

P.I. Works provides centralized mobile network performance and capacity management solutions.

P.I. Works solutions assure lower costs for managing the network. They allow the existing network to be used more efficiently, minimizing capital costs for capacity expansion.

P.I. Works helps to improve the mobile subscriber experience.

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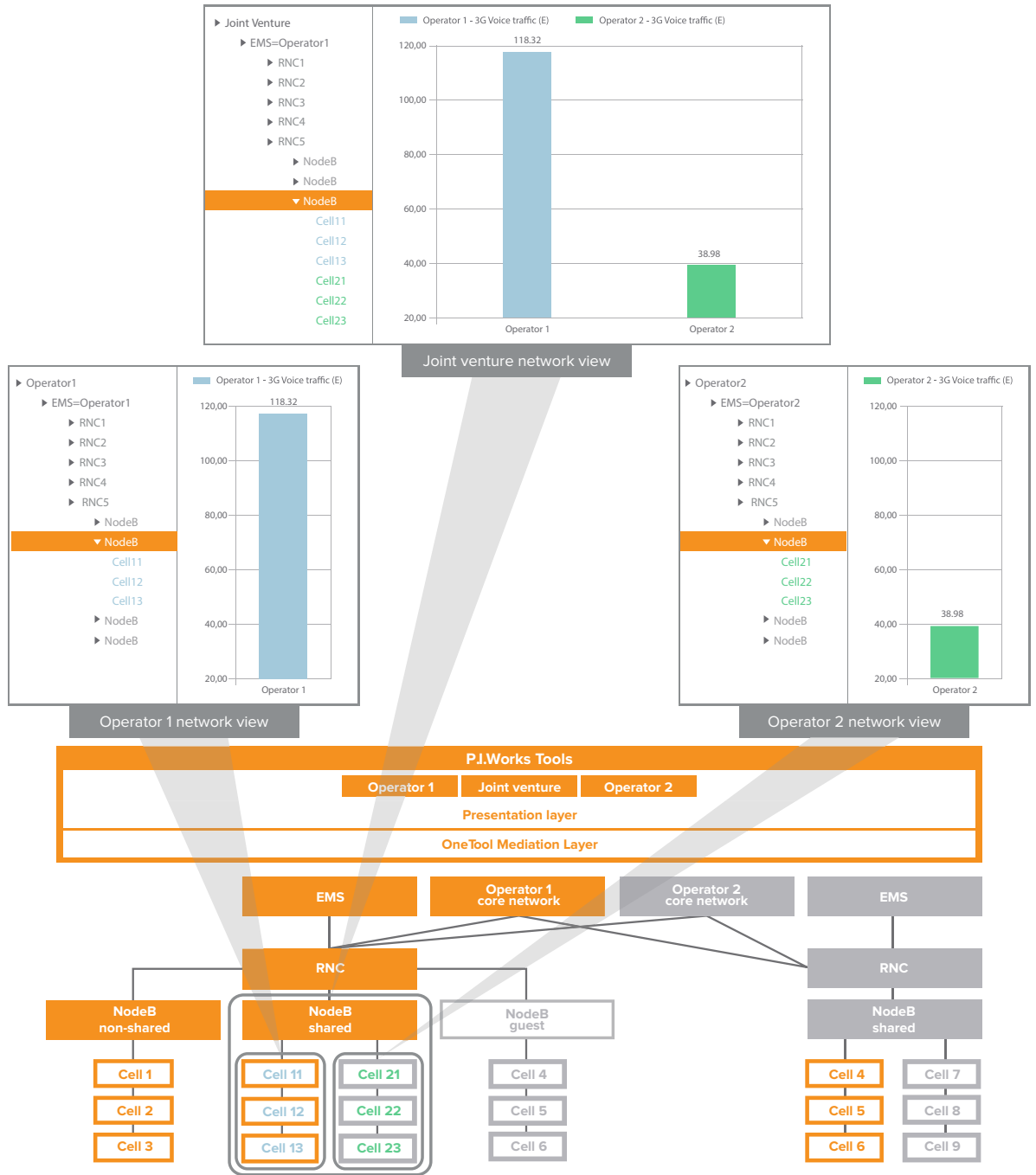
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P.I. WORKS MULTI-OPERATOR SHARED NETWORKS

Business considerations and regulatory mandates in many countries drive multiple Mobile Network Operators to share their network assets. P.I. Works offers comprehensive solutions for Network Sharing, including monitoring and optimization tools, services and managed services to plan, roll-out, manage and optimize multi-operator net-



Implementing Network Sharing can be a viable approach to increasing coverage and at the same time reducing costs.

But the technical challenges of managing the additional complexity can be daunting.

P.I. Works Network Sharing solutions aggregate all data from the network and segregate network performance data according to the selected sharing model, presenting each operator party a simple view on only their network KPIs. Private data is kept private and secure.

Value of network sharing

- ▶ CapEx prevention (>30%)
- ▶ OpEx Saving (> 30%)
- ▶ Organizational, Operational efficiencies
- ▶ Increase in effective spectral capacity due to channel pooling efficiency gains
- ▶ Increased cell site density
- ▶ Extended coverage, for less
- ▶ Quicker rollout speed
- ▶ Environmental Improvements

From Network Sharing Fundamentals, Dr. Kim Kylesbech Larsen, Head of Technology Office, Ooredoo Group

OTHER PRODUCTS

● SON Solution

uSON is a centralized automated network optimization solution. Adaptive learning algorithms are coordinated centrally to manage improvements to complex heterogeneous networks. P.I.SON yields best subscriber experience, increased data throughput, while minimizing OpEx and improving utilization of network equipment leading to CapEx reductions by deferral.

● Umbrella Monitoring

uSON PM is an umbrella performance management solution for Mobile Network Operators. Besides Radio, Core and Transmission network support, custom sources like IN, VAS, Fixed Network Equipment, CEM and many others are also supported with advanced performance reporting, GIS interfaces and alarm management features.

● RAN Troubleshooting

uSON Inspection is an advanced, easy to use interface for in-depth examination of the access network with root-cause analysis functions. Mobility analysis, advanced GIS functions, timing advance visualization, CM vs PM correlation features, golden parameter audits features allow operator to improve their engineering efficiency while minimizing drive-test costs and customer complaints.

Critical Success factors

Key sharing models supported. Passive element sharing, compound multi-vendor network sharing, national roaming mode are supported.

Control of your own network assets. Individual Operators have full visibility only to their own assets. KPIs will be evaluated only for your own network. Joint ventures can evaluate KPIs across the entire network.

Secure. Strong, password-protected segregation at application level between private operator data.

Customizable optimization. Automated uSON optimizers can be configured to operate selectively on segregated Operator data.

Near-real-time data access. Less than 12 minutes delay.

Lowest-cost approach to fulfill regulatory coverage requirements

Benefits

Better subscriber experience. Positive incentives to roll out into underserved areas; improved quality of service, particularly in congested areas.

Quick Results. See the impact on your network in less than one month.

Reduce OPEX. Personnel savings by fewer assets to manage and increased productivity due to simple management of complex network topologies.

Reduce CAPEX. Reduced CapEx pressure from lower upgrade and replacement costs.

Case Study: Shared Network Performance Management for EU Operators

CUSTOMER PROFILE

- ▶ 2 Tier-1 Operators in the EU formed a joint venture to share active and passive assets in a 2G & 3G mobile network
- ▶ Sharing at the BTS/NodeB, BSC/RNC, transmission, EMS, and core network levels

SOLUTION

- ▶ P.I. Works uSON PM performance monitoring application deployed with OneTool data mediation platform
- ▶ Maintain segregated logical networks so each Operator can see only their own data
- ▶ Individual Operator data is separated via application-level security using strong password protection of roles and permissions
- ▶ Lu signalling over secure virtual tunnels

CHALLENGES

- ▶ Allow private assets to exist along side of shared assets
- ▶ KPIs to be evaluated and reported separately and accurately for each Operator
- ▶ A global view of KPIs provided to the Joint Venture
- ▶ Strict separation of access to data must be enforced

RESULTS

- ▶ Unified view on network performance of each Operator's assets
- ▶ Common point of management on shared assets
- ▶ Significant increase in productivity of engineering teams, reduced site costs, energy savings led to significant OpEx reduction
- ▶ Increased coverage and network quality

Application Note for Centralized SON

The challenges in managing Shared Networks are restrictions in optimization activities and the complexity of configuration management. Centralized Self-Organizing Network (SON) algorithms in uSON were developed to address such complexity.

In Shared Networks, configuration management is performed with complex rule sets. Managing these extensive rules becomes a burden for Network Operators. uSON addresses this complexity. uSON allows the definition of Shared Network specific rules for host, guest and Shared Network Elements with Parameter Consistency Correction modules.

Following can be performed by Parameter Consistency Correction modules.

- ▶ Manage golden parameters per site cabinet, per clutter types and per RAN sharing rules; inconsistent settings are detected and corrected automatically.
- ▶ New cell golden parameters management according to site cabinet, clutter types and RAN sharing rules.

Carrying out an optimization activity in a Shared Network is not trivial due to restrictions in equipment sharing. uSON addresses these constraints by introducing Customizable Rules and Solution Sets (SON network parameter update actions).

Solution Sets can be customized according to shared equipment type. For example, if the antenna is shared, the uSON module Cell Outage Detection and Compensation (CODC) can be set to utilize only power actions instead of tuning electrical tilts in neighboring cells in order to compensate for the lost traffic by the sick cell.

This customization capability is a common functionality of uSON.