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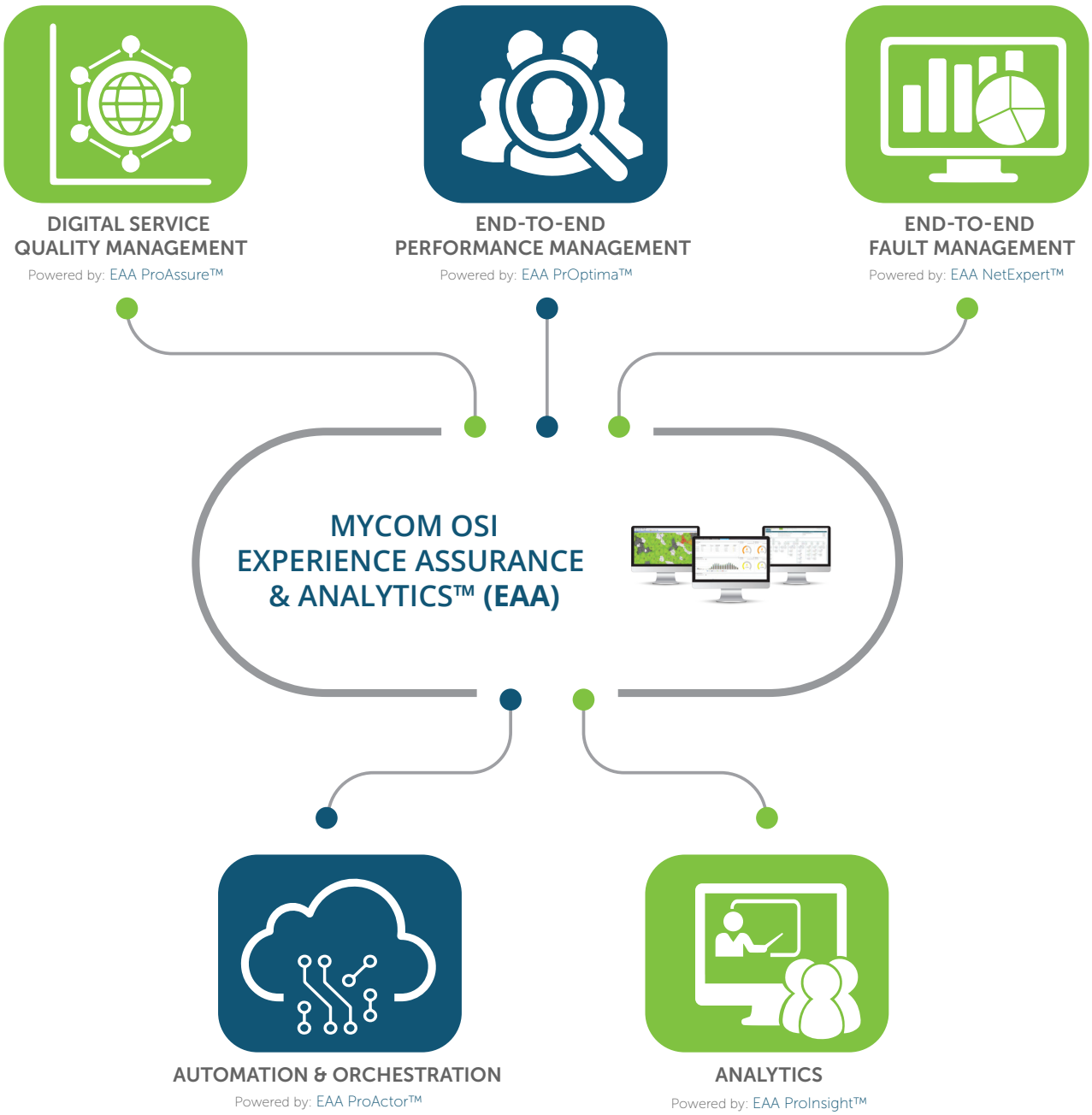
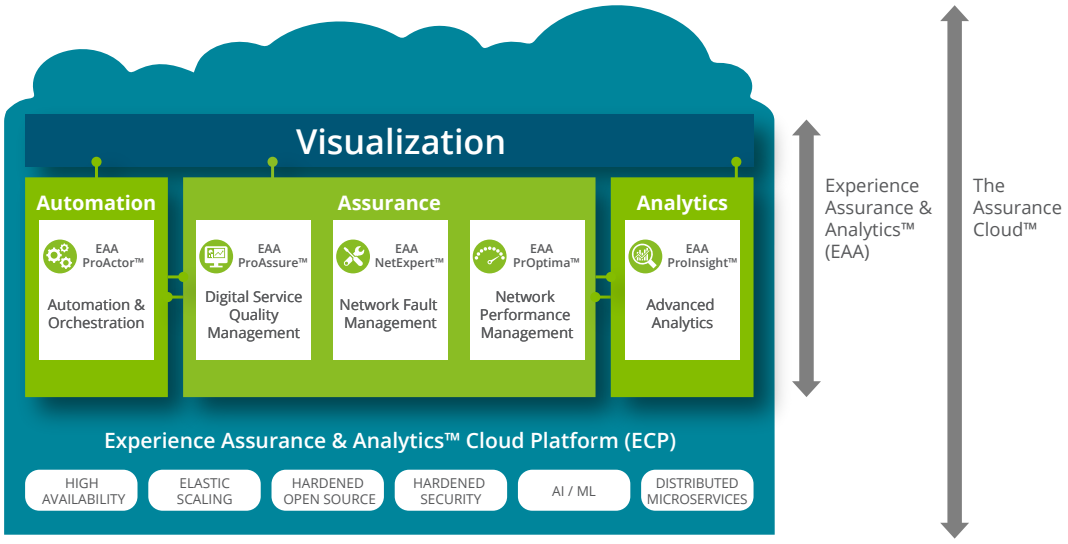
eBook : How to Assure Quality and Performance of your Network and Services

39 Service Assurance Use Cases



INTRODUCTION

This eBook describes 39 use cases deployable with MYCOM OSI's customers using MYCOM OSI's Experience Assurance & Analytics™ (EAA) suite of applications to achieve measurable benefits and address specific business requirements. They span a wide spectrum of scenarios but share a common theme; in every case, advanced service assurance is the core capability that enabled the specific benefits.



MYCOM OSI's Experience Assurance & Analytics™ (EAA) is an integrated, comprehensive suite of 5 core applications, enabling Communications Service Providers (CSPs) to manage network, service quality and performance – not only of the underlying network, but also the digital experiences of customers. EAA is deployed across global Tier 1 CSPs as individual or integrated deployments to deliver on a broad range of service assurance requirements for CSPs. Today, many of the world's largest CSPs use MYCOM OSI's EAA suite to manage the experiences of enterprise customers and over 2 billion subscribers.

The core applications within EAA are shown in the above diagram, and include:

- MYCOM OSI EAA ProAssure™ - Digital Service Quality Management
- MYCOM OSI EAA PrOptima™ - Network Performance Management
- MYCOM OSI EAA NetExpert™ - Network Fault Management
- MYCOM OSI EAA ProActor™ - Automation & Orchestration
- MYCOM OSI EAA ProInsight™ - Advanced Analytics

The Experience Assurance & Analytics™ Cloud Platform (ECP) is the virtualization platform that hosts EAA applications on private and public clouds. It enables infrastructure independence, leverages a wide range of open-source technologies and provides unified data management and services to EAA applications.

MYCOM OSI's Assurance Cloud™, announced at Mobile World Congress in February 2019, is the world's first carrier-grade service assurance Software-as-a-Service (SaaS) offering that enables CSPs to deploy MYCOM OSI's EAA suite of applications and its catalogue of digital transformation solutions from the public cloud within a subscription commercial model.

THE DEPLOYMENT MODELS OF THE USE CASES DESCRIBED IN THIS DOCUMENT

The 39 use cases described in this eBook are implementations of either The Assurance Cloud™ (on public cloud) or one or more EAA applications running on private cloud, virtual machines or bare metal infrastructure. All use cases can be realized by the MYCOM OSI Assurance Cloud™.

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USE CASE
Troubleshooting mobile network signaling message floods

CUSTOMER SITUATION

One of the world's major mobile operators experienced long outages over a large metropolitan area — and resulting customer complaints — two Fridays in a row. About 3 million failed Location Area Updates (LAUs) were generated each day and one cell had 82,000 failed LAUs out of 84,000 update attempts. Because of the large number of customers affected, rapid restoration of service was critical.

The operator immediately used its MYCOM OSI EAA PrOptima™ performance management solution to explore the alarms and troubleshoot the problem. EAA PrOptima™ was installed when they began a major project to replace vendors for their radio and packet-switched core networks. Important criteria in their choice of EAA PrOptima™ were its converged multi-vendor and multi-system (radio, circuit and packet core networks) capabilities, combined with flexible, out-of-the-box KPIs and reporting – all at a lower Total Cost of Ownership than their previous performance management system.

SOLUTION

Once customers began to report problems the operator used EAA PrOptima™ to analyze the trouble tickets and to view location information with its Geographical Information System (GIS) capabilities to zero in on the cells that were most likely causing the problem.

Troubleshooting report such as KPIs, Top N and performance comparisons with previous Fridays were used to identify the cells with degrading performance. Capacity and performance management data were also used to further analyze the behavior of the suspect cells. At any point in the analysis the user could drill down with a single click to gather details about the cell or perform on-the-fly computations.

The troubleshooting analysis determined that the failures were coming from 2G signaling problems in the circuit-switched core network and that the radio network was not implicated.

To understand how the outage had affected the radio interface, MYCOM OSI out-of-the-box KPIs for analyzing Location Area Update (LAU) problems were generated and shown graphically using GIS for each Base Station Controller (BSC). The graphs showed clearly that LAU messages had spiked during the outage period for one Base Station Controller.

To determine if specific cells were the major contributors, the BSC data were drilled down to the cell level. The worst 70 cells by failed LAU were selected and forwarded to the GIS module for visual analysis. The map showed the majority of the error cells were located and concentrated in a specific metro-geographic area, where the majority of the customer trouble tickets had originated.

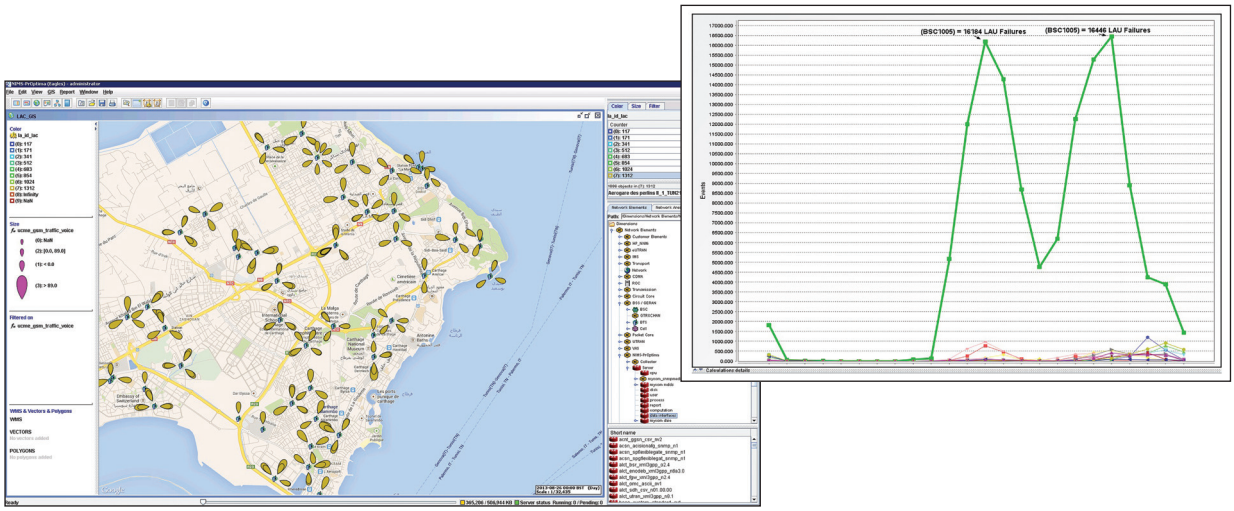
BENEFITS

- Near real-time monitoring, alarming, reporting and network diagnostics
- Billions of data points processed per hour
- Automated data analysis to detect complex performance degradations
- Automated workflows and issue resolution processes
- Multi-vendor, multi-technology, multi-domain
- Unified, end-to-end fault, configuration, performance and trouble ticket processing
- Powerful, integrated GIS capabilities
- Flexible, out-of-the-box KPIs and reports aligned to workflow processes

QUICK FACTS

- **Customer:** European mobile operator with >3 million mobile customer base
- **MYCOM OSI solutions:** EAA PrOptima™
- **Domains:** RAN, circuit-switched core, packet-switched core, ePC, VAS, IMS
- **Technologies:** GSM, UMTS, LTE
- **Vendor equipment:** NSN, Ericsson, Cisco, Huawei

Information sent to the operator's deep packet inspection system enabled determination of the International Mobile Subscriber Identity (IMSI) numbers of the terminals causing the problem. Upon further exploration it was determined that the terminals were M2M power meters connected to a service provider who had gone out of business. The IMSIs had been deleted from the Home Location Register (HLR) but the SIM cards had not been removed from the terminals, so they continued to send LAUs that were then rejected by the HLR. About 3 million failed LAU were generated per day, causing a spike in HLR signaling failures.



RESULTS

The EAA PrOptima™ powerful GIS module capabilities, the robust and flexible reporting and the readily available KPIs enabled the operator to troubleshoot and resolve a major and complex customer-impacting outage in about 10 minutes. The analysis and root cause determination would not have been possible with their legacy network performance management system.

The EAA PrOptima™ alarm module provided near-real time monitoring and automatic notification of the network performance degradation. Complex multi-conditional algorithms ensured that only the relevant alarms were triggered and forwarded. Good KPIs and reports that support the operator work processes are critical, since they have more than 3.5 million network elements and store data up to 700 days.

EAA PrOptima™ performance management unifies fault, configuration, performance, and trouble ticketing information from all sources on an end-to-end basis, independent of vendor, technology or domain. This enabled the operator to achieve rapid problem detection, notification and isolation, comprehensive diagnostics and root cause analysis, and closed-loop decision support process automation.

EAA PrOptima™ automatically processes terabytes of performance management data in near real-time, has advanced correlation, analysis, reporting and visualization modules, and has highly flexible automation, workflow and configuration capabilities.

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USE CASE
Proactively managing end-to-end 2G/3G/4G RAN health

CUSTOMER SITUATION

A European mobile operator was experiencing Radio Access Network quality issues and problem resolution times that exceeded its business and customer experience objectives. In addition, business operating expense (Opex) cuts resulted in a reduction of staff. So the operator was challenged to radically improve its level of service but with fewer resources available to accomplish this business imperative.

The operator had deployed disparate performance management systems over time as the network evolved and as new technologies and equipment vendors were introduced. Performance data from these systems were not harmonized and therefore could not be integrated into an end-to-end view. In addition, the data were not available until the next day, which delayed problem identification and root cause analysis. Proactive network health monitoring was not feasible.

When the operator undertook the project to replace its entire radio access and core mobile network infrastructure with new vendor equipment, it also took the opportunity to upgrade its legacy network performance management system to MYCOM OSI EAA PrOptima™. They were now able to manage proactively their business objectives across multiple vendors and networks — all at a lower Total Cost of Ownership (TCO).

SOLUTION

With EAA PrOptima™, performance data across all technologies and equipment vendors are collected and harmonized into a single system and immediately made available to operations and engineering teams. The operator used EAA PrOptima™ to monitor the health of its network on a routine basis, to prioritize remediation actions and to perform sophisticated correlation, trending and analysis that could pre-empt performance problems.

As part of the operator's daily network health monitoring process, operations engineers received a scheduled report every morning. This report, based on custom-defined health indexes that the operator created from weighted Key Performance Indicators (KPIs), identified, by region, the worst performing elements in their network. By using the health index report the operations team could prioritize their actions to maximize impact and service improvement. They were able to analyze the problem, perform root cause analysis and determine a path to resolution by clicking on specific problem areas and drilling down to performance details, GIS maps and other reports — all provided in context and updated automatically.

The operator used the EAA PrOptima™ extremely powerful capabilities to analyze trends by using custom-defined time functions and formulas to compare current data with previous time periods. Because EAA PrOptima™ stores all data as part of its collection mechanism, the engineers were able to navigate to any historical time period without having to define the report in advance of importing data.

BENEFITS

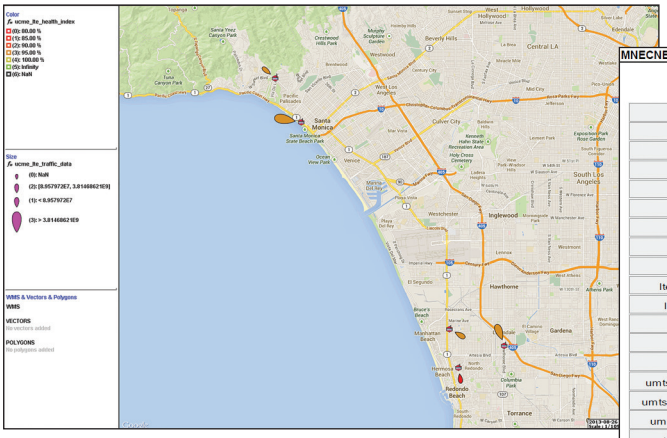
- End-to-end view and analysis on a unified platform
- Harmonized data across multiple domains, technologies and vendors
- Near real-time monitoring, alarming, reporting and diagnostics
- Automated data analysis to proactively identify incipient problems
- Flexible KPIs, analysis and reporting aligned to customer workflows
- Powerful, integrated GIS capabilities
- Billions of data points processed per hour

QUICK FACTS

- **Customer:** European mobile operator with 20+ million customers and 3+ million network elements
- **MYCOM OSI solutions:** EAA PrOptima™
- **Domains:** RAN, circuit-switched core, packet-switched core, evolved packet core, transmission network, VAS
- **Technologies:** GSM, UMTS, LTE
- **Vendor equipment:** NSN, Ericsson, Cisco, Huawei, ZTE, Alcatel-Lucent

Throughout the day the operator took advantage of flexible, out-of-the-box KPIs and reporting capabilities to perform proactive monitoring. Near real-time KPIs are computed continuously and mapped to pre-defined threshold alarm functions to automatically identify trends symptomatic of performance issues. The operator defined sophisticated threshold functions and correlations to deliver effective and efficient automated, proactive network intelligence.

Results were provided in dashboards that enabled visualization of network health and business metrics end-to-end, including not only performance but also fault and capacity management data. The dashboards make it easy for engineers or executives to interpret and, if necessary, make necessary configuration modifications to network resources.



MNECNEL: iRAT_Cluster3

	25 Aug 13	26 Aug 13	27 Aug 13	28 Aug 13	29 Aug 13	30 Aug 13	31 Aug 13
Cells Per Cluster	1267	1267	1267	1267	1267	1267	1267
traffic_data	819.42 GB	1.876 TB	1.823 TB	1.882 TB	2.163 TB	2.333 TB	819.42 GB
accessibility_data	97.20 %	97.06 %	98.51 %	98.26 %	98.38 %	98.13 %	97.20 %
retainability_data	99.49 %	99.52 %	99.49 %	99.46 %	99.47 %	99.48 %	99.49 %
traffic_voice	377.74 E	11010.95 E	16885.57 E	17833.40 E	13235.36 E	17798.25 E	600.14 E
accessibility_voice	99.80 %	99.78 %	99.71 %	99.49 %	99.76 %	99.77 %	99.80 %
retainability_voice	99.80 %	99.78 %	99.71 %	99.49 %	99.76 %	99.77 %	99.80 %
LTE_Cells	512	512	512	512	512	512	512
lte_traffic_data	748.37 GB	866.44 GB	949.30 GB	967.72 GB	1.163 TB	1.404 TB	748.37 GB
lte_accessibility_data	99.09 %	99.08 %	99.01 %	98.98 %	99.05 %	99.21 %	99.11 %
lte_retainability_data	99.87 %	99.86 %	99.82 %	99.81 %	99.77 %	99.80 %	99.87 %
UMTS_Cells	355	355	355	355	355	355	355
umts_traffic_data	70.67 GB	1011.17 GB	875.72 GB	913.34 GB	975.67 GB	900.53 GB	70.67 GB
umts_traffic_voice	91.46 E	9809.93 E	15466.27 E	16203.74 E	11572.42 E	16084.77 E	313.86 E
umts_accessibility_data	99.75%	99.66%	99.64%	99.59%	99.66%	99.69%	99.75%
umts_accessibility_voice	100.60%	99.83%	99.69%	99.33%	99.70%	99.76%	100.60%
umts_retainability_data	98.76%	98.63%	98.51%	98.44%	98.52%	98.52%	98.76%
umts_retainability_voice	99.62%	99.51%	99.46%	99.55%	99.50%	99.65%	99.62%
GSM_Cells	400	400	400	400	400	400	400
gsm_traffic_data	397.80 MB	43.60 GB	41.42 GB	45.69 GB	48.66 GB	50.67 GB	397.80 MB
gsm_accessibility_data	87.03 %	86.35 %	93.79 %	92.61 %	93.09 %	91.67 %	87.03 %
gsm_retainability_data	98.82 %	99.11 %	99.09 %	99.02 %	99.05 %	99.06 %	98.82 %
gsm_traffic_voice	286.28 E	1201.02 E	1419.30 E	1629.66 E	1662.93 E	1713.48 E	286.28 E
gsm_accessibility_voice	99.08 %	98.33 %	98.53 %	98.04 %	98.28 %	98.23 %	99.08 %
gsm_retainability_voice	99.01 %	98.19 %	97.85 %	97.63 %	98.01 %	98.41 %	99.01 %

RESULTS

Using EAA PrOptima™, the operator instituted a process to regularly monitor network health and resolve network resource-related problems with the highest priorities. Since EAA PrOptima™ provided detailed, aggregated network performance data across their entire network at intervals down to 5 minutes — as well as automated tools to analyze the situation — the operator was able to identify problems and troubleshoot them in less than an hour instead of the previous period of 24 hours or more. The result was reduced time-to-resolution, improved customer experience and improved business metrics, accessible all within one single unified performance management platform.

In addition, the operator used near real-time trending performance data and advanced analytics, to identify incipient problems before outages occurred and to provide valuable resource utilization data to capacity planners and optimization engineers, to ensure appropriate capacity is always available.

The unified, end-to-end dashboards summarizing network health in near real-time enabled the executive management team to have a clear and accurate understanding of the status of the business. The high level of automation and improved productivity provided by EAA PrOptima™ enabled the operator to create a comprehensive approach to managing its network health and performance while also reducing costs.

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USE CASE
Simplifying RAN optimization for successful LTE deployments

CUSTOMER SITUATION

To accommodate a rapid growth in mobile broadband data usage and subscribers, a major mobile operator was accelerating its Long Term Evolution (LTE) coverage with new deployments as well as optical carrier adds. The new networks needed to be turned on quickly and with optimum performance while making efficient use of network and human resources. From a customer service perspective it was critical to maintain service quality before, during, and after the launches took place. This was challenging because of LTE's complexity, the rapid pace of deployments and limited staff.

The operator chose the MYCOM OSI EAA PrOptima™ performance management solution to ensure quality throughout the LTE network launches. Once live, EAA PrOptima™ continuously monitored the Radio Access Network (RAN) performance, capacity and quality.

Important criteria in the operator's decision to choose EAA PrOptima™ were its converged multi-vendor, multi-system (radio, circuit and packet core networks) and cross-domain capabilities that integrated fault, performance and configuration management data. Essential to rapid and accurate deployments were its flexible, out-of-the-box Key Performance Indicators (KPIs) and reports and powerful analysis and correlation features.

SOLUTION

EAA PrOptima™ provided critical insights and analyses to network engineering and optimization departments, capacity planning and infrastructure rollout teams, and network service operations centres. Because of its flexibility and embedded LTE capabilities, it became an essential tool to optimize the LTE network before and after launch. Then, on an ongoing basis the networks were monitored continuously and optimized as needed for performance stability and capacity utilization.

EAA PrOptima™ was used for coverage, resource allocation and quality assurance engineering activities such as:

- Pre- and post-launch optimization
- Macro and cluster optimization
- Carrier tuning
- Hotspot and worst cell detection
- Localization of degraded cells
- Handover and neighbor list optimization
- Parameter optimization and audits
- Capacity, traffic balancing and expansion analysis

BENEFITS

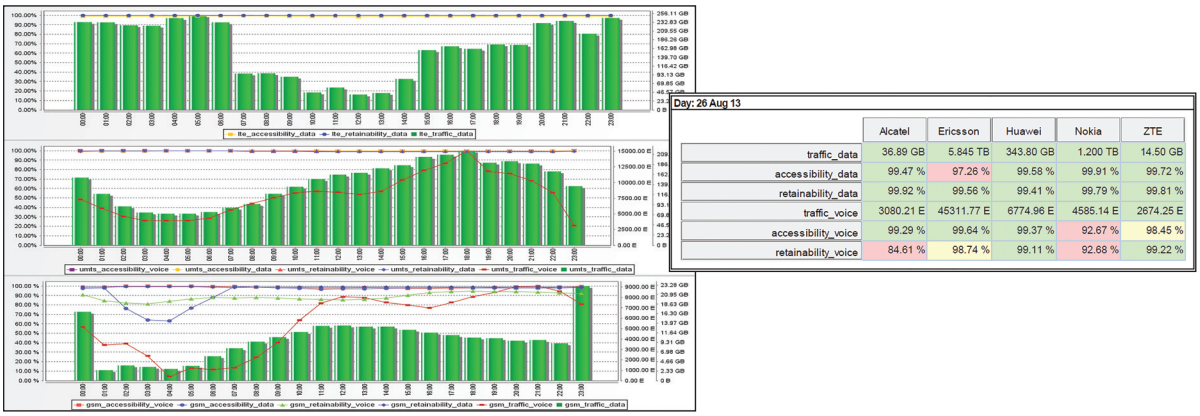
- Integrated performance, fault and configuration management
- Improved efficiency through manual and automated workflows
- Flexible, out-of-the-box KPIs and reports aligned to workflow processes
- Advanced, automated correlation, analysis, reporting and visualization capabilities
- Powerful, integrated GIS capabilities

QUICK FACTS

- **Customer:** European mobile operator, mobile subscriber base >3 million
- **MYCOM OSI solutions:** EAA PrOptima™
- **Domains:** RAN, circuit-switched core, packet-switched core, ePC, VAS, IMS
- **Technologies:** GSM, UMTS, LTE
- **Vendor equipment:** NSN, Ericsson, Cisco, Huawei

The operator depended upon guided diagnostics — automated and embedded business processes within decision trees that are triggered for manual or automatic network modifications. The underlying powerful decision support system automatically performed calculations on terabytes of performance data to identify underperforming or degraded network elements and then suggest actions for resolution. Automated root cause analysis helped to initiate immediate corrective action and ensured optimum performance through pre- and post-launch activities, network audits and on-going network optimization. This focus on intelligent automation enabled staff to dramatically increase productivity and ensured consistency and quality in the resulting actions.

For LTE pre-launch tuning, the operator initiated automatic LTE parameter audits that included recurring comparisons to standard parameter values and resulted in the automatic generation of command files. The EAA PrOptima™ underlying decision support system automatically performed calculations to create accurate script files and logs. Physical cell Identifier (PCI) collision conflicts were detected including potentially confusing situations. Because EAA PrOptima™ integrates fault management it detected active fault alarms at the eCell and eNodeB levels and then suggested actions for resolution or, as desired, automatically made the changes required.



Day: 26 Aug 13

	Alcatel	Ericsson	Huawei	Nokia	ZTE
traffic_data	36.89 GB	5.845 TB	343.80 GB	1.200 TB	14.50 GB
accessibility_data	99.47 %	97.26 %	99.58 %	99.91 %	99.72 %
retainability_data	99.92 %	99.56 %	99.41 %	99.79 %	99.81 %
traffic_voice	3080.21 E	45311.77 E	6774.96 E	4585.14 E	2674.25 E
accessibility_voice	99.29 %	99.64 %	99.37 %	92.67 %	98.45 %
retainability_voice	84.61 %	98.74 %	99.11 %	92.68 %	99.22 %

An important part of post-launch optimization included LTE health index alerting and troubleshooting. The user could quickly open an out-of-the-box report on the health of an eCell. The health index is a composite index metric constructed from key LTE performance indicators such as accessibility, retainability, availability and throughput. Root cause analysis can be performed with ease since EAA PrOptima™ correlates fault and configuration data with performance data. It analyzes, diagnoses and correlates health index KPI values with historical configuration changes and active fault alarms. Health index alerting report results can be mapped using the GIS feature for easy analysis or with graphs and tables for deep diagnosis and drill-down at the click of a mouse.

EAA PrOptima™ automatically troubleshoots the LTE handover process including decision, preparation and execution while navigating from the eCell to neighbors and target cells and then suggesting resolution actions. Intra-LTE handover troubleshooting can be performed up to the Mobility Management Entity (MME) and across domains
(RAN, Core). When site outages occur, the system can perform auto-recovery and self-healing to resolve the problem.

To identify degraded cells, guided diagnostics calculated network health KPIs that were aggregated for all technologies, by vendor. The KPI formula editor then enabled the user to shape the data to fit their reporting needs, such as the percentage of cells by vendor for LTE, UMTS, and GSM. Trend charts and reports were then aggregated hourly by LTE, UMTS, and GSM technologies, sorted and filtered highlighting the lowest-performing cells — including “sleeping cells” — and were then viewed on a GIS map for locating the problem area geographically. Alternate guided workflows could then be used to drill deeper into the causes for the degraded cell performance.

The MYCOM OSI out-of-the-box KPI formula definitions and performance reports enabled rapid adoption and incorporation into the operator’s work practices. The user-friendly formula editor, which accommodates multiple vendors and release versions, made it easy to update KPIs without modifying reports.

RESULTS

By providing near real-time visibility and analysis of performance, fault, and configuration data, the operator’s LTE networks were launched and operated at peak efficiency, delivering maximum capacity and with an excellent quality of service. From a staffing perspective, the EAA PrOptima™ automated root cause analysis and workflows increased productivity and enforced consistency.

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USE CASE
Managing network capacity to optimize performance and reduce Capex

CUSTOMER SITUATION

Mobile operators face customer churn and unnecessary capital expenditures if they do not manage, optimize and accurately forecast the capacity of their networks. This is especially true of Radio Access Networks (RANs) that are sensitive to customer behavioral trends such as adoption of mobile data and video, as well as time-sensitive and location-specific impacts on traffic such as large special events like conventions.

An operator's existing capacity planning approach consisted of multiple stand-alone vendor-based and technology-based solutions where the data were often out-of-date and not shared across the organization. In addition, workflow processes were ad hoc and the analysis and decision-making processes were largely manual. The result was consistently inaccurate forecasts that, "just to be safe", resulted in deployment of more capacity than was warranted or in less capacity than actually needed to maintain the customer expected quality of service. Inadequate analysis tools and lack of streamlined processes resulted in inefficient use of engineering staff and an increased operating expense.

The operator chose the MYCOM OSI EAA PrOptima™ unified performance management solution to manage, optimize and forecast the network capacity across multiple technologies, network domains and equipment vendors. Important factors in selecting EAA PrOptima™ were the ability to process very large volumes of performance management data in near real-time and the advanced, out-of-the box correlation, analysis, reporting and visualization modules that act on the imported data. It was essential that the system would simplify their capacity management tasks and provide more accurate forecasts. To accomplish this they needed highly flexible automation, workflow and configuration capabilities. An integrated system was desired to promote information sharing, consistency and accuracy across their traffic, capacity planning and radio optimization staff. It was important that the system provided scalability to meet the operator's needs now and in the future.

SOLUTION

EAA PrOptima™ was deployed to manage the capacity of the installed network resources, optimize its use and forecast and plan infrastructure growth — all from a single system. They use it for capacity planning of all domains including RAN, circuit-switched core, packet-switched core and value-added services. The system gathers very large volumes of network statistics from multiple data sources and provides powerful analytical tools and automation capabilities to help the operator quickly interpret and take action on the statistical data.

The operator used the advanced formula editor to create Key Performance Indicators (KPIs) and perform complex evaluations in near real-time across diverse vendors, technologies and software release versions. The KPIs were constructed using functions such as busy hour, busy hour values and time shifts. Capacity management reports and graphs were then built quickly with the easy-to-use drag-and-drop graphical interface.

BENEFITS

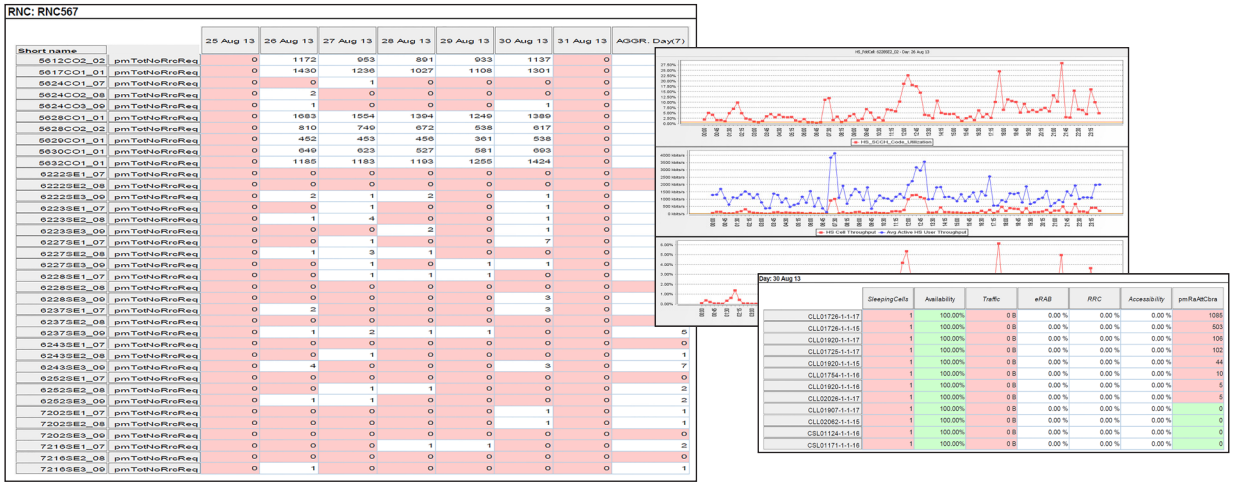
- Multi-vendor, multi-technology, multi-domain converged solution
- Billions of data points processed per hour
- Simplified, more automated capacity management
- Reduced capital expenses from powerful optimization and more accurate forecasts
- Flexible, out-of-the-box correlation, analysis, reports and visualization
- Highly flexible automation, workflow and configuration capabilities
- Scalability to meet the operator's needs now and in the future
- Information sharing, consistency and accuracy across organizations

QUICK FACTS

- **Customer:**
  European mobile operator with >3 million mobile customer base
- **MYCOM OSI solutions:**
  EAA PrOptima™
- **Domains:**
  RAN, circuit-switched core, packet-switched core, ePC, VAS, IMS
- **Technologies:**
  GSM, UMTS, LTE
- **Vendor equipment:**
  NSN, Ericsson, Cisco, Huawei

These capacity management reports display visually the results of advanced statistical and trend analyses and are used to automatically monitor busy hour traffic and air interface loads as well as to predict resource loading in near real-time.

Alerts when network resource utilization thresholds exceed acceptable levels are set up easily with the EAA PrOptima™ alarm module, which provides near real-time monitoring and automatic notification of performance degradation on any calculation within the solution. Multiple alarm evaluators including the complex multi-conditional algorithms process any type of calculation data, including raw counters, KPIs or alphanumeric attributes and ensure that only relevant alarms are triggered.



EAA PrOptima™ spans the capacity management lifecycle to help the operator ensure optimal utilization of existing network resources. It streamlines capacity management processes through powerful analyses, automation, resource utilization trending, automatic threshold breach detection and results presentation. EAA PrOptima™ computes capacity utilization indicators, network statistics, KPIs and complex statistical calculations, and provides intuitive statistical data visualization. The operator uses performance profiles to characterize element utilization, to monitor cells and sites weekly and to alert when an element's performance degrades. The profiles are derived automatically by analyzing historical performance data over a sliding or fixed period. Poorly performing elements are then evaluated to determine corrective actions. These candidates can be analysed further and any necessary capacity expansions ordered.

The operator uses the process automation module to capture best practices, to optimize site roll-outs, expansions and carrier additions and to automate initial analysis of degraded network elements. Automation capabilities are also used to monitor and automatically change resource configuration parameters to improve capacity. This is particularly useful for managing network capacity during special events, such as concerts or major sports events, where customer concentrations can easily cause traffic to exceed available capacity.

EAA PrOptima™ is highly scalable and uses near real-time network data to identify congestion severity and rank UTRAN cells and NodeBs to identify sites that require action. Scorecards identify the state of congestion over specific time periods using a weighted point system. GIS maps then localize congestion geographically. Automated root-cause analysis can initiate immediate corrective action. Resource load forecasting and planning is performed periodically to make decisions on network expansion budgets and investment priorities, such as when to order or expand NodeBs and RNCs, when to order backhaul E1/PTP expansions, IuB-PS roll-out priorities and when to add carriers. The operator uses EAA PrOptima™ to reduce forecasting complexity and improve accuracy by using actual historical data, market factors and expected resource and traffic growth in powerful regression calculations. They can then assess the impact on the utilization of the air interface, the NodeB channel elements, code and power, IuB, etc.

RESULTS

By managing capacity with near real-time data and making automatic network adjustments based on current conditions, the operator made more intelligent data-based decisions that improved customer service levels and avoided unnecessary network expansions. Advanced correlation, analysis, reporting and visualization modules, plus highly flexible automation, workflow and configuration capabilities increased staff efficiency and accuracy.

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USE CASE
Cost-effective management of shared RAN networks

CUSTOMER SITUATION

Pressured to meet financial targets in the midst of growing competition, an explosion of data traffic and LTE network build-outs, two mobile operators decided to share their Radio Access Network (RAN) assets and capacity. To reduce costs and improve efficiency these two European operators created a joint venture that would manage their overlapping national networks as two separate geographic areas while still maintaining national coverage. By reducing duplicate network assets and sharing investment and operational costs, both operators could improve profitability. Deploying LTE faster and providing better coverage, data rates and capacity also improved service quality.

In this RAN sharing arrangement each operator managed 2G, 3G, and 4G cells owned by the other operator: Operator 1 managed radio network resources, quality and maintenance in one of the geographic areas while Operator 2 managed the other area.

The operators were faced with a complex transition process as well as the need, on an ongoing basis, to manage and report on network performance and capacity of the cells they were managing as well as their full nationwide network. This meant both companies needed to exchange data about the cells they were hosting for the other.

The operators chose MYCOM OSI EAA PrOptima™ because of its carrier grade, converged, multi-vendor and multi-technology performance management capabilities that facilitate massive network transformations and keep networks running at optimum performance. Of particular importance were its near real-time monitoring, analysis, reporting and visualization capabilities, coupled with process and configuration automation.

SOLUTION

To perform the migration, each operator transferred responsibility for clusters of cells to the other operator, cluster-by-cluster. Once sites were transferred they could be decommissioned or converted to the operator's preferred network equipment vendor and location. This process continued until all sites were moved to the operator having geographical responsibility.

For filtering and reporting, cells that Operator 1 was hosting needed to be distinguishable from its own cells, so sites were given unique joint venture IDs that indicated the host operator and whether the site had been successfully transferred. In addition, network data and Key Performance Indicators (KPIs) needed to be shared between operators. Each operator needed to be able to create new KPI names and to autonomously update mappings and KPIs. The data shared between operators needed to use the same format and distinguish 2G, 3G and 4G cells.

BENEFITS

- Flexible, out-of-the-box KPIs and reports aligned to workflow processes
- Near real-time monitoring, alarming, reporting and network diagnostics
- Automated data analysis to detect performance degradations
- Automated workflows and issue resolution processes
- Multi-vendor, multi-technology, multi-domain
- Automated workflows and issue resolution processes

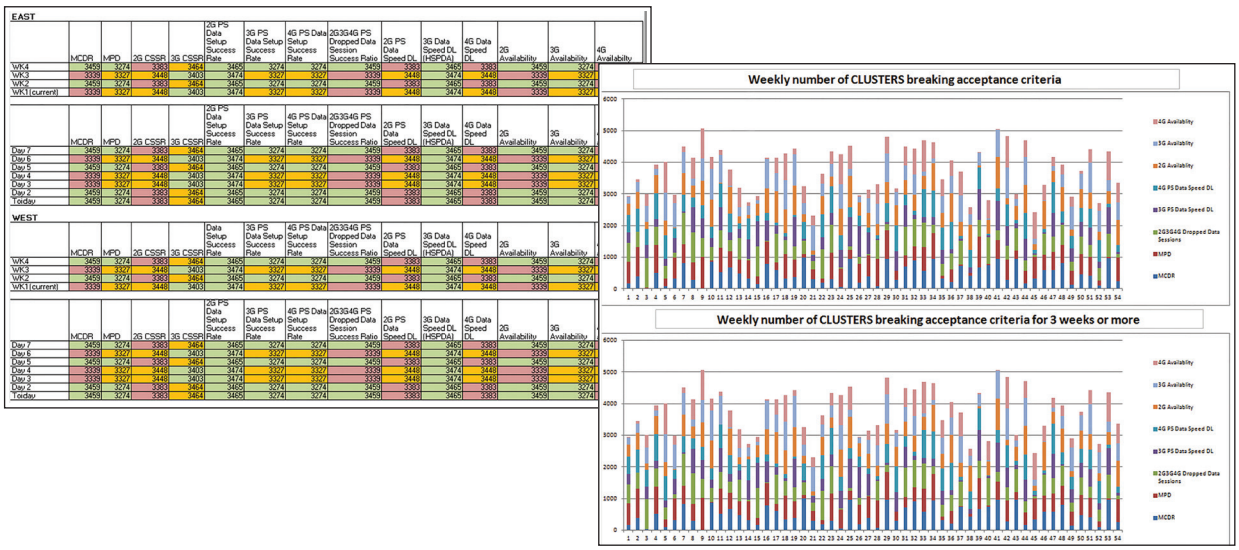
QUICK FACTS

- **Customer:**
  European mobile operators with >3 million mobile customer base
- **MYCOM OSI solutions:**
  EAA PrOptima™
- **Domains:**
  RAN
- **Technologies:**
  GSM, UMTS, LTE
- **Vendor equipment:**
  NSN, Ericsson, Cisco, Huawei

EAA PrOptima™ was used to group elements by network areas, geographies and clusters and then to report on them regularly as well as automatically when thresholds were exceeded. Performance of all cells was initially base-lined and then, once transferred, acceptance was handled with Service Level Agreement (SLAs), trending and threshold reports.

The EAA PrOptima™ unified report builder provided fast ad hoc analysis and KPI drill-downs of near real-time data via scheduled reports and performance-based notifications. Guided diagnostics enabled users to customize reports and to resolve incidents with high productivity and effectiveness. For example, daily network statistics were provided by cluster and owner as well as the Top N worst performing resources, all of which could be viewed on a GIS map.

The operators used the EAA PrOptima™ easy-to-use drag-and-drop graphical user interface and powerful report analytics to perform utilization capacity analysis, management and forecasting.



RESULTS

By reducing duplicate network assets and sharing investment and operational costs, both operators were winners, being able to improve service quality and their bottom lines. The EAA PrOptima™ comprehensive performance management and flexible reporting capabilities enabled both operators to manage their complex RAN sharing project with accuracy and efficiency, independent of vendor, technology or domain.

The EAA PrOptima™ powerful capacity management features enabled both operators to cost-effectively manage and optimize their original as well as hosted infrastructure during this complex transition and to target areas for infrastructure expansion or harvesting.

mycomOSI
The Assurance Cloud Company™

USE CASE
Enabling large scale vendor swaps in record time

CUSTOMER SITUATION

A major mobile operator undertook a massive project to change infrastructure vendors for its entire radio network, which consisted of 9,000 base stations. From a customer service perspective it was critical to maintain service quality before, during and after the equipment swaps took place. In addition, payments to the new vendor were predicated on achieving levels of quality at least as good as the former equipment.

A performance management system was needed to ensure no loss of network and service performance, and to enable a smooth transition. The system had to be up and running quickly with ease of adding new KPIs and reports 'on the fly'. There was also a need for future proof performance management (ability to cover LTE RAN, ePC, etc.).

The operator chose the MYCOM OSI EAA PrOptima™ performance management solution to provide a smooth transition between Radio Access Network (RAN) vendors as well as to ensure quality before and after the swap, even while the network data traffic was continuing to grow rapidly. Once live, EAA PrOptima™ was used to continuously monitor the RAN performance, capacity and quality.

Important criteria in the operator's decision to choose EAA PrOptima™ were its converged multi-vendor, multi-system (radio, circuit and packet core networks) and cross-domain capabilities combined with a flexible GUI, out-of-the-box Key Performance Indicators (KPIs) and reports, and powerful analysis and correlation features.

SOLUTION

MYCOM OSI EAA PrOptima™ offered ready-to-use off-the-shelf adaptors to collect performance data from the network infrastructure (Ericsson and Huawei) for a quick view across both old and new systems. To accelerate the implementation, a KPI library was used, which saved critical project time. At the visualization level, EAA PrOptima™ included GIS interface, workspace, alarm module, profiling module and web GUI for enhanced visualization across the network.
EAA PrOptima™ became an essential tool to optimize the network as the RAN vendor transitions were occurring and to generate provisional acceptance reports that compared the quality before and after equipment replacement. Once the systems were swapped, the network needed to be continuously monitored and in some cases optimized for performance stability.

Once a cluster of 25 to 30 sites were swapped to the new vendor's equipment, the network was monitored and optimized using out-of-the-box reports and analysis that showed historical performance of elements or groups of elements before and after the swap. The KPI formula editor enabled the user to utilize a single KPI for both vendors, showing continuity before and after within a single graph to fit their reporting needs. It alternatively also allowed the viewing of the performance on a GIS map to visualize problem areas geographically.

BENEFITS

- Multi-vendor, multi-technology, multi-domain
- Flexible, out-of-the-box, multi-vendor KPIs and geographical and cluster-based reports
- Advanced and historical correlation, analysis, reporting and visualization capabilities
- Powerful, integrated GIS capabilities
- Automated analysis to detect performance degradations
- Improved operational and resource efficiency
- Efficient capacity planning and optimization
- Improved troubleshooting on trouble-tickets

QUICK FACTS

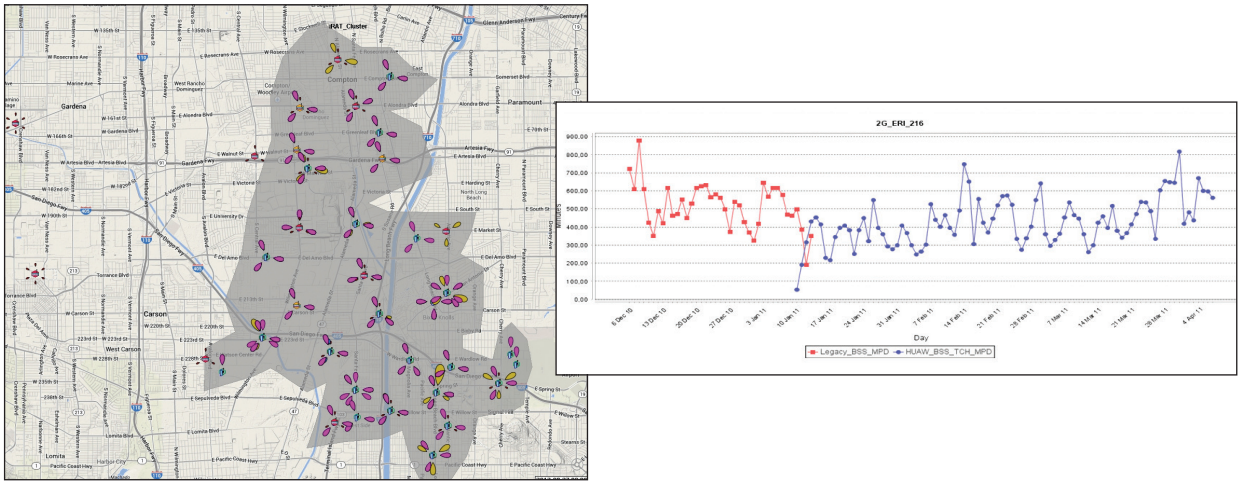
- **Customer:**
  European mobile operator with 15 million customer base and growing
- **MYCOM OSI solutions:**
  EAA PrOptima™
- **Domains:**
  RAN, circuit-switched core, packet-switched core, ePC, VAS, IMS
- **Technologies:**
  GSM, UMTS, LTE
- **Vendor equipment:**
  NSN, Ericsson, Cisco, Huawei, Alcatel-Lucent, Siemens

The MYCOM OSI out-of-the-box KPI formula definitions and performance reports enabled rapid adoption and incorporation into the operator's work practices. The user-friendly formula editor accommodates multiple vendors and release versions, making it easy to update KPIs without modifying reports.

Guided analytical process workflows could be used to automatically drill deeper into the causes of the degraded cell performance. The root cause analysis performed provides suggested recommended actions on the identified problem elements or even triggers configuration changes on the network that are updated automatically according to pre-defined logic. These capabilities ensured optimum performance through pre- and post-launch activities, network audits and ongoing network optimization.

Once the performance was at the expected level, provisional acceptance reports were used to document the performance and, if acceptable, to generate a partial payment to the vendor. The acceptance reports needed to be easy to create and results presented immediately via intuitive graphs. The operator simply entered the cluster to be monitored, the reference cluster and the comparison time period. The KPIs results, including the legacy KPIs and vendor Service Level Agreement (SLA) KPIs, were calculated for all vendors in the network and for all systems (2G, 3G and combined 2G/3G) within the acceptance report.

After an area (2-6 clusters) was swapped to the new equipment, the network was monitored for a stability period. At the end of the period the final acceptance report documented the performance and was used for quality assurance tracking. EAA PrOptima™ provided an accurate single source of statistical results accessible and shared by both the operator and the vendor. These final reports were used for triggering any remaining payments to the vendor. It was important for EAA PrOptima™ to deliver multiple-domain, carrier-grade, technology-agnostic and vendor-agnostic performance management capabilities to ensure that RAN quality would run at high performance pre-launch, post-launch and on an ongoing basis.



RESULTS

EAA PrOptima™ provided critical insights for infrastructure roll-out teams, as well as network engineering, optimization and capacity planning departments. By providing near real-time visibility and analysis of performance across all domains, the operator's vendor-swapped networks operate at peak efficiency, deliver maximum capacity and provide an excellent quality of service.

The EAA PrOptima™ powerful GIS capabilities, the robust and flexible reporting, the readily available KPIs and the automated analysis enabled the operator to quickly develop and customize the reports it needed. In addition, intelligent, automated workflows increased productivity and enforced consistency.

Since the successful vendor swap management, EAA PrOptima™ was extended to support and manage the performance of end-to-end 2G, 3G and LTE core and radio access networks.

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The Assurance Cloud Company™

USE CASE
Monitoring and analyzing issues across RAN and IP backhaul networks

CUSTOMER SITUATION

Lacking an integrated performance management solution, this European mobile operator had one group of specialists who focused on managing the Radio Access Network (RAN) using a dedicated set of tools, and another team with different set of dedicated tools who monitored and analyzed its IP backhaul network. This siloed situation depended on manual processes, if any were used at all, to analyze correlations and performance-impacting interrelationships between the two domains.

The operator wanted to increase its operational efficiency, troubleshooting speed and mean-time-to-repair by managing both RAN and backhaul domains from the same network performance management solution. They wanted to monitor the network end-to-end, allowing drill down to problem elements across technologies, and to perform root cause analysis across both network domains — all from the same platform. Composite Key Performance Indicators (KPIs), reports and dashboards were needed to encompass data from both RAN and backhaul domains.

The operator chose the MYCOM OSI EAA PrOptima™ performance management solution because of its ability to manage multiple technologies and equipment vendors across access, backhaul, core and service domains. It was also important to have out-of-the-box advanced correlation, analysis, reporting, and visualization capabilities from one single graphical user interface. The ability to process very large volumes of performance management data in near real-time was also required.

SOLUTION

EAA PrOptima™ opened up a new world of capabilities to the operator. Instead of narrow, siloed perspectives, they could now gain powerful insights and end-to-end network performance visibility across both RAN and IP backhaul domains that improved operational efficiency and led to faster mean-time-to-repair.

Data were not only gathered in near real-time from both RAN elements and backhaul transmission devices, but the data were loaded and harmonized in a unified database. This enabled visual correlation of cross-domain data in a single dashboard, as well as reports that combined data from both domains, multiple technologies and multiple vendor equipment.

Single, composite, cross-domain serviceability KPIs that contained sub-KPIs from the different domains were created. Statistical data were aggregated from each domain and correlated or grouped logically by technology, region or service. The user had the capability to drill down from the cross-domain serviceability KPIs into individual domain component elements. The operator took advantage of the solution's ability to perform topology-driven correlations, i.e. to correlate KPIs, drill-down and roll-up for deep-dive root cause analysis.

BENEFITS

- Multi-domain, multi-vendor, multi-technology
- Flexible, out-of-the-box, multi-vendor KPIs and geographical and cluster-based reports
- Advanced and historical correlation, analysis, reporting and visualization capabilities
- Powerful, integrated GIS capabilities
- Automated analysis to detect performance degradations
- Improved operational efficiency

QUICK FACTS

- **Customer:**
  European mobile operator, 15 million subscribers (Group Level) across 3 countries
- **MYCOM OSI solutions:**
  EAA PrOptima™
- **Domains:**
  RAN, IP backhaul, IP/UPM
- **Technologies:**
  GSM, UMTS, LTE
- **Vendor equipment:**
  Huawei, NSN, Juniper, Cisco, Ceragon, Flexihybrid

To resolve performance issues the mapped RAN network elements to backhaul and/or core network elements used in the initial analysis could be used as a starting point for drill down to isolate the domain and specific network elements where the serviceability was being effected. In addition, the users created quality-indexed, multi-domain KPIs to rank the worst sites based on both radio and backhaul performance.

Even more efficiency was gained by using the EAA PrOptima™ Decision Support System (DSS) that automatically performs calculations and evaluations through terabytes of network performance data. This was previously performed manually. The flexible and extensive process automation module allows the users to embed multiple decision trees for simultaneous and automatic root cause analysis across RAN and backhaul domains with recommended actions for resolving issues on identified problem elements.

One example of a cross-domain operational troubleshooting workflow starts by identifying a NodeB with a high call drop rate. Traversing to the Cell Site Gateway, the user can see if the call drop rate is isolated to the UMTS network or if the GSM and LTE cells which share a common Cell Site Gateway are also affected. Then further traversing using the rollup or drill down functionality to the backhaul network, the user can check key resource KPIs along the way. Thus, the user quickly determined whether the problem was latency degradation, or a pseudo-wire availability, or traffic utilization problem in the backhaul network or was caused by QoS dropped packets at a Mobile Aggregation Site Gateway.

The user could see synchronized views of RAN and cell site router data within the same workspace and then manage and monitor the links between the cell site gateways and the aggregation routers.

The ability to see a multi-domain view, roll up and drill down between domains, and assess traffic across both IP and mobile networks provided the operator insights that were not previously attainable in standalone single domain solutions. This significantly reduced the time required to identify problems.

RESULTS

EAA PrOptima™ provided critical cross-domain monitoring and analysis of RAN and IP backhaul networks. By providing near real-time visibility and analysis of performance across domains it was possible to quickly visualize, troubleshoot and manage network performance degradation across traditionally isolated domains. This resulted in improved operational efficiency, rapid troubleshooting time and reduced mean-time-to-repair — all of which resulted in excellent quality of service.

The EAA PrOptima™ powerful GIS capabilities, the robust and flexible reporting, the readily available KPIs and automated analysis enabled the operator to quickly develop and customize the reports needed. In addition, intelligent automated workflows increased productivity and enforced consistency.

The scalable converged performance management solution is highly flexible and processes very large volumes of performance management data in near real-time. The EAA PrOptima™ system is capable to support complex use cases that depend on the ability to show relationships between different network elements from different domains.

mycomOSI
The Assurance Cloud Company™

USE CASE
Managing outsourced network operations

CUSTOMER SITUATION

A European mobile operator outsourced network maintenance and general operations to multiple equipment suppliers in order to place more emphasis on customers and revenue generation and to achieve desired network quality at a contracted price. The operator wanted to put in place a governance process to independently manage and benchmark these managed service providers (MSPs) by using service level agreements (SLAs) that were based on performance metrics.

The operator wanted to establish a vendor-independent, "manager-of-managers" infrastructure and reporting overlay so they could regularly analyze and compare impartial performance data from all their MSPs. The approach would also reduce the barrier for vendor swaps. They desired a unified performance management solution that would gather accurate network data, unify it and provide integrated benchmarking, SLA management and reporting.

The operator chose the MYCOM OSI EAA PrOptima™ carrier-grade performance management system for their outsourced network operations governance because it provided a unified, powerful and flexible analytics and reporting framework based on independent, neutral sources of performance data from all their MSPs network equipment, no matter what technology or network domain.

SOLUTION

The EAA PrOptima™ unified performance management system is agnostic to vendor, technology and domain, and specializes in discovering and handling data from a large variety of networks such as LTE, UMTS, circuit-switched core and packet-switched core. The data are harmonized and consolidated in an open data warehouse, providing a "single source of truth" for powerful SLA reporting, analysis and troubleshooting capabilities. Since the EAA PrOptima™ data mediation engine is event-based, importation starts as soon as data become available so the reports and analysis reflect near real-time data.

To benchmark its MSPs, the operator used the EAA PrOptima™ reporting framework to monitor each MSP's network equipment and to compare their performance overall and for specific, grouped network areas. Network quality was tracked closely and continuously against agreed SLA targets that were often MSP-specific.

The operator used out-of-the-box and easily created Key Performance Indicators (KPIs) to assess network quality for all their vendors and to oversee network upgrade releases. Example KPIs were cell availability, speech call setup success rate, node uptime. These could be graphed by network area, by technology, by individual MSP and for multiple MSPs. SLA performance adherence reports also contained measures that reflected the operator's quality strategy and market position.

BENEFITS

- End-to-end view and analysis on a unified platform
- Multi-vendor, multi-technology, multi-domain
- Billions of data points processed per hour
- Unified, open data storage providing a "single source of truth"
- Near real-time monitoring and reporting
- Flexible, out-of-the-box KPIs and reports aligned to workflow processes
- Reports by network areas or groups of new elements

QUICK FACTS

- **Customer:**
  European mobile operator with >3 million mobile customer base
- **MYCOM OSI solutions:**
  EAA PrOptima™
- **Domains:**
  RAN, circuit-switched core, packet-switched core, ePC, VAS, IMS
- **Technologies:**
  GSM, UMTS, LTE
- **Vendor equipment:**
  NSN, Ericsson, Cisco, Huawei

RESULTS

EAA PrOptima™ enabled the operator to actively govern and manage their MSPs by using a unified system to analyze actual performance. They easily defined multi-vendor and multi-release KPIs that provided seamless trend reporting across vendors and across network release upgrades. Benchmarking could be performed for any chosen KPI irrespective of vendor, technology or domain.

EAA PrOptima™ provided fast reporting and analysis and was extremely scalable for their very large networks. The network element discovery mechanism also provided quick data visibility for new network elements. Strong data reliability and carrier-grade robustness were achieved, leading to accurate and reliable SLA reporting. This was important since the SLAs often had financial implications for the MSPs.

An added result of proactive MSP governance was achieving year-on-year network quality improvements and higher levels of overall network efficiency.

mycomOSI
The Assurance Cloud Company™

USE CASE
Automating processes and parameter audits to improve network quality

CUSTOMER SITUATION

The complexities of today's multi-vendor and multi-technology networks challenged a mobile operator's ability to analyse and process network data, to incorporate best practices and to modify the hundreds of network parameters that require constant management to achieve optimum service quality for its customers.

A US mobile operator required an efficient, accurate and timely change management solution to ensure parameters for all its network elements – independent of vendor or technology – were well documented and conformed to best practice golden parameter standards. In addition, the operator wanted to automate processes such as parameter audits, optimization, special event management and microwave link stabilization to reduce operational expense and ensure consistency of action.

Overall, the operator wanted to dramatically increase its operational efficiency through process automation while continuing to ensure a high quality of service.

The operator selected the MYCOM OSI EAA ProActor™ carrier-grade automation solution to replace manual processes with closed loop automation of best practices and operational processes. By taking a unified, end-to-end perspective that integrated performance with configuration, inventory and trouble ticket management the operator could make more insightful decisions. Also important were the EAA ProActor™ analysis, reporting and visualization capabilities.

SOLUTION

Off-the-shelf MYCOM OSI adaptors collected billions of performance data records and continuously monitored the operator's GSM, UMTS, and LTE networks. The EAA ProActor™ process automation capabilities reached across multiple network domains and included automated diagnostics and network engineering as well as operation processes.

The EAA ProActor™ closed loop process workflows performed high-volume automated root-cause analysis, audits and other computations in near real-time. For example, it automatically performed daily audit checks and managed golden parameters for tens of thousands of macro-, micro-, femtocells and Distributed Antenna System sites.

The solution detected levels of cell congestion and triggered any required network parameter reconfigurations based on the state of congestion and the operator's service quality agreements — all in a fully automated and consistent manner. It also performed parameter deviation detection and correction, RAN load and congestion control, site and cell outage healing, resource utilization and peak traffic handling. As a result, cell loads were controlled and performance optimized.

BENEFITS

- Cost reduction and improved efficiency from automation
- Improved network quality and ability to meet service level agreements
- Maximized ROI on network equipment and resources
- Complete closed loop decision support automation
- Alignment with workflow processes
- Near real-time monitoring and reporting
- Flexible, out-of-the-box automated KPIs and reports
- Uniform multi-vendor, multi-technology, multi-domain performance management

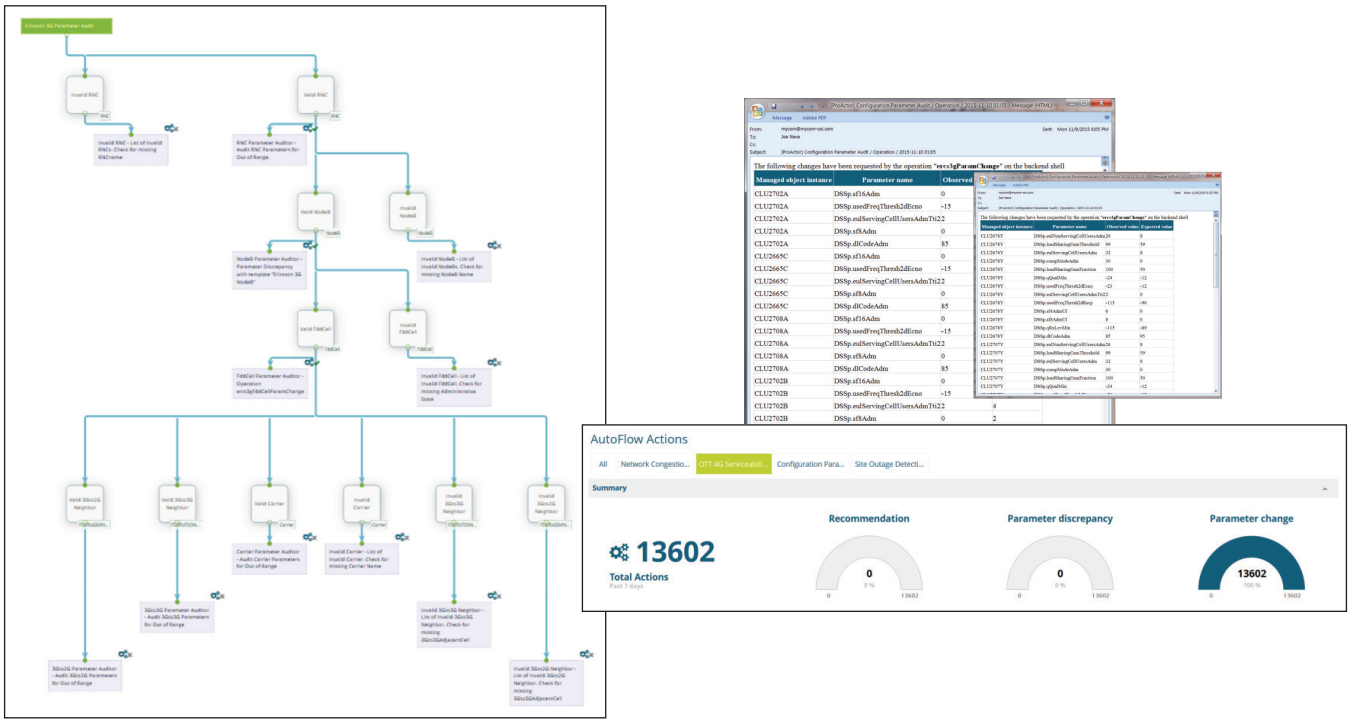
QUICK FACTS

- **Customer:**
  US mobile operator with >115 million customer base
- **MYCOM OSI solutions:**
  EAA ProActor™
- **Domains:**
  RAN
- **Technologies:**
  GSM, UMTS, LTE
- **Vendor equipment:**
  NSN, Ericsson

EAA ProActor™ was also used for performance and network engineering process automation where manual repetitive analysis and diagnostic tasks were replaced with automatic near real-time or batch analyses and actions. Network-centric business process automation captured best practices and increased the efficiency and effectiveness of, for example, capacity planning, analysis of degraded cells, sleeping cell detection and reporting as well as complex network performance alerting.

The operator created and customized automation scenarios and used pre-packaged, logic-based Key Performance Indicators (KPIs) for each vendor and technology. Automated scheduled reports provided notifications of parameter audit violations and analytics compared managed service providers as an example.

As a result, performance management data was enriched with trouble ticket and fault management information to enhance root cause analysis and troubleshooting.



RESULTS

EAA ProActor™ enabled the operator to automate event management tasks that were previously performed manually. This greatly improved productivity, enabled process consistency, freed up human resources and minimized human errors. It ensured the best possible network quality during extreme network load situations.

Billions of performance data records were collected, cell loads were controlled using closed loop process automation and changes were made to network equipment parameters in order to optimize performance. Process automation delivered a competitive edge to the operator through reduced incident recovery times and consistent treatment of issues, repeatability and reliability. By automating repetitive issue detection and resolution the operator achieved consistent results and auto-restoration. Engineers could therefore focus on more complex incidents.

Through process automation the operator realized substantial cost savings and customers experienced the best possible service.

mycomOSI
The Assurance Cloud Company™

USE CASE
Taking a unified view to manage performance across multiple domains

CUSTOMER SITUATION

This European mobile operator had several national operating companies across the world that had deployed IP-based converged networks that simultaneously carried data, voice and video services originating from mobile and fixed sources. Each company was using siloed systems to manage the performance of their networks, such as 2G, 3G, packet-switch and transport. The systems only managed a specific network domain or technology and required numerous manual tasks.

Instead of this narrow approach, the operator wanted to deploy a single performance management solution that would take a unified, end-to-end view across multiple domains and technologies by consolidating performance management data from fixed, mobile and transport domains. The business goal was to increase operational efficiency, provide more powerful and cost effective performance management and increase troubleshooting speed and mean-time-to-repair compared to its siloed legacy systems.

The operator wanted a consolidated view at the group level as well as for each local company. The solution needed to provide visibility to all network resources and mediate and analyse correlations and performance-impacting relationships between domains, such as RAN and IP backhaul. They wanted to monitor the networks end-to-end, to drill down into network element data and to perform root cause analysis across varying network domains — all from the same platform.

The operator chose the MYCOM OSI EAA PrOptima™ carrier grade, converged multi-vendor, multi-technology and multi-domain performance management solution to manage its converged networks. The solution provides out-of-the-box advanced correlation, analysis, reporting and visualization capabilities that process very large volumes of performance management data. The solution was selected for its ability to provide flexible automation, workflow, alarming and configuration capabilities and to provide insightful results to multiple organizations within the Group as well as the local operating companies.

SOLUTION

EAA PrOptima™ provided the operator with powerful end-to-end, unified network performance visibility and insights across domains and across their local companies. Large volumes of data were not only collected and aggregated from a variety of domains, technologies, and vendor devices, but also harmonized in a unified database and then enriched with performance and customer experience data from other sources.

Single and composite Key Performance Indicators (KPIs), reports and dashboards integrated data from all domains. Statistical data were correlated and grouped logically, e.g. by technology, hierarchical network area, region or service. Topology-driven correlations and cross-domain KPIs provided deep-dive root cause analysis into individual network elements.

BENEFITS

- Near real-time monitoring, alarming, reporting and network diagnostics
- Billions of data points processed per hour
- Automated data analysis to detect complex performance degradations
- Automated workflows and issue resolution processes
- Multi-vendor, multi-technology, multi-domain
- Unified, end-to-end fault, configuration, performance and trouble ticket processing
- Powerful, integrated GIS capabilities
- Flexible, out-of-the-box KPIs and reports aligned to workflow processes

QUICK FACTS

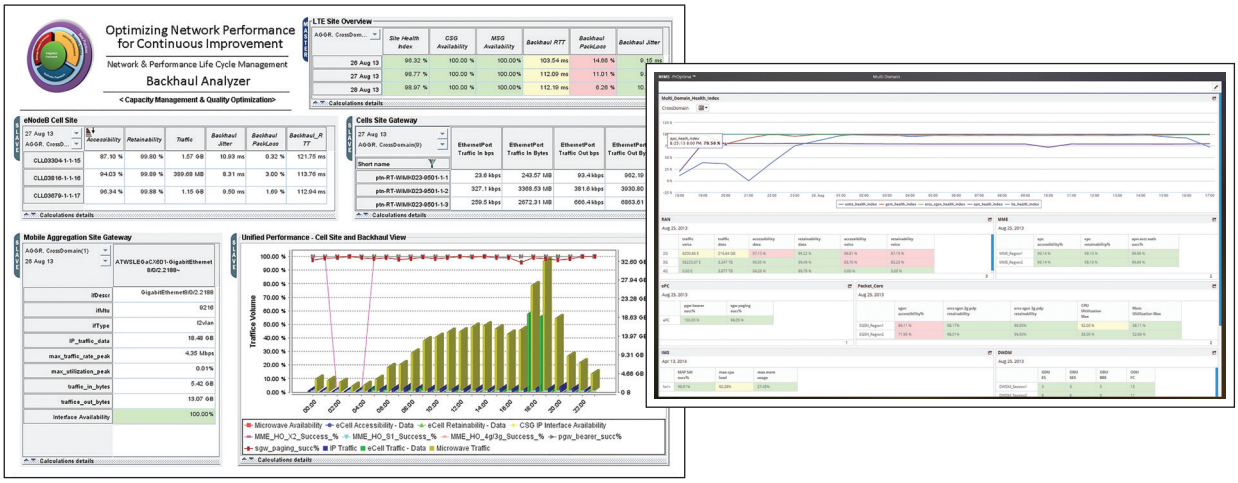
- **Customer:**
  European mobile operator, 15 million subscriber base
- **MYCOM OSI solutions:**
  EAA PrOptima™
- **Domains:**
  RAN, IP backhaul
- **Technologies:**
  Radio access network (2G, 2.5G, 3G, 4G), packet and circuit core networks, transmission, VAS platforms
- **Vendor equipment:**
  NSN, Ericsson, Cisco, Huawei

To resolve performance issues the user could, for example, map RAN network elements to backhaul or core network elements, drill down to RAN elements, and then across backhaul to core elements. Trending, diagnostics and alarms enabled them to proactively prevent network performance issues.

Even more efficiency was gained by using EAA PrOptima™ Decision Support System that automatically performed calculations and evaluations through terabytes of network performance data — tasks that were previously performed manually. The operator used this flexible and extensive process automation capability to automate root cause analysis across domains and often configured it to suggest or take action for resolution. EAA PrOptima™ was also used to automate repetitive performance and network engineering processes and capture best practices to increase efficiency and effectiveness.

Visual correlations across domains, technologies and vendors, as well as across the company, were viewed in a single dashboard. Data points from any network domain could be consolidated into a single performance view. A drag-and-drop user interface made it easy to take a multi-domain view, roll up and drill down between domains and assess traffic across multiple network domains. This provided the operator with insights that were not previously attainable and significantly reduced the time required to identify problems.

EAA PrOptima™ consolidated performance data from different domains into single reports that could show, for example, daily aggregated RAN domain health statistics by technology or daily aggregated ePC domain, IMS Network, DWDM or VAS health statistics. By selecting any data point the user initiated drill-down and diagnostic workflows. Quality and network statistic reports were able to be distributed to operations, marketing and business organizations in real-time.



RESULTS

EAA PrOptima™ provided a consolidated end-to-end performance view across all network domain assets, including 2G, 3G, 4G, core, router, and microwave technologies. All data from radio, transport and IP devices were mediated by EAA PrOptima™. By providing visibility and analysis of performance across domains the operator quickly visualized, troubleshooted and managed network performance degradation across traditionally isolated domains. For example, they could point to an IP Interface experiencing instability and then navigate and correlate to related network domains.

The multi-domain robust and flexible reporting capability enabled continuous end-to-end performance visibility at both Group and local levels. Readily available KPIs and automated analysis enabled the operator to quickly develop and customize the reports it needed.

Intelligent, automated workflows increased productivity and enforced consistency. The result was increased operational efficiency and, by quickly resolving service impacting network issues, customer satisfaction.

mycomOSI
The Assurance Cloud Company™

USE CASE
Transforming performance management to increase customer satisfaction

CUSTOMER SITUATION

This very large Asian operator's goal was to differentiate itself based on network quality. They wanted to use end-to-end network performance insights to deliver a superior customer experience. But end-to-end performance management was not feasible even at a small scale with their multitude of technology-, domain-, and region-specific tools and manual processes. Instead, they transformed and consolidated their operations by creating a centralized Super Network Operations Centre that would manage one of the largest networks in the world.

To do this, the operator required a performance management solution that would take a unified, end-to-end view by consolidating and harmonizing data from their entire network, including multiple domains, vendors, releases and technologies — across 23 operating areas with 150 million subscribers. The robust solution needed to support their massive network scale. provide near real-time data availability, analysis and reporting, automate routine tasks, unify processes and support proactive management. It also needed the flexibility to support current and future complex services and technologies.

The operator chose the MYCOM OSI EAA PrOptima™ carrier-grade multi-vendor, multi-technology and multi-domain performance management solution to harmonize and analyze very large volumes of network data in near real-time, speed the integration of new equipment and technologies and use network insights in ways that benefit subscribers. A critical feature was EAA PrOptima™ ability to dynamically link access, transmission, core and VAS domains into service models — aggregating across domains, vendors or technologies. Out-of-the-box advanced correlation, analysis, drill-down, reporting and visualization functions enable proactive management. At the same time
flexible automation, workflow, alarming and configuration capabilities reduce mean-time-to-repair and improve operational efficiency.

SOLUTION

EAA PrOptima™ provided the operator with powerful end-to-end, unified network performance visibility and insights across its regions. Large volumes of data were not only collected and aggregated in near real-time from a variety of domains, technologies and vendor devices, but also harmonized in a unified database and then enriched with performance and customer data from other sources such as billing systems.

Individual and composite Key Performance Indicators (KPIs) were correlated and grouped logically, e.g. by technology, hierarchical network area, region or service. Cross-domain KPIs and topology-driven correlations sped root cause analysis and were even used to determine the impact of specific user devices on the network. Trending, diagnostics, alarms, and easy deep-dives into individual network elements enabled the operator to proactively prevent network performance issues.

BENEFITS

- Unified performance management across domains, vendors, releases, technologies
- Large library of out-of-the-box, up-to-date interface adaptors
- Carrier-grade robustness and massive scalability
- Performance visibility across all domains
- Near real-time collection, mediation and aggregation of any network data
- Advanced end-to-end correlation, analysis, reporting and visualisation
- Flexible, out-of-the-box, multi-vendor KPIs and geographical and cluster-based reports
- Closed loop automation of processes, diagnostics and analyses
- Ad hoc analysis across all data via a flexible drag-and-drop graphical user interface

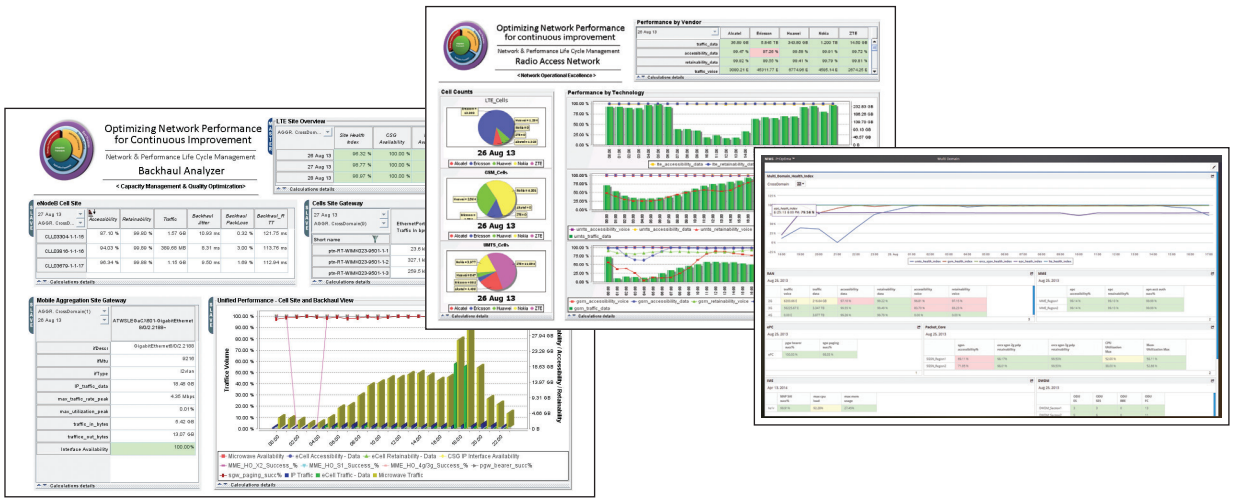
QUICK FACTS

- **Customer:**
  Asian mobile operator, 150 million subscriber base
- **MYCOM OSI solutions:**
  EAA PrOptima™
- **Domains:**
  Radio, transport, IP
- **Technologies:**
  Radio access network (2G, 2.5G, 3G, 4G), packet and circuit core networks, transmission, VAS platforms
- **Vendor equipment:**
  Ericsson, Juniper, Cisco, Huawei

EAA PrOptima™ automatically detected changes in network behavior, site expansions, new vendors or new domains and automatically adapted KPIs and reports so that they always represented the true network situation.

Even more efficiency was gained by using the EAA PrOptima™ capability to automatically perform calculations through terabytes of network performance data — tasks that were previously performed manually. The operator used this flexible and extensive process automation capability to automate root cause analysis across domains and often configured it to automatically suggest resolution or take action. EAA PrOptima™ was also used to automate repetitive processes and capture best practices to increase efficiency and effectiveness.

Dashboards showed correlations across domains, technologies, and vendors, as well as across the company, consolidating any data points into a single view. The drag-and-drop user interface made it easy to take a multi-domain view, roll up and drill down between domains, and assess performance across multiple networks. This provided the operator with insights that were not previously attainable and significantly reduced the time to identify and resolve problems. EAA PrOptima™ automatically created consolidated reports that could show, for example, daily aggregated RAN health statistics by technology or vendor, nationwide or for specific areas.



RESULTS

EAA PrOptima™ provided a consolidated end-to-end performance view on a massive scale across all of the operator's network domains. All data from radio, transport and IP devices were harmonized by EAA PrOptima™. By providing near real-time visibility and performance analysis across domains the operator quickly visualized, troubleshot, and managed performance degradations across traditionally isolated domains.

Flexible dashboards enabled continuous end-to-end performance visibility at both country and regional levels. Out-of-the-box KPIs and automated analyses enabled the operator to quickly develop and customize reports. Intelligent, automated workflows increased productivity and enforced consistency. They detected issues and performed root cause analysis and automated healing, tuning, and optimization that boosted productivity up to 50%. Proactive monitoring of KPIs reduced downtime and increased network quality, thereby reducing churn.

By consolidating performance management across the country the operator increased its operational efficiency, lowered total cost of ownership and improved customer satisfaction.

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The Assurance Cloud Company™

USE CASE
Service assurance and capacity management for large events

As one of the biggest international events, the Olympic Games pose a set of unique challenges to the organizers and to those responsible for the host city's infrastructure including mobile communications. This Use Case describes how one of the leading UK Communications Service Providers (CSPs) worked with MYCOM OSI to successfully address the mobile communications challenges of London Olympics 2012.

When London was chosen in July 2005 to host the 2012 Olympics, the mobile communications landscape was still voice-centric. Some years later, following the iPhone launch and the success of apps, online video and social media, CSPs around the world would discover how much voice-centric mobile network deployments were struggling with the rising data tsunami.

In the UK, a mobile network outage a few months before the Olympics opening ceremony made the headlines. Many analysts speculated that the use of apps would give rise to network blackouts, while the Mayor of London also shared concerns that UK mobile networks would be unable to cope with increased demand during the Games.

One of the leading UK CSPs described the expected demand as 'equivalent to 3 Cup Finals a day, or 3 royal weddings, for 3½ weeks'. To address this expectation, which also presented an opportunity for increased roaming revenue, the CSP needed to work closely with a number of stakeholders including MYCOM OSI.

SOLUTION

The CSP knew that it had to invest in new network infrastructure to ensure that service quality would not be compromised while also capturing international roaming users during the Games. On a normal day, the CSP's mobile network saw more than 45TB of data, 90 million phone calls and 90 million text messages. Demand during the Olympics was expected to be dramatically higher.

But planning for the expected increase is not straightforward: demand comes from people who attend an event and want to find out more about the athletes who compete, as well as people who just want to check the results, watch the events streamed or use their handset as a TV complement. Furthermore, these Games – labeled the Twitter or Social Media Olympics by many analysts – were expected to be like no other previous event.

At the same time, the CSP wanted to optimize its investment in network equipment so that any additional expenditure would be justified by the CSP itself – rather than the equipment vendors the CSP worked with – based on an objective assessment of actual network needs.

The CSP already had such an objective process in place, working with MYCOM OSI and using the multi-vendor and multi-domain MYCOM OSI EAA PrOptima™ solution to monitor its Radio Access (2G, 3G, HSPA+ and 4G), Core and Microwave Transmission networks as well as its VAS platforms. This process was part of the unified Service Assurance approach that the CSP favored.

BENEFITS

- Reduced uncertainty due to proven solution capability
- Simplified network view based on data from all network layers
- Efficient sharing of information with all internal/external stakeholders
- Better collaboration with equipment vendors by using a single source of truth
- Faster response to issues via proactive cross-domain monitoring
- Optimal use of expertise through reduced need for training or IT assistance
- Highest ROI using a unified end-to-end performance view

QUICK FACTS

- **Customer:** UK CSP with around 20 million customers
- **MYCOM OSI solutions:** EAA PrOptima™, MYCOM OSI services
- **Domains:** RAN, circuit-switched core, packet-switched core, transmission, VAS
- **Technologies:** GSM, UMTS, LTE
- **Vendor equipment:** Alcatel-Lucent, Cisco, Ericsson, Huawei, NSN, ZTE

Based on this process, the CSP focused on optimizing its London network and identifying areas where new equipment had to be rolled out or sharing agreements with other CSPs could be made. The CSP's team of engineers for special events, who also had to take care of the network preparations for the Queen's Jubilee celebrations, worked with similar teams from New Zealand and South Africa to learn from recent large-scale sporting events.

As its radio access network relied on two equipment vendors, the CSP looked into Service Level Agreements to minimize equipment downtime/issues. Still, the need for objective governance and single source of truth meant that the CSP would utilize MYCOM OSI and EAA PrOptima™ as reference. In this way, arguments in areas where both vendors were responsible for the network or cases of potential friction if a vendor proposed extra equipment would be reduced.

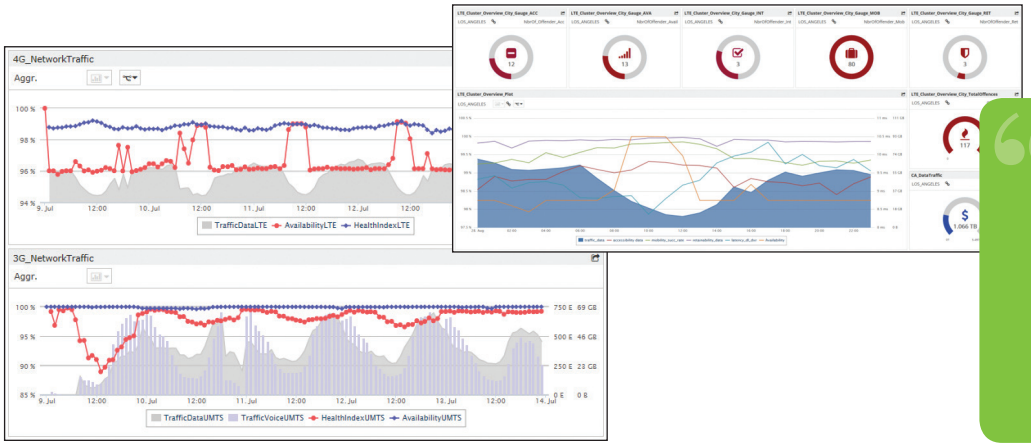
Similarly, it was important for the CSP to rely on a holistic view of its network so that issues spanning multiple technologies and domains would be identified correctly as cross-domain issues. The role of MYCOM OSI and of the EAA PrOptima™ solution here was indispensable.

Just 2 months before the opening ceremony, an urgent requirement arose: it was essential to upgrade 4 adaptors (interfaces) to 2G and 3G equipment, in order to monitor new network nodes. Such upgrades typically take months for most vendors, but not for MYCOM OSI, due to its adaptor productization. MYCOM OSI delivered the adaptors in less than a month, allowing the CSP plenty of time to test and ensure that its network was ready before the Olympics' first day.

The CSP identified a number of key sites, including the Olympic Park and areas of London where it expected a large number of people to aggregate (e.g. Hyde Park). To monitor performance at peak times, the CSP grouped the network elements serving each area of interest to ensure that their behavior met the specified criteria. The EAA PrOptima™ easy-to-use GUI makes this kind of network element grouping and association easier. The MYCOM OSI Services team also provided consultancy when the CSP needed clarifications or advice on best practices.

Key metrics such as availability, accessibility, retainability and integrity described the overall, multi-domain network health. With near real-time visibility of network performance, the CSP's engineers could add capacity when and where needed. In fact, EAA PrOptima™ includes performance threshold-based modules for capacity planning and for alarms.

To assist the CSP's Engineering and Operations teams, the MYCOM OSI Services team provided onsite support throughout the Games, focusing on key metrics and daily reports shared with key technical/business executives. EAA PrOptima™ facilitates such reports, which can be easily created and then scheduled/exported, typically in the form of easy-to-visualize dashboards customized for each stakeholder. In addition, it is possible to identify and resolve issues proactively by making full use of the EAA PrOptima™ geographical and alarm capabilities.



> "...more people streamed video on their mobiles than ever before, watching events live and catching up with all the action they'd missed"
>
> CSP spokesperson
> Late 2012

RESULTS

Olympics 2012 was a great success. Similarly, the CSP's network succeeded in supporting the mobile communication needs of millions of British and foreign visitors who flooded London. Traffic rose by up to 25%, instant action replay on handsets after Usain Bolt's 200m race win made the CSP break its video data streaming record, and when Mo Farah and Jamaica's 4x100m relay took gold, the network served up enough data to stream video to one screen for 40 years.

Satisfied with the performance of the network, based on the metrics defined before the start of the event, the CSP recognized the valuable contribution of the MYCOM OSI team. The CSP continues to work with MYCOM OSI to manage the performance of its network today.

USE CASE
Improving trouble ticketing accuracy and processing through automation

CUSTOMER SITUATION

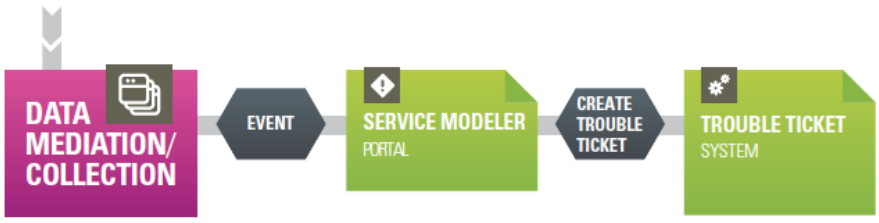
A European Communications Service Provider (CSP) needed to improve the time required to obtain information on impacted customer services. Adhering to this constraint would ensure the Service Management Center (SMC) technicians could assess impacts and respond to customer issues quickly improving the customer experience.

In addition, the SMC, also known as the Network Operations Center (NOC), needed to dispatch tasks to technical resolution teams with all necessary information, including the root cause, the Ticket ID and the expected Time of Resolution, to ensure lean and accurate communication to both customers and management.

SOLUTION

Because the integrated Trouble Ticket creation capability was offered as an add-on to the MYCOM OSI EAA NetExpert™ Service Impact™, the MYCOM OSI team chose EAA NetExpert™ Trouble Ticket Adapter (TT-AR) to integrate with the TT system (Remedy).

Within the TT system all communication details about customers, products, services and elements were pre-loaded. This allowed for segmenting precise and proactive communication to customers, internal management and dedicated customer facing teams, providing correct and timely information to specific audiences such as top revenue-producing customers, thus reducing churn.



EAA NetExpert™ Service Impact™ leveraged EAA NetExpert™ dialogs feature to automatically receive and send actions for processing in the TT system. This allowed the customer's SMC to manage and dispatch tickets through EAA NetExpert™ Service Impact™ quickly, such as associating and disassociating ticket automation capabilities with events.

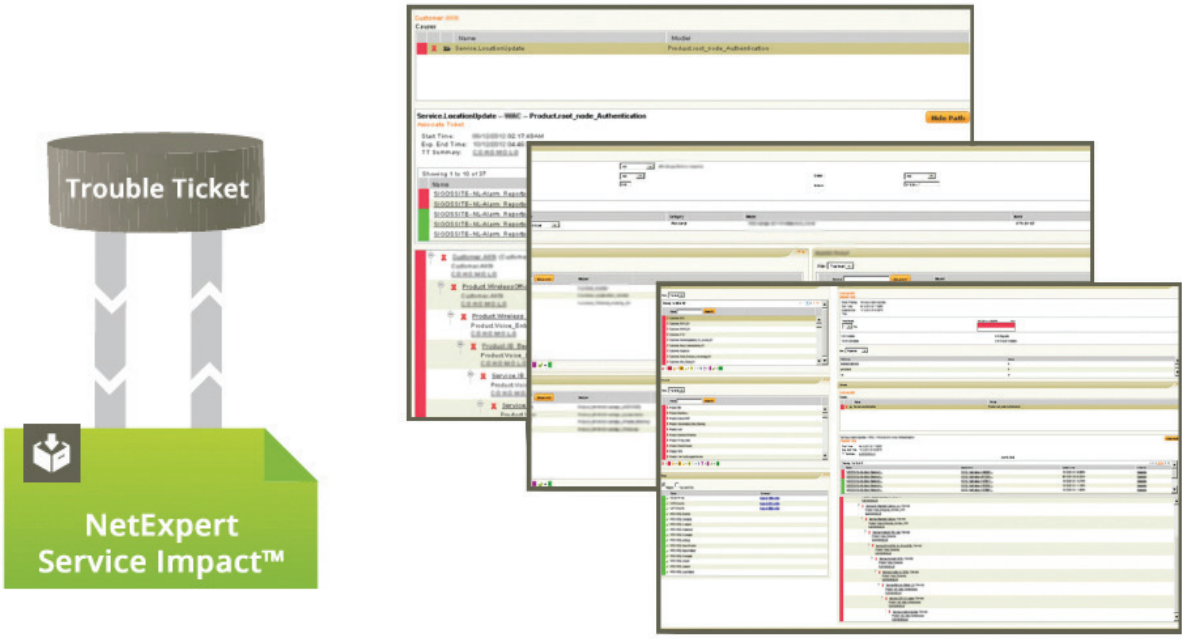
For example, the SMC technicians could create a ticket using the EAA NetExpert™ TT-AR interface to send all affected customers information about impacted products, services and elements. Any new impacts were automatically added to existing trouble tickets.

BENEFITS

- Focused on correct priorities with fast-track issue handling
- Reduced manual data entry time from ~30 minutes to ~2 minutes per incident
- Improved ticket data accuracy
- Improved uniform communication to corporate groups
- Improved processing by automating dispatched ticket updates as they were received

QUICK FACTS

- **Customer:** European CSP
- **MYCOM OSI solutions:** EAA NetExpert™ Service Impact™, EAA NetExpert™ Trouble Ticket Adapter (TT-AR), installation services
- **Third-party products used:** Oracle v11, Remedy 7.5, Sun M3000 4 core, 2.52 GHz Ultra-SPARC T2 hardware, Sun T5220 8 core 1.2 GHz Ultra-SPARC T2 hardware



RESULTS

With 7 million objects and 1500+ corporate customers or customer groups managed, not only did the SMC improve mean time to repair/resolve (MTTR), but an unexpected secondary benefit resulted from the CSP's account managers and legal staff using the solution. Both parties were able to access the tool for timely information. And, in addition, customer advocates, who look at outages on a customer site to take action and resolve outages, were able to use the information to solve their issues.

Just as important, data accuracy improved while the SMC saw a reduction in manual entries by operators for re-keying errors since consistent data was now shared between systems. It can be estimated that a configuration of this size may generate an average of 30-40 potential manual data entry requirements per hour, demanding 2-3 minutes each of staff time, if handled by a skilled operator. The EAA NetExpert™ automation capabilities reduced that consolidated administration time from around one hour to approximately one minute. In addition, EAA NetExpert™ eliminated the risk of manual data entry errors during ticket creation and ticket updating, which avoided miscommunication.

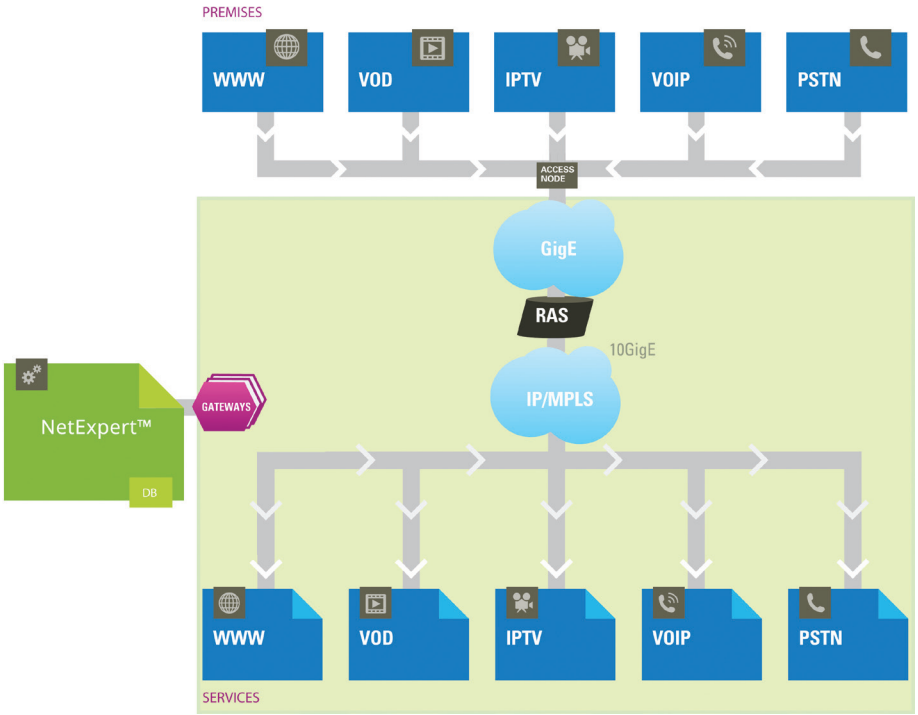
USE CASE
Dynamic inventory access

CUSTOMER SITUATION

A Communications Service Provider (CSP) required a provisioning system to provide new services to its customers. The CSP wanted to ensure that its customers received optimal service the moment the service contract began, so that they would continue to renew their contract with the CSP. Most importantly, the CSP wanted to be able to ensure that network resources were available and not in a fault state before provisioning took place.

SOLUTION

MYCOM OSI worked with the CSP to provide a MYCOM OSI EAA NetExpert™ based framework with eight EAA NetExpert™ systems managing four different regions. The CSP wrote all of the provisioning and business rules in the EAA NetExpert™ 4G (4th Generation) rule language, and the EAA NetExpert™ database contained all the necessary inventory information.



Driven by the powerful EAA NetExpert™ platform, the MYCOM OSI Generic Gateways communicated with a third-party test system tool (Tollgrade), performing loop testing to find the optimal bandwidth and assuring that the required network resources were available to provision. Based on data derived from this testing, EAA NetExpert™ fine-tuned the customer bandwidth, ensuring optimal service and customer experience.

BENEFITS

- Ensured optimal services from the moment the service contract began
- Provided assurance that the DSL circuit had been provisioned correctly and was operating at optimum bandwidth
- Helped increase customer satisfaction, achieving 99.6% provisioning success rate

QUICK FACTS

- **Customer:** CSP, 3.6 million subscribers
- **MYCOM OSI solutions:** EAA NetExpert™, Generic Gateways
- **Third-party products used:** Tollgrade Test Systems

RESULTS

With over 60,000 managed devices, 3.6 million subscribers, 550 operators (users), and 20,000 provisions per day, the CSP achieved reliable, automated flow-through provisioning utilizing the MYCOM OSI Generic Gateways and rules to drive test applications. The EAA NetExpert™ database contains all necessary inventory information, and a feed from the CSP's Fault Management system showed a 99.6% provisioning success rate.

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USE CASE
De-risking LTE deployment

CUSTOMER SITUATION

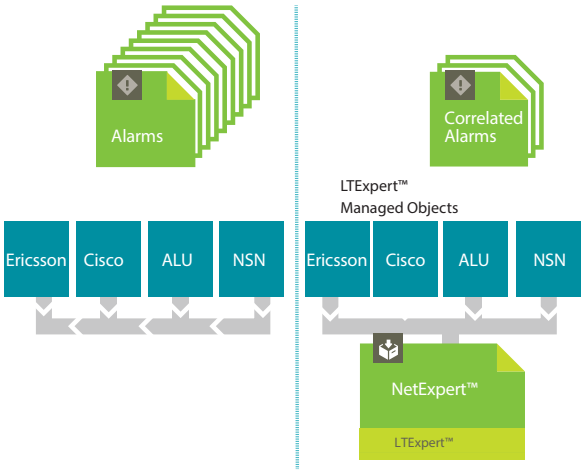
A long-standing US Communications Service Provider (CSP) evolved its network to include LTE while maintaining 2G/3G capabilities. With a mature rule set and varied technology sets integrated into their current OSS system, they relied heavily on the MYCOM OSI EAA NetExpert™ cross-vendor correlation capability to provide root-cause analysis for their Network Operations Center (NOC) technicians.

The customer wanted to build on its current MYCOM OSI solution to avoid a total replacement, leverage their current investment, reduce LTE upgrade risks, simplify the LTE deployment effort and provide standardization in adopting their new 4G/LTE network. Building on its current solution would also improve the learning curve for operators by providing standard alert terminology they could act on quickly.

The customer needed a vendor-agnostic, cross-component end-to-end LTE solution that would manage faults across multi-vendor domains as well as across multi-technology equipment. They also needed enough detail and analysis for operators to respond to actionable information.

SOLUTION

MYCOM OSI provided a 3GPP-Compliant LTE solution that extended the core features of the customer's EAA NetExpert™ platform, providing fault management and service assurance of new wireless technologies, while focusing on
cross-domain and cross-vendor correlation.



The LTE solution consisted of a core LTE package along with a set of multi-vendor plug-ins for specific vendor equipment. These provided the interfaces to alarms and notifications for individual network elements and element management systems (EMSs), as well as the management of those alarms and notifications.

BENEFITS

- Reduced LTE upgrade risk by limiting new equipment purchases and integrations
- 3GPP Rel-10 compliant
- Cross-vendor correlation-normalized vendor-specific alarms into 3GPP standard alert syntax, which allowed MYCOM OSI services to build correlations quickly using policies (pre-built logic)
- Cross-domain correlation-managed relationships between multi-vendor equipment across Access, Transport and Core domains
- Simplified deployment effort by leveraging existing MYCOM OSI customer investment
- Improved NOC efficiency by faster issue identification and MTTR

QUICK FACTS

- **Customer:**
  US CSP
- **MYCOM OSI solutions:**
  EAA NetExpert™, LTExpert™, MYCOM OSI installation services, integration services, configuration and development services
- **Vendor equipment:**
  Alcatel-Lucent, Ericsson, NSN, Cisco, Tekelec, Juniper

LTExpert™ provides two major components consisting of:

- A collection of standardized plug-ins for their vendor-specific equipment with built-in LTE relationships:
  - Normalizing the affected managed objects (MOs)
  - Mapping the alarms to the LTE 3GPP standard alert terminology
- The packaged LTExpert™ application:
  - Common Object Model
  - Pre-defined alerts
  - Complex LTE-defined correlations (cross-domain, cross-vendor)
  - Integration framework (dialogs, processes, rules, definitions and more)

By providing standardized vendor adaptors and a pre-built packaged LTE application for the customer's unique network, MYCOM OSI tailored the CSP's LTE solution to its networks and equipment.

RESULTS

The EAA NetExpert™ LTExpert™ normalized alarms generated from multiple vendor devices by type and relationship, not by vendor. For example, different vendor devices, such as related ALU and Ericsson eNodeBs linked by an X 2 interface via ALU cell service routers (CSRs) and aggregation (AGG) routers, could signal a port was down with varying syntax. Alarms were mapped to the common model to generate vendor neutral alerts using the 3GPP standards – showing the type of problem occurring.

When a piece of equipment generated an alarm, cross-vendor correlation automatically filtered the events based on different criteria, generating and propagating relevant alerts for operator attention.

In addition, LTExpert™ provided cross-domain correlation by handling a multitude of complex relationships between the domain managers, including:

- Access, radio access portion of the network (RAN)
- Transport, backhaul and long-haul transmission portions of the network
- Core, systems that managed:
  - Customer access
  - Authentication
  - Services
  - Policy
  - Traffic

ELEMENT CLASS	EMS	VENDOR
eNodeB	OSS RC/Explorer	Ericsson
eNodeB	5620 SAM	ALU
MME	NetAct	NSN
S-GW	ASR 5000/ASR 5500	Cisco
P-GW	M2000	Huawei
PCRF	Policy Server	Tekelec

Cross-domain correlation enabled EAA NetExpert™ to determine the problem down to the domain (Access, Transport, and Core), instead of whether the problem existed just outside of a domain, helping the NOC operators reconcile in which domain the issue occurred, speeding up time to resolution. For example, if S1mme link alarms were received from the Core and Access domains and Over Temperature Detected alarms were received from the Transport domain, the LTE solution isolated the problem: high temperature detected in a cell service router.

Most importantly, in this case, the CSP avoided a complete overhaul of its fully converged fixed and wireless platform, while still being able to evolve to LTE.

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The Assurance Cloud Company™

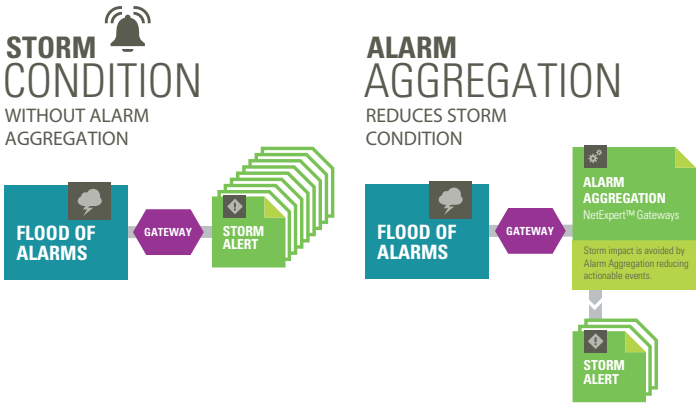
USE CASE
Reducing alert floods through alarm aggregation

CUSTOMER SITUATION

A US Communications Service Provider (CSP) managing wireless switches and infrastructure risked mass outages from weather-related storms and natural disasters. Hurricane or tornado seasons greatly impacted the customer with loss of service alerts and the cascade of alert notifications that various devices generated during inclement weather conditions.

With a mature rule set and a distributed network, the customer already utilized multiple features of MYCOM OSI EAA NetExpert™ that drastically reduced the ratio of alarm data processed to alerts generated – reducing tens of millions of alarms processed daily and ultimately only generating thousands of alerts.

The customer wanted Network Operations Centers (NOC) operators to remain aware of weather-related or natural disaster conditions, yet the challenge was the overwhelming amount of information received during adverse weather events. Devices generating the majority of these alarm notifications could overwhelm and fully occupy the entire fault management system due to their sheer volume of transactions. Stopping the gateway or suppressing transactions to avoid the condition was impractical since other alarm conditions that still required attention could be embedded in the alarm flood.



The solution required the ability to identify the start and end of an alarm "flood" condition without the loss of data. The solution also needed to pinpoint the best alarm candidates for "aggregation management." Finally, the customer also wanted to avoid manual actions required by operators to identify and invoke any special actions. Therefore, the capability to identify the flood condition needed to be solely based on the rate of alarm transactions received during a defined time interval.

SOLUTION

Evaluating the customer's systems, operator input, and alert reports, MYCOM OSI targeted three device classes that were generating excessive alarm transactions during nominal and adverse conditions. These were not the only device classes to generate excessive alerts, but they were the noticeable offenders.

BENEFITS

- Implemented and tested the new solution in just 2-3 days, with only a minor amount of customization
- Reduced daily transactions on the Gateway from 200,000 to 20,000
- Reduced alarms generated from 30,000 a day to 2,000
- Helped NOC operators to manage alert floods and noisy devices
- Improved overall fault management system performance, including automation

QUICK FACTS

- **Customer:**
  US CSP
- **MYCOM OSI solutions:**
  EAA NetExpert™, MYCOM OSI installation and configuration services

Using customer input and historical alarm data, the team devised a list of targeted alerts for each Managed Class. These lists identified the individual or groups of alerts that were the most or least problematic generating the largest amount of transactions. This list then became an inclusion list of high volume targeted alerts for that class. For other classes, this list evolved into an exclusion list of the few alarms that were NOT involved leaving all other alarms as candidates.

For this customer's rule sets within Gateway Analysis, MYCOM OSI mapped the Affected Managed Object, Alert Name and Alert Severity into Alarm Aggregation attributes just prior to the location where control passes to the rules engine or policy engine. The team then added aggregation management attributes to the Managed Class, which would store the list of alerts to target for aggregation. (These updates are often the only customizations required for implementing "Alarm Aggregation management").

Providing a configurable threshold of transactions during the aggregation interval solved the requirement to indicate the start and end of a "flood" condition. This "Flood Threshold" value is used to indicate the count of transactions processed when a "flood" threshold alert is generated on behalf of the offending alert. An alert, with the naming convention of "Flood Threshold (original Alert name)" is created when the flood threshold is met or exceeded. If the flood threshold alert exists, it is only updated, which indicates that this alert instance is still experiencing an excessive rate of data. Once the flood condition has subsided, the flood threshold alert is no longer updated and subsequently times out and clears.

Using customer input, MYCOM OSI loaded the aggregation management parameters for each Managed Class to identify how the alerts were to be aggregated within the Generic Gateway. The small customization and code insertions were made into the Gateway Analysis rule sets for these Managed Classes. Automating these processes via scripting expedited the transition.

RESULTS

After one month of production, the customer reported one of the targeted devices reduced the daily gateway transactions from 200,000 to 20,000. "The device now only generates approximately 2,000 alerts per day. The device used to generate over 30,000 alerts per day before the changes. We have taken this device from a top 10 noisy Element Management System (EMS) perspective to a fairly quiet device."

Each of the automated Managed Classes showed the same improved results. The entire EAA NetExpert™ system showed better performance and operators using Alert Navigator saw fewer alert transactions and an enhancement in user interface response.

ELEMENT CLASS	MANAGED CLASS #1	MANAGED CLASS #2	TOTAL
Total Alarm Data Transactions	1,589,115	2,301,772	**3,890,887**
Percentage of Processing calls AVOIDED	85.73%	59.48%	**70.94%**
Total transaction SAVINGS by Aggregation	1,391,020	1,369,014	**2,760,034**

The effort to determine the busiest or noisiest gateways, especially when identifying offending alerts, resulted in benefits beyond the initial attempt to manage through alert floods. The aggregation management configuration allowed operators to identify target alert instances that were noticeable during storm conditions, and also highlighted noisy alert instances during nominal times, which was an unexpected advantage producing noticeable positive results.

Statistically speaking, in approximate terms, Alert Aggregation provides a minimum of a 33 percent reduction in actionable items from a gateway once three instances of an alarm data are received within an aggregation time interval. That reduction jumps to 50 percent when four or more instances of alarm data are received.

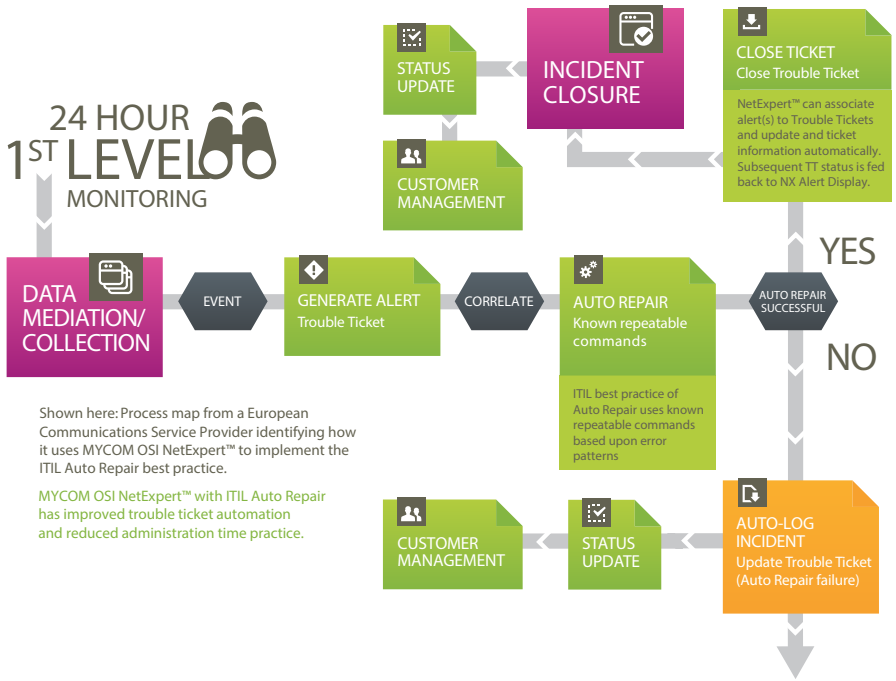
The Alert Aggregation functionally provided the customer a feature rich way to avoid alarm floods while still indicating the presence and passing of this condition, along with providing detailed data on the condition. The solution was a "bolt on" into existing legacy rule sets and required only a minor amount of customization; therefore, it did not impact the way alerts are currently processed or managed by that rule set. Since the solution was implemented at the Managed Class level, it could be selectively applied where deemed necessary. In just two to three days, the solution was implemented and tested, and the customers' development staff quickly comprehended and utilized the features of Alarm Aggregation.

USE CASE
Supporting ITIL best practices through unified fault management

CUSTOMER SITUATION

The parent group of a large Communications Service Provider (CSP) in Europe initiated an IT Infrastructure Library (ITIL) best practices' effort. A key requirement was a fault management solution that ensured each operator adhered to the ITIL framework, especially for auto repair. Further evaluating its next generation OSS needs, the customer realized that using its existing management systems for any ITIL effort would be problematic. Each system (ticketing, testing, IP monitoring, etc.) had its own approach to integration, and tying them together as they were would be costly and time-intensive.

To reduce costs and drive ahead with the ITIL initiative, the customer pursued a single solution implementation, rather than adapting multiple individual systems.



Shown here: Process map from a European Communications Service Provider identifying how it uses MYCOM OSI NetExpert™ to implement the ITIL Auto Repair best practice.

MYCOM OSI NetExpert™ with ITIL Auto Repair has improved trouble ticket automation and reduced administration time practice.

SOLUTION

MYCOM OSI EAA NetExpert™ with Distributed Management Policies (DMP) and the Distributed Management Policies/Trouble Ticket (DMP/TT) adapter were used together with professional service installation services. Four key Vendor-Specific Adapters (VSAs) were installed on site, connecting to Ericsson, Huawei and Siemens equipment, and to the IP network.

BENEFITS

- Reduced manual data entry requirements from 30 minutes to 2 minutes
- Reduced overall operator administration time from 1 hour to 1 minute
- Improved data accuracy and consistency

QUICK FACTS

- **Customer:** European CSP
- **MYCOM OSI solutions:** EAA NetExpert™, Distributed Management Policies (DMP), DMP/TT (Trouble Ticket) adapter, installation services, 4 Vendor-Specific Adapters (VSAs)
- **Third-party products used:** Oracle v11, Remedy 7.5, Sun M3000 hardware

RESULTS

Using EAA NetExpert™ enables the customer to more extensively automate ticket ordering by leveraging the solution's dialogs feature, in concert with the Auto Repair requirements of the ITIL framework. In addition, to associate and disassociate ticket automation capabilities, the customer also automates ticket creation and closing. This capability has reduced, and in certain cases removed, the need for practical operator intervention.

It is estimated that a configuration of this size may generate 30-40 potential manual data entry requirements per hour, demanding at least 2-3 minutes each of staff time, if handled by a skilled operator. EAA NetExpert™ automation capabilities may reduce that consolidated administration time from one hour to approximately one minute.

Data accuracy is also improved, with no need for operators to re-key information. Furthermore, consistent data shared between systems can limit troubleshooting confusion and speed time to resolution during service-impacting events.

Another key advantage of using the EAA NetExpert™ solution, in addition to supporting ITIL efforts, is its flexible configuration, which requires only one central database. Unlike other systems claiming fault management capabilities, the EAA NetExpert™ design of one database for both live and cleared alarms, as one example, greatly improves the operator's ability to quickly generate consolidated, correlated reports. The design eliminates the need to go back across multiple databases for key information. Additionally, it improves how quickly the administrator can manage any issues raised in the reports, since data is more consistent and already correlated.

Additional solution capabilities beyond the customer's initial requirement included site level correlations, work force site automation and the ability to have a single dashboard view of the network. Resulting benefits include the reduction of unnecessary alarms and related labor costs tied to unnecessary troubleshooting, the ability to automate workforce site processes based on generated alarms for more consistent tracking and faster time to resolution, and the reduction of multiple manual processes otherwise required to correlate data into one actionable view.

Use Case features at a glance:

FEATURE	BENEFIT
Trouble ticket automation	Speeds time to resolution and reduces manual operator involvement
Auto repair	Standardizes operational processes to match ITIL best practices
Flexible configuration design	Requires only one central database to ease deployment and simplify data collection for reporting

Use Case technologies at a glance:

TECHNOLOGY	PART NUMBERS
EAA NetExpert™	NX-SRV
DMP	DMP-SRV
DMP/TT	NX-DMP-TT

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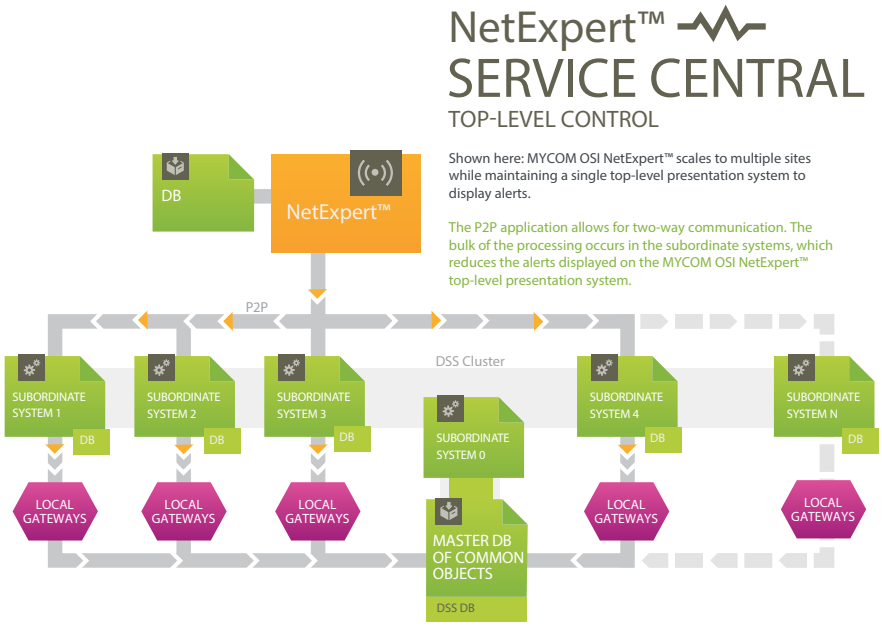
USE CASE
Rapid scalability with high-volume alarm processing

CUSTOMER SITUATION

This long-standing US Communications Service Provider (CSP) managing wireless switches, transport and infrastructure across the United States, utilizes multiple features of MYCOM OSI EAA NetExpert™ to drastically reduce the ratio of alarm data processed to alerts generated. Expanding into more locations now that this customer was going to be acquiring companies through its growth strategy, the CSP needed to scale its system to manage the increase in devices on the network.



SOLUTION

The MYCOM OSI team replicated and scaled the EAA NetExpert™ system by connecting multiple EAA NetExpert™ systems through the Peer-to-Peer (P2P) application along with a supporting feature set, called Service Central. Allowing for load balancing and distribution of services, Service Central utilizes a single system for presentation and consolidation of alerts and multiple lower level systems that provide the actual alarm processing for all managed devices. Using P2P and Service Central, the MYCOM OSI team ultimately provided two regional Network Operations Centers (NOCs) the ability for centralized network control. The two individual locations are each supported by a geo-redundant Disaster Recovery (DR) setup, which is periodically synchronized with the production system using a Service Central enhancement called Service Central Mirror. These two Service Central configurations have continuously expanded and now support a total of 16 subordinate EAA NetExpert™ systems that utilize 2,000 gateways and support approximately 200 operators.

BENEFITS

- Scalability – increased raw alarm data processing power
- Reduced maintenance activities across multiple instances of EAA NetExpert™ (via DSS, Database Sharing Service)
- Retained all existing hardware and software solutions, while allowing integration of newly-acquired acquisitions into the Service Central system

QUICK FACTS

- **Customer:**
  US CSP
- **MYCOM OSI solutions:**
  EAA NetExpert™, EAA NetExpert™ Peer-to-Peer (P2P) Gateway Central, Web Alert, Database Sharing Service (DSS), consulting on configuring, integrating, and deploying new EAA NetExpert™ systems (from company acquisitions) with the existing Service Central configuration

With multiple EAA NetExpert™ systems available for alarm processing, the customer had the opportunity to delineate and segregate its network fault management by focusing individual subordinate EAA NetExpert™ systems to manage by device class, technology, vendor, service or geography. Although defining management categories was not necessary, it enabled the customer to provide focused services and assisted with the load balancing of the subordinate systems.

By introducing Database Sharing Service (DSS) Clustering into the setup for the subordinate systems, these EAA NetExpert™ systems could share multiple components such as rulesets, managed objects and their relationships. In addition, DSS inherently provided benefits such as a single point of update for all rules and managed objects along with the ability to add a new system quickly by setting up additional shared nodes, which are essentially additional EAA NetExpert™ instances. DSS also advanced the ability for each EAA NetExpert™ system in the cluster to provide redundancy and to have the ability to "take over" for each other since they all shared the same rules and object models. As long as the managed devices were reachable, DSS could provide each system the capability to manage the duties for any other system.

RESULTS

The implementation of Service Central allowed the customer to continue to utilize all of its existing hardware and software solutions that were created initially, without having to re-engineer or drastically change the way devices were monitored or managed.

To simplify load balancing, the customer decided to implement DSS at the subordinate level, which allows each individual system to retain the ability to manage any device class in its network.

The chart below shows the amount of raw alarm data messages that are now processed monthly using Service Central and the ultimate number of alerts displayed to the operators using a combination of rules, advanced fault management features and correlations. Both of the newly installed systems regularly manage these volumes and have plenty of room left for additional growth.

MONTHLY VOLUME	EAST	WEST	TOTAL
Raw Messages	73,700,000	69,300,000	143,000,000
Alerts Generated	676,000	767,000	1,443,000
Alerts Displayed	155,000	181,000	336,000

In addition, the installation of Service Central Mirror allowed the primary servers to periodically or manually synchronize all active alerts into the geo-redundant DR setups. Service Central Mirror therefore allows the DR systems to contain all active alerts that are present in the production system, which provides for minimal impact on operators upon transitioning to the DR systems.

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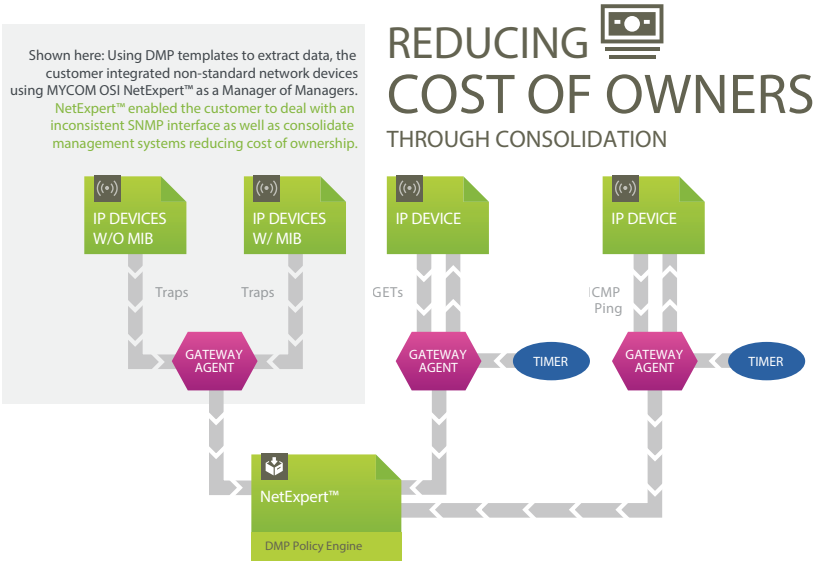
USE CASE
System consolidation and integration of non-standard SNMP interfaces

CUSTOMER SITUATION

A Communications Service Provider (CSP) in Europe purchased equipment that did not conform to integration standards, creating a diverse network management environment. The customer needed to manage unsolicited messages (traps) from the Simple Network Management Protocol (SNMP) gateway agents in its managed network. Since the SNMP interface did not follow the standard integration model of supplying a Management Information Base (MIB), trap processing became a challenging task. It was difficult for the customer to comprehend the information coming in, slowing down and complicating the overall process of integration.



SOLUTION

The MYCOM OSI team used the MYCOM OSI EAA NetExpert™ Distributed Management Policy (DMP) templates to achieve trap management for monitoring. The templates included pre-defined actions to speed up the process of managing the network. To allow the fault management system to manage traps, the team configured a Gateway Agent to receive SNMP traps on a specific host and port address. When DMP received the trap data from the SNMP Gateway Agent for processing, DMP performed additional data processing including building the Affected Managed Object (AMO) Name, Alarm Name and similar information. If the Managed Object (MO) did not exist in the fault management system, DMP created the MO and then generated an alert based on the incoming trap data. When the alarm cleared, the incoming trap's state changed to "OK" in lieu of "PROBLEM," and the accompanying alert in the fault management system was set to "NORMAL," indicating the alarm condition was no longer present.

BENEFITS

- Reduced administration time by providing templates for complicated tasks
- Overcame a non-standard SNMP device integration model
- Reduced overall cost of ownership by consolidating management systems

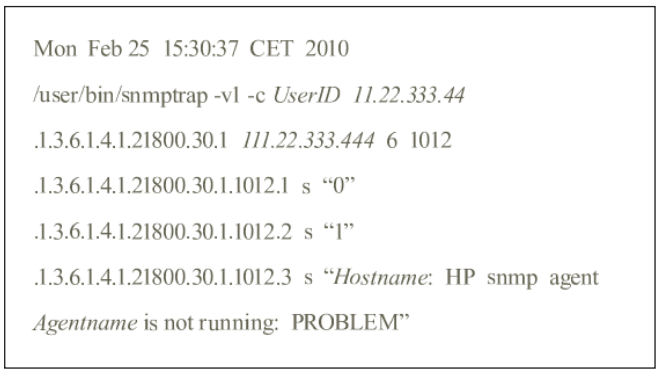
QUICK FACTS

- **Customer:** European CSP
- **MYCOM OSI solutions:** EAA NetExpert™, Distributed Management Policies (DMP), SNMP Gateway Agent, development services to manage SNMP devices

RESULTS

Using EAA NetExpert™ as a Manager of Managers, the customer reduced total cost of ownership by reducing its licensing fees through consolidating management systems into EAA NetExpert™. In addition, EAA NetExpert™ enabled the customer to be able to deal with an inconsistent SNMP interface that was not following the standard integration model of supplying a MIB. Since the traps coming in from an SNMP device are received in a fixed format, the MYCOM OSI team found patterns in the data, so that the relevant data could be processed for further usage. Using DMP templates, the team extracted basic alert information and values for extended alert properties, which consisted of tailored customer data.

The MYCOM OSI team developed and leveraged pre-defined templates that offered pre-defined actions. This DMP template was designed to receive traps in an XML format from the gateway agent. The template understands the pattern of the information coming in, and intelligently deciphers and extracts the relevant information. For example, to format the IP address received from the SNMP trap to form the AMO for the alarm to be generated, the IP address was reformatted with underscored lines replacing dots and created under class IP. The figure below shows the type of incoming data that was extracted and concatenated to form new fields in the template (dummy data has been italicized to protect confidential data). The pre-defined template offered ease of use, enabling EAA NetExpert™ to integrate with different vendors and data formats.



USE CASE

Prioritizing broadband network alerts in inclement weather conditions

CUSTOMER SITUATION

A leading European telecom operator that offers mobile telephony, fixed telephony and broadband services to its subscribers required a system to enhance its existing fault management system to handle overwhelming alarm situations during inclement weather conditions, typically thunderstorms. In absence of such a system, the operator risked mass outages as a cascade of alert notifications hit the operator's NOC.

Thunderstorms were causing the generation of a flood of alarms from the devices/elements in the operator's broadband network. These were being reported as power supply problems, power cut-offs, etc. from every affected device across the affected areas of the national network. Efficient handling of the alarms was not possible as the operator could not distinguish real alarms from the spurious/transient alarms, or those that were of a lower priority.

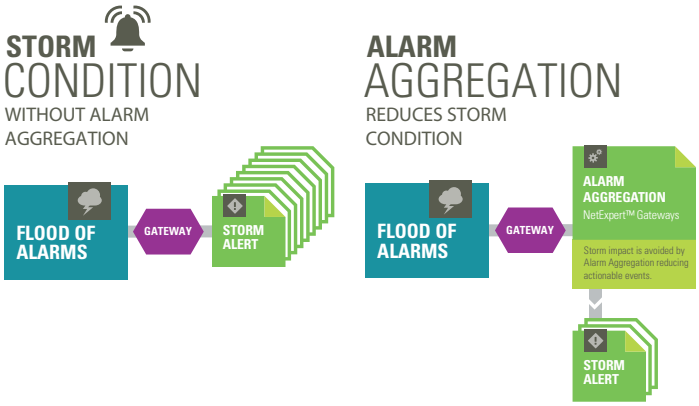
In addition to this, the flood of alarms slowed down the Fault Management system.

Typically, tens of thousands of alarms were raised within 30 minutes during a thunderstorm, whereas the operator did not expect more than a few thousands of alarms on a normal day.

The operator required regulated alarm filtering based on policies so that the most relevant alarms were filtered and presented to the users, without losing any critical alarms embedded within the alarm flood. The operator wanted to reduce the alerts by profiling them by severity and class of the network device/ element that raised the alarm.

SOLUTION

The offered solution included the MYCOM OSI EAA NetExpert™ DMP (Distributed Management Policies) server with the AFM (Advance Fault Management) module.



BENEFITS

- 30%-50% reduction in actionable alerts
- Avoid alarm floods while still indicating the presence and data of the flood condition
- Plug-in DMP module on existing FM system, requiring minimum customization
- Manage alert floods and noisy devices
- Improved FM system performance

QUICK FACTS

- **Customer:**
  European broadband operator
- **MYCOM OSI solutions:**
  EAA NetExpert™ DMP-AFM module
- **Domain:**
  Broadband
- **Vendor equipment:**
  Alcatel-Lucent, Huawei, etc.

The DMP module provided the required advanced policy configuration to prevent event storms (e.g. during thunderstorms). Evaluating the customer network, operator input and the alarm reports, MYCOM OSI targeted specific device/element classes that were generating excessive alarm transactions during the thunderstorms. Using the customer input and historical alarm data, a list of targeted alerts for each Managed Class was devised. These lists identified individual or groups of alerts that were the most or least problematic generating the largest amount of transactions. MYCOM OSI mapped the Affected Managed Object, Alert Name and Alert Severity into DMP-AFM attributes, in order to create the policies within the DMP-AFM module.

The beginning and end of the thunderstorm period was also indicated through a flood threshold value, which indicated the count of transactions processed when a flood threshold alert was generated because of an offending alert. If the flood threshold alert existed, this indicated that the alert instance was still experiencing an excessive rate of data. Once the flood condition had subsided, the flood threshold alert was no longer updated and subsequently timed out and cleared.

RESULTS

Within a month of deployment, the operator reported drastic reduction of alarm alerts from the targeted devices, from hundreds of thousands in a day to a few thousands. Each of the automated Managed Classes showed the same improved results. The entire EAA NetExpert™ Fault Management system also showed better performance and the users saw fewer alert transactions and an enhanced user interface response.

The effort to determine the busiest or noisiest devices, especially when identifying offending alerts, resulted in benefits beyond the initial attempt to manage alert floods.

The DMP-AFM policy configuration allowed the operator to identify target alert instances that were noticeable during thunderstorms, and also highlighted noisy alert instances during nominal times.

USE CASE
Seamless monitoring during network upgrades and swaps

CUSTOMER SITUATION

A leading European telecom operator that offers fixed line and mobile telephony, broadband, cable TV, internet and coastal radio services to its 3.5 million mobile subscribers required a system to monitor and optimize performance of new radio access and core networks during infrastructure swap-out of old network equipment vendor with new vendor equipment.

A Performance Management system was needed to ensure no loss of network and service performance and to enable a smooth transition during the swap.

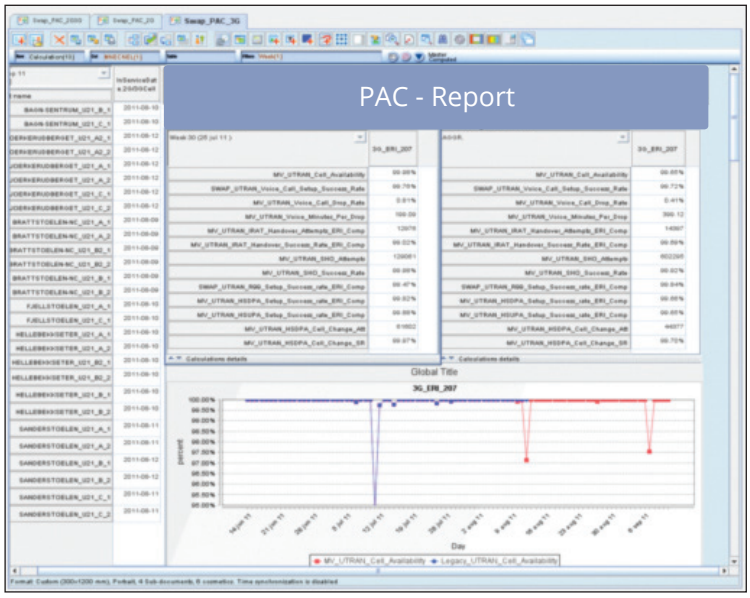
A key requirement was that the system be made up and running quickly with ease of adding new KPIs and reports 'on the fly'. There was a need for future-proof performance management so that the operators' LTE RAN and EPC networks could be supported as well.

SOLUTION

MYCOM OSI offered ready-to-use, off-the-shelf adaptors to collect performance data from network infrastructure (old vendor and new vendor) for quick viewing for both old and new vendor systems.

The project was kick-started with the MYCOM OSI EAA PrOptima™ KPI library to save precious project time. The offered solutions included GIS interface, workspace, alarm module, profiling module and web GUI for enhanced visualization across the network. It provided the capability of benchmarking RAN replacement as the operator moved from one vendor to another.

MYCOM OSI created dynamic reports and KPIs as the transition took place.



BENEFITS

- Smooth vendor swap with no subscriber impact
- Clear vendor acceptance criteria measured on performance benchmarks
- Improved operational efficiency
- Improved capacity planning
- Uniform performance management reporting
- Improved troubleshooting and reduced trouble tickets

QUICK FACTS

- **Customer:** European mobile operator with 3.5 million subscribers
- **MYCOM OSI solutions:** EAA PrOptima™
- **Domains:** RAN, circuit-switched core, packet-switched core, evolved packet core
- **Technologies:** GSM, UMTS, LTE
- **Vendor equipment:** Ericsson, Cisco, Huawei

EAA PrOptima™ was integrated with the operator's inventory system, which resulted in new visibility of the network assets combined with performance intelligence. EAA PrOptima™ produced the necessary KPIs/Metrics to indicate whether the new sites (of the new vendor) were good enough to be accepted, as the roll-out happened. This resulted in zero impact to the operator's subscribers during the transition, as all potential problems were proactively highlighted.

Some detailed actions performed included:

- External database integration - Migrating cell/area/cluster information to EAA PrOptima™
- Inventory data migration
- Generating KPIs for Acceptance Reporting (FAC/PAC)
- Creating KPIs combining legacy data and new vendor data

After the success of the transition, EAA PrOptima™ was extended to manage the performance of the new LTE EPC based on new network elements, followed by the LTE RAN of the new vendor. Consequently, the system was upgraded to support new circuit core and EPC networks. MYCOM OSI extended the PM system to a new vendor of 2G, 3G and LTE radio networks.

RESULTS

EAA PrOptima™ provided the capability of benchmarking RAN and Core replacement as the operator moved from one vendor to another resulting in a smooth transition, with no impact on subscribers.

When MYCOM OSI managed the performance of complete E2E 2G, 3G and LTE across core and radio domains, operational efficiency improved manifold. Capacity and troubleshooting reports were made available from the first day. The use of custom KPIs to focus on the most important issues and custom reports to support operational work processes reduced the time to identify problems and troubleshoot them. This also resulted in improved capacity planning and time to resolve for trouble tickets.

EAA PrOptima™ was able to bring uniformity in performance reporting as the operator and vendor used the same PM solution.

After the initial swap-over, the operator used EAA PrOptima™ extensively for the entire E2E performance management, as a trusted management system. The operator was able to use performance criteria for vendor equipment acceptance and payments.

USE CASE
Resolving E2E network capacity bottlenecks

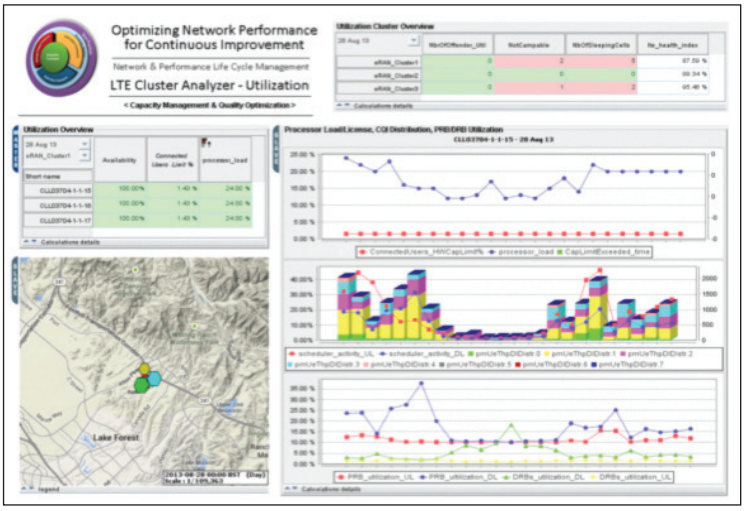
CUSTOMER SITUATION

A large European mobile network was buckling under the growing demand for new mobile data services. Frequent network enhancements were made to avoid data congestion and bottlenecks, requiring the operator to closely monitor the network capacity to enhance capacity of various network elements. In the absence of a proactive performance monitoring system, the user had to constantly monitor the network activities to prevent congestion, often reacting late.

In addition to this, predefined reports on specific capacity KPIs were not available. These were important for proactive capacity upgrades. Also, there was no flexibility to create capacity reports on an E2E network-wide basis. Threshold-based capacity alarms, performance trends and Worst-N/Best-N reports were critically required to resolve the capacity problems.

SOLUTION

With the MYCOM OSI EAA PrOptima™, the mobile operator was able to carry out periodic and proactive observation of network utilization on a daily, weekly, and/or monthly basis. This was achieved through performance alarms, performance monitoring and Worst-N reports.



Processor loads, PRB and DRB utilization (UL and DL)

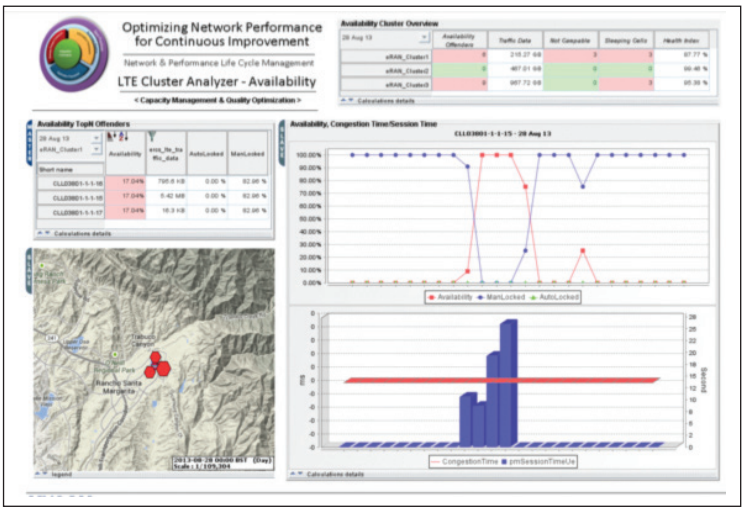
EAA PrOptima™ uses flexible reporting, not requiring SQL or external BI integration, offering off-the-shelf, weekly BH reports based on daily BH values, ranked across different days of the same week. The steps taken by the NOC engineer included viewing the Worst-N reports and verifying the problem by analyzing impact on the network, at the dashboard level. By checking the KPIs against the baseline and its trend, the operator was guided to drill down into the problem locations where the capacity bottlenecks were observed.

BENEFITS

- Support network planning by identifying locations with immediate capacity needs
- Strategic proactive capacity planning
- Increase speed of capacity upgrades and prevent bottlenecks
- Reduce Opex through predefined capacity KPI reporting

QUICK FACTS

- **Customer:** European mobile operator with 42 million subscribers
- **MYCOM OSI solutions:** EAA PrOptima™
- **Domains:** RAN, circuit-switched core, packet-switched core, evolved packet core, IMS core, IN, VAS
- **Technologies:** GSM, UMTS, LTE
- **Vendor equipment:** NSN, Ericsson, Huawei, Alcatel-Lucent



Network congestion time

By analysing the impact of capacity bottlenecks and assigning priorities, EAA PrOptima™ helped the Planning/ Optimization engineer to focus and identify actions to be taken to address the capacity problem. After this, the user could confirm fixes to the problems. The system was extensively used by the network planners, system engineers and quality engineers.

RESULTS

With EAA PrOptima™, the optimization engineer was able to carry out periodic and proactive observation of network capacity and readily receive performance alarms over the dashboard, email and SMS.

The user could navigate between Worst-N, trend reports, capacity alarms to high-level dashboards. The user could also suspend capacity alarms for a certain time and network element. Other EAA PrOptima™ features that were used were alarm generation, scheduled reports, report and emailing by event.

A capacity analysis report on LTE cells allowed detection of cell identities that showed a consistent high level of traffic over a period of several weeks; a set of KPIs defined as counter aggregations over BH points in time; topology filters based on thresholds set on such KPIs and, finally, reports listing the cell identities that show multiple threshold breaches over a period of several weeks.

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USE CASE
QoS management and reporting for NOC

CUSTOMER SITUATION

A large European mobile operator required to share network performance data with internal stakeholders at different levels: high-level for top management to detailed data for NOC engineers, offering quick drilldown to identify QoS problems. It was important to process and present Performance Management data in an easy and comprehensive form for quick analysis, either pre-configured or customizable within specified limits.

A web interface with pre-aggregated reports was recommended as an important way to display and access PM data. Also, exporting the data into different common formats would help the user to distribute the relevant data for operations and optimization teams to take parallel actions.

Besides presenting data to the various stakeholders, the operator required that a comparison be made between regional network quality and network-wide performance. By analyzing a predefined report for each region, a quick and comprehensive view on overall performance would be established.

SOLUTION

With MYCOM OSI's EAA PrOptima™ NOC dashboard, reports were generated that offered a quick view of the overall network performance, in addition to regional performance data.

NOC dashboard for 4G service and OTT health

Some of the reports created were color-coded coverage plots for all 2G, 3G and 4G for specific locations or for the entire network.

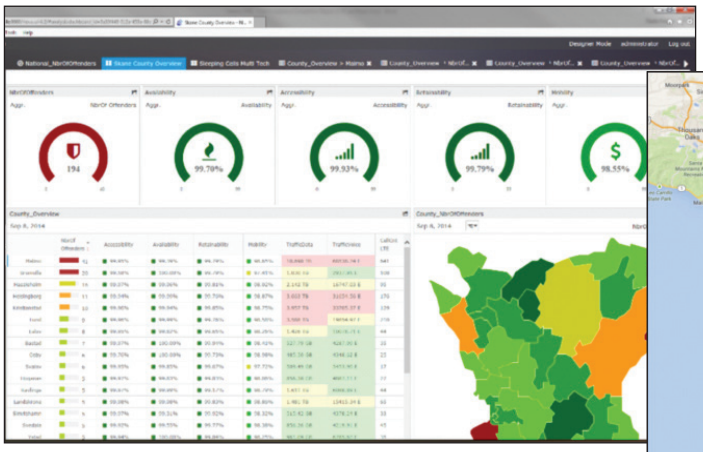
Reports were also generated for throughput of a particular network area (cell cluster, cell). The dashboards were pre-aggregated as per customer's requirement.

BENEFITS

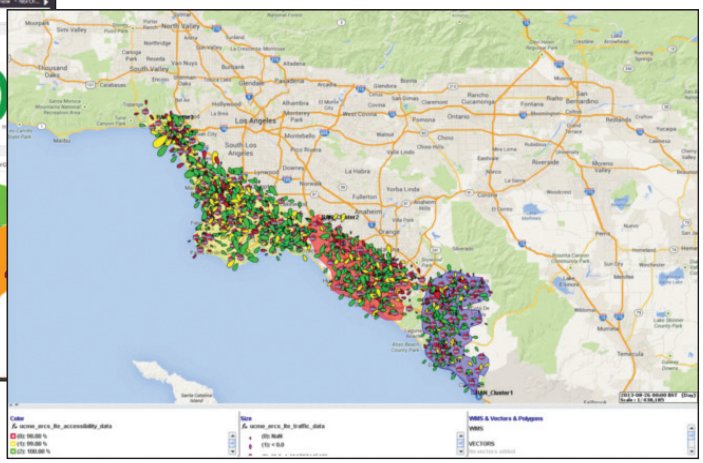
- Web-based access for organization-wide reporting
- Top KPI visualization for NOC engineers
- Easy-to-understand charts/graphs/tables
- GIS view of locations mapped with performance data
- Suggested drilldowns for quick RCA

QUICK FACTS

- **Customer:** European mobile operator with 42 million subscribers
- **MYCOM OSI solutions:** EAA PrOptima™
- **Domains:** RAN, circuit-switched core, packet-switched core, evolved packet core, IMS Core, IN, VAS
- **Technologies:** GSM, UMTS, LTE
- **Vendor equipment:** NSN, Ericsson, Huawei, Alcatel-Lucent



EAA PrOptima™ Web Reporter screen



GIS view of network elements identifying 2G/3G/4G KPIs

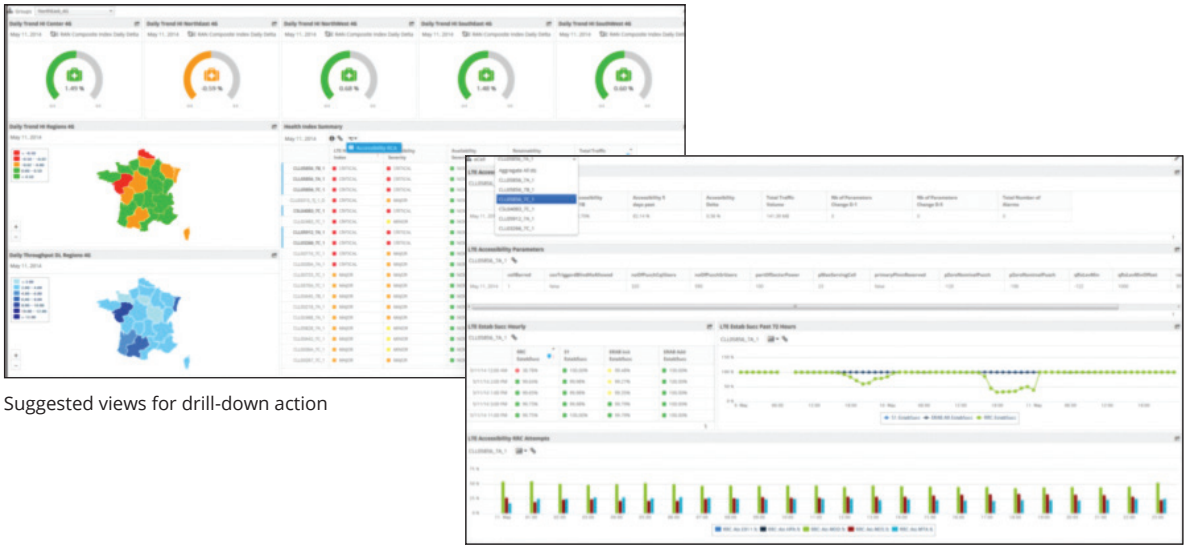
Some of the KPIs correlated with a GIS map were:

- Handovers between 2G, 3G and 4G
- Availability of sites
- Integrity - Traffic data volume, latency, jitter, packet loss, throughput, etc.

GIS views could be quickly arranged in EAA PrOptima™ through drag-and-drop operation and correlation capability to render the results of an investigation, e.g. identifying the coverage area affected by a KPI degradation in a cell cluster. Conversely, a selection in a GIS view was used as filter criteria to trigger table/graph views.

RESULTS

Predefining reports in the dashboard helped to offer a high-level view for C-level and NOC manager. The easy-to-understand graphs and charts help identify the most critical performance issues across the network. KPIs that had the most impact on quality of experience were highlighted and tracked in near real time.



Suggested views for drill-down action

The detailed NOC reports were customized as per engineer/management needs through simple drag-and-drop functions. The reports were analyzed by the operator's quality engineer, network domain manager and NOC manager. After identifying problems on the dashboard, the NOC engineer could drill down into the root cause of the degrading KPI, e.g. Health Index. EAA PrOptima™ suggested views took the engineer to the next level of troubleshooting, identifying the candidate cells to optimize.

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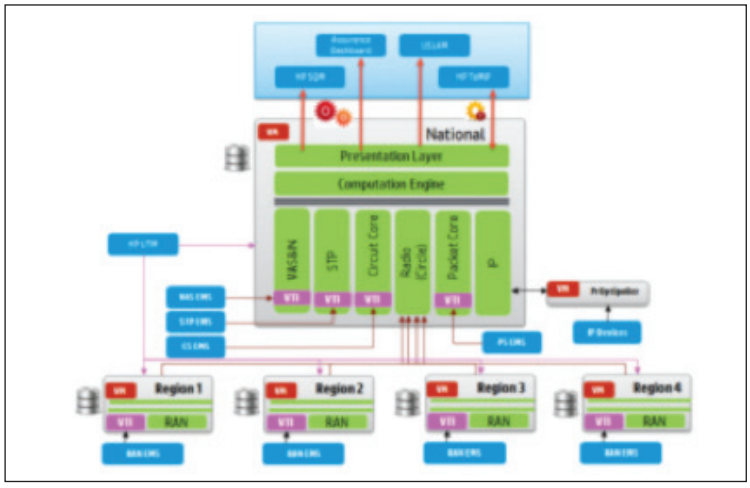
USE CASE
Realizing the vision of unified performance management

CUSTOMER SITUATION

A very large Asian mobile and fixed operator was building a Super Network Operations Centre (SNOC) for efficient management of its entire national network, to speed up the integration of new equipment and technologies, as well as to convert network data into information to the benefit of its large subscriber base (185 million subscribers). The SNOC, which was based on services-driven network management, required a Performance Management at its core to carry out the critical functions required.

Committed to delivering the best network quality and customer experience, the operator was rolling out an aggressive voice and data growth plan. The massive size of the network deployment and subscriber base required a single, carrier-grade network performance system to meet the scalability requirements of the multi-vendor, multi-domain network.



Performance management scalable architecture

However, there were challenges in implementing a large scale performance management solution using legacy tools. The umbrella performance management was required to have service quality impact analysis, support for multi-technology, multi-vendor, across multi-domains to handle SNOC service level complexity. The solution was expected to be highly scalable, offering a robust solution to consolidate the different performance data sources.

BENEFITS

- Customer impact and loss analysis
- Proactive notification from network to business and/or customers
- Predictive network problem detection
- Optimization of revenue
- Dashboard view of the network and services for the C-level as well as operations teams
- Increased operational efficiency and higher productivity
- Improved customer experience through reduced MTTR, end-to-end SLA for services and proactive service impact

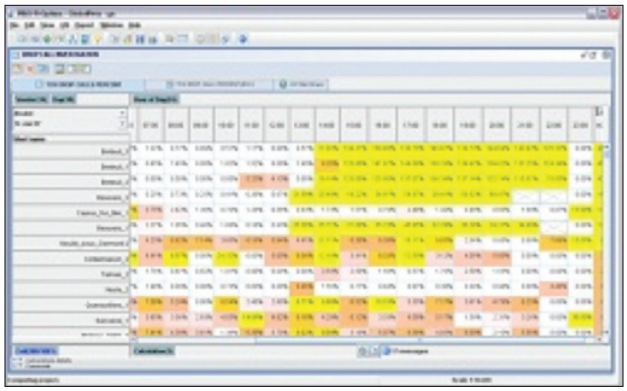
QUICK FACTS

- **Customer:**
  Asian mobile and fixed operator with 185 million subscribers and 700K cells
- **MYCOM OSI solutions:**
  EAA PrOptima™
- **Domains:**
  RAN,circuit-switched core, packet-switched core, transmission network, VAS
- **Technologies:**
  GSM, UMTS
- **Vendor equipment:**
  NSN, Ericsson, Cisco, Juniper, Comviva, Roamware, NSN, Ericsson, Extreme, Citrix, Huawei, ECI, NEC, Tellabs, Ceragon

SOLUTION

MYCOM OSI EAA PrOptima™ network performance management solution provided out-of-the-box support for such a super-large network, supporting multiple technologies, domains and equipment vendors across access, backhaul, core and service networks.

After selection and consequent deployment, EAA PrOptima™ processed very large volumes of performance, configuration
and services data in near real-time, using advanced correlation, analysis, reporting and visualization modules. EAA PrOptima™ created intelligence out of billions of disparate data sources across vendors, technologies and domains.



Flexible reporting with advanced correlation, drill-down and roll-up functions

RESULTS

The operator used the EAA PrOptima™ features of automation, workflow and customization of KPIs, alarms and reports to continuously derive operational and business benefits. The SNOC users extensively used the EAA PrOptima™
multi-domain aggregated view of the 2G and 3G mobile network performance, with the ability to drill down from national level to any supported network element of Packet Switching (PS), Circuit Switching (CS), IP and VAS/IN. Network KPIs in jeopardy were detected and resolved before the threshold breaches occurred. The following was achieved through performance management at the SNOC:

- Optimization of revenue/investment through consolidation of silo PM systems across the national network (an umbrella system for the E2E network)
- Dashboard view (network and service) for CEO/CTO/manager/operations for a better handle on developing network/service situations
- Increased operational efficiency and productivity through proactive/predictive information
- Proactive service impact information to Customer Care
- Improved customer experience through proactive notification of network/service degradation and predictive trending, leading to improved MTTR and reduced down-time

Robust traffic forecasting functions

MYCOM OSI, The Assurance Cloud Company™, is a leading independent provider of Assurance, Automation and Analytics solutions to Tier 1 Communications Service Providers including Deutsche Telekom, Globe, Reliance Jio, Safaricom, Sprint, STC, Telefónica, Three UK, Telenor, T-Mobile, Verizon and Vodafone. Its cloud native, award-winning Experience Assurance & Analytics™ (EAA) solutions visualize, automate and optimize digital experiences as well as network and service quality end-to-end across CSPs hybrid physical, telco cloud and IT networks. With the Assurance Cloud™, MYCOM OSI launched the telecom industry's first carrier-grade service assurance SaaS (Software as a Service) offering. Headquartered in London with 250+ staff worldwide, MYCOM OSI has been 100% focused on telecom and networks for 25+ years. Its systems assure service quality for over 2 billion subscribers and enterprise customers globally.

UC29-Q319-V7

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USE CASE
Eliminating performance problems through worst cell cluster analysis

CUSTOMER SITUATION

A large European multi-vendor mobile operator wanted to identify worst performing cells and cell clusters in its 2G, 3G and 4G networks to quickly eliminate rogue or underperforming cells/clusters.

A daily worst cell list with related reports/dashboards (daily, hourly) was required to be viewed every few seconds. The ranking of the worst cells/clusters was to be based on the Health Index KPI (comprising RRC/RAB establishment failure rate, UL and DL volumes, etc.). The Health Index KPI was to be augmented by external data, e.g. ARPU for cell/Node B, in order to prioritize actions. There was a need for regional and national worst cell lists to be generated and emailed to users daily. The report was to be based on averages and standard deviation for the KPI for the last 30 days. The worst cell report also had to offer drill-down from national to regional level, KPIs to counter level in order to isolate the issues.

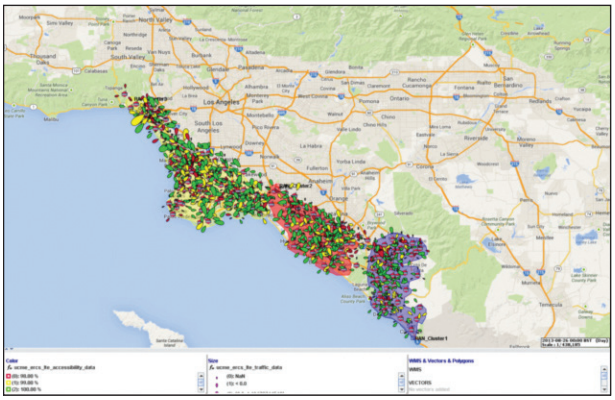
A cluster analysis was also required based on high-level KPIs to analyze the worst clusters of a region. The Cluster KPIs would show the aggregated values pointing to certain problems in the network. The user would then drill down to the single elements.

Additionally, PM reports were expected to offer correlation between different report types, e.g. GIS to graphs/tables and vice versa.

SOLUTION

Worst cell list was created in the MYCOM OSI EAA PrOptima™ adding different KPIs to a report and defining thresholds for the results. To create a worst cell list, a number of multi-vendor and multi-technology KPIs were taken into account.

The EAA PrOptima™ reports have flexible dimensions, e.g. thresholds, time, network element, technology type, vendor type, etc., allowing flexibility to the user to create the criteria for worst cells.



LTE accessibility-based worst cells/cluster on GIS map

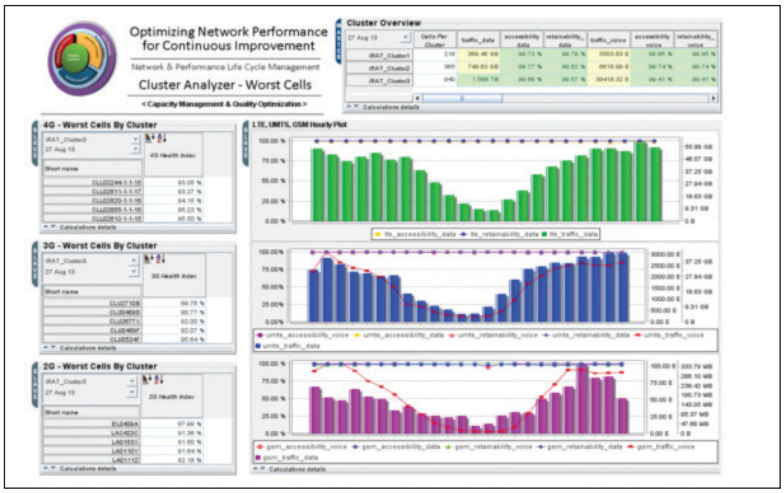
BENEFITS

- Quick identification of worst offenders (within seconds) on network level as well as regional level
- GIS view to visualize and correlate badly performing cells/cluster to its Health Index
- Quick navigation between GIS view and other reports (Tables/Graphs)
- Reduce MTTR

QUICK FACTS

- **Customer:** European mobile operator with 42 million subscribers
- **MYCOM OSI solutions:** EAA PrOptima™
- **Domains:** RAN, circuit-switched core, packet-switched core, evolved packet core, IMS Core, IN, VAS
- **Technologies:** GSM, UMTS, LTE
- **Vendor equipment:** NSN, Ericsson, Huawei, Alcatel-Lucent

The GIS module was offered to visualize the cluster with a color-code to indicate its health. Drilling down into a cluster showed the single elements, the KPIs and counters within the GIS module. In absence of predefined clusters, polygons were used to group network elements.



2G/3G/4G worst cells/clusters based on Health Index

The optimization engineer was able to check the worst cell report or performance alarm report using predefined dashboards of EAA PrOptima™. After comparing the KPI and the baseline, they could analyze the impact of violations and assign priorities for activities to fix the problem.

For the worst cluster reporting, the optimization engineers used worst cluster report for analysing root causes. After checking daily KPIs against the baseline, they could analyze different scenarios such as configuration changes, new integration, cell performance and worst cells of a cluster.

EAA PrOptima™ was extensively used by the operator's RAN Experts and system engineers.

GIS views were quickly arranged using drag-and-drop operations to define different data reports, e.g. identifying the coverage area affected by a KPI degradation in a cell cluster. Conversely, a selection in a GIS view was used as a filter criteria to drill down to tabular/graphical reports.

RESULTS

Using EAA PrOptima™, the engineers could generate the worst cell lists generated within a few seconds. EAA PrOptima™ allowed analyzing the impact of violations and assigning priorities using both drill-down and roll-up functions, as required by the operator.

After visualizing clusters in GIS and performing a drill-down/roll-up using polygons, grouping, and area filters, the engineers could isolate the worst cells/clusters within seconds, enabling optimization activities on those cells/clusters.

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USE CASE
Orchestrating service quality in hybrid NFV networks

PROJECT SITUATION

2 Tier 1 European operators participated in a TMF-driven catalyst project to monitor the quality of digital services in a hybrid NFV network environment. Service performance data had to be collected from both physical and virtualized LTE core networks and orchestrated in real-time. Disparate data from physical and virtualized core networks had to be run with the same QoS policies and root cause analyses, followed by automated corrective actions in near real-time, across both networks.

It was important to integrate and visualize the QoS information about different services in an end-to-end high-level view.

Until then, the only method involved collection of assurance data from physical and NFV sources through separate systems and their subsequent correlation. Additionally, there were no QoS algorithms/policies that were run on the degraded metrics to identify the E2E QoS impact.

Since all suggested corrective actions would be based on manual root cause analysis in silo systems and not employing automation, it would lead to errors in analysis. Unsynchronized reporting would cause critical delays in problem resolution, ultimately leading to escalated operational costs. This would have a negative impact on the operators' profitability, contrary to the promise of an NFV network.

SOLUTION

MYCOM OSI EAA ProAssure™ digital service quality management system and EAA ProActor™ function together for automated self-orchestration of 2G, 3G, LTE and NFV networks, to collect and harmonize performance and service assurance data across technologies and vendors into a single service orchestration system.

The system was connected to the EPC EMS and the vEPC via MANO to provide the required service orchestration of the EPC and vEPC network elements, based on the QoS policy violations detected. The system performed real-time data correlation, QoS policy management and root cause analysis, followed by closed-loop automation to take corrective actions. The ecosystem also included integration with physical network/service inventory and MANO sources of inventory and fulfilment data.

As one of the service orchestration cases, when the service KPI availability degraded for a particular corporate social networking service, the SQM system triggered alarms which were sent to the EAA ProActor™ E2E policy orchestration system.

The policy orchestration ran root cause analysis on the degraded corporate service through exchanges with the end-to-end service assurance management system including navigation across the service graph definition and evaluating the policy rules based on KQIs attached to the service graph.

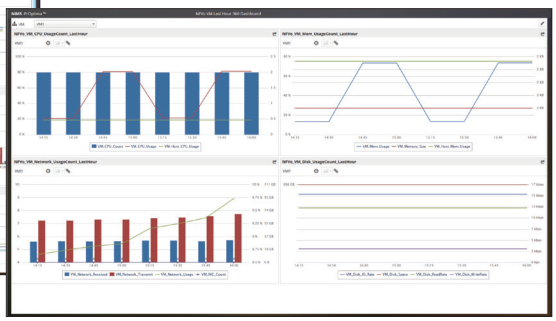
BENEFITS

- Unified, hybrid network, service orchestration architecture
- Automatic integration and enablement of new VNFs for network service topology and configuration updates in (near) real time
- Closed-loop automated workflows and issue resolution processes
- Policy-driven multi-tenancy resource mediation (scale-in and scale-out)
- Guarantee service reliability through automated service recovery and troubleshooting
- Dynamic modeling of new hybrid physical/logical services
- Powerful, integrated GIS E2E service dashboard capabilities

QUICK FACTS

- **Project:** TMF NFV self-optimization catalyst involving 2 Tier 1 European operators
- **MYCOM OSI solution:** EAA PrOptima™ service assurance platform and EAA ProActor™
- **Domains:** Radio access network, IP transport network, evolved packet core, NFV Core- vEPC (vMME, vSGW, vPGW), NFV MANO
- **Assurance Data Sources:** Probes (OTT data), PM and FM
- **Technologies:** UMTS, LTE, NFV
- **Vendor equipment:** NEC vEPC, Netcracker MANO

Virtual Machine CPU and Memory Usage



Virtual Infrastructure Capacity Management

EAA ProActor™ automated root cause logic provided two recommended actions for solving the problem:

- Increasing the small buffer size of a certain MASG (Mobile Access Site Gateway) router of the IP mobile backhaul, which was impacting the delivery of short messages applications such as the social networking corporate service
- The scale out on a vMME as the vMME cluster congestion was impacting the 4G accessibility for the location where the corporate customer was present

As was later confirmed, the vMME had suffered a surge in incoming service requests resulting in increased usage of Virtual Machine (VM) CPU & memory. As a result, EAA ProActor™ policy layer triggered two corrective actions, one to the NFV Orchestrator (MANO) for vMME scale out and the second action towards the physical inventory system for parameter change on the IP router for small buffer size increase.

When the automated actions were executed, the NFV Orchestrator (MANO) and the physical network Configuration Manager notified EAA ProActor™ policy orchestration that the prescribed actions had been successfully executed, and the alarm was cleared, thus closing the loop.

The EAA ProAssure™ vEPC real-time dashboards combine functional and resource data, vis a vis, vEPC functional KPIs such as accessibility, mobility, availability, etc., and vEPC VM Resource KPIs received from the NFV Orchestrator (MANO).

The user-friendly dashboard allows operators to identify specific service issues and drill down to performance details, GIS maps, and other reports.

vEPC Real-time Dashboards

RESULTS

Using MYCOM OSI service quality management and automation system, the operators and TMF derived maximum benefit of using a collaborative, pre-integrated, service orchestration and automation system, which can be deployed during any stage of a CSP's network virtualization transformation project.

The users were able to perform rapid problem detection, notification, and isolation, followed by root cause analysis and closed-loop automation. The web-based service level dashboards enabled the users to identify developing QoS problems across physical and virtualized parts of the network and troubleshoot them in real-time.

With this high level of service orchestration and prescriptive automation, customer productivity improves as manual data processing and manipulation is drastically reduced. With faster resolution of digital service quality issues in an evolving hybrid NFV environment, customer experience improves, and new NFV-based digital services can be launched with confidence.

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USE CASE
Assuring quality of corporate IP broadband service

CUSTOMER SITUATION

Telecom operators face customer churn and revenue losses if they do not manage the quality of service offered to their corporate customers, whether fixed, broadband or mobile. To prevent customer churn, operators want to carry out proactive service management, message customers about impending service issues and prevent SLA/OLA violations. Operators also want to launch and monetize new services in an agile manner.

The operator is an OSS and network technology leader in the European region. Its new all-IP next generation fixed broadband network required service monitoring in order to assure the highest Grade-of-Service to its corporate enterprise customers. It wanted to prioritize the incident management support for these high revenue business-IP customers. Although the operator had trialled SQM tools in the network, they had failed to scale with the increase in traffic load and the complexity of integration required.

The operator chose the MYCOM OSI EAA ProAssure™ digital service quality management solution to manage the service quality across its broadband technology network delivered by different equipment vendors. Important factors in selecting EAA ProAssure™ were its ability to process very large volumes of service management data in near real-time, its advanced service modelling and easy integration with PM, FM and CMDB systems. Such an integrated system covered all digital service needs of the operator then and for the future.

SOLUTION

EAA ProAssure™ has been deployed in the operator network to manage the service quality of Ethernet Virtual Private Line. They use it for proactive and reactive network service operations. The system gathers very large volumes of service data from multiple data sources and provides powerful web based visualization dashboards.

The umbrella digital SQM system manages millions of customer endpoints and service instances and also fully automates inventory integration that keeps the service template instances and customer connectivity chain updated. It also offers REST API integration points for their next generation and common assurance architecture.

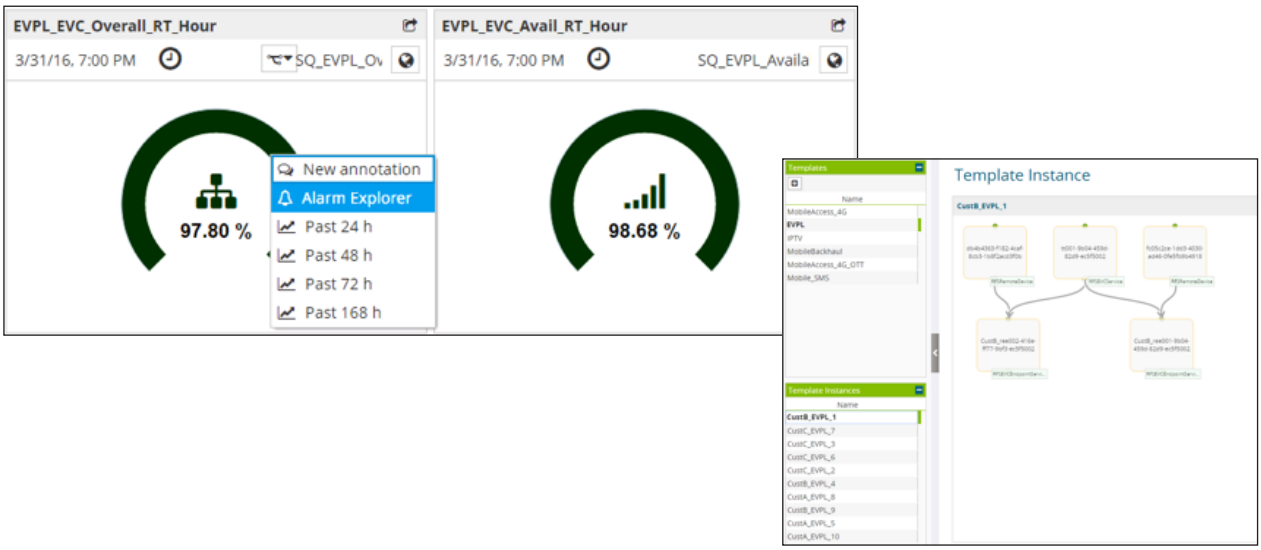
EAA ProAssure™ open, collaborative interfaces (largely based on TMF standards) collect performance/time-series data as per TMF 628, collect alarm data and publish northbound KPI/KQIS/reports as per TMF 628. It also determines the impact of network faults and performance degradation on services. EAA ProAssure™ uses northbound publication of service problems using
x.733 interface.

BENEFITS

- Multi-vendor, multi-technology, multi-domain converged solution
- Billions of service data points processed per hour
- Flexible, out-of-the-box correlation, analysis, reports and visualization
- Scalability to meet the operator's current and future needs
- Assess impact of network on services and speed-up identification of QoS issues
- Proactive operations that speed up identification of QoS issues by advanced drill-down and navigation to network level, allowing preventive maintenance and reducing MTTR
- Adaptable to service and network topology changes, covering a range of fixed, mobile and IoT services
- Reduced time to market through rapid roll-out of new services in an NFV environment, reacting quickly to network/service bottlenecks
- Collaborative web based multi-team platform that unifies service quality view for proactive NOC/SOC and monitoring of service usage by business teams

QUICK FACTS

- **Customer:**
  Tier 1 European fixed, broadband and mobile operator; fixed subscriber base of 33 million and mobile subscriber base of 38 million
- **MYCOM OSI solution:**
  EAA ProAssure™
- **Domains:**
  Broadband, IP, EVPL
- **Technologies:**
  Broadband, IP
- **Vendor equipment:**
  Juniper, Cisco, Huawei, ALU



EAA ProAssure™ monitors the traffic of the enterprise service through KPIs such as availability, accuracy (latency and errors) and speed of the new fixed broadband metro ethernet network. It proactively identifies problems with individual enterprise services and highlights and prioritizes problems to take remedial action. Service instances that are undergoing Service Level Objective (SLO) or Operational Level Agreement (OLA) violations are reported. Because of its tight coupling with the underlying inventory/CMDB system, EAA ProAssure™ identifies the resources contributing to the violations.

Such proactive identification of service violation, followed by Root Cause Analysis to understand the problems with specific KPIs or network elements, helps reduce the operator's mean time to repair. EAA ProAssure™ also automatically directs the problem to external trouble ticket systems or other operator teams, who might be interested in the information, such as Corporate Sales or Customer Care.

EAA ProAssure™ proactive management capabilities include identification of developing problems in services and resolving them before they impact the customer. It drives NOC/SOC priorities to focus on revenue-impacting problems, speeding up identification of service issues in both physical and virtualized fixed and mobile networks. Because of the large size of the operator, EAA ProAssure™ processes very large volumes of service performance, faults and traffic data in near real-time with advanced reporting and drill-down capabilities.

RESULTS

Result Id	Alarm Name	MO Class	MO Name	Severity	Raised Time
100000992	EVPL_Availability	EVPL_RFSEVCService	CustC_EVPL_7_tt001-9b04-459d-82d9-ec5f5004	MAJOR	4/12/16, 4:01 PM
100000991	EVPL_Availability	EVPL_RFSEVCService	CustC_EVPL_6_tt001-9b04-459d-82d9-ec5f5008	MAJOR	4/12/16, 4:01 PM
100000990	EVPL_Availability	EVPL_RFSEVCService	CustC_EVPL_3_tt001-9b04-459d-82d9-ec5f5007	MAJOR	4/12/16, 4:01 PM
100000989	EVPL_Availability	EVPL_RFSEVCService	CustC_EVPL_2_tt001-9b04-459d-82d9-ec5f5005	MAJOR	4/12/16, 4:01 PM
100000988	EVPL_Availability	EVPL_RFSEVCService	CustB_EVPL_1_tt001-9b04-459d-82d9-ec5f5002	MAJOR	4/12/16, 4:01 PM
100000987	EVPL_Availability	EVPL_RFSEVCService	CustA_EVPL_8_tt001-9b04-459d-82d9-ec5f5006	MAJOR	4/12/16, 4:01 PM
100000986	EVPL_Availability	EVPL_RFSEVCService	CustA_EVPL_5_tt001-9b04-459d-82d9-ec5f5003	MAJOR	4/12/16, 4:01 PM
100000985	EVPL_Availability	EVPL_RFSEVCService	CustA_EVPL_10_tt001-9b04-459d-82d9-ec5f5001	MAJOR	4/12/16, 4:01 PM

By managing the Corporate IP customers, the operator has been able to achieve 24/7 surveillance support for its Service Operations Centre (SOC). The engineers now proactively check SLAs that could be violated. When services of corporate customers who are on Ethernet Virtual Private Line begin to degrade, higher priority is assigned to them. The EAA ProAssure™ SQM system has also helped the operator to launch new services faster. The operator can now design new services quickly using flexible design rules and templates for agile service launches.

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USE CASE
Automating special event management to ensure high quality of service

CUSTOMER SITUATION

Special events — such as sporting events, conventions, and trade shows — are characterized by large numbers of people using large numbers of mobile devices in relatively confined locations. This creates an exceptional demand for mobile services and places enormous strains on the mobile service provider's ability to deliver and manage capacity and coverage at an appropriate level of quality.

This large North America operator wanted to maintain the best possible network quality in spite of the extreme network loads generated at events. In addition, they wanted to move from manual processes to closed loop process automation.

Since the operator manages hundreds of special events each year, they selected the special event management underpinned by the MYCOM OSI EAA ProActor™ automation solution, to provide high-quality mobile services for event participants. EAA ProActor™ provides a carrier grade, multi-technology, multi-domain, multi-vendor network automation capability that is essential for special event management. The delivered services provided the optimum utilization of deployed network capacity and when necessary included the deployment of distributed antenna systems, small cell solutions, mobile cell sites and Cells on Wheels (COWs).

EAA ProActor™ also met the operator's demand to automate best practices and operational procedures, resulting in consistency, reliability and repeatability. Of particular importance were its monitoring, analysis, reporting and visualization capabilities, coupled with process and configuration automation. The solution also needed to be flexible enough to support the rapid adoption of new services and technologies.

SOLUTION

The operator used EAA ProActor™ Campaign Management AutoFlow™ (rule-sets)
to automatically detect cell congestion and, throughout the event, make needed network parameter changes that would maximize network quality for customers.

Commercial-off-the-shelf EAA PrOptima™ adaptors collected and monitored GSM, UMTS and LTE network element performance counters. Then the EAA ProActor™ AutoFlow™ automatically detected levels of cell congestion and created XML parameter files based on the state of congestion and the operator's service quality agreements. Various states of congestion can trigger actions such as parameter reconfigurations.

The EAA ProActor™ automated closed loop process workflows collected network performance data, performed root cause analysis and other computations and triggered network parameter changes — providing consistent pre-defined changes to the network based on the current capacity needs of the users. Network parameters were dynamically adapted to the detected severity of congestion.

BENEFITS

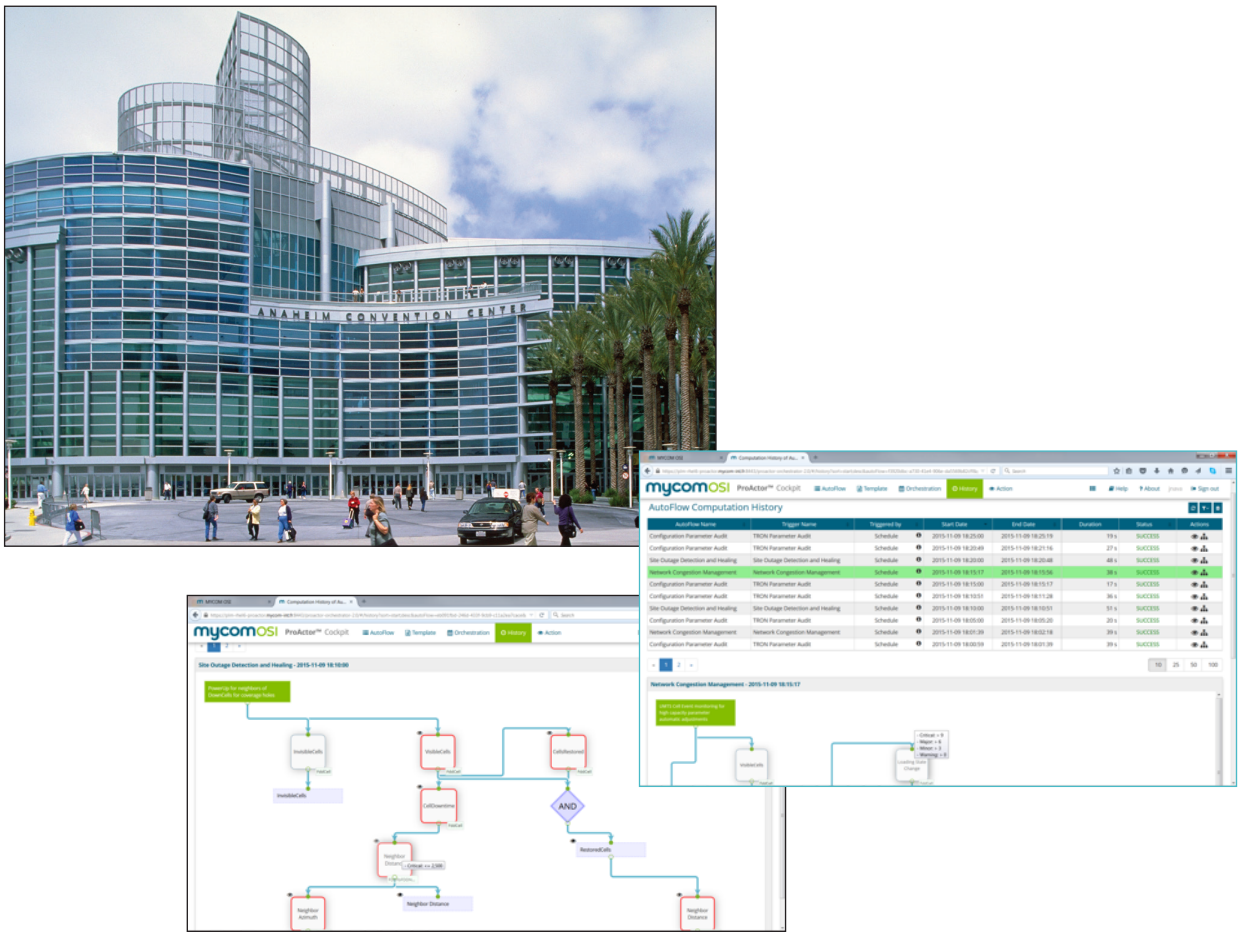
- Cost-effective and consistent approach to special event management
- Complete closed automation support
- Near real-time monitoring and reporting
- Uniform multi-vendor, multi-technology, multi-domain performance management
- Flexible, out-of-the-box, automated KPIs and reports
- Alignment with workflow processes
- Future-proof architecture on a single platform

QUICK FACTS

- **Customer:**
  American mobile operator,
  >115 million subscriber base
- **MYCOM OSI solutions:**
  EAA ProActor™
- **Domains:**
  RAN
- **Technologies:**
  GSM, UMTS, LTE
- **Vendor equipment:**
  NSN, Ericsson

For an indoor event at the Convention Centre the operator automatically detected congestion based on direct Radio Network Controller readings and performed alleviation every 5 minutes. They selected high frequency updates to UMTS parameter sets in order to provide the quickest changes to network resources and offered services based on the current demands of the high concentration of mobile subscribers at the event.

The operator used off-the-shelf reports and pre-packaged, logic-based Key Performance Indicators (KPIs) for each vendor and technology. Automated and KPI trending reports were also generated and instantly visualized to monitor event performance in near real-time.



RESULTS

EAA ProActor™ enabled the operator to automate event management tasks that were previously performed manually. This greatly improved productivity, enabled process consistency, freed up human resources and minimized human errors. It ensured the best possible network quality during extreme network load situations.

Using the underlying EAA PrOptima™ platform, billions of performance data records were collected per minute, cell loads were controlled using closed loop automation and changes were made to network equipment parameters in order to optimize performance. The EAA ProActor™ automation removed manual analysis and diagnosis and improved consistency, repeatability and reliability.

As an example, the event drew 30K attendees. EAA ProActor™ monitored multiple technology sectors at the convention centre, 2 hotels and the surrounding area that contained both indoor Distributed Antenna Systems and macro cells. Over the two days of the event approximately 384 completely automatic decision cycles were run that resulted in 460K parameter corrections based on the radio environment and current loading of resources.

As a result, customers experienced the best possible service throughout the entire event, even in the face of insufficient network resources. Parameters were only changed on resources whose loads required intervention. All this was done automatically without any manual operations.

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USE CASE
Capacity analysis for managing mega, merged networks

PROJECT SITUATION

Mobile operators share networks or merge their network infrastructure for several business reasons, one of the main being Capex optimization and management of their networks. This is especially true of capacity management of the Radio Access Networks (RANs).

When two large European mobile operators merged their network infrastructure across RAN and core networks, it resulted in creating a mega mobile operator, the largest in the country.

As part of this merger, they also combined their operations, including NOC/SOC and the underlying OSS. The biggest challenge was to manage the joint network performance and to optimize the capacity of this new network without any impact on customer experience.

This meant that the unified performance management system had to scale up to over 400,000 cells of the combined Tier 1 networks. The capacity metrics had to be extracted from a complex multi-vendor network (comprising RAN, core, IP, VAS, and transmission). The system had to be deployed in very short timelines for minimum disruption. It was also required to have high compliancy and integration with all of the legacy OSS ecosystem of the 2 large networks.

The operators chose the MYCOM OSI EAA PrOptima™ unified performance management product, and the EAA ProInsight™ network analytics product to optimize and forecast the network capacity across multiple technologies, network domains and equipment vendors. Important factors in selecting MYCOM OSI were the ability to process very large volumes of performance management data in near real-time and the generation of the advanced correlations and computations that would result in accurate capacity utilization and forecasts. It was also very important that the system provided scalability to meet the merged operator's growth in the future.

SOLUTION

The solution for the unified system was based on a centralized MYCOM OSI platform and a third party Hadoop cluster-based Big Data System. The centralized architecture employed a shared "Big Data Storage Infrastructure" facility, which used a Distributed File System (DFS).

EAA ProInsight™ network analytics system was deployed to manage the capacity of the combined network resources, optimize their use and forecast and plan infrastructure growth — all from a single system.

The mega operator uses the single system for capacity planning of all merged domains including RAN, circuit-switched core, packet-switched core and value-added services. Throughout the merger consolidation steps, the combined OSS system gathers large volumes of network statistics from multiple data sources and EAA ProInsight™ provides powerful analytical tools to help the operator quickly interpret and take action on the computed analytics.

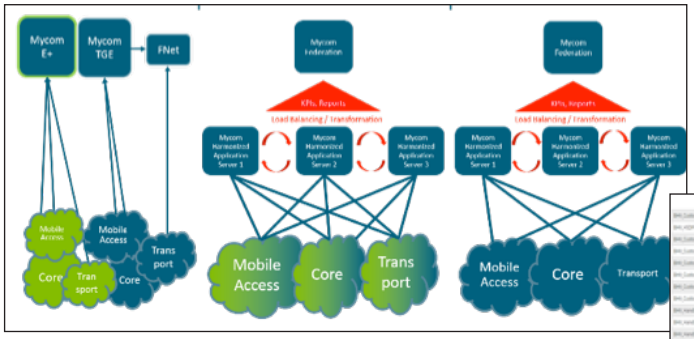
BENEFITS

- Billions of heterogeneous data inputs, converted into terabytes of data and hundreds of correlations per hour
- Simplified, predictive capacity utilization and accurate forecasts
- Reduced capital expenses from powerful optimization and engaging under-utilized network infrastructure
- New technology readiness allows checking configured capacity against actual use for VoLTE, Small Cells, NFV and IoT
- Analytics-driven investments through prioritization of network expansions and investments in services and devices, based on location and customer need
- Dynamic capacity management of campaigns and special events

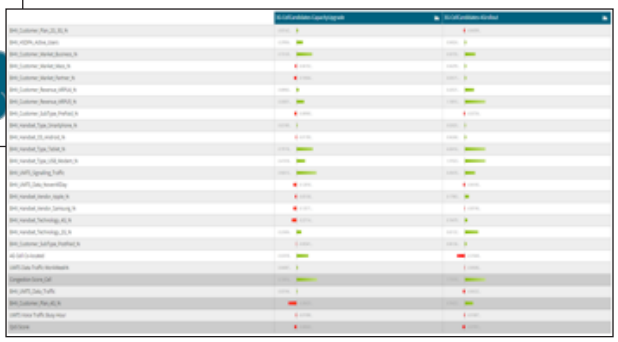
QUICK FACTS

- **Customer:**
  Merged European mobile operator with 5.4 million fixed broadband subscribers and 42.6 million mobile subscribers
- **MYCOM OSI solutions:**
  EAA ProInsight™, EAA PrOptima™
- **Domains:**
  CS core (MSC, HLR, MGW, etc.), PS core (SGSN, GGSN, IMS, Network Objects from legacy PM systems), transmission (Radio, ATM, SDH, PDH), VAS (SMSC, MMSC, etc.) and IP
- **Technologies:**
  GSM, UMTS, LTE, IMS
- **Vendor equipment:**
  Radio: Huawei and Ericsson 2G/3G/4G (ZTE being decommissioned); Circuit core: NSN, Huawei; Packet core: Huawei, NSN, ZTE; IMS: Ericsson, Broadworks, ACME; Transmission: Alcatel, Huawei, NSN, Ericsson, Fujitsu, Marconi, SIAE; IP: Cisco, Juniper, Huawei, Redback, Netscout, F5; VAS: ALU, ZTE, Huawei, Acision

EAA ProInsight™ generates capacity management analytics and visually presents the results of advanced statistical and trend analyses. EAA ProInsight™ also provides southbound integration to specific surrounding systems. These systems include FM, Service Test management, Inventory, SQM, Service Problem management and the services related to these different data sources. The network analytics transform OSS into an intelligent capacity planning engine, using over hundreds of PM KPIs and specific, customer-defined RAN related use-cases.



Steps towards Merged Network and OSS Transformation



Profiling template scoring report showing profiles (grouped network elements)

Example forecast for a selected Performance Indicator and time scope (past and future)

EAA ProInsight™ and EAA PrOptima™ span the network capacity management lifecycle to help the operator ensure optimal utilization of existing network resources. They streamline capacity management processes through powerful analyses, resource utilization trending and automatic threshold breach detection. They help with specific RAN capacity-related use cases, some of which are:

- RAN worst cell analysis, which provides flexible health indexes to determine the worst cells
- RAN Worst cluster analysis, which addresses the need to swiftly identify and assess offending clusters of cells, enabling map-based visualization of clusters, drill-down and roll-up
- Rapid RAN analysis isolates performance degradations, providing a top-down approach to problem detection

EAA ProInsight™ specifically provides intuitive statistical data visualization, forecasting and prioritizing capacity upgrades, based on customer usage, ARPU, location, etc. EAA ProInsight™ highly scalable next-generation network analytics solution provides the operator unique network utilization and subscriber behavior insights by integrating and associating technical information (for example busy hour traffic) with commercial metrics (such as handset types or customer plans the subscribers are on).

Additionally, in the new merged network the operator is considering automation capabilities to monitor and automatically change resource configuration parameters to improve capacity. This is particularly useful for managing network capacity during special events, such as concerts or major sports events, where subscriber concentrations can easily cause traffic to exceed available capacity.

RESULTS

By managing capacity with near real-time data and making automatic network adjustments based on current conditions, the operator made more intelligent data-based decisions that improved customer service levels and avoided unnecessary network expansions. Advanced correlation, predictive analysis, forecast, and near-real time visualization increased staff efficiency and accuracy and optimized Capex.

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USE CASE
Capacity and congestion optimization using network analytics

CUSTOMER SITUATION

Mobile operators face customer churn and unnecessary capital expenditures if they do not manage, optimize and accurately forecast the capacity of their networks in line with the needs of the customers.

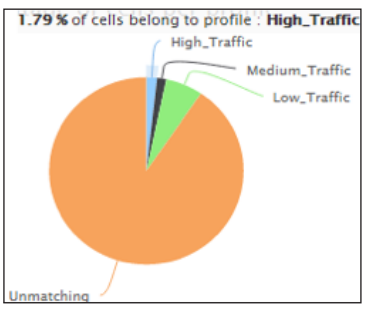
This Tier 1 European operator's existing capacity planning approach consisted of multiple stand-alone solutions where the data was often out-of-date and not shared across the organization. In addition, the analysis and decision-making processes were largely manual and reactive. The result was consistently inaccurate forecasts that resulted either in deployment of more capacity than was warranted or in less capacity than actually needed to maintain the customer expectations. Inadequate capacity and congestion analysis tools resulted in inefficient network investment, poor use of engineering staff and an increased operating expense.

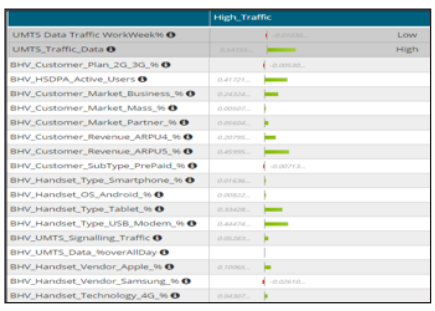
A network analytics solution was sought by the operator in order to align the network capacity growth and network utilization with the customer behavior insights by integrating and associating technical information (such as busy hour traffic, congestion levels, etc.) with commercial metrics (such as device types, service types or customer tariff plans).

SOLUTION

EAA ProInsight™ was deployed for insightful analytics including versatile statistical view of technical and commercial metrics, correlation analysis of key variables, detailed network (cell, site, etc.) profiling and forecasting. This was done in order to address tactical (more immediate, near-term) and strategic (more medium- to long-term) capacity needs and congestion relief. EAA ProInsight™ integrated with PM, CRM, billing and other Big Data sources in order to correlate the network and business data and generate the required near-real time and off line analytics.

Strategic capacity planning was achieved by developing cell cluster profiles, which meant cells with similar network/device/customer characteristics were grouped together. The network planning manager was now able to forecast and prioritize capacity upgrades using geo-location, ARPU, subscriber density, handset mix and OTT data and was consequently able to perform better Capex planning. The data sources used for generation of such analytics included PM, CRM, billing and probes data.





BENEFITS

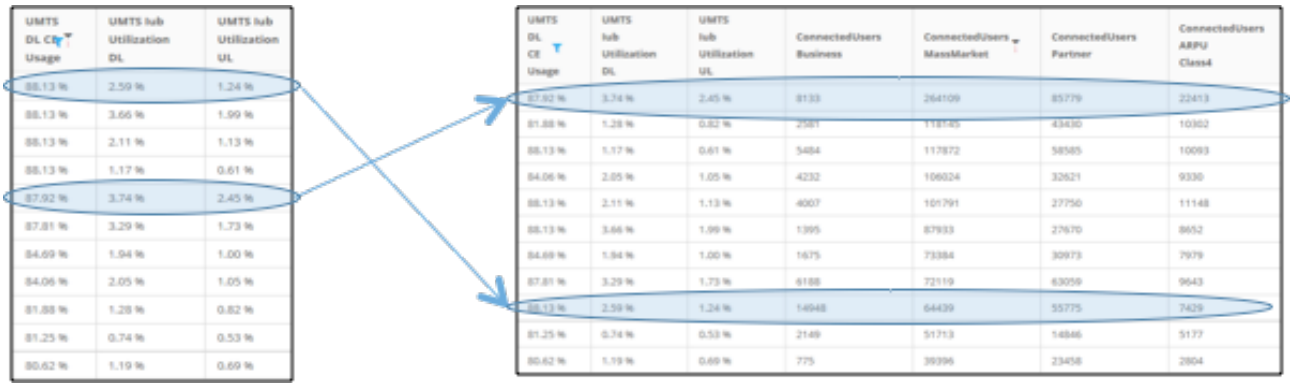
- Simplified, predictive capacity utilization and accurate forecasts
- Reduced capital expenses from powerful optimization and engaging under-utilized network infrastructure
- New technology readiness allows checking configured capacity against actual use for VoLTE, Small Cells, NFV and IoT
- Analytics-driven investments through prioritization of network expansions, and investments in services and devices, based on location and customer need
- Dynamic capacity management of campaigns and special events
- Billions of heterogeneous data inputs converted into terabytes of data and hundreds of correlations per hour
- Collaborative information sharing, consistency and accuracy across CSP teams (technical and business)

QUICK FACTS

- **Customer:**
  European mobile operator: 20 million mobile subscribers
- **MYCOM OSI solutions:**
  EAA ProInsight™
- **Domains:**
  CS core (MSC, HLR, MGW, etc.), PS core (SGSN, GGSN, IMS), transmission (Radio, ATM, SDH, PDH), VAS (SMSC, MMSC, etc.) and IP
- **Technologies:**
  GSM, UMTS, LTE, IM
- **Vendor equipment:**
  Radio: Huawei and Ericsson 2G/3G/4G; Circuit core: NSN, Huawei; Packet core: Huawei, NSN, ZTE; IMS: Ericsson, Broadworks, ACME; Transmission: Alcatel, Huawei, NSN

As part of capacity optimization, the NOC engineer and the operations manager were able to resolve congestion using new re-prioritization techniques. This involved correlation of PM KPIs with location data, subscriber density, technology and service type.

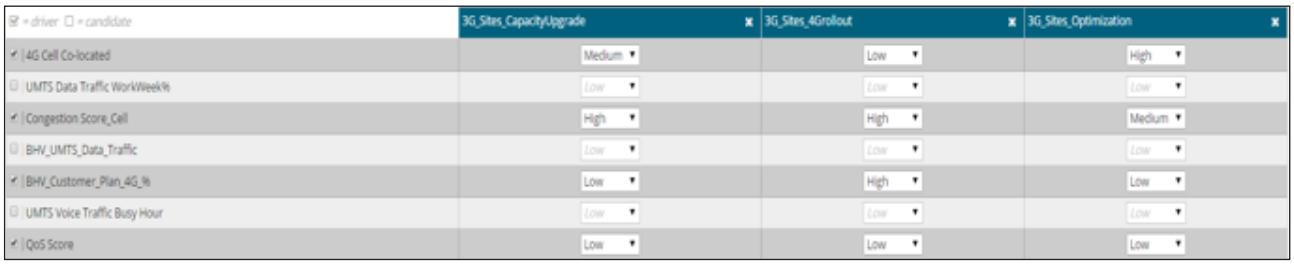
The NOC engineer was able to prioritize actions (capacity increase, traffic re-routing, etc.) based on the Congestion Score calculated by EAA ProInsight™. This also resulted in tactical NOC prioritization for particular marketing launches such as the Apple device launch.



UMTS DL CE Usage	UMTS Iub Utilization DL	UMTS Iub Utilization UL
88.13 %	2.59 %	1.24 %
88.13 %	3.66 %	1.99 %
88.13 %	2.11 %	1.13 %
88.13 %	1.17 %	0.61 %
87.92 %	3.74 %	2.45 %
87.81 %	3.29 %	1.73 %
84.69 %	1.94 %	1.00 %
84.06 %	2.05 %	1.05 %
81.88 %	1.28 %	0.82 %
81.25 %	0.74 %	0.53 %
80.62 %	1.19 %	0.69 %

UMTS DL CE Usage	UMTS Iub Utilization DL	UMTS Iub Utilization UL	ConnectedUsers Business	ConnectedUsers MassMarket	ConnectedUsers Partner	ConnectedUsers ARPU Class4
87.92 %	3.74 %	2.45 %	8133	264109	85779	22413
81.88 %	1.28 %	0.82 %	2581	118145	43430	10302
88.13 %	1.17 %	0.61 %	5484	117872	58585	10093
84.06 %	2.05 %	1.05 %	4232	106024	32621	9330
88.13 %	2.11 %	1.13 %	4007	101791	27750	11148
88.13 %	3.66 %	1.99 %	1395	87933	27670	8652
84.69 %	1.94 %	1.00 %	1675	73384	30973	7979
87.81 %	3.29 %	1.73 %	6188	72119	63059	9643
88.13 %	2.59 %	1.24 %	14948	64439	55775	7429
81.25 %	0.74 %	0.53 %	2149	51713	14846	5177
80.62 %	1.19 %	0.69 %	775	39396	23458	2804

Further to this achievement in capacity and congestion relief, the optimization engineers were able to use the analytics generated by EAA ProInsight™ to carry out customer usage driven capacity optimization. This involved analyzing customer behavior or patterns in EAA ProInsight™ and then developing optimization schemes to follow the customer patterns. One of the most successful schemes was the forcing of 4G users to a 4G cell in order to relieve congested 3G cells.



☑ = driver ☐ = candidate	3G_Sites_CapacityUpgrade	3G_Sites_4Grollout	3G_Sites_Optimization
☑ 4G Cell Co-located	Medium	Low	High
☐ UMTS Data Traffic WorkWeek%	Low	Low	Low
☑ Congestion Score_Cell	High	High	Medium
☐ BHV_UMTS_Data_Traffic	Low	Low	Low
☑ BHV_Customer_Plan_4G_%	Low	High	Low
☐ UMTS Voice Traffic Busy Hour	Low	Low	Low
☑ QoS Score	Low	Low	Low

RESULTS

By managing capacity with near real-time data and relieving/diverting network congestion, the operator was able to meet customer usage needs better, providing just the right capacity for the customer services. Such intelligent analytics-based decisions improved customer service levels and avoided unnecessary network expansions. Advanced correlation, analysis, reporting, and visualization combined with capacity forecasting, kept the operator a step ahead, and successful in meeting customer expectations.

Now the operator has extended the use of EAA ProInsight™ to predict future capacity needs for smart infrastructure decisions. It also helps the operator to evaluate the impact of devices and OTT on network capacity. Regular insights into network/service/devices usage by customers are used to plan new technology and services.

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USE CASE
Efficiently rolling out high-performance 3G and LTE networks

CUSTOMER SITUATION

A major European mobile operator's goal was to provide the first 3G network in their country. However their legacy performance management solution was unable to cope with the anticipated data explosion from their planned 3G and future LTE data networks. In addition, their engineers did not have tools for efficient troubleshooting and reporting during and after the roll-out.

The new networks needed to be turned up quickly, accurately and with optimum performance while making efficient use of network and human resources. Management's goal was a two-factor improvement in staff productivity. From a customer service perspective it was critical to maintain service quality before, during and after the launches took place. This was challenging because of network complexity, the rapid pace of deployments and limited staff.

Managing 3G services efficiently and accurately required a world-class performance management solution. The operator chose MYCOM OSI EAA PrOptima™ to provide a smooth transition from their GPRS network as well as to ensure quality before and after the 3G rollout. Once live, EAA PrOptima™ continuously monitored the Radio Access Network's (RAN) performance, capacity and quality even as data traffic was growing rapidly.

Important criteria in the operator's decision to choose EAA PrOptima™ were its carrier-grade, multi-vendor and multi-technology performance management capabilities that facilitate massive network roll-outs and keep networks running at optimum performance. Of particular importance were its near real-time monitoring, analysis, reporting and visualization capabilities, coupled with flexible, out-of-the-box Key Performance Indicators (KPIs) and reports. EAA ProActor™ was selected for its supporting role in process and configuration automation.

SOLUTION

To roll out their 3G infrastructure the operator used EAA PrOptima™ for new node performance verification and EAA ProActor™ for automated configuration parameter checks, surrounding node checks and new feature validation. Post launch, EAA PrOptima™ was used to optimize their RAN. EAA PrOptima™ and EAA ProActor™ together ensured high performance RAN quality pre- and post-launch and on an ongoing basis.

For pre-launch tuning, the operator used EAA ProActor™ powerful automation system to automate 3G parameter audits including recurring comparisons to standard parameter values. These resulted in the automatic generation of command files. Physical Cell Identifier (PCI) collision conflicts were detected including potentially adverse customer experience. Once a cell was deployed, the network was monitored and optimized using out-of-the-box reports and analysis. The MYCOM OSI out-of-the-box KPI formula definitions and performance reports enabled rapid adoption and incorporation into the operator's work practices.

BENEFITS

- Flexible, out-of-the-box KPIs and cluster-based reports aligned to workflow processes
- Automated workflows and issue resolution processes
- Out-of-the-box optimization algorithms
- Improved operational efficiency and resource productivity
- Near real-time monitoring, alarming, reporting and network diagnostics
- Multi-vendor, multi-technology, multi-domain

QUICK FACTS

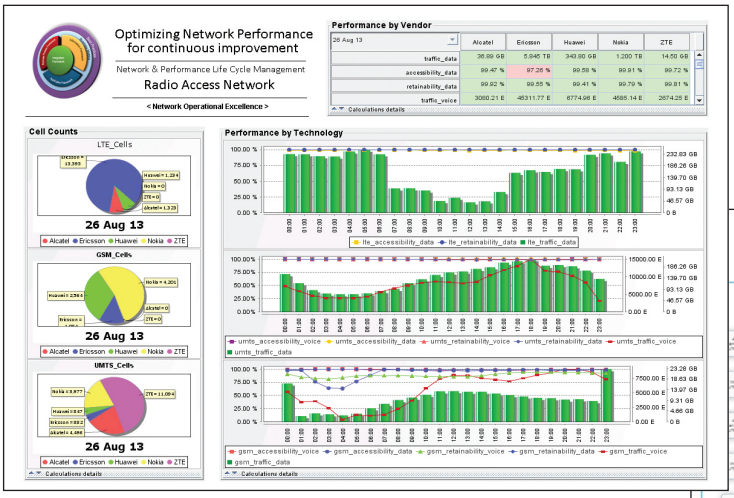
- **Customer:** European mobile operator with >20 million customer base and 20,000 3G cells
- **MYCOM OSI solutions:** EAA PrOptima™, EAA ProActor™
- **Domains:** RAN, circuit-switched core, packet-switched core, ePC, VAS platforms
- **Technologies:** GSM, UMTS, LTE
- **Vendor equipment:** Huawei, NSN

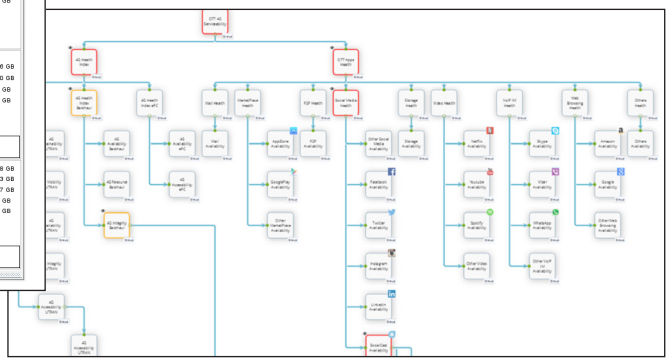
The user could shape the data to fit their reporting needs using the KPI formula editor and view it on a GIS map to locate problem areas geographically. Capacity and troubleshooting reports were also available out-of-the-box, making it very easy to get up and running quickly.

An important part of post-launch optimization included guided diagnostics and 3G health index alerting and troubleshooting using cell health reports by technologies or vendor. The health index is a composite index metric constructed from Key Performance Indicators such as accessibility, retainability, availability and throughput. Health index alerting results can be mapped for easy analysis using the GIS feature or with graphs and tables for deep diagnosis and drill-down at the click of a mouse.

EAA PrOptima™ automatically troubleshoots the entire handover process while navigating from the cell to neighbors and target cells and then suggesting resolution actions. Handover troubleshooting can also be performed across domains (RAN, Core) and root cause analysis can be automated with EAA ProActor™ to initiate immediate corrective action and ensure optimum performance throughout the life cycle. This focus on intelligent automation enabled staff to dramatically increase productivity and ensured consistency and quality in the resulting actions.

It was important to be able to quickly generate reports that analyzed actual and expected performance of network elements as well as network areas. The EAA PrOptima™ unified report builder provided fast ad hoc analysis and KPI drill-downs of near real-time data via scheduled reports and performance-based notifications. Because of its flexibility and embedded 3G capabilities, EAA PrOptima™, in combination with EAA ProActor™, became an essential tool to roll out and optimize the operator's 3G network.





RESULTS

The EAA PrOptima™ comprehensive performance management and flexible reporting capabilities enabled the operator to manage its 3G launches with accuracy and efficiency, independent of vendor, technology or domain.

More than 1,500 KPIs and several hundred reports were migrated from the legacy solution. Today, EAA PrOptima™ generates more than 600 scheduled reports daily covering more than 3,000 KPIs, in addition to ad-hoc reports created by a large, multisite engineering team. The EAA PrOptima™ powerful GIS capabilities, the robust and flexible reporting, the readily available KPIs along with EAA ProActor™ automated analysis and workflows increased productivity and enforced consistency.

By providing near real-time visibility and analysis of performance, fault and configuration data, the operator's 3G networks were launched and operated at peak efficiency, delivering maximum capacity and with an excellent quality of service. From a staffing perspective, the EAA ProActor™ automated root cause analysis and workflows increased productivity and enforced consistency beyond the operator's two-factor improvement goal.

The result is a higher level of productivity and lower Total Cost of Ownership (TCO) than their previous performance management system. Using EAA PrOptima™ and EAA ProActor™ the operator will have the tools they need for their next step — LTE deployment.

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USE CASE
Assuring digital services (VoLTE, IPTV, IP-VPN) for a Digital Service Provider

CUSTOMER SITUATION

A Tier 1 Middle Eastern Communication Service Provider (CSP) with around 12 million customers, part of a 167 million customer group network, had the ambition to be the leader in digital service transformation, which required next generation systems to manage and support the transformation.

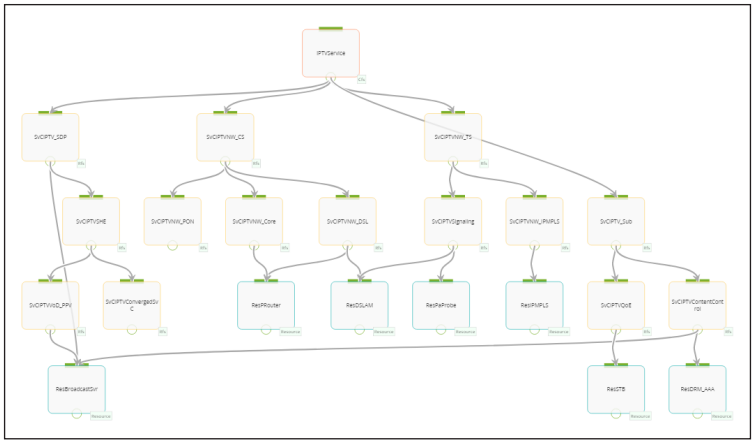
The operator required a next generation Service Quality Management (SQM) solution to support its transformation to a Digital Service Provider, as it launched over 30 new digital services - on LTE initially - to be migrated to an NFV environment in the near future.

The operator's requirements included:

- Strong focus on corporate and consumer customer service quality requiring complex use cases, including service problem management
- Major transformation to become leading Digital Service Provider
- All fixed and mobile digital services (IP-VPN, IPTV, VoLTE, IM, MBB, etc.) to be assured across all networks
- Advanced and automated modeling, discovery, monitoring, alerting and analysis of a wide range of network and customer facing services
- Advanced predictions, proactive monitoring and forecasting capabilities
- Integration with other platforms (CRM, billing, passive probes, active probes, geo-location systems, etc.) within the ecosystem

SOLUTION

MYCOM OSI offered its digital SQM and Analytics solution within its integrated Experience Assurance and Analytics™ (EAA) system for deployment within the operator's state-of-the-art Service Management Center (SMC). The SMC monitors all enterprise and consumer services across fixed and mobile networks, such as IP-VPN, IPTV (VOD, catch-up TV), mobile video, VoLTE and instant messaging.



BENEFITS

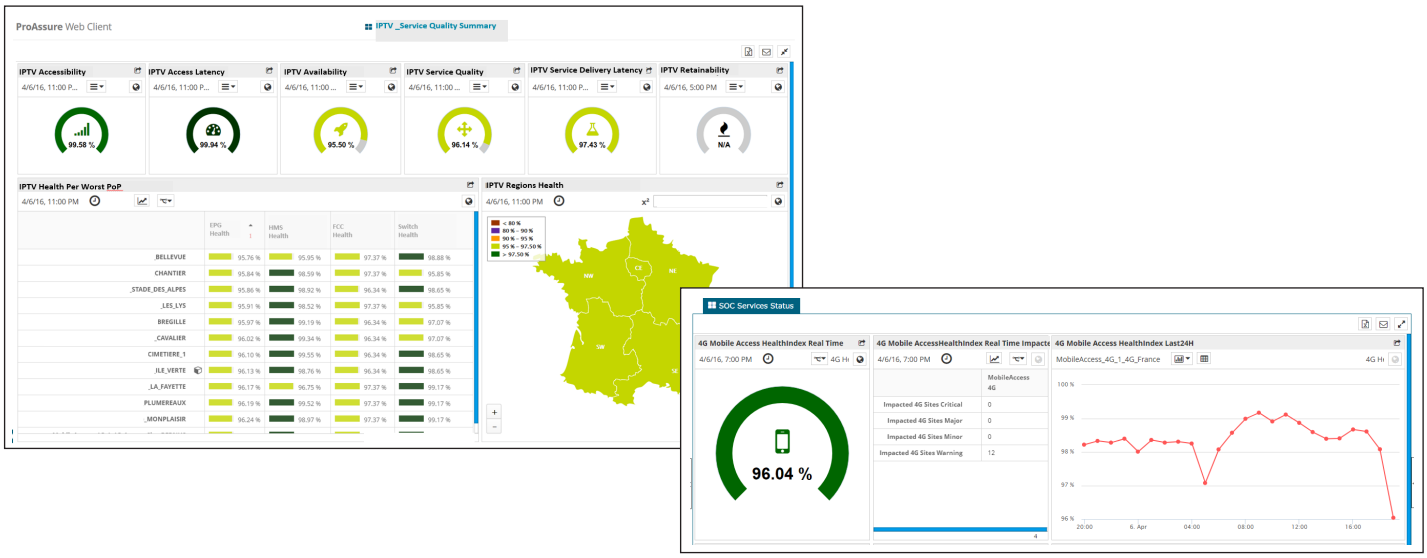
- Prioritization of high value corporate customer requirements
- Provision of superior service levels
- Rapid pre-empting, identification and resolution of service degradations
- Enhancement of monetization through rapid service introduction
- Lowering of the cost and increasing of the efficiency of operations through a consolidated surveillance center
- A future-proofed system for evolving technologies such as NFV, M2M/IoT, 5G and Cloud, key for a Digital Service Provider

QUICK FACTS

- **Customer:** Middle Eastern mobile operator that serves around 12 million customers
- **MYCOM OSI solution:** Experience Assurance and Analytics™ (EAA)
- **Technologies:** 3G, LTE, NFV
- **Vendor equipment:** ALU, Ericsson, Anritsu

The offered EAA system provides advanced capabilities including:

- Automated modeling, discovery, monitoring, alerting and analysis of a wide range of network and customer facing services
- A single end-to-end view of its converged mobile/fixed network with visibility and correlation through network/service/customer layers
- Proactive surveillance with automated bottom-up service impact and top-down root cause analyses in real-time across regions, technologies, device types and services
- Dynamic service model for all physical, logical and virtual infrastructure components
- Forecasting and prediction of service quality bottlenecks



RESULTS

The EAA service assurance and analytics system has been delivering key benefits to the Digital Service Provider:

- Single, integrated assurance suite that manages end-to-end network and service quality across all hybrid (virtual and physical), Telco (2G/3G/4G RAN, backhaul/transmission, core, messaging) and IT (Cloud/datacenter/Application) network domains
- Proactive and real-time surveillance with automated bottom-up service impact and top-down root cause analyses, enabling on-demand, dynamic digital services
- Cloud-native and self-orchestrated assurance suite that is based on micro services architecture principles, containerization, big data storage, elastic auto-scaling and agile DevOps development/deployment
- Dynamic on-boarding and lifecycle management with automated discovery, monitoring, visualization, alerting and analysis for virtual and physical infrastructure; closed loop assurance with policy- and analytics-driven auto-recovery and self-healing support for integration with the CSP ecosystem (service and domain orchestration engines, inventory/configuration management, IT service management, SON and CEM systems)

The technical and commercial experience has enabled the operator to quickly embark on its digital transformation program, positioning it as a global Digital Service Provider leader.

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USE CASE
Assuring carrier-grade performance for large enterprise SD-WAN

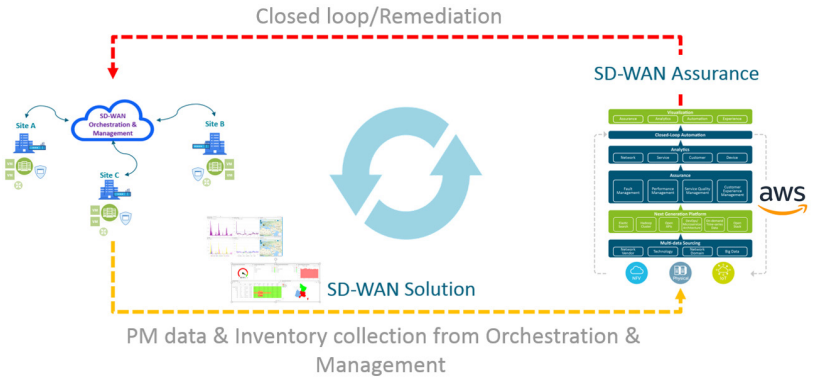
CUSTOMER SITUATION

A large European enterprise was unable to exploit the full potential of its SD-WAN deployment because it lacked the visibility of link performance necessary to confidently migrate a sufficiently large proportion of application traffic from dedicated to low cost internet links. This lack of visibility meant it was unable to respond quickly to performance issues by re-routing traffic across available links through the SD-WAN orchestrator, maintaining reliability and performance for business-critical applications.

In order to achieve the full operational benefits of SD-WAN (enterprise WAN cost efficiencies without sacrificing reliability and performance), the enterprise had two key business requirements. The first was visibility across its IT organization of the performance of multiple Internet Service Provider (ISP) / Communications Service Providers (CSPs) links throughout its footprint of hundreds of branch locations. This would enable it to compare and contrast ISP / CSP link providers on a like-for-like basis, select link providers accordingly, enforce complex SLAs, and adjust for cyclical link performance. The second requirement was real-time automated SD-WAN orchestration based on link performance, providing 'assurance-driven closed loop automation' to maintain performance and reliability by rapidly re-routing traffic in response to changes in link conditions.

SOLUTION

MYCOM OSI's SD-WAN solution enabled the enterprise to view its SD-WAN performance in real time, at global (enterprise), branch, application and link levels. Today it supports the entire IT organization by providing drag and drop CxO dashboards with summary-level performance at enterprise and application levels, with high granularity link-level views for IT operations teams for rapid root cause identification and remediation of performance degradations.



BENEFITS

- Reduced operational costs through more remote IT troubleshooting and higher adoption of SD-WAN
- Reduced issue resolution times through real-time alerting and recommended workflows
- Reduced connectivity costs through precise connectivity provider SLA conformance and link utilization visibility
- Maintained high performance and reliability even while routing more applications through low cost internet links

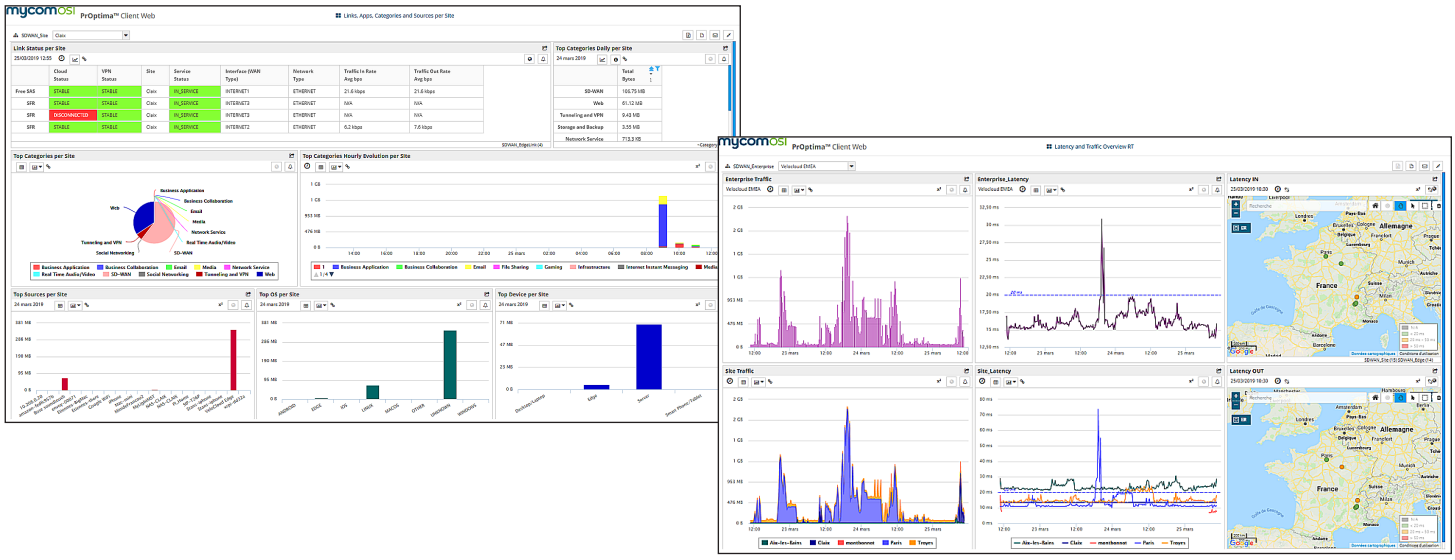
QUICK FACTS

- **Customer:**
  Large enterprise in the retail sector with 100's of branches across Europe
- **Business challenge:**
  Lack of adoption of SD-WAN due to lack of clear business case and inability to maintain reliability & performance
- **MYCOM OSI solution:**
  SD-WAN SmartPacks™ delivering performance management and augmented workflows and SD-WAN orchestration
  Application: EAA PrOptima™

With real-time alerts for performance issues, configurable KPIs / KQIs and thresholds, the solution supports assurance-augmented automation through integration with its SD-WAN orchestrator, as well as recommended actions and workflows for IT operations teams.

MYCOM OSI's pre-integrated SD-WAN SmartPacks™ provide out-of-the-box (OOTB) vendor-agnostic KPIs for simple like-for-like comparison of performance across vendors; pre-defined tabular, graphical and GIS-based reports; and scenario-based workflow recommendations based on specific network behaviour patterns for admin and IT engineering teams.

Based on MYCOM OSI's class leading, cloud native EAA PrOptima™ performance management application, the solution supports rapid scalability for the enterprise through its cloud native architecture, which allows the seamless, zero-touch activation of assurance for new branches both within and across its regional borders.



RESULTS

- **Accelerated rollout –** On a global level, this large enterprise has been able to accelerate its SD-WAN roll-out because the MYCOM OSI solution provides its IT organization with the visibility to precisely measure and demonstrate the cost savings realized for each branch
- **Increased adoption –** On a per branch level, MYCOM OSI's solution has enabled to increase the average percentage of traffic using low cost internet links vs. dedicated lines, because its IT organization is able to maintain expected application performance (Quality of Service / QoS) for core business applications
- **Zero-touch –** In terms of branch WAN connectivity setup time and effort, the enterprise typically cuts this down from weeks to hours, and while this is a general advantage of SD-WAN; crucially the MYCOM OSI assurance system itself is also activated and configured entirely remotely. Each new branch is today deployed following a template configured for that enterprise, and its traffic immediately appears in all dashboards
- **Reduced on-site IT troubleshooting –** MYCOM OSI's solution has enabled the enterprise to conduct more IT issue resolution remotely from its regional and HQ offices. This has reduced its Mean-Time-To-Resolve (MTTR), as well as travel costs for site visits
- **Reduced connectivity costs –** MYCOM OSI's solution has enabled the enterprise to identify over-allocation of bandwidth and eliminate underperforming connectivity providers. This has significantly reduced the connectivity costs across its entire branch footprint

USE CASE

Assuring IPTV services with improved quality of service and experience

CUSTOMER SITUATION

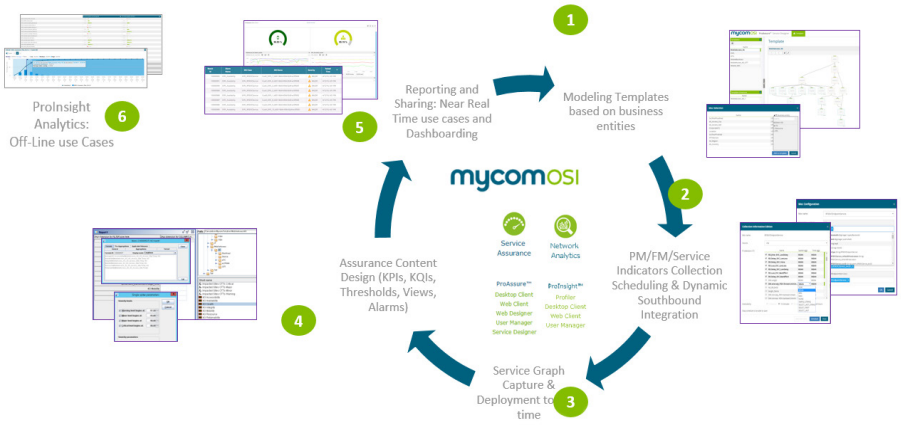
A global Tier 1 Communications Service Provider (CSP) was struggling to roll out its IPTV services to high growth enterprise verticals, because it did not have the means to guarantee the same enterprise-grade performance as alternatives (such as locally hosted content).

The CSP needed a system capable of monitoring customer quality of experience (QoE) and implementing closed-loop automation of its network to identify and resolve root-causes for low QoE. With its complex, multi-vendor environment, it saw a huge integration challenge ahead of it, and risked losing a potentially lucrative new revenue stream.

To unlock this opportunity quickly, the CSP approached MYCOM OSI, seeing a potential fit with its combination of extensive experience of over 25 years with complex multi-vendor environments, and its EAA ProAssure™ digital Service Quality Management (SQM) application.

SOLUTION

MYCOM OSI deployed its EAA ProAssure™ application 'Service Quality Anayzer', which was quickly integrated into the CSP's network through a pre-existing catalogue of adapters. It provided a real-time, detailed view of IPTV service quality based on comprehensive, pre-defined KQIs on a per-channel basis. It also provided pre-defined and highly configurable (drag and drop) reports giving visibility into critical information such as the 'Worst-N channels', channel availability over time and correlated KPIs such as jitter, packet loss and Inter Arrival Time which comprise the KQIs. Advanced analytics is provided by EAA-ProInsight™.



BENEFITS

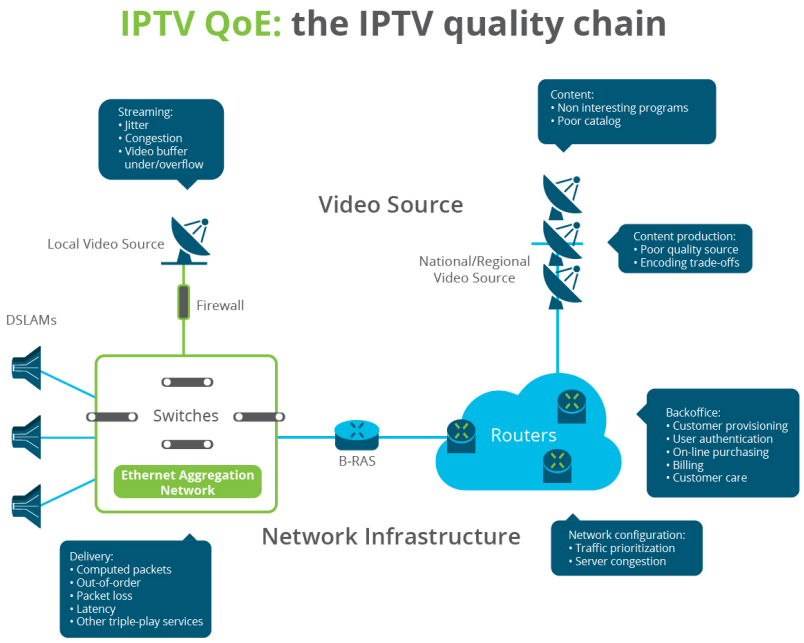
- Differentiated QoE based on channel value, with premium channels covered by specific monitoring solutions
- Rapid root cause identification across the entire network topology, driven by IPTV specific KQI optimization
- Precise, cost-efficient network expansion tailored to IPTV service, based on rich data-driven intelligence
- Identification and resolution of more issues before impacting on the end customer

QUICK FACTS

- **Customer:**
  Tier 1 CSP in the Middle East region
- **Business challenge:**
  Rolling out IPTV in new enterprise verticals while maintaining enterprise-grade performance and reliability
- **MYCOM OSI solution:**
  Set of IPTV specific Service Quality Management (SQM) solutions
  Applications: EAA ProAssure™, EAA ProInsight™

MYCOM OSI's unique value was in its ability to correlate these KPIs and KQIs with the performance of the CSPs' network elements. This allowed the CSP to rapidly identify the root causes of degradations in service quality, and deliver automated notifications and workflow recommendations into its NOC/SOC teams.

Through this unique correlation capability, MYCOM OSI's solution uniquely incorporated IPTV specific KPIs into its KQIs such as buffering times, delay, under and overflow and jitter. It also combined these with network specific KPIs including traffic congestion, packet loss and latency. These provide a much more precise reflection of the genuine experience of the end user and a basis for precise and rapid root-cause analysis and issue resolution.



RESULTS

The CSP today has been able to deploy its IPTV service extensively, delivering enterprise-grade QoE by implementing five IPTV-specific Service Quality Management use cases with specific results, including:

- **Faster identification of service quality issues** with MYCOM OSI's Service Quality Analyzer™ solution, which allows simple UI-based drill-down and roll-up of the end-to-end network topology for root cause identification
- **Real-time identification of channel unavailability** with MYCOM OSI's Channel Availability Monitor™ solution, which delivers real-time notifications when any IPTV channel goes offline
- **Efficient prioritization of service impacting issues** with MYCOM OSI's Worst-N Channel Reporter™ solution, which provides a view over time of the worst performing IPTV channels from the perspective of QoE
- **Service quality differentiation for high-value content** with MYCOM OSI's Premium Channels Monitor™ solution, which isolates those channels generating premium revenues and provides specific views for issue resolution before they impact on the end customer
- **Precisely targeted network expansion / investment** with MYCOM OSI's Worst-N Network Node Reporter™ solution, which provides a view over time of the worst performing network elements, specifically in relation to the impact on QoE for the IPTV service

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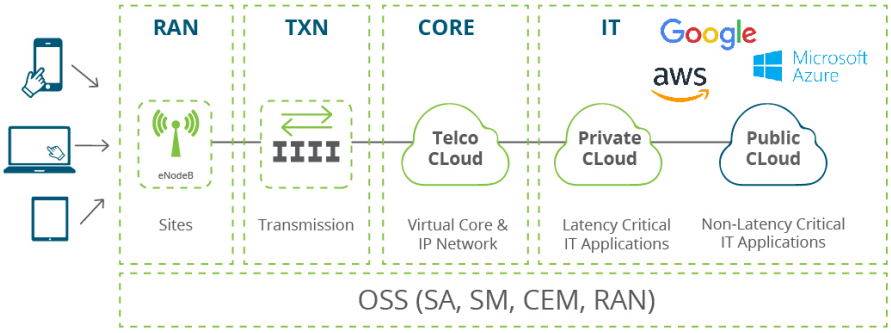
USE CASE
Assuring SDN/NFV telco cloud networks and services

CUSTOMER SITUATION

A high growth UK Tier 1 CSP was facing the challenge of escalating Capex and Opex. To address this, it embarked on a wholesale digital transformation programme, with ambitious targets across customer experience, QoS, churn/acquisition, automation and revenue.

Digital Transformation came with significant risk. A key pillar in this transformation was to adopt the telco cloud: a fully virtualized core and IT network, driven by NFV and SDN and supported by private and public cloud infrastructure. This would unlock significant efficiency gains and support rapid growth and automation. As a pioneer in this rapidly evolving space, the CSP faced significant risks in service assurance associated with migrating from legacy PNF to VNF based services.

MYCOM OSI was an ideal fit for this requirement, with its comprehensive Experience Assurance & Analytics™ (EAA) portfolio of assurance applications already available on the Amazon Web Services (AWS) public cloud.



SOLUTION

MYCOM OSI's entire EAA suite of applications was deployed, on the AWS public cloud, to provide service assurance for the CSP's telco cloud, running on its private cloud infrastructure. This includes:

- Management of end-to-end network and service quality across hybrid (virtual and physical) Telco (3G/4G RAN, Backhaul/transmission, Core, Messaging) and IT (Cloud/Datacenter/Application) domains
- Proactive and real-time surveillance with automated bottom-up service impact and top-down root cause analyses

BENEFITS

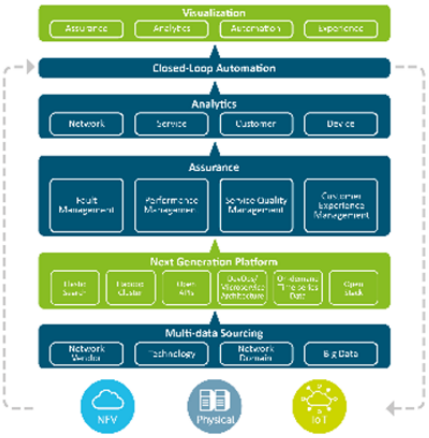
- Reduced assurance system costs through system rationalization / unification
- Reduced assurance system infrastructure Capex through public cloud deployment
- Accelerated rollout of telco cloud while maintaining carrier-grade QoS/QoE
- Assurance system stability maintenance through rapid growth, due to elastic scalability of the cloud native platform
- Increased levels of automation driven by assurance-augmented closed-loop orchestration

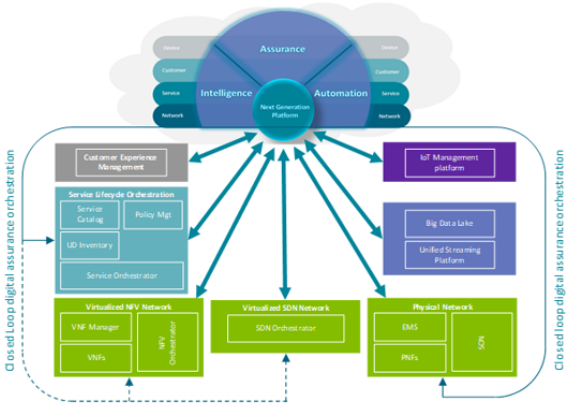
QUICK FACTS

- **Customer:**
  High growth UK Tier 1 CSP
- **Business Challenge:**
  Delivery of an aggressive strategy of digital transformation supported by telco cloud, while maintaining carrier-grade QoS / QoE
- **MYCOM OSI solution:**
  Assurance Cloud™, Experience Assurance & Analytics™ (EAA) suite of applications run from the public cloud (AWS)
  Applications: EAA ProAssure™, EAA ProActor™, EAA PrOptima™

- Automated discovery, onboarding, monitoring, visualization, alerting and analysis for VNFs and PNFs
- Closed-loop assurance, with auto-recovery and self-healing support via integration with service / domain orchestrators Inventory / configuration management and IT service management systems
- Agnostic interoperability with NFV, SDN, virtualization and telco cloud vendors and open source technologies through standard APIs;
- Cloud-native, self-orchestrated assurance suite based on micro-services, containerization, big data storage and elastic auto-scaling;
- Regular updates supported by Continuous Integration and Deployment (CI/CD) and a collaborative DevOps methodology.

- **Telco cloud assurance orchestration**
- **Agile real-time operations**
- **Digital service assurance and monetization**
- **Powerful cloud-native platform**





RESULTS

The CSP saw benefits quickly, by taking advantage of MYCOM OSI's Software-as-a-Service (SaaS) Assurance Cloud™ delivery model, based on AWS. It saw a reduction in costs, improvement in business agility, improved TTM and increased automation:

- 50% reduction in assurance system Opex by replacing legacy silo assurance systems with the integrated MYCOM OSI Experience Assurance & Analytics™ (EAA) suite of applications running on a single, dedicated AWS instance
- 75% reduction in service assurance implementation time for new services, by leveraging MYCOM OSI's catalogue of pre-integrated digital transformation Solutions, as well as eliminating the time and effort associated with infrastructure deployment
- Reduced mean time to repair (MTTR) through MYCOM OSI's integrated assurance system, which provides real-time alarms and root-cause analysis (RCA) and leverages PNF and VNF orchestrators to trigger remediation actions
- Move towards an automation target of 80% including automated onboarding, inventory management, self-healing solutions and integration with SON and CEM systems
- Improved business agility through MYCOM OSI's flexible SaaS commercial model, which enables the CSP to activate solutions on demand by selecting from a pre-integrated catalogue of over 200 digital transformation solutions
- Readiness for a rapid 5G launch with the MYCOM OSI business model providing support for 5G within the wireless network domain at no additional charge

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The Assurance Cloud Company™

USE CASE
Assuring 5G networks and services

CUSTOMER SITUATION

A global EU-based Communications Service Provider (CSP) was investing heavily in 5G infrastructure and network virtualization, but its legacy assurance systems were fragmented and lacked the scale and flexibility to adapt to the significantly greater volume of data and configuration complexity associated with 5G operations.

An integrated, end-to-end assurance capability was needed that could seamlessly on-board 5G networks and services, support a new generation of technologies (SDN, NFV, Cloud-RAN) and scale rapidly. The CSP quickly realized that it also needed a completely different cost model that enabled it to control TCO in the face of an uncertain future services landscape in monetizing 5G (with new broad categories including IoT), and uncertain future assurance capacity and functionality requirements.

The CSP approached MYCOM OSI, recognizing its unique, outcomes-based approach and the significant advantages of its Assurance Cloud™ business model. It had four major objectives: automation, vendor reliability, platform stability and roadmap security.

SOLUTION

The CSP and MYCOM OSI collaborated to define a phased implementation approach, with each phase, introducing new packages of outcomes-based solutions that cater to its 5G requirements, as well as LTE and other network domains. The solutions included planning and forecasting, monitoring, root-cause analysis, reporting and automation through physical (Inventory / CMDB) and virtual (NFV-MANO) orchestrators. In total, more than 200 specific outcomes-driven solutions were included in the overall solution.

The solution was delivered as a cloud service on Amazon Web Services (AWS), and provided assurance not only of all the CSP's mobile services (including 5G), but also of the CSP's private cloud infrastructure. This allowed the CSP to monitor peripheral OSS and BSS systems as well as identify and remediate the root causes of issues within those systems.

BENEFITS

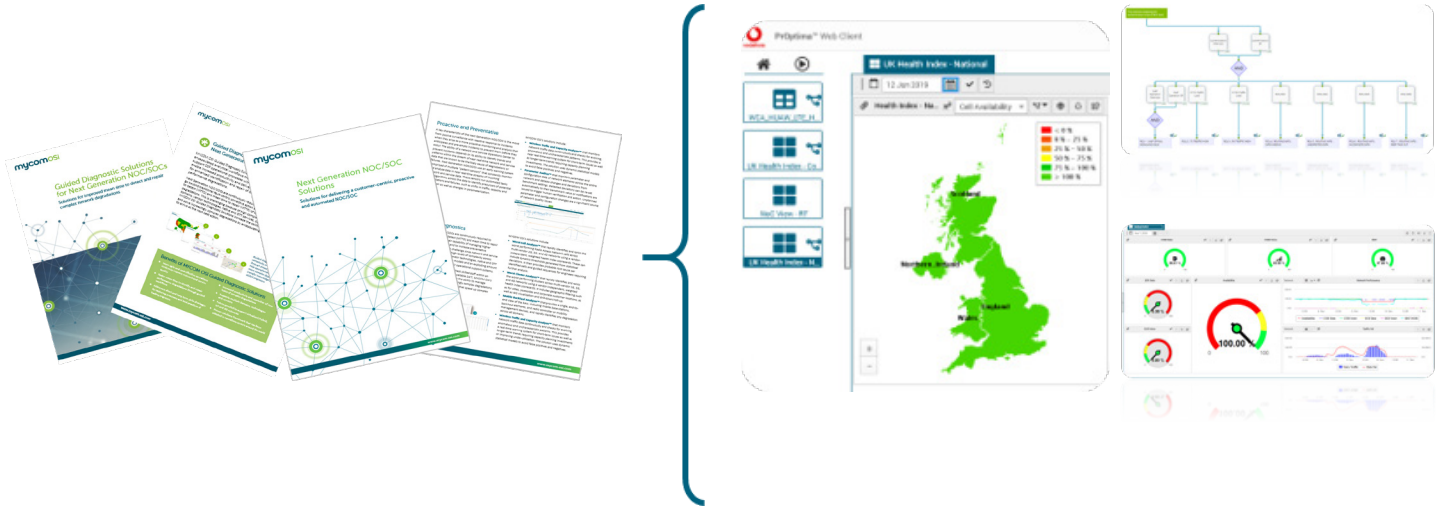
- Future-proof service assurance suite capable of managing the demands of 5G network operations
- Reduced NOC/SOC operational overhead, specifically through increased automation
- Zero cost of adapting to the CSP's unique national market context, rapidly deploying specific use cases through a DevOps and CI/CD at no additional charge
- Streamlined, more efficient process that eliminated manual tasks, through a consultative partnership

QUICK FACTS

- **Customer:**
  Top-10 Tier 1 CSP
- **Business Challenge:**
  Control of TCO while facing the uncertainty of future 5G assurance functionality and capacity requirements.
- **MYCOM OSI solution:**
  The Assurance Cloud™: the full Experience Assurance & Analytics™ (EAA) suite of applications provided as a Software-as-a-Service (SaaS) offering with over 200 pre-integrated digital transformation solutions
  Applications: EAA ProAssure™, EAA ProInsight™, EAA ProActor™, EAA PrOptima™, EAA NetExpert™

Some of the specific digital transformation use cases' that the CSP deployed are as follows:

- **RAN Technology Monitors™** including all access technologies: 2G/3G/4G/5G
- **RAN Worst Cell Analyzers™** providing the means to prioritize remediation based on consistent underperformance
- **Auto-Ticketing solutions** eliminating significant overhead from manual trouble-ticketing activities
- **RAN Root-Cause Analyzers™** RCA) (automating the identification of root causes for common issues
- **Self-Healing Automation™** for core and RAN domains, significantly reducing MTTx by providing closed-loop automation
- **Planning and Forecasting solutions** supporting data-driven planning for greater precision and improved Capex RoI



RESULTS

The CSP was able to deploy the solution in under 4 months and achieved:

- **Elimination of service assurance infrastructure costs** by subscribing to the Assurance Cloud™ (the Experience Assurance & Analytics™ (EAA) suite of applications from the public cloud), which includes full infrastructure management and operations by MYCOM OSI
- **Elimination of assurance system failure in high data usage scenarios** by leveraging the on-demand scalability of the public cloud, which can sustain peak performance under extreme scenarios, even with 5x increase in data throughput or more
- **Elimination of lengthy, expensive new feature acquisition costs** by leveraging full access to all future features, including major version upgrades, together with a collaborative, DevOps approach to innovation, free of charge and with alignment of incentives based on the subscription model
- **Downtime reduction to near-zero** with zero downtime for feature upgrades, and built-in 99.99% high availability leveraging an active-active, geo-redundant, micro-services architecture in the public cloud
- **Increase of NOC/SOC efficiency** by introducing automation for repetitive, manual tasks, reducing the MTTR for network issues and eliminating 'swivel-chair' procedures requiring multiple systems to complete a single process
- **Reduction of customer impacting** issues through 'pro-active NOC/SOC operations' (enabling the identification and resolution of service impacting faults before they impact on the end customer)

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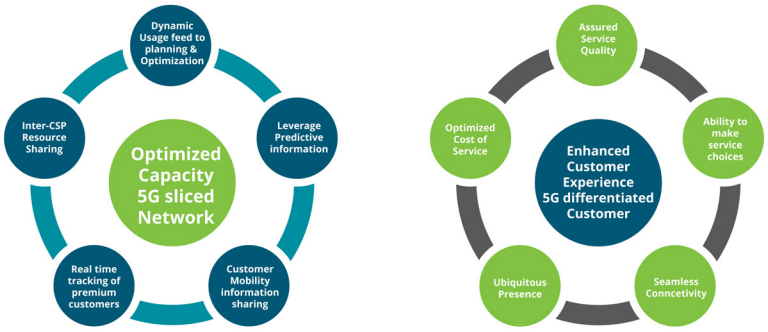
USE CASE
Assuring advanced 5G services at scale

CUSTOMER SITUATION

In parallel with ongoing commercial 5G deployments, several Tier 1 CSPs were investigating how to realize advanced 5G use cases, with network slicing supporting service level guarantees across latency, speed and device density (uRLLC, eMBB, mMTC). As a pioneer in the space of 5G network assurance, MYCOM OSI participated in a series of TM Forum Catalyst Proofs of Concept to collaboratively design and demonstrate the assurance capabilities necessary to realize what the CSPs considered to be the 'promise of 5G'.

MYCOM OSI contributed by enabling assurance-driven real-time, closed loop automation of network operations under highly dynamic, uncertain conditions. Essential to this was applying Artificial Intelligence (AI) / Machine Learning (ML) for near-term prediction, and augmenting real-time orchestration based on a holistic view of trade-offs between SLA adherence across multiple user groups and the optimization of Return on Investment (RoI) in the medium and long-term. The CSPs essentially needed to move from the labs to the market: scaling out advanced 5G services in the context of multiple simultaneous and diverse scenarios across IoT, enterprise and consumer.



SOLUTION

MYCOM OSI demonstrated assurance of standards and open source networks, and supported the critical requirements of cross-CSP cooperation necessary to realize cross-border services.

- **Leveraging open source –** The first ONAP-compatible slicing model supporting full lifecycle with common inventory & modelling
- **Predictive and cyclical demand modelling –** A ML algorithm for predicting near-term demand anomalies and leveraging service and domain orchestrators to expand capacity appropriately

BENEFITS

- Demonstrated capability to deliver guaranteed QoS
- Feasibility of lucrative enterprise use cases via ability to manage complex SLAs in real-time
- More efficient Capex via ability to implement 'deterministic' planning based on assurance data-driven forecasting
- Improved focus on RoI through Introduction of the strategic closed loop (supporting the tactical closed loop)
- Enriched visibility of networks, services and customers through the ingestion of more diverse data including telemetry

QUICK FACTS

- **Customer:**
  Multiple Tier 1 CSPs
- **Business challenge:**
  Move advanced 5G use cases from the labs to the market
- **MYCOM OSI solution:**
  Based on the Experience Assurance & Analytics™ (EAA) suite of applications, MYCOM OSI implemented AI/ML, leveraged ONAP, open APIs and support for real-time closed loop automation, enriched awareness via ingestion of real-time telemetry and contextual data (such as weather and traffic)
  Applications: EAA ProAssure™, EAA ProInsight™, EAA ProActor™, EAA PrOptima™

- **Tactical closed-loop automation –** Based on real-time network slice utilization data, MYCOM OSI supported threshold crossing orchestration through API-based integration with service and domain orchestrators;
- **Strategic close loop automation –** MYCOM OSI's performance management time-series data was used to support the identification of trends in capacity utilization, which, combined with customer value data, supported a data-driven 'deterministic' approach to planning with the ultimate goal being enhanced profitability;
- **Leveraging peripheral contextual data –** MYCOM OSI was able to demonstrate how location, weather, biotelemetry (for sports scenarios), customer value and connected car routing data can be used to enhance the predictive allocation of bandwidth and spectrum across cell sites and distributed core network elements;
- **Providing the visibility to manage complex SLAs –** MYCOM OSI's KPI/KQI monitoring and root cause analysis capabilities supported CSPs' ability to govern complex SLAs with enterprise customers such as streaming video and conference services providers, which when combined with blockchain-powered smart contracts, enables the real-time operation of SLA management based on a shared, immutable record
- **Applying open APIs –** MYCOM OSI used several open APIs, such as TMF 628 (Performance Management), TMF 649 (Thresholding) and TMF657 (Service Quality Management) to provide the feasibility of loosely coupled technology architectures

RESULTS

- The CSPs were able to demonstrate the feasibility of advanced 5G slicing use cases. MYCOM OSI today continues to engage with them to expand on this collaborative work on future TM Forum Catalysts
- Minimization of resource capacity under-utilization by implementing AI/ML, to predict expected and unexpected (near future) capacity availability and requirements, and by leveraging orchestrators to scale up or down resource allocations accordingly;
- Delivery of guaranteed service performance at scale and profitably whether in relation to speed, latency or device density, by ensuring that enough resources are available to fulfil a given use case requirement, without over-allocating resources to the point that the network becomes unprofitable
- Enhancement of open standards through collaboration by addressing inadequacies in for example, API definitions to accelerate the development of open standards to the point of commercial readiness
- Automation of service discovery and assurance activation through open standards such as TOSCA, enabling any service that complies with the TOSCA model to be deployed without the need for a separately developed assurance 'silo'
- Real-time service feasibility based on highly granular awareness of current and expected future network utilization within the expected geographical area of a requested service, enabling CSPs to monetize more of the available capacity within their networks and opening up the possibility of proactive promotion of personalized services

USE CASE
Assuring VoLTE Performance and Service Quality

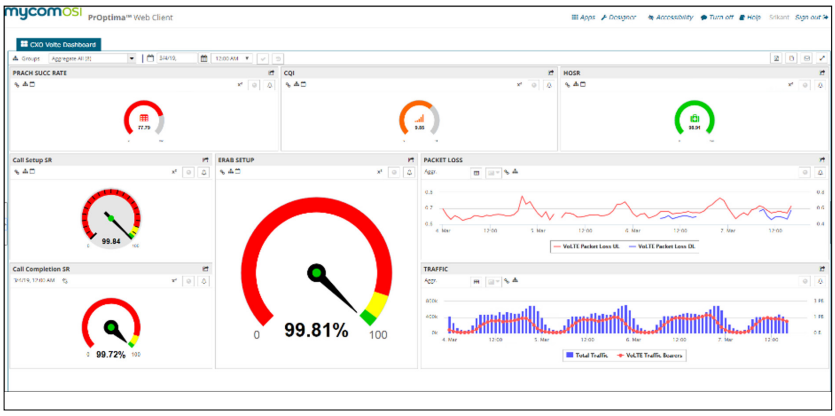
CUSTOMER SITUATION

Customers of the VoLTE service of a leading Indian CSP's were complaining of regular dropped calls and service degradations. The operator needed to improve its VoLTE service performance and reliability and optimize the network with real-time proactive surveillance and troubleshooting.

The NOC needed three key capabilities. First, it needed to monitor the end-to-end VoLTE service in real time and rapidly identify and resolve issue root causes. Second, it needed to monitor the underlying network in real-time and rapidly identify impacted customers in the event of a network element fault. Third, it needed to identify trends in VoLTE service quality and pro-actively optimize the network to maintain expected Quality of Experience (QoE).

The CSP approached MYCOM OSI because its unique end-to-end digital transformation solutions portfolio included a comprehensive set of VoLTE-specific solutions.

SOLUTION



Among several solutions delivered within a wider transformation programme, MYCOM OSI delivered three solutions to address the CSP's VoLTE challenges specifically:

- **VoLTE Mute Call Analyzer™ –** A bidirectional solution covering the root causes of VoLTE mute calls, i.e. identifying the root cause in reaction to a detected mute call as well as identifying if a fault will cause mute calls
- **VoLTE Dropped Call Analyzer™ –** A bidirectional solution covering the root causes of VoLTE dropped calls i.e. identifying the root cause in reaction to a detected dropped call as well as identifying if a fault will cause dropped calls

BENEFITS

- Faster root-cause identification across a RAN and Backhaul
- Automation of triage and root-cause identification for quality managers
- Rich information and guidance provided alongside probable root-causes for NOC/SOC engineers
- Elimination of domain-specific assurance silos through end-to-end cross-domain root-cause analysis
- Improved NOC/SOC effectiveness through severity-based prioritisation of investigation / remediation

QUICK FACTS

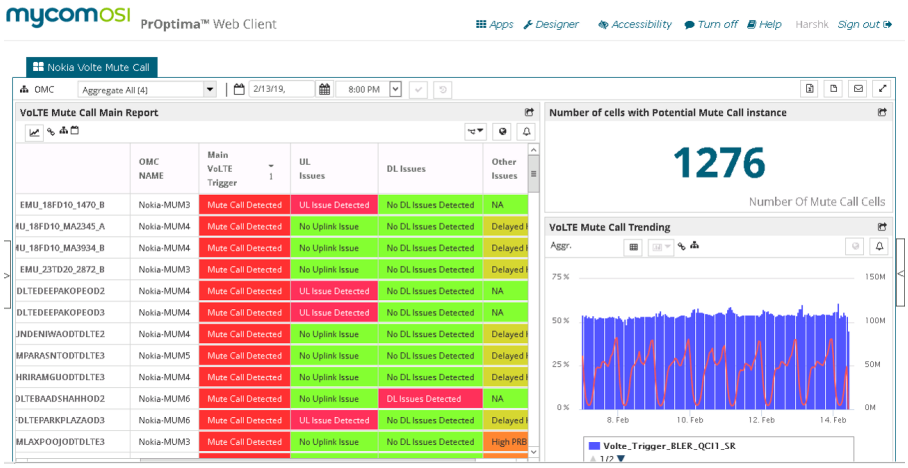
- **Customer:**
  Large Indian Tier 1 CSP
- **Business challenge:**
  Low QoS / QoE for VoLTE services
- **MYCOM OSI solution:**
  Three specific solutions as part of a wider overall project, providing advanced root-cause analysis for VoLTE dropped calls, mute calls and SRVCC issues
  Application: EAA PrOptima™

- **SRVCC Failures Analyzer™ –** Identification of the causes for failures in Single Radio Voice Call Continuity (SRVCC), wherein VoLTE calls are continued over a Circuit Switch (CS) session, when an ongoing voice session with a VoLTE-capable device moves out of range of an LTE network

Within these three categories a total of 22 root causes, incorporating integrated RAN and Backhaul / Transmission data analysis, and spanning congestion, system load, routing failures, signalling failures and memory utilisation, among others, are now automatically associated with a given VoLTE issue. These root causes are assigned probabilities, where necessary based on data on historical root causes in similar conditions, using intelligent correlation from the service to the network.

In the other direction (from fault), the solutions enable the CSP to rapidly identify specific problematic backhaul paths impacted by degraded links, and the associated RAN sites

Reporting of overall VoLTE performance is based on issue classes which are automatically (algorithmically) identified and aggregated for at-a-glance dashboards, summarized into VoLTE-specific KPIs and KQIs.



RESULTS

The CSPs were able to demonstrate the feasibility of advanced 5G slicing use cases, and MYCOM OSI today continues to engage with them to expand on this collaborative work on future TMF Catalyst;

- **Improved accuracy and efficiency of issue troubleshooting –** The CSP's NOC/SOC teams receive a unified view of all key problem areas to rapidly narrow down the scope of investigation with simple drill-down and intelligent correlation to identify the most probably root causes
- **Rapid backhaul path and link analysis –** MYCOM OSI's solutions provide the CSP's NOC/SOC teams with the ability to improve recovery times through rapid identification of degraded links, the impacted paths and corresponding RAN sites
- **Enriched cross-domain views –** The integrated solutions provide end-to-end visibility of the network across the RAN and backhaul domains
- **Automation –** The solutions support automation of the 'first cut' analysis for quality engineers, so that routine issues can be immediately actioned upon, enabling engineers to focus on investigating more complex issues
- **Guided analysis –** The probably root causes provided by the solutions also contain the procedures and methods to objectively identify the root cause of degradations in specific network nodes contributing to customer experience issues

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USE CASE

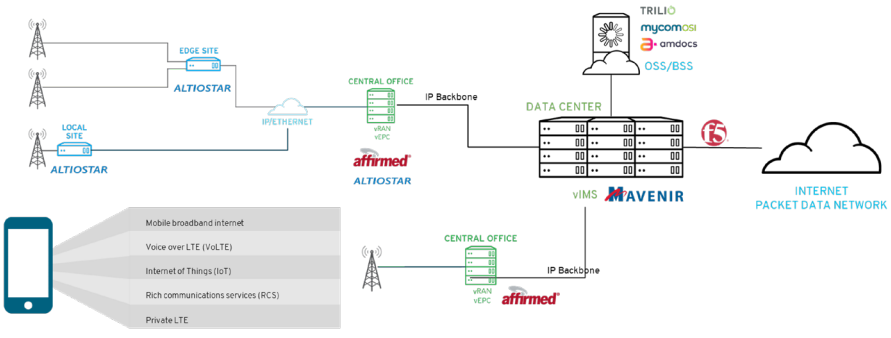
Assuring carrier-grade performance in the Red Hat Virtualized Central Office (VCO)

SOLUTION REQUIREMENT

In their ongoing digital transformation, to avoid wasting valuable legacy real estate Communications Service Providers (CSP) are looking to repurpose their Central Offices, from single-purpose to multi-purpose edge Data Centers (DC), capable of fulfilling multiple use cases and running cloud-native services (CNF/VNF/SDN).

Red Hat is leading an ambitious project to create a Virtualized Central Office (VCO) capability, leveraging multiple open-source projects as well as Red Hat's own OCP and OSP container orchestration and OpenStack implementations. However, to evolve the solution to v2.0, it required the capability to assure the performance of services running on the VCO with lack of advanced closed loop assurance-driven automation in open source, risking under-performance against the increasingly critical 'carrier-grade' differentiation that CSPs provide versus overlay services.

Red Hat, therefore, partnered with MYCOM OSI for its deep experience and cloud native Experience Assurance & Analytics™ (EAA) suite of applications, which can be easily deployed across a distributed edge-DC footprint but functionally aggregated and operated by a regional or central NOC/SOC team.



VIRTUALIZED MOBILE DATA NETWORK

SOLUTION

MYCOM OSI's cloud native Experience Assurance & Analytics™ (EAA) provides assurance for the solution that monitors and correlates all solution components, including hardware, cloud platforms, NFV (and 'CNF') infrastructure, VNFs and service chains. The service chains span a range of consumer fixed, mobile and enterprise services.

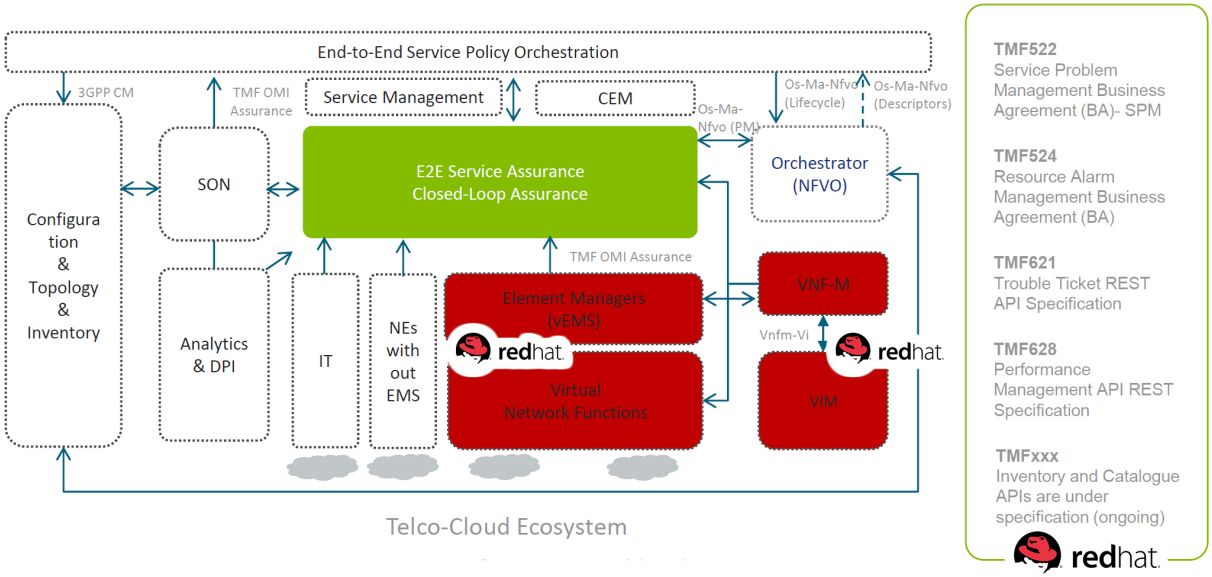
BENEFITS

- Closed loop automation for services running entirely or partially within the VCO environment
- Reduced MTTD/MTTR for issues through advanced triple-correlation and hybrid contextual awareness
- Real-time performance monitoring across physical and virtualized components, functions and services running in the VCO environment

QUICK FACTS

- **Solution:**
  Repurposing CSPs' legacy central office footprint to support new virtualized services
- **Business challenge:**
  Lack of advanced service assurance that supports SLA guarantees for new services and verticals
- **MYCOM OSI solution:**
  Experience Assurance & Analytics™ (EAA) suite of applications, deployed locally on VCO infrastructure but providing centralized assurance visibility and control
  Applications: EAA ProAssure™, EAA ProInsight™, EAA ProActor™, EAA PrOptima™, EAA NetExpert™

MYCOM OSI's solution collects data from across the VCO components (VIM, SDN-O, VNFM), using open APIs including Os-Ma-Nfvo (lifecycle, descriptors and performance management), Vnfm-Vi and a range of TMF APIs (TMF522, TMF524, TMF621, TMF628, and new TMF Inventory and Catalogue APIs currently under development).



RESULTS

- **Enhanced real-time visibility –** The solution enables proactive, real-time surveillance of performance and service quality, and automated service impact and root-cause analyses of degradations and failures within the VCO environment
- **Introduction closed loop automation –** The solution also provides closed loop automation functions for continual optimization, zero-touch operations and self-healing capabilities
- **Augmented VCO orchestration based on end-to-end network visibility –** Because MYCOM OSI provides end-to-end assurance across all hybrid (virtual and physical) Telco (3G/4G RAN, Backhaul/Transmission, Core, Messaging) and IT (Cloud/Datacenter/ Application) network domains, it ensures that network or service degradations in other areas of the network do not impact VCO service and network performance and quality, and vice versa
- **Reduced MTTD / MTTR –** Data collection and analysis across the entire physical and virtual network, including VCO, provides CSPs complete visibility into service delivery and operations. Data-based preventative and corrective recommendations are automatically sent to the NFV orchestrator, reducing MTTD and MTTR
- **Assuring performance guarantees for IoT use cases –** With the VCO unlocking edge IoT use cases requiring low latency, the MYCOM OSI solution enables the VCO to be market-ready to deliver SLA guarantees to enterprise and public sector customers across a new range of verticals such as smart factories, smart cities and safe cities

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