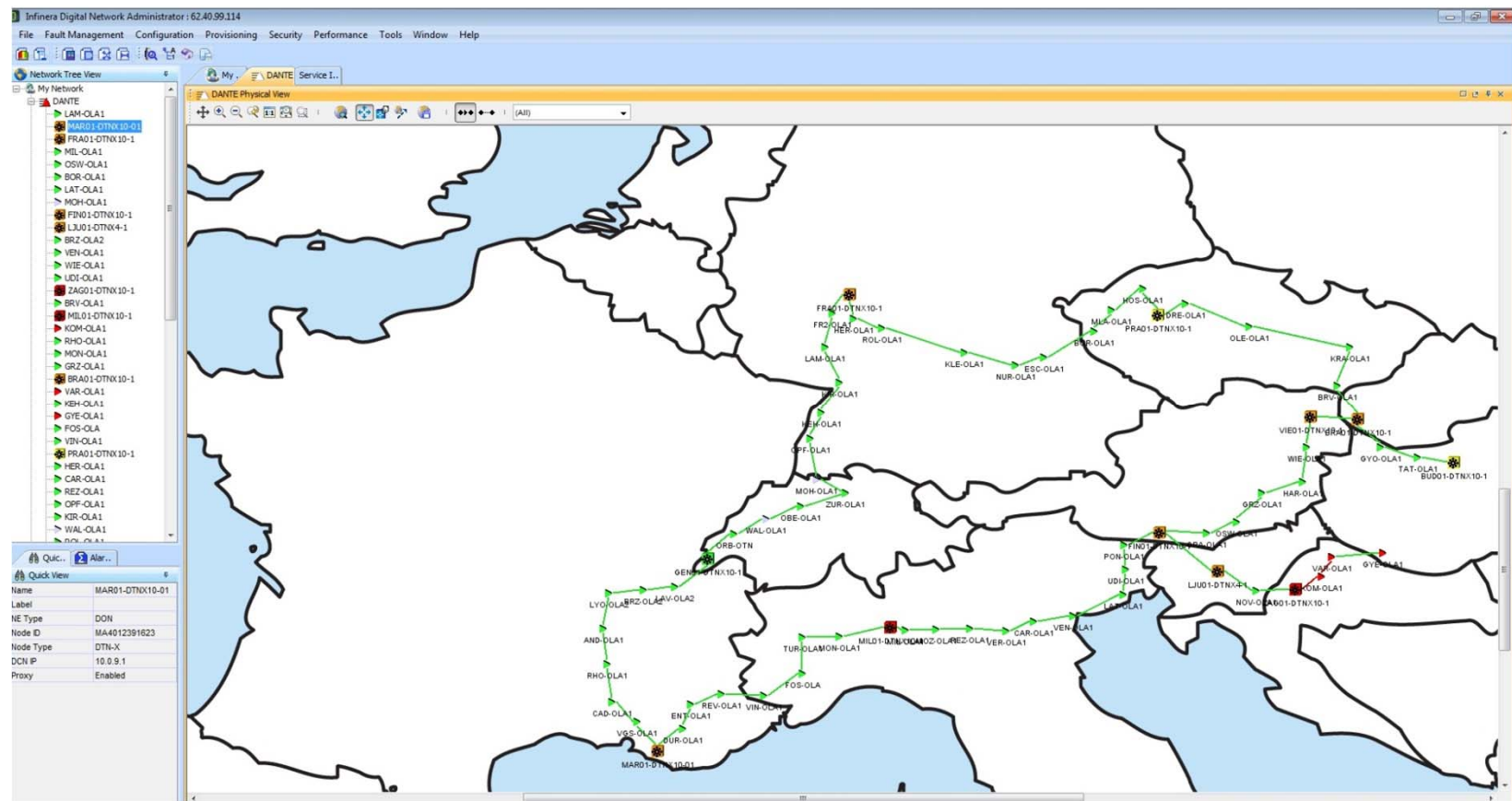
- Selection of equipment that will deliver
 - Higher Service levels (Enhanced Monitoring and Reporting)
 - Lower Operational Costs
 - Quicker fault resolution
- Training
 - Fully trained Staff before migration starts
 - Implementing Lessons learnt after each stage
 - Improved Product = Improved Training

Alarms Monitoring



- Little Change in how its done!!
- Alarms are monitored as they were with ALCATEL estate. SNMP traps are correlated and displayed on the existing dashboard system. This is for 1st and 2nd level support.
- Alarms are also monitored directly from the INFINERA network management systems (NMS) – named DNA. This is for 2nd and 3rd level support plus vendor support.
- DNA 'GEO' window and 'alarm status' window displayed on OC wall
- DNA Alarm management seems easier to control cf NMS and more intuitive

Full Graphical 'GEO' Representation of the Network via DNA "Green is Good"



connect • communicate • collaborate

OSS Developments



- Previous regime
 - OSS system and field systems correlated manually
 - *Engineers expected to update OSS post adds/moves/changes*
 - *Stale data*
 - *Poor inventory management etc*
 - *Poor customer service data*
- New Regime
 - OSS is driven by field system
 - *Correlation is semi automatic*
 - *Operator validation currently*
 - *Deployed in JUNIPER and INFINERA platforms*

- INFINERA Path Comparison Tool
- This is new and enable us to synchronise the services in the NMS (DNA) with what we have in the Operational Database.
- Why is this good -
 - You all know why !!!
 - Consistent naming standards
 - We know that all configured paths are consistent with DB
 - The knowledge is in the network – why try to duplicate it...

- INFINERA Hardware Comparison Tool
- This is new and enable us to synchronise the HW on the INFINERA network with what we have in the database. This works well for Juniper as well.
- This was developed internally and good for staff that do not have access to the management system.

GEANT Plus Enhancements



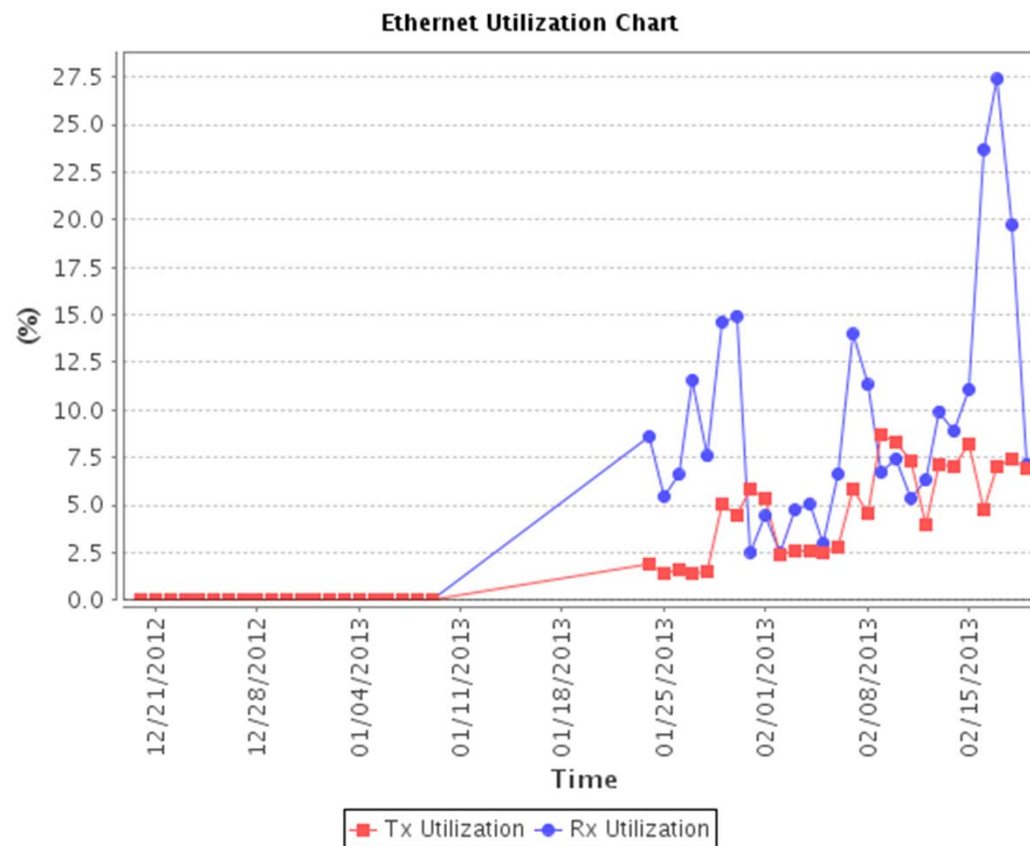
- Point to Point capacity service
- With ALCATEL MCC we couldn't correlate the EoSDH services to display meaningful alarms on the dashboard for first line support. This implies that the response time for outages is slow.
- With the Juniper MX (L2 over IP) solution, these alarms can easily be correlated and displayed on the dashboard meaning that the response time for outages are faster now.
- Never had visibility of usage for L2 circuits previously

Reporting

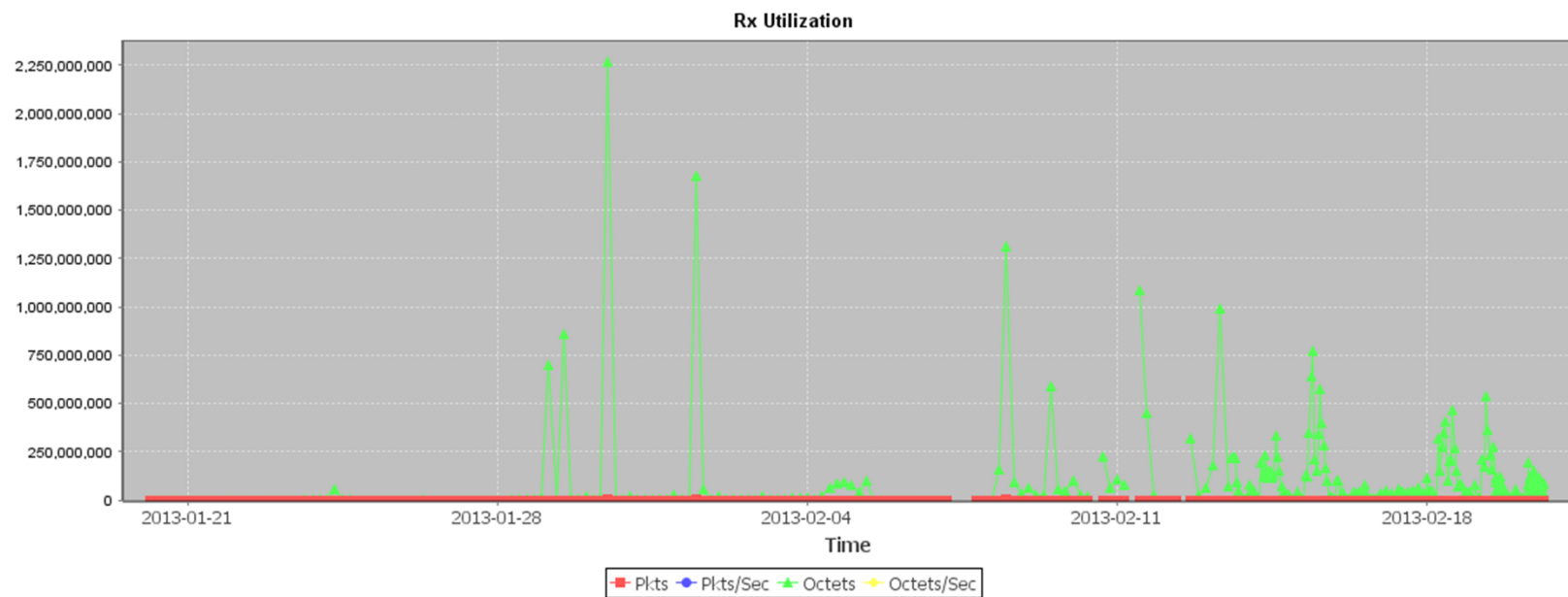


- Utilization for lambda services can easily be reported compare to LMS.
- Reporting generally far superior with DNA

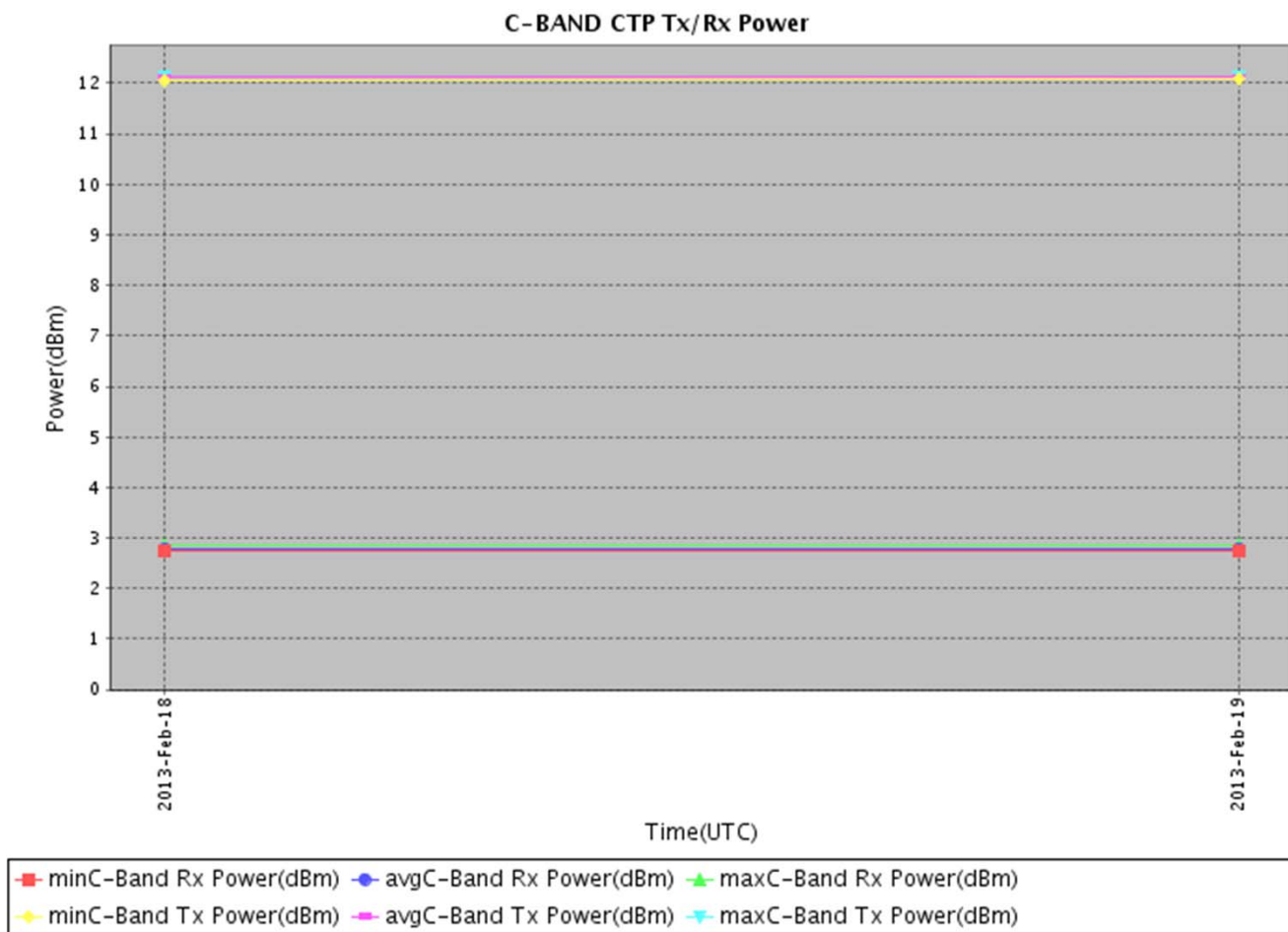
Real Time Ethernet Utilization Graphs On All Client Ports



Real Time Octet/Pkt Graphs On All Client Ports



Real Time Availability Graphs On All Ports Client and Line



Real Time Physical Properties Reporting On All Ports Client and Line



Trib Client Properties for 1-A-2-T7-1 on GEN01-DTNX10-1

Summary

Label:

Circuit ID: 1360763424.MA4012391682.0.1.1.2.7.1:bud-gen_LHC_CERN-NIIF_12014C

State:

General Protection State Real Time PM 15 Minute History 24 Hour History GMPLS UNI PM Chart

Analog Statistics	15:53:27 Initial Value	15:53:42 Last Value	5-Seconds Delta
Optical Power Received 1 (dBm,dBm,dB)	0.91	0.91	0.00
Optical Power Transmitted 1 (dBm,dBm,dB)	1.40	1.40	0.00
Laser Bias Current 1 (mA,mA,mA)	66.65	66.40	-0.12
Optical Power Received 2 (dBm,dBm,dB)	0.48	0.48	0.00
Optical Power Transmitted 2 (dBm,dBm,dB)	1.90	1.56	0.00
Laser Bias Current 2 (mA,mA,mA)	66.65	66.77	-0.12
Optical Power Received 3 (dBm,dBm,dB)	1.18	1.18	0.00
Optical Power Transmitted 3 (dBm,dBm,dB)	1.97	1.86	0.04
Laser Bias Current 3 (mA,mA,mA)	67.14	67.14	-0.12
Optical Power Received 4 (dBm,dBm,dB)	1.30	1.29	0.00
Optical Power Transmitted 4 (dBm,dBm,dB)	2.74	2.66	-0.07
Laser Bias Current 4 (mA,mA,mA)	66.77	66.53	-0.37
Optical Power Received 5 (dBm,dBm,dB)	1.26	1.26	0.00
Optical Power Transmitted 5 (dBm,dBm,dB)	2.40	2.47	-0.03
Laser Bias Current 5 (mA,mA,mA)	60.30	60.18	-0.12
Optical Power Received 6 (dBm,dBm,dB)	0.55	0.55	0.00
Optical Power Transmitted 6 (dBm,dBm,dB)	2.39	2.47	0.08
Laser Bias Current 6 (mA,mA,mA)	64.82	64.82	0.37
Optical Power Received 7 (dBm,dBm,dB)	1.50	1.51	0.00
Optical Power Transmitted 7 (dBm,dBm,dB)	1.53	1.38	0.21
Laser Bias Current 7 (mA,mA,mA)	66.28	67.26	0.98
Optical Power Received 8 (dBm,dBm,dB)	1.02	1.02	0.00
Optical Power Transmitted 8 (dBm,dBm,dB)	2.07	1.92	0.08
Laser Bias Current 8 (mA,mA,mA)	66.16	66.28	0.00
Optical Power Received 9 (dBm,dBm,dB)	-0.14	-0.13	0.01
Optical Power Transmitted 9 (dBm,dBm,dB)	1.48	1.16	-0.06
Laser Bias Current 9 (mA,mA,mA)	66.28	66.77	0.24

Local Reset Refresh Interval 5-Seconds

Apply Close Help

- Ease of Service Provisioning
 - A few clicks compared to hardware changes
 - i.e. LANPHY/WANPHY software change
- INFINERA solution makes service provisioning simple, enabling the Implementation team to deliver more.
- Pre-cabling and capacity in place for some time into the future
 - Less site visits
 - Better delivery times due software provisioning of capacity
 - Green field sites offered DB clean up

DCN – Management Network



- DCN is simpler now as all the INFINERA kit is IP aware unlike ALCATEL
 - where we needed to create OSI over IP tunnels to manage the DWDM nodes. This also means we were maintaining cisco routers as dedicated OSI router.
- With INFINERA, we created a VRF for the DCN, making it simpler to manage using standard IP connectivity.
 - Downside is that DCN is 'in-band'
 - Cost of going out of band was prohibitive
 - There is an out of band access to most equipment though

Protection and Restoration



- We are now able to re-route services either manually or automatically with the INFINERA solution. This was not possible with the ALU.
- INFINERA solution makes circuit re-routing simple, enabling the OC to expend time with other pro-active tasks.

Outcomes



- 'Network' driven OSS systems required some development but not huge
- Transmission network is 'a generation' leap ahead of previous technology
- Fault isolation and identification is far simpler
- The system is probably more intuitive meaning cross discipline 1st or second line engineers are more able to use it
- Newer technology – more robust transport – currently we see far fewer failures to date
- New vendor support – fresh relationship – improvements
- Better reporting and visibility into services provided
- Faster provisioning and fault identification
- More stable NMS

- Can the network become your OSS?
- Will OC staff become de-skilled and too reliant on vendor?
- G-MPLS – self healing
 - vs
- Protection switching scope and cost
 - Vs
- MPLS fast re-route
 - Vs
- IP re-routing
- Beyond 100G.....