Industry perspectives on implementation of ITU-T Recommendations, E.804, E.806 etc. – Case of PNI

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Presentation Outline

- **ITU-T Supporting References for Vendor-based QoS monitoring systems**
- **How RPM System guarantee QoS measurements reliability (using E.806)**
    a. QoS measurement principles in E.806
    b. Introducing RPM's Reliability Indicator
    c. Introducing RPM's Source Availability
- **Considerations for reliable QoS KPI Reporting in RPM (using E.804)**
    a. Examples of RPM Monitored KPIs
    b. KPI reporting per OMC Vendor
    c. KPI Reporting across OMC Vendor
- **Conclusion & Way Forward**

ITU Supporting References- E.804

ITU-T Recommendation E.804- This Standard has been adopted by PNI to provide guidance on the "**classification of QoS indicators**" for regulatory **compliance reporting** and enforcement

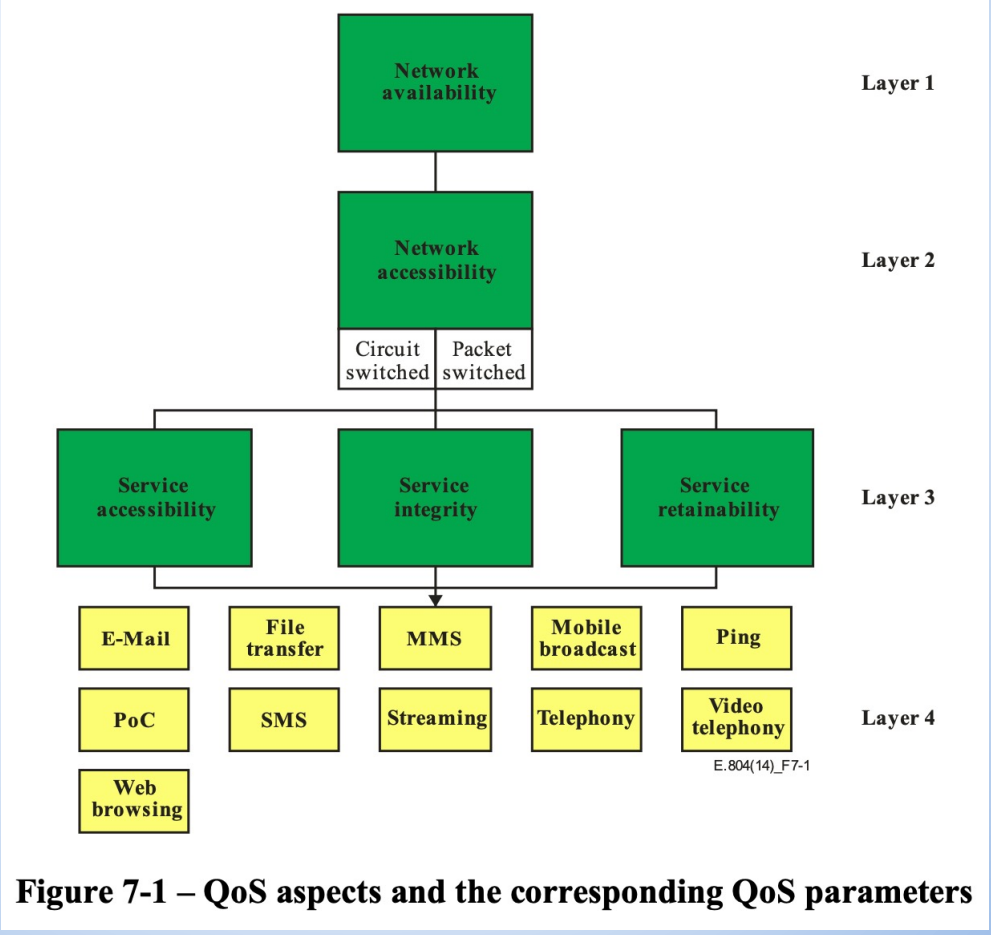


Figure 7-1 – QoS aspects and the corresponding QoS parameters

ITU Supporting References- E.806

ITU-T Recommendation E.806- This Standard has been adopted by PNI to guide its system-based QoS measurement approaches in the areas of **OMC data collection, integration, post-processing and KPI reporting**

Recommendation ITU-T E.806

Measurement campaigns, monitoring systems and sampling methodologies to monitor the quality of service in mobile networks

1 Scope

This Recommendation describes a baseline framework of best practices for measuring quality of service (QoS) throughout the industry, and covers mobile network QoS measurement campaigns, characteristics and requirements for monitoring systems, post-processing scenarios, as well as sampling methodologies used by regulators, test equipment vendors, companies that deliver network measurements, data analysts and service providers to monitor QoS on a national level.

Other ITU Supporting References- E.802

ITU-T Recommendation E.802- This standard guides NMS Vendors such as PNI on ITU recommended QoS assessment approaches such as **real traffic monitoring**, to start with.

Objective measurements are carried out in the case of network performance parameters and other QoS parameters where these can be quantified. Subjective measurements are carried out in the case of subjective aspects and also for quantifiable parameters to determine how the customers perceive the quality they think they receive.

NOTE – For a more detailed overview on measurements and further information, see also [ITU-T Hdbk QoS].

7.1 Objective measurements

Criteria like call set-up time, call failures and interruptions can quite easily be measured with appropriate probes in appropriate locations. Measurements can be made either on real traffic or on artificially generated traffic on public traffic or private networks.

Other ITU Supporting References- E.805.1

ITU-T Recommendation E.805.1- This standard enables NMS Vendors like PNI to assist NRAs to define appropriate KPI measurement formulas using **established standards** and **vendor supporting** documentations.

Regulators who seek to implement an operational strategy for network performance monitoring are in particular advised to consider the following actions to:

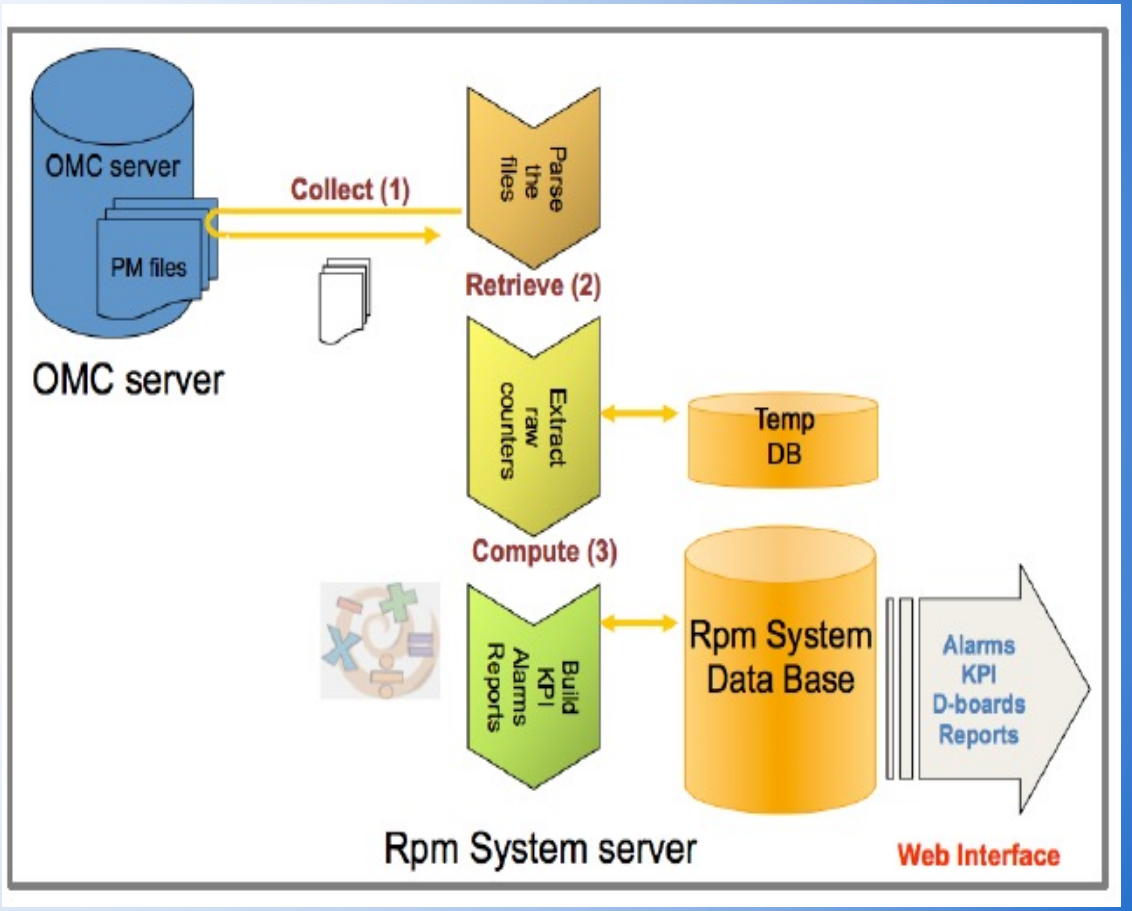
1) validate that the required provisions exist in the licence or regulations that grant the regulator right to request information about network performance counters;
2) validate that the required provisions exist in the licence or regulations that require(s) the SP to cooperate with the regulator on performance counter reporting;
3) align with SPs on the appropriate KPI measurement formula based on established standards and relevant vendor supporting documentation;
4) consider the staff size, capacity and budget available to perform measurements;

How RPM System guarantee QoS measurements reliability **using E.806**

QoS measurement principles in E.806

PNI's RPM systems have been designed to comply with E.806 as follows:

- Representative Sampling
- Data Integrity and completeness
- Simultaneous measurements across several radio access technologies (RAT)
- KPI visualization and reporting to end-users using GIS tools
- Automatic data storage and back-up



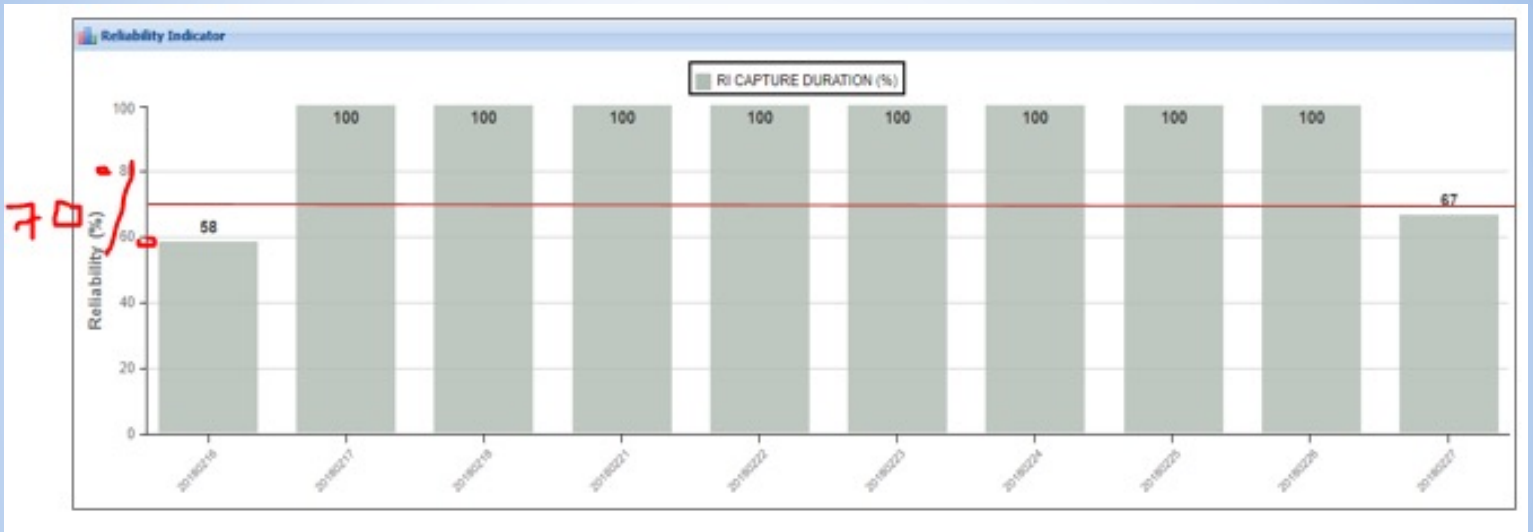
Introducing RPM's Reliability Indicator (RI)

- **Reliability Indicator (RI) function** is essentially used to assess the reliability of Operator's PM data in terms of the sampling scale required to guarantee KPI values that are representative of the "QoS delivered" by the network.

- The RI, as a mathematical function on data reliability, considers such metrics as the **"*number of operational cells*"** reporting their counters as well as the "***capture duration per day***" on reporting.

- The RI is expected to be **over 70% per day** for the obtained measurement result to truly reflect the performance of the entire network on that particular day

Introducing RPM's Reliability Indicator (RI)



Graph of Reliability Indicator (RI) for a sample 2G network

Introducing RPM's Source Availability (SA)

- **Source Availability (SA):** This metric in the RPM addresses issues about the availability of PM files at source (i.e. MNO FTP server)

- SA is also an assessment metric for the presence rate of all relevant **File IDs (Huawei) /Object Types (Ericsson)** required to compute all the QoS KPIs in the regulators' Licences.

- SA values below **seventy percent (70%) are most likely** to affect QoS KPI measurement.

Considerations for reliable QoS KPI Reporting in RPM **(using E.804)**

Examples of RPM Monitored KPIs & Related Metrics

KPI Category (ITU-T E.804)	QoS Indicator
Network Availability	Cell Availability (MTTR)
Service Accessibility	SDCCH Congestion
	TCH Congestion
	Call Setup Success Rate
	Data Access Success Rate
Service Retainability	Call Drop Rate
	Voice Call Drop Rate
	Data Drop Rate
Service Integrity	Data Speed (Downlink)
	Data Speed (Uplink)

KPI reporting per OMC Vendor

- PNI implements E.804's concept of "**selection of appropriate trigger points**" when measuring and reporting on a given KPI.

For example, TCH Congestion is measured using "TCH seizure failure counters" compared to "TCH seizure requests".

- KPI Reporting "over network elements" (i.e. cell, districts, province, national) or "measurement hours" is implemented using "**counter aggregation**".

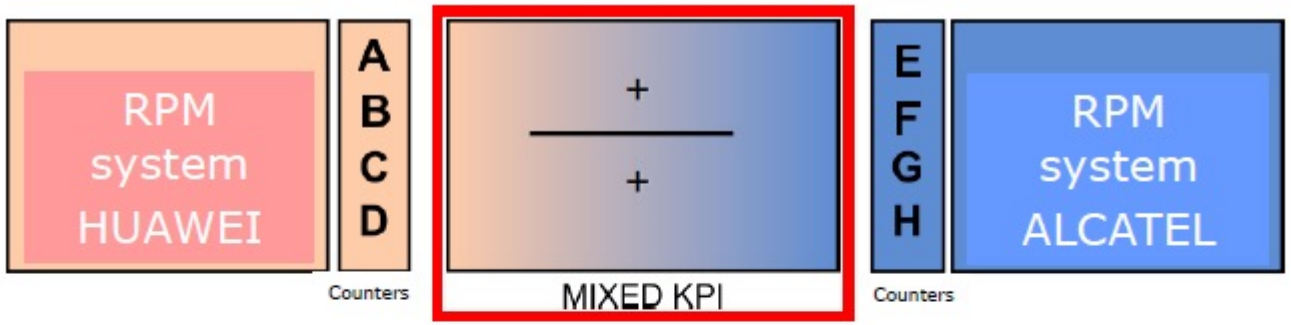
For example, given a "District, A" with cells, Cell A1, Cell A2 and Cell A3, the aggregated KPI value for "District A" for a given day is determined by dividing the sum of all numerator counter values of Cells A1, A2 and Cell A3 by the sum of the denominator counter values of those same cells.

KPI reporting across OMC Vendors

- The RPM systems uses the "**Mixed KPIs concept**" to create KPIs from counters coming from different RPM system applications (probe or different OMC vendors). The KPI result is only available at common aggregation level

- Mixed KPIs behave as standard KPIs and can thus benefit from **standard functionalities** such as
  - Dashboards
  - Report
  - Data Exports

Mixed KPI module in RPM



Mixed KPI Average number of available TCH	(coalesce(hua_bss_K3015+ alc_bss_MC250, hua_bss_K3015, alc_bss_MC250))

*Coalesce is use for counter NULL in our example where one of the two counters values will be affected even if one of then is NULL

Performance Benchmarking & Scoring in RPM (Ref: ITU-T E.840, E.804)

- RPM Atlas Portals have the ability to display GIS information which is invaluable for benchmarking Operators/SPs and represent network performance in map-view formats
- It can integrate DT, OMC-R, Opinion Polls and Complaints Mgt. information in single (1) map view- per Region/District/Province

E.g. REGION XXXX/ & PERIOD: MM/YYYY			
Service Provider_A		Service Provider_B	
KPIs	Value	KPIs	Value
Coverage:	-85dBm	Coverage:	-105dBm
Call Setup Success (%)	98%	Call Setup Success (%)	80%
Call Drop (%):	0.45%	Call Drop (%):	3.67%
Voice Quality (MOS)	3.7	Voice Quality (MOS)	1.8
#Complaints	25	#Complaints	155

Conclusion & Way Forward

- ITU-T Recommendations provide Vendors useful guidance to **develop and improve their QoS monitoring solutions** in accordance with best practices.

- PNI would continue to share its **use-case implementations on various QoS standards** as part of contributing to the standards development activities within the ITU.

- Beyond the framework of the ITU on QoS measurements, Vendors like PNI are also guided by **3GPP Technical Specifications (TS) in defining the KPI measurement** requirements.

THANK YOU