



NGMN Operations Requirements

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France Telecom, KPN**

**Version 1.3
11th February 2010**



Tabel of Content

Document History	4
0 Preamble.....	5
1 Quality & Quantity of Alarms.....	6
1.1 Short description	6
1.2 Expectation of benefit - saving potential (CAPEX/OPEX)	6
1.3 Requirements.....	6
1.3.1 Overall alarming concept	6
1.3.2 Alarm quantity.....	6
1.3.3 Alarm quality.....	7
1.3.4 Interfaces	7
2 Automatic Software Management.....	8
2.1 Short description	8
2.2 Expectation of benefit - saving potential (CAPEX/OPEX)	8
2.3 Requirements.....	9
3 Energy Saving	10
3.1 Short description	10
3.2 Expectation of benefit - saving potential (CAPEX/OPEX)	10
3.3 Requirements.....	10
3.3.1 Requirements on NE / X2 interface	10
3.3.2 OSS/EMS requirements	11
4 LTE Automatic Neighbor Relation (ANR) / Self Organizing Networks.....	12
4.1 ANR	12
4.1.1 Short description	12
4.1.2 Expectation of benefit - saving potential (CAPEX/OPEX)	12
4.1.3 Requirements.....	12
4.2 SON Operation.....	13
4.2.1 Short description	13
4.2.2 Expectation of benefit - saving potential.....	13
4.2.3 Requirements.....	13
5 Performance Management in Real-time.....	15
5.1 Short description	15
5.2 Expectation of benefit - saving potential (CAPEX/OPEX)	15
5.3 Requirements.....	15
6 Substitution of Monitoring Probes by Infrastructure Inherent Trace Functionality.....	16
6.1 Short description	16
6.2 Expectation of benefit - saving potential (CAPEX/OPEX)	16
6.3 Requirements.....	16
7 eNodeB Plug & Play - Self Commissioning	17
7.1 Short description	17
7.2 Expectation of benefit - saving potential (CAPEX/OPEX)	17
7.3 Requirements.....	17
8 OSS Standard Itf-N	19
8.1 Short description	19
8.2 Expectation of benefit - saving potential (CAPEX/OPEX)	19
8.3 Requirements.....	19
9 LTE Parameter Optimization	21
9.1 Short description	21



9.2	Expectation of benefit - saving potential (CAPEX/OPEX)	21
9.3	Requirements.....	21
10	Automatic Inventory	22
10.1	Short description	22
10.2	Expectation of benefit - saving potential (CAPEX/OPEX)	22
10.3	Requirements.....	22

Document History

Version	Date	Prime Editor	Remarks
1.0	1 st Dec 2009	Deutsche Telekom, Vodafone	Initial version of the document
1.1	2 nd Dec 2009	Deutsche Telekom, Vodafone	Basis for TMF meeting in Orlando, FL; editorial house keeping, format alignment, etc.
1.2	5 th Feb 2010	Deutsche Telekom	Incorporation of FT/Orange remarks; editorial house keeping, format alignment, etc. This version has been accepted by KPN/e-Plus
1.3	11 th Feb 2010	Deutsche Telekom	More (minor editorial) remarks and house keeping from FT/Orange and Deutsche Telekom, e.g. in chapter 3 "Energy Saving"



0 Preamble

The purpose of the document is to give the industry a strong guidance regarding business needs from network operations point of view.

The document contains the ten most important operational requirements, in a first step agreed between Deutsche Telekom and Vodafone – now also agreed with France Telekom/Orange and KPN/e-Plus. The requirements are driven by the fact that only a higher grade of automation and maximum usage of Next Generation technologies will improve efficiency of network operations in a multi-vendor, multi-technology environment.

Key targets are further reduction of operational costs and time to market by minimizing the so-called integration tax of network infrastructure and OSS/BSS environment using standardized interfaces and functionalities. The document describes such functionalities; it is not the intention to specify realization details.

The Operators are convinced that only commercial-off-the-shelf (COTS) products, based on agreed industry standards, are able to fulfill such requirements. Current proprietary vendor solutions are not considered effective enough to drive the necessary shift in automation. The Operators expect that both network and OSS/BSS suppliers work together and develop appropriate standards and solutions. The Operators are committed to support those standardization efforts via the existing bodies, e.g. 3GPP, NGMN, and TMF.

1 Quality & Quantity of Alarms

1.1 Short description

Today's Telco products are in many cases composed out of different components (e.g. network elements, IT systems, network element managers, ...). The supplier must ensure that an overall alarming concept for their product has been developed instead of independent alarming from each single component.

The concept must ensure that the quantity and quality of alarms allow efficient incident and problem management processes with a minimum number of operators. A layered approach focusing on service degradation and customer impact should support the fast identification of the relevant root causes to minimize the time back to service. Reasonable prioritizations, documentation of alarms as well as alarm correlation on all levels are the basis.

Network operators are today often faced with alarm floods, alarm avalanches caused by single incidents, wrong alarm prioritization, misleading alarm descriptions, and incomplete maintenance manual (e.g. repair actions).

1.2 Expectation of benefit - saving potential (CAPEX/OPEX)

Well designed alarm concepts for the overall product minimize the number of service outages and in case of failure the time back to service. Network operator's loss of market image and a loss in revenue can be minimized extensively. The alarm concept needs to be provided as part of the product and should not be project specific.

Good alarm quality and a minimum quantity of alarms reduce operational costs significantly. Without appropriate correlation and meaningful alarms, complex networks are no longer manageable in centralized network operations centers.

1.3 Requirements

1.3.1 Overall alarming concept

The supplier and their R&D departments are the owner of the detailed system know-how and are responsible for the overall alarming concept. Today the supplier's development departments for network elements and OSS are working often autonomously in that area. The basis to design an overall alarm concept needs to be established between the different vendor's product lines before the start of development phase.

1.3.2 Alarm quantity

Only alarms that fulfill the quality requirements and which have an additional benefit to solve abnormal conditions should be forwarded by the NE. Meaningless events must be avoided.

Alarm correlation

To fulfill the quality requirements and to reduce the event number correlation must be implemented on all levels (network element & element manager). Correlation rules which

cover the whole product including all composed components must be part of the product solution and should not be project specific. FM agents on NE level (e.g. IT-systems) should be used to reduce the number of unwanted events.

A further correlation of these alarm data in combination with KPI/PM data is needed to give a clear overview of the service related to the whole system environment.

Number of alarms

- In general per incident there should not be more than 10 alarms on the instance which caused the failure.
- Alarm floods of instances which did not cause the failure need to be blocked in any case.

1.3.3 Alarm quality

Focus on customer and service impact

In incident situations the following question need to be answered by the system alarms, without the need for any additional optional tooling:

“What does this incident mean for the customer and the service at all?”

Prioritization of alarms

Criteria for Critical alarms:

- Total disturbance of the system or significant service impact for customers
- Performance, capacity, throughput restrictions
- Accounting disturbed

Criteria for Major alarms:

- Outage of a redundant component (e.g. outage of a redundant power supply)
- Introduction of retaliatory actions required, to ensure the service availability

Alarm maintenance manuals

Alarm maintenance manuals must contain a clear repair action for the dedicated malfunction.

Wherever possible event-based automated repair actions to solve standard error situations without manual interaction should be implemented, if not already implemented on the Network Element level.

Alarm text

Alarm text should contain description of abnormal condition, probable cause, service impact, root cause and a clear short repair action or reference to online maintenance manual. Meaningless events have to be avoided.

1.3.4 Interfaces

See chapter 8 “OSS Standard Itf-N”.

2 Automatic Software Management

2.1 Short description

Software management applications require today too many manual interactions which cause unnecessary efforts and avoidable problems during implementation of updates.

Distribution and activation of SW and FW to all network elements shall be automated to a very high degree. IT standard software distribution systems or DSL forum standards (TR196) could be taken as guidance.

Minimum requirement:

Software management has to ensure that even within large networks the Network Element software updates can be implemented centrally within the maintenance window (e.g. 22:00 to 05:00). Less complexity can avoid failures.

2.2 Expectation of benefit - saving potential (CAPEX/OPEX)

Software Management is from operational aspects divided into the following phases: Preparation, Activation and Wrap-up phase

Preparation phase

Network Element and OSS status has to be checked and software packages must be downloaded in parallel to the Network Elements.

Activation phase

During nightshift the software has to be activated within the maintenance window (22:00 to 05:00) and standard network element status checks need to be executed.

Wrap-up phase

In the dayshift remaining errors need to be solved and remaining tasks need to be finished.

The software activation success depends on the accuracy of preparation. Failed activation tasks lead to additional nightshifts or additional efforts in the following dayshifts. Based on today's experiences about 5% of software activation are unsuccessful.

Estimated saving potential (illustrative figures):

	short term (0 -2years from now)	long term (4 – 8 years from now)
Preparation phase	< 10%	< 50 %
Activation phase	< 20%	< 90 %
Wrap-up phase	< 15%	< 30 %

2.3 Requirements

Short term

“NE health-check”

OSS system has to be able to verify automatically that network elements are ready for software upgrade. The health-check (e.g. faulty HW Modules, critical alarms, free disk space) has to be executed during the dayshift to ensure the correct behavior and preconditions of the NE itself.

Automated software download

The software download to the NEs should work in parallel with a minimum of unavoidable manual steps. A result overview list must be provided.

One-click NE software activation

Software activation should also work in parallel with a minimum of unavoidable manual steps. The NE health-check should support also the wrap-up activities for urgent issues.

Automatic rollback

Only if the software activations fail completely an automatic rollback should be initiated.

Long term

SW package is made available on OSS, and NEs are tagged on OMC for upgrade. Policies for software activation are set.

All necessary activities (NE-health check, SW download, SW activation, corrective actions) are carried out policy controlled by the software management application.

A final upgrade report is provided that will be used as basis for the final wrap up phase.

It is understood that with the long term approach the operator loses detailed control of each single step necessary for a software upgrade. A policy controlled bulk software upgrade is expected to be less error prone than today's solutions

3 Energy Saving

3.1 Short description

Energy is a main part of the operational expenses. Thus not only network elements with low power consumption become more and more important but also the temporary shutdown of unused capacity is valuable.

Currently network elements can only be put in stand-by mode using modems or SMS controlled switches managed by separate tools. For an integrated energy saving functionality network elements shall provide a stand-by mode with minimum power consumption and a possibility to switch on and off this stand-by mode remotely via the element management system without affecting the customer (e.g. dropped calls).

An automatic capacity-driven energy saving mode can only be realized in existing networks using higher-level network management systems based on performance data. Due to the delay of delivery of the PM data a restart at short notice cannot be guaranteed. Thus a reliable and riskless solution is currently not feasible. With the help of SON features integrated in network elements and element managers a dynamic temporary shutdown of unused capacity shall be enabled.

3.2 Expectation of benefit - saving potential (CAPEX/OPEX)

For example by switching-off a GSM site for 6 hours a day (e.g. during night) energy costs (OPEX) can be saved approximately per 25% of the time.

3.3 Requirements

3.3.1 Requirements on NE / X2 interface

- The network element shall provide an energy saving mode with minimum power consumption allowing a restart of the network element in less than 5 min triggered via the O&M or X2 interface.
- In case a loss of connection of the X2 or O&M interface is detected, the node shall restart without any further trigger.
- The network elements shall be informed about the status of neighbor sites. If additional capacity is needed, neighbor sites in energy saving mode shall be restarted via X2 interface immediately (less than 5 min).
- Energy saving features shall be considered in other SON use cases (load balancing, cell/service outage detection & compensation, mitigation of unit outage).
- Sites in energy saving mode shall be considered in automatic HO adjustment (via X2).
- Non-availability of sites due to energy saving mode (node itself and associated NEs) should not be alarmed by the NE.
- The energy saving functionality shall be adequately expandable to 2G / 3G technologies.

3.3.2 OSS/EMS requirements

- The energy saving functionality shall be controlled by the element manager. A GUI shall be available to de-/activate a static / dynamic energy saving mode of single or groups of nodes incl. definition of time frames when the feature shall be active.
- The system supports automatic detection of low-load periods as basis for operator or automatic decisions on definition of time frames when the feature shall be active.
- The energy saving functionality shall be supported completely on the Itf-N (BulkCM and / or CLI).
- It shall be possible to configure thresholds and rules of conditions to “switch-on/off” a site automatically.
- The element management system shall have the actual status of the network element at all time.
- The de-/activation of other SON features associated with automatic “switch-off” shall be configurable (automatic HO-adjustment of neighbor sites, load balancing, cell/service outage detection & compensation, mitigation of unit outage).
- A failed re-start of a network element shall be alarmed.
- Non-availability alarms of sites due to energy saving mode shall be suppressed. This applies not only for alarms of the NE in energy saving mode itself but also alarms of connected NEs shall be avoided (e.g. neighbor-nodes, switches, etc., preferably at NE level).
- It shall be possible to identify the designated energy saving mode in performance data (preferably at NE level) in order to consider this in KPI calculations (e.g. cell availability).
- Under the assumption that the “switch off” of cells is only done if a redundant coverage is given by other cells (of e.g. eventually other collocated RAT) the system supports the import and export of traffic indicators from cells to understand the traffic situation in the cells doing the backup. If the traffic is exceeding a certain operator defined load the system ensures that cells in energy saving mode are activated at once to ensure best customer experience with respect to performance and quality.
- The delivery of these traffic indicators shall be in more real-time than PM to ensure a quick reaction on changed traffic situation in the backing cells.

4 LTE Automatic Neighbor Relation (ANR) / Self Organizing Networks

4.1 ANR

4.1.1 Short description

The SON use case Automatic Neighbor Cell Configuration and X2 Setup is defined in the 3GPP Release 8 standards. Based on UE Measurements the eNodeB adapts the NR Table. ANR Algorithm and decision making is located in eNodeB

Neighbor Relations Table

Neighbour Relation			O&M controlled Neighbour Relation Attributes		
NR	LCI	TCI	No Remove	No HO	No X2
1	LC#1	TCI#1			
2	LCI#1	TCI#2			✓
3	LCI#1	TCI#3	✓		

4.1.2 Expectation of benefit - saving potential (CAPEX/OPEX)

In current 2G / 3G radio networks about 50% of the network configuration changes initiated by network planning and optimization work orders contain ADJC adaptations. ANR has the potential to reduce the effort in network engineering and operations departments significantly.

4.1.3 Requirements

- Operator expect from ANR within Intra-LTE, Inter-LTE and Inter-RAT for all handover types:
 - Full substitution of initial planning of relationships based on planning tools;
 - automatic configuration of neighbor relationships inclusive setup of related X2 interfaces;
 - automatic optimization of neighbor relationships
- There shall be fast initial ANR data handling and conditional list implementation, where it is possible to set up a scheme of neighboring cells over multiple Sites with a minimum of UE initiated traffic and customer impact. To face the risks on issues (like lengthy measurement gaps due to ANR or HO failures and call drops due to missing neighbors) several optional features are asked for. It is underlined that these related requirements shall not put into question that the above SON characteristics of ANR shall be fulfilled.
 - EMS and OSS should provide a general ANR monitoring & control application covering policy control, history log and switch on/off functionality per site and cell.
 - Conditional lists in form of white and black lists as defined by 3GPP shall be stored and configurable within the configuration application / EMS and OSS platform. These lists can be read and configured via the northbound interface in

- operator's network management level. The ANR functionality informs directly new identified neighbors to the EMS and the OSS.
- Neighbor cell lists shall be autonomously configured and optimized by the system based on UE measurements according to 3GPP's ANR, with user setting options like: which UE measurements to use for cell list optimization, forbidden adjacency relations, no handover & no remove attributes, etc.
 - ANR functionality is expected in a way that following handover procedure can be done directly after or "on the fly". This means that the time for relationship identification and configuration inclusive setup of X2 is minimized on less than 2 seconds.
 - The system shall support specific ANR measurements and its configuration separated from specific HO measurements to enable early relationship identification. Target of this is to ensure that the relationship configuration time does not endanger the successful following handover.
 - For LTE->3G and LTE->2G neighbor relation configuration some pre-planned information via northbound interface or available information in a Multi-RAT system (like given relations of collocated cells, scrambling codes or ARFCN of likely neighbors) can be used to mitigate side-effects of time consuming UE measurements in an efficient way.
- Network and Management System support for Automatic X2-Setup based on handover-relations.
 - Network and Management System to be able to configure / manage "no X2 flag", "no remove flag" and "no HO flag" (as opposed to eNodeB only per 3GPP)
 - Due to missing standardized ANR functionality for the direction from 3G or 2G to LTE the system shall support neighbor relation planning for these directions. Future standardization to cover multi vendor scenarios is asked for. The exchange of neighbor relation lists from planning tools or other EMS via northbound interface shall be supported. Within the Multi-RAT system of one supplier the different RAT neighbor relation information shall be considered to achieve automatic neighbor relations also for 3G->LTE and 2G->LTE directions.

4.2 SON Operation

4.2.1 Short description

SON and related savings are seen as an essential economical characteristic of LTE strongly asked for by all operators. The following requirements shall be seen in a way that operators see their responsibility to offer excellent quality beside commercial considerations. As a consequence it has to be ensured that operator keep the control on all new SON functionality by implementation of appropriate policy control and finally the general prove of concept.

4.2.2 Expectation of benefit - saving potential

The below listed requirements provide operator network control in SON trust building and learning phase. It allows in all situations that a very good network quality can be assured.

4.2.3 Requirements

Following generic requirements are applicable generally to all SON features:

- SON functionality / capability shall have controlled implementation in order to build trust and confidence in automation and avoid massive operational impact
- Network and Management System should provide a general SON Monitoring & Control Application covering policy control, history log and switch on/off functionality per site and cell
- SON centralized and distributed approach must be supported (depending on the SON use case)
- Network and Management System should provide possibility to configure certain break points for SON Operations, allowing the operator for manual intervention to proceed with the logic, or to halt / abort it
- Network and Management System shall be synchronized in real time with SON initiated network changes. Notifications shall also be available real-time via the CM Northbound Interfaces to NMS
- Network and Management System should provide a valuable Reporting Suite for SON activities
- Network and Management System shall fully support SON as defined in 3GPP standards, inclusive CM Northbound Interface 3GPP BulkCM IRP (CORBA or SOAP based)
- Provide an open Northbound Interface for all SON related parameters for interoperability with 3rd party tools
- Network and Management System should be able to request or report the SON related changes for statistical analysis and historical view
- It shall be possible to customize SON policies. On the one hand, there shall be flexibility to adjust the SON functionality to the Operator's requirements. On the other hand, customization shall be a simple process to minimize the manual effort required.

5 Performance Management in Real-time

5.1 Short description

Major challenge of Performance Management is providing the relevant counters as fast as possible and in a maximum efficient way. Therefore, future Performance Management capabilities have to consider the requirements for *online performance management* as well as the need for *optimized configuration, administration* and *monitoring* of performance data with respect to the available technical and human resources.

Dedicated reports of specified KPIs for trouble shooting purposes support *automatic identification of network problems and automatic error correction proposals*.

5.2 Expectation of benefit - saving potential (CAPEX/OPEX)

- Earlier availability and visibility of performance data leads to faster error detection and correction. This reduces the *time back-to-service*.
 - Better network quality, better customer satisfaction and increased revenue
- Efficiency gain for measurement configuration, administration and monitoring tasks
- KPI definition, threshold definition and the development are under vendor's responsibility. Today these tasks have to be done often by network operators.

5.3 Requirements

- Free configurable measurement and delivery periods for each counter or counter group.
- Efficient data transfer mechanism, e.g. simply structured and compact raw data format with a maximum net data rate, e.g. *csv* (current XML-based 3GPP standard has large overhead; might be improved using e.g. appropriate compression methods; subject for standardization)
- EMS internal post-processing of raw data without significant delay (near real-time)
- Automated counter or counter group administration (incl. activation).
- Automated performance data quality management, e.g. automatic counter restart after outage
- Function for simple threshold based on counters and KPIs
- Function for simple KPI calculation based on counters
- Automatic identification of network problems and error correction.

6 Substitution of Monitoring Probes by Infrastructure Inherent Trace Functionality

6.1 Short description

In comparison with active service testing (e.g. through “robots”) passive monitoring via probes means the permanent monitoring, storing and processing of relevant signaling network data. These data contain control plane as well as user plane data.

Today current vendor call and IMSI trace solutions are often only limited to single network elements. Probing capabilities across several network elements and technologies are not supported.

6.2 Expectation of benefit - saving potential (CAPEX/OPEX)

High investments in external passive probes can be avoided. The number of drive tests as well as engineering and operational efforts can be reduced.

6.3 Requirements

- The infrastructure system supports trace functionality as specified in 3GPP 32.421, 32.422, and 32.423. It shall be possible to trace information (standardized or proprietary) on interfaces Uu, S1, X2.
- The trace functionality is seen as basis for trouble-shooting, optimization, network wide monitoring and trouble detection and customer specific trouble shooting.
- Interface to external 3rd party systems like Customer Experience Mgmt systems
- User Call Trace applications should be able to capture and store real-time data for specific calls or subscribers across several network elements and technologies (e.g. 2G/3G/LTE).
- Tracing and logging of all successful and unsuccessful calls to any of registered numbers
- Application has to offer the ability to set call identifying parameter values. These settings shall act as call / transaction filters. Each parameter of every protocol has to be available for selection.

Typical filter parameters should be:

- Called party number, calling party number
- MSISDN, IMSI, IMEI
- Service of call (Speech, Video telephony, SMS, Supply. Services)
- Location Area Code, Cell ID
- Access Point Name
- Service Area Code
- GSN-IP addresses, MS-IP addresses, HSDPA, HSUPA usage

7 eNodeB Plug & Play - Self Commissioning

7.1 Short description

Automated network integration of new eNodeBs via auto connection to OSS (DHCP, Network Element Manager), core network (S1), Security Gateway and neighbor sites (X2). The auto configuration functionality deploys the required data (e.g. SW, firmware, parameters, etc.) automatically.

7.2 Expectation of benefit - saving potential (CAPEX/OPEX)

Potentially reduce the number of on-site visits to just one. Manual configuration effort of Radio, Core and Transmission Network can be significantly reduced.

Prerequisites have to be fulfilled like automated IP Sec Certificate and License Management. In addition the IP network has to be configured in advance (e.g. IP routing).

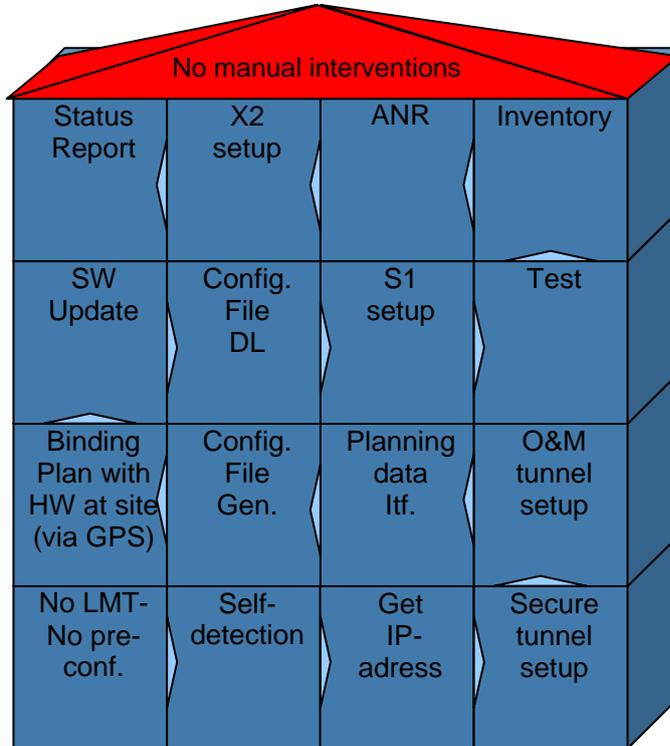
7.3 Requirements

In order to take full advantage of the eNodeB Plug & Play functionality the deployment and installation process must not contain more than the following steps

- eNodeB Hardware installed on site
- eNodeB powered on
- eNodeB connected to Network Operators IP Network

→ Result: “eNodeB is properly on air” and can be taken into commercial service by the operator

The following picture illustrates the expected flow:



Important: License management should be transparent for the operator and must not cause any negative deployment and deployment impact

8 OSS Standard Itf-N

Standardized (network, vendor, EMS and technology independent) Northbound Interfaces between Element Manager and Network Management Layer

8.1 Short description

Although it is not the intention of the document to specify implementation details the Operators expect the industry to jointly develop and use common standards, which deliver the semantic connectivity and not only the underlying transport mechanisms. The goal is to achieve out-of-the-box interoperability and more flexible integration, as well as the re-use of the same interfaces between OSS/BSS and the Network or EMS. Based on existing frameworks, provided by the standardization bodies, solutions should be implemented that support plug & play behavior of network and OSS/BSS infrastructure. This will lead to more open interfaces to allow for 3rd party software integration.

Amongst others this implies usage of common data models, e.g. based on SID, interface standards, such as SNMP and XML (if appropriate), and state-of-the-art technologies as SOA, web services, etc. As those standards are evolving over time the Operators resign from specifying exact software versions and implementation details. Our aim is to ensure upwards and downwards compatibility to ease integration of multi-vendor, multi-technology systems for all management areas.

8.2 Expectation of benefit - saving potential (CAPEX/OPEX)

The main benefit is achieved, as soon as the specification can be re-used to implement similar interfaces for different integration scenarios that means to interface different EMS or Network Elements with the NMS (OSS) architecture without creating a complete new implementation of the interface. The goal is to improve efficiency (in terms of cost and effort) for the integration of new EMS and to reduce cost and effort to maintain each single interface in a different way.

Vision:

- “Plug & Play” integration of EMS into the OSS environment (no additional cost and effort during the implementation and the life cycle of network technologies and related EMS)
- De-coupling of EMS – OSS layers (changes on EMS or on NE may not lead to changes on OSS layer)
- Re-use of OSS client interfaces

8.3 Requirements

This chapter contains “generic” requirements only, valid for each type of interface between EMS and NMS.

- **“Plug & Play”** → It must be possible to implement the interfaces between network and OSS systems easy and efficient by lowest costs and smallest effort (ideally without any development and/or configuration).
- **Useful** → It must deliver efficient support for the OSS business processes. The interface must deliver the needed OSS semantics to support the process.

- **Re-useable / Generic** → The interface must be generic enough, to enable the re-use in different integration/business scenarios
- **Flexible / Extensible** → It must be possible to extend the interface capabilities (methods and attributes), without breaking the standard
- **Standardized / Open** → The interface has to be based on unambiguously standardized specification, which does not allow room for interpretation. The specification and related artifacts must be freely available and useable for everybody.
- **Mature / Stable** → The interface must be stable and mature, to avoid expensive changes on implemented interfaces.
- **De-coupled** → Changes in the application or in the interface implementation at one of the communication partners may not lead to the need for changes in the application or in the interface implementation of the other communication partners.
- **Evolutionary** → OSS interface shall re-use already existing, widely adopted and mature IT standards (e.g. transport protocols) to avoid “reinventing the wheel”.
- **Independent** → The interface specification must be independent from underlying infrastructure.
- **Upward / Downward Compatible** → It must be possible to implement a new version of an interface specification at one of the communication partners, while the other communication partners still use an old version of the interface specification.
- **Interoperable** → The interface implementation shall be based on an interoperable portfolio of interfaces / interface specifications to support different OSS business processes using a common architecture and a common information model.
- **Scalable** → No performance constraints caused by the interface specification or the implementation.
- **Secure** → The interface has to be able to ensure confidentiality and availability of the data, which is transferred by the interface.
- **Reliable / Having Integrity** → The interface implementation has to ensure the reliability and the integrity of the data, which is transferred by the interface.
- **Adopted & Verified** → Widely adopted and verified, so that every vendor supports it.

9 LTE Parameter Optimization

9.1 Short description

In current 2G / 3G Networks parameter optimization is done manually by analyzing drive-test data and performance measurements. An automated parameter optimization has the possibility to reduce the effort for Network optimization and operations significantly.

9.2 Expectation of benefit - saving potential (CAPEX/OPEX)

Network quality and customer satisfaction will be enhanced. Network planning and optimizations efforts can be reduced significantly.

9.3 Requirements

Use cases:

SON should support the automatic parameter optimization for the following use cases:

- Automatic optimization of coverage and capacity related parameters in dependency of related KPIs and thresholds.
- Automatic optimization of QoS and GoS related parameters (i.e. adaption of scheduling and / or RACH parameters) in dependency of related KPIs and thresholds
- Automatic optimization of mobility and handover related parameters (i.e. cell individual offsets, down tilts, Event A related parameters) in dependency of related KPIs.
- Automatic optimization of cells or services in outage based on an unambiguous detection of this outage.

Configuration:

- Optimization for identified parameters shall be done within a value range, defined by the operator.
- Optimization shall be done with respect to KPIs and parameters not directly related to the use case KPI (i.e. other KPIs shall not become worse than defined thresholds (e.g. handover optimization shall be done with respect to capacity related parameters resp. KPIs).
- Dependency between KPIs resp. definition which KPIs shall be considered in addition to use case KPI(s) shall be configurable by the operator.
- Thresholds for start and end point of parameter optimization shall be configurable by the operator.
- Optimization cycle should be configurable (periodically, event-based)
- Support of centralized / decentralized solution
- Degree of automation configurable by the operator.
 - Optimization cycle completely automated: yes / no
 - Automated import of optimized settings: yes / no
- Import / export function of network status with history and fallback solution.
- OSS should provide standardized interfaces to planning tools / processes.

10 Automatic Inventory

10.1 Short description

An Automatic Inventory function shall synchronize in real time with the Configuration Management system (CMS). Notification of any change to a passive or active element or its configuration relevant to a business process must be possible: Consumer of that might be directly the Configuration Management System (CMS) / Network Inventory or other OSS Systems. The same information shall also be available in addition via batch load or polling mechanisms.

The Configuration Management System (CMS) is the grouping of all relevant inventory systems to provide information required by the Planning, Deployment and Operations Processes.

10.2 Expectation of benefit - saving potential (CAPEX/OPEX)

- Significant reduction of OPEX from reduction of manual updates to the information managed in the CMS
- Significant reduction of OPEX due to accurate information, real time as a basis for Planning, Deployment and Operation
- Significant reduction of OPEX due to accurate auditable real time information, for changes to the network infrastructure, to achieve SOX and BILMOG compliance
- Significant reduction of CAPEX due to accurate real time information, enabling adequate capacity to be provided (not too much, not too little)

10.3 Requirements

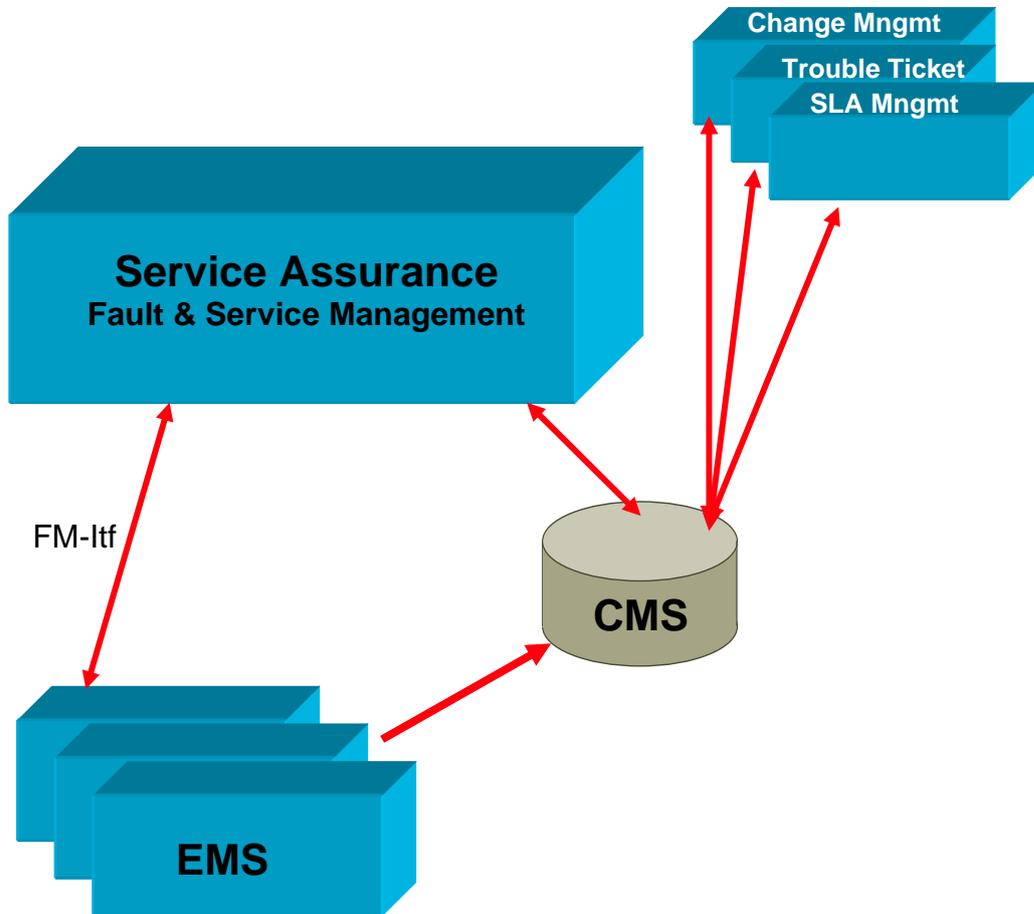
Vendor infrastructure (RAN & Core Network elements)

- Standardized interface for signaling information about changes performed in the network.
- Standardized interface to poll the information about Network Element configuration and components.
- All changes are available via a push or pull mechanism.

E.g. following the final self test the eNodeB delivers

- a state change notification
- details on its resource configuration (resource inventory)
- details on its parameter configuration (configuration inventory)

The picture below aims to illustrate the high level architecture of a Configuration Management System integration in Operator's OSS environment



Configuration Management System (CMS) Integration