Carrier SDN and the Evolution of Network Service Management

• Carsten Collatz, regional PLM EMEA
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Agenda

New 5620 SAM Features in SAM 14.0
• VNF Management
• Enhancements to VSAP
• New Web App Network Supervision
• New Web App Golden Configuration
• New Web App ESM Dashboard for BNG
• Enhancements to Service Supervision (IGP Map, Event Timeline)
• Analytics Server for Appl. Assurance and Network/Service Level Reports (NSP 17.0)

Nokia Portfolio for NFV Management
Network Service Platform (NSP)
NSM Portfolio Updates in 2017
5620 SAM Product Update
Platform, Service and VNF Features
Platform Features

- Installation through RPM
  - Plan to support QCOW image delivery in 2017
- Supporting Aux DB on HP Vertica for Big Data / Analytics
- RHEL 6.7 (and later 6.x releases, when required through patches)
  - RHEL 7 is planned for SAM 15.0
  - KVM as part of RHEL is supported for virtualization
- JBoss EAP 6.2 (improved Security features to handle DoS attacks)
- VMware ESXi 5.x and 6.0
  - Use Fiberchannel over 8G or iSCSI over 10G for SAN access
- Client: Windows 7, 8, 8.1
  - Windows 10 support tested for 14.0R7 (quick check for 14.0R5 revealed no issues)
New License Model - License Points for all Network Elements

- Continue to license based on the network size
- Network size to be represented in license points
- License points will be allocated to actively managed MDAs, IMMs, Cards, Chassis/Network Elements, VNF
- All license points in SAM are the same, regardless of the managed domain
- All license points will be priced at the same € amount
- Total value of the Classic and Premium Suites will be derived based on the total number of LP
- License points will be priced differently per Software Suite: Classic and Premium
- All LP calculations will be based in Euro currency
5620 SAM 14.0 VNF Management

General Strategy

- Provide VNF LCM function that adhere to ESTI NFV approach to orchestrate VNF instantiation, scaling, healing and updates
- Extend EMS FCAPS functions to the VNFs and provide VNF monitoring across the virtual infrastructure

VNF Manager (later to be covered by CBAM)

- Instantiate VNF
- Automate VNF commissioning
  - Instantiation, Scaling
- Restful API for NFVO

VNF Monitoring

- Provide general monitoring and troubleshooting GUI
- Visualize the VNF/VNFC and their KPIs and KCI
VNS – Virtualized Network Services
A new way of working

Network services “App Store” customer portal

Data center

Operator network

Customer portal

Select VNS service

Order branch equipment

Network services catalog

VNS

VSD

VSC

Network services Gateway
NSG-P & NSG-V
VSAP Operational Excellence
MODERN FCAPS AND ROUTE ANALYTICS FOR SDN / DATA-CENTER

Based on proven 5620 SAM and 5650 CPAM core with a new technology evolution for SDN networking

550+ SERVICE PROVIDER DEPLOYMENTS

5620 SAM
OVER A DECADE OF EXPERIENCE

RE IMAGINED FOR SDN / DATA-CENTER ENVIRONMENT

NEW
Next Generation fault correlation

NEW
BGP events historical correlation to overlay events

NEW
SDN Abstraction Focused

Based on CPAM
VSAP Fault Correlation (Alarms)

- Graphical view of alarms and faults in the network
- Alarm correlation for root cause analysis
- Remedial action for expediting problem resolution
5620 SAM Product Update
GUI Enhancements
Service Supervision Enhancements – OAM Tests On Demand

• On demand layer 2 CFM tests from selecting SAPs on a given service
• OAM Test failure KPI gets triggered on failure

Integrated additional troubleshooting tools.
Service Supervision Enhancements – Event Timeline
Event logging history on all service related objects

- Show config, alarm, state change, OAM test failure related events mapped on timeline
- Also available in the context of an active alarm on a service

Predictive Analysis & Enhanced troubleshooting tools to quickly identify culprits.
5620 SAM Product Update
Tools (Golden Config, ESM Dashboard)
Display Snapshot using Sunburst Chart

Summary of the Node configuration such as number of Services, node type

List of Snapshots

Create new Snapshot

Node IP Address

Audit Snapshots

Sunburst Chart to display the content of the Snapshot
When clicked on, each tile flips over to show detailed KPIs and set thresholds.

Hover over to get an icon for more KPI details, Alarms, and a KPI Plotter.

Alarm View: List View, Hierarchical View, RCA View, Alarm Stats Distribution by severity

KPI Plotter: Pick the KPI of choice and see its plot. Zoom into specific time durations for a more granular look.
5620 SAM Product Update
SAM Analytics
SAM Analytics Architecture

Additional Aux Server for more data collection
- Big Data Cluster for increased storage and retention
- Analytics Server for Customized Reporting

Introduced with SAM 14.0R1 in 2016
Replacing functionality of 5670 RAM for AA Reporting
Adding Network/Service Level reporting
SAM Analytics Web Application

- Save the report in a variety of formats
- Modify input prompts for further data analysis
- Change chart type
- Navigation for multi-page reports
Network and Service Level Reports (beta in SAM 14.0R5)

- **Y.1731 Two-way Delay**
  - Report on latency and jitter based on OAM test results
  - Highlighting applied per forwarding class where latency and/or packet loss exceed thresholds
    - ORANGE - when Maximum RTD double or more the Average RTD
    - YELLOW - Loss is greater than 0%
    - RED - Loss exceeds 5%
  - Results from SAM DB initially
- **Use case:**
  - QoS Analysis - identify potential service impacting issues based on thresholds for latency, jitter and packet loss
Nokia Portfolio for NFV Management
Nokia Portfolio – EPC and other VNF

5620 Service Aware Manager (SAM)
End-to-end service-aware IP network manager

9471 Wireless Mobility Manager (WMM)
- 2G/3G/4G SGSN
- LTE MME
- Combo SGSN/MME
- Virtual WMM (VMM)
- Evolving to Cloud MM (cMM)

7750 Service Router Mobile Gateway
- Next-gen GGSN (2G/3G/4G)
- LTE SGW
- LTE PGW
- LTE PGW/GGSN
- SGW/PGW/GGSN
- ePDG
- TWAG
- Virtual MG (VMG)
- Evolving to Cloud MG (cMG)

7750 VSR
- VSR-PE, VSR-BNG and VSR-WFGW,
- VSR-LNS and VSR-vRGW with value added services VSR-AA, VSR-IPSEC and VSR-NAT

NetAct

CBAM for VNFM
INTEGRATED, E2E NETWORK MANAGEMENT FOR MOBILE NETWORKS

Common hardware
Common northbound API

Single Sign-On
Application cross usage

5620 SAM

NetAct

Integration
Integration

Mobile Backhaul
EPC
Mobile Radio Access
Mobile Core

IP Edge
IP Core
MBH
Microwave
S/P GW SGSN
EPDG
MME/GGSN
SC Femto
2G
3G
LTE
SRAN
WiFi
5G
SC Pico
IMS
SDM
MSS
VoLTE
VSR and EPC VNF management: Solution architecture
5620 SAM (with VNFM in 2016) + CloudBand Application Manager (CBAM)
Network Service Platform (NSP) Product Update
Comparing traditional vs. cloud era networks

<table>
<thead>
<tr>
<th>Traditional networks</th>
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<tbody>
<tr>
<td><strong>Network infrastructure</strong></td>
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<tr>
<td>• Static demands/services</td>
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<tr>
<td>• Underutilized network infrastructure</td>
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<tr>
<td>• Physical network functions</td>
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<tr>
<td><strong>Network management toolbox</strong></td>
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<tr>
<td>• Single vendor</td>
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<tr>
<td>• Domain silos</td>
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<tr>
<td>• Manual workflows</td>
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<tr>
<td><strong>Northbound interfaces</strong></td>
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<tr>
<td>• Proprietary device/service models</td>
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<tr>
<td>• Detailed/rich object models</td>
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<tr>
<td>• APIs to traditional BSSs/OSSs</td>
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<tr>
<td><strong>Network infrastructure</strong></td>
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<tr>
<td>• Unpredictable traffic patterns/dynamic services</td>
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<td>• Optimized network infrastructure</td>
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<tr>
<td>• Virtual &amp; physical network functions</td>
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<td><strong>Network management toolbox</strong></td>
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<tr>
<td>• Multi-vendor/Multi-layer/NFV-aware</td>
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<tr>
<td>• Service provisioning automation &amp; simplification</td>
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<td>• Network resource control</td>
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<td><strong>Northbound interfaces</strong></td>
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<td>• Abstract YANG models</td>
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<tr>
<td>• REST/RESTconf APIs</td>
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<td>• APIs to NG OSS/Service Orchestrators</td>
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Evolution?
Why NSP? Carrier SDN use cases
Service automation and network optimization

BoD/calendaring
Network slicing
Value-added services

Greater resilience
Unlock stranded bandwidth
Dynamically tune network

The cloud-based applications that dominate network traffic have no permanent location or duration.

Bell Labs research shows that operators are also able to support 24% more revenue-generating traffic by using sophisticated algorithms to intelligently distribute new connections across their network.
The NSP functional blocks - WAN automation and resource optimization

Path placement and optimization
- In-line, multi-domain, inter-layer path computation and creation
- Real-time topology and analytics-triggered network optimization
- Flow placement and control

Service fullfilment
- Policy-based mapping of service abstractions to detailed provisioning templates
- Intelligent service instantiation optimizes customer experience and network utilization
NSM Portfolio Update
Outlook to 2017
NSM portfolio strategic decisions
ONE NSP product, multiple modules!

• Architectural harmonization
  - SAM, OMS and NSP become different modules of a single product
  - Modules can run autonomously, no need to have all installed

• Branding
  - Use the name NSP for the entire solution

• Key focus areas
  - Automation, optimization, workflow orientation
  - Industry leading IP and Optical Network Managers evolving from 1350 OMS & 5620 SAM
  - Complete, streamlined solution for integrated IP & Optical management where SDN fulfilment functions are complemented by IP multi-vendor and optical assurance functions from SAM and OMS
What’s in it for you?

<table>
<thead>
<tr>
<th></th>
<th>Optical</th>
<th>IP/Optical</th>
<th>IP/MPLS</th>
<th>Carrier SDN</th>
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<tbody>
<tr>
<td>Everything you loved about OMS...</td>
<td>Full Optics portfolio support (inc. legacy)</td>
<td>Everything you loved about SAM...</td>
<td>Everything you like about NSD/NRC...</td>
<td></td>
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<tr>
<td>+ new apps (FM, SS, NS...)</td>
<td>+ unified IP/optical management</td>
<td>+ seamless evolution path to SDN</td>
<td>+ dynamic multi-vendor service assurance capabilities</td>
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Opex reduction, unified management

New revenue enablers, agility & control

Unified NSP portfolio
Leveraging 5620 Assurance apps for SDN and Optical Management

Common assurance applications

Network Supervision
Service Supervision
Analytics & Reporting
Fault Management

KPI, analytics, correlation engines

- Initial NSP release will include common Fault Management across both Optical and Packet infrastructure managers (OMS / SAM), replacing legacy ALMAP application in OMS.
- Optical capabilities in the Supervision and Analytics applications will follow in later releases.
Reference Architecture Example: Standard IP Network Management (fSAM)
Non relevant modules are greyed out
Key takeaways

SAM evolution to NSP 17:
- Enables self-paced path to carrier SDN
- Enables IP + Optical integration
- Preserves current investment in SAM
- Takes assurance/analytics to the SDN era
- Changes nothing – if you don’t want it to

NSP “17” – target 1Q2017