

Dimensioning and Optimizing Mobile Networks with Performance Management System

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Contents

- **Background and research problem**
- **Radio network technologies**
- **Network monitoring tools**
- **Performance management**
- **Tellabs 8000 PMS**
- **Performance management integration**
- **Performance management in the access networks**
- **Dimensioning and optimizing**
- **Conclusions and future studies**

Thesis was made for Tellabs, Inc.

Background

- **Rapid mobile technology development**
 - > More traffic in the access network
 - > Flatrate based pricing accelerating the growth
- **Access networks from circuit switched to packet switched**
 - > Several network technologies in the radio access networks
- **Performance pressures to the access network**

Research problem

- **Adding more capacity is not enough**
 - > However it has been the traditional solution
 - > Adding more capacity is problematic with different technologies in the network
 - > With increased speed, the additional capacity is getting expensive
- **Better to use dimensioning and optimizing methods**
 - > Performance management system can help in it
 - > Also some other OAM methods can be used

Radio network technologies

- **Radio technologies**

- > GSM, GPRS, EDGE, UMTS, HSPA
- > Next generation technologies
- > Transmission speeds are increasing, latencies are decreasing

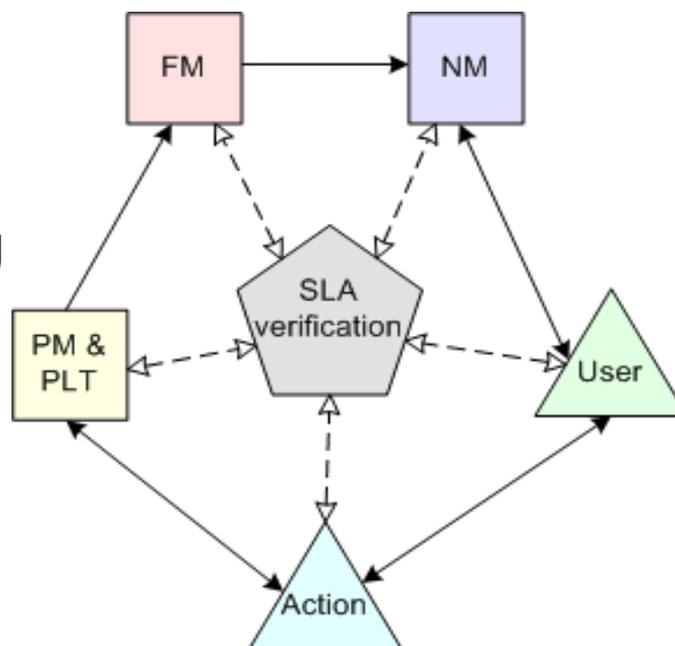
- **Radio access transport network technologies**

- > TDM, ATM, FR, Ethernet, IP, MPLS
- > Technologies differ in:
 - Speed
 - Service quality delivery
 - Operation and maintenance capabilities

Network monitoring tools

- **Most important tools are:**
 - > Performance management
 - > Fault management
 - > Connectivity tests
 - > Other OAM functions

- **All the tools are part of the network monitoring process**



PM = Performance Management

PLT = Packet Loop Test

FM = Fault Management

NM = Network Management

SLA = Service Level Agreement

Performance management

- **Performance management includes the functions that enable the performance measurements in the network**
- **Purpose is to collect data, which can be used to verify the physical and logical configuration of the network and to locate possible problems in the network as early as possible**
- **The performance data is collected from the network elements by polling the elements directly or by using some OAM methods**
- **The managed or monitored performance objects are often called as performance indicators and statistics**

Performance data processing

- **The collected performance data is usually processed in the management tool to some relative %-values that can be compared in the different sizes of networks**
- **The results are then processed to real-time monitoring and to performance reports**
- **The performance reports are historical reports from the certain time window**
- **If the performance management system includes also fault management functions, the collected performance data can trigger faults and alarms, if necessary**
- **Performance management can also be used to verify service level agreements**

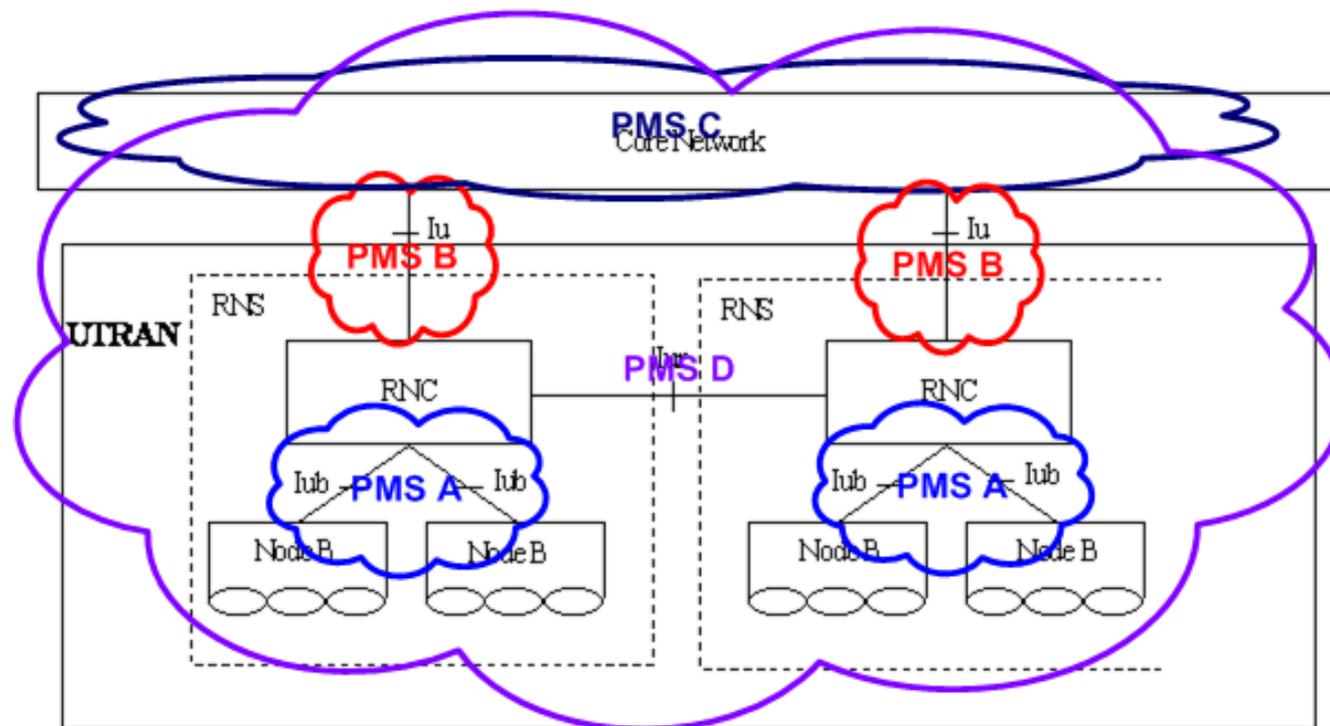
Tellabs 8000 Network Manager Performance Management Package

- **A module of Tellabs 8000 Network Manager**
- **Can manage Tellabs and some 3rd party network elements**
- **Tellabs 8000 PM has only functions to manage the performance, other modules handle the connectivity and fault managing issues**
- **It can offer performance data for other performance management system integration and the fault data for the fault management system**
- **The reports are versatile and can be processed in many forms**
- **Best usage in the mobile access transport networks**

Performance management system integration (1/2)

- There can be many different performance management systems in the same network in the different levels or segments
- Usually the operator wants to use only one management system on the top of the other systems
- There is a need to integrate the performance systems – some will act as "slaves" and one will be the "master"
- For example between the UTRAN interfaces:
 - > Base station – RNC
 - > RNC – MSC / MGw
 - > RNC – SGSN

Performance management system integration (2/2)



- The different performance management systems and tools need to use common and standardized interfaces between them
- Various performance management tools vary with many properties, but the interfaces should be the same

Performance management in the access networks

- **Usually at least three different performance management systems in the mobile networks:**
 - > Air interface in the radio network
 - > Radio access network
 - > Core network
- **One of the systems need to act as the umbrella system where all the faults, alarms and reports are integrated**
- **The operators have many requirements for the network monitoring and also for the network management**
 - > Certain performance indicators have to be monitored
 - > The reports should be clear and exportable to some 3rd party applications

Dimensioning and optimizing

- **Two terms that are often used in the literature of telecommunications network planning:**
 - > Optimizing = to find minimum or lowest cost of a specific network design
 - > Dimensioning = to ensure that expected needs will be met in an economical way, both for subscribers and operators
- **The processes are usually initiated when:**
 - > New technologies, elements or features are taken into use
 - > External edge conditions have changed
 - > Detection of decreased QoS performance in network segment
 - > As a daily network operation process

Dimensioning and optimizing methods

- **Radio network traffic balancing**
 - > Handovers for example between the different WCDMA layers or between the UTRAN and GSM
 - > Handovers can be load based or service based
- **Other transport solutions**
 - > To use more cost effective transport technologies
 - > For example Ethernet, DSL and hybrid solutions
- **Traffic engineering methods**
 - > QoS differentiation
 - > Capacity reservation for logical connections on the physical links
 - > Traffic rerouting, routing protocols' fast convergence, etc.
- **The problem is that the operators haven't done optimizing or dimensioning that much, only adding more capacity when needed**

Conclusions and future studies

- **It was quite a surprise that many operators have done no optimizing at all, and very little dimensioning**
- **However, it is pretty obvious that the operators has started to get interested on the optimizing and dimensioning process**
 - Hopefully we will see some good solutions in the near future
- **More development work is needed in:**
 - > Performance management tool integration processes
 - > How to use better the different technologies' OAM capabilities
 - > To investigate more dimensioning and optimizing solutions

Thank you

Questions?