

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

E.861

(02/2006)

SERIES E: OVERALL NETWORK OPERATION, TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS

Quality of telecommunication services: concepts, models,
objectives and dependability planning – Use of quality of
service objectives for planning of telecommunication
networks

Defining operations competency metrics

ITU-T Recommendation E.861



International
Telecommunication
Union

Document Sharing Hub

ITU-T E-SERIES RECOMMENDATIONS

OVERALL NETWORK OPERATION, TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS

INTERNATIONAL OPERATION	
Definitions	E.100–E.103
General provisions concerning Administrations	E.104–E.119
General provisions concerning users	E.120–E.139
Operation of international telephone services	E.140–E.159
Numbering plan of the international telephone service	E.160–E.169
International routing plan	E.170–E.179
Tones in national signalling systems	E.180–E.189
Numbering plan of the international telephone service	E.190–E.199
Maritime mobile service and public land mobile service	E.200–E.229
OPERATIONAL PROVISIONS RELATING TO CHARGING AND ACCOUNTING IN THE INTERNATIONAL TELEPHONE SERVICE	
Charging in the international telephone service	E.230–E.249
Measuring and recording call durations for accounting purposes	E.260–E.269
UTILIZATION OF THE INTERNATIONAL TELEPHONE NETWORK FOR NON-TELEPHONY APPLICATIONS	
General	E.300–E.319
Phototelegraphy	E.320–E.329
ISDN PROVISIONS CONCERNING USERS	E.330–E.349
INTERNATIONAL ROUTING PLAN	E.350–E.399
NETWORK MANAGEMENT	
International service statistics	E.400–E.404
International network management	E.405–E.419
Checking the quality of the international telephone service	E.420–E.489
TRAFFIC ENGINEERING	
Measurement and recording of traffic	E.490–E.505
Forecasting of traffic	E.506–E.509
Determination of the number of circuits in manual operation	E.510–E.519
Determination of the number of circuits in automatic and semi-automatic operation	E.520–E.539
Grade of service	E.540–E.599
Definitions	E.600–E.649
Traffic engineering for IP-networks	E.650–E.699
ISDN traffic engineering	E.700–E.749
Mobile network traffic engineering	E.750–E.799
QUALITY OF TELECOMMUNICATION SERVICES: CONCEPTS, MODELS, OBJECTIVES AND DEPENDABILITY PLANNING	
Terms and definitions related to the quality of telecommunication services	E.800–E.809
Models for telecommunication services	E.810–E.844
Objectives for quality of service and related concepts of telecommunication services	E.845–E.859
Use of quality of service objectives for planning of telecommunication networks	E.860–E.879
Field data collection and evaluation on the performance of equipment, networks and services	E.880–E.899
OTHER	E.900–E.999

For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation E.861

Defining operations competency metrics

Summary

Improving network and service operations quality and efficiency to significantly reduce cost has become a business imperative for telecommunications service providers worldwide. However, one needs objective metrics by which to measure operations quality and efficiency and to facilitate comparison of them among service providers. This Recommendation describes a set of metrics called Total Operations Competency (TOC) metrics that are designed to cover a comprehensive view of network and services operations. Although each metric is useful on its own, metrics can also be combined to construct quantitative indicators for high-level business objectives. These indicators, in conjunction with cost functions for metrics improvements, can be used to formulate a rich set of optimization problems pertinent to operations.

Source

ITU-T Recommendation E.861 was approved on 13 February 2006 by ITU-T Study Group 2 (2005-2008) under the ITU-T Recommendation A.8 procedure.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

© ITU 2006

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

CONTENTS

Page

1	Scope	1
1.1	Overview	1
1.2	Metrics framework and business value	1
2	Terms and definitions	2
3	Abbreviations.....	3
4	TOC metric categories and structure	4
4.1	TOC metrics categories	4
4.2	TOC metrics structure	6
5	TOC metric structure and definitions	7
5.1	Process metrics	7
5.2	SLA/Service Quality metrics.....	31
5.3	Resources and staffing metrics.....	39
5.4	Productivity and unit cost metrics	46
5.5	IT/OS infrastructure metrics.....	49
5.6	Regulatory compliance metrics	52
5.7	Organization metrics	54
5.8	Technology specific metrics.....	55

ITU-T Recommendation E.861

Defining operations competency metrics

1 Scope

1.1 Overview

Ensuring and maintaining an optimal operations environment is critical to any service provider's (SP) business. Current industry conditions and complex business needs, however, pose formidable challenges in their ability to do so. Rapid changes and deployments of new technologies and services in recent years, along with budget and staff cutbacks, have strained the SP's permanent operations staff, resulting in:

- Poor operations planning for new technologies and services;
- OS infrastructures unable to keep up with new technologies and services;
- Less than optimal operations processes, which are unable to respond to customer's demands (e.g., long service-provisioning cycle time);
- Under-utilized network capacity or unnecessary capital expenses; and
- Escalating operations expenses.

To start addressing these challenges, service providers are seeking capabilities and/or resources to analyse, optimize and/or outsource their operations as well as searching for critical benchmarks or standards to plan and measure their operational improvements.

A plethora of metrics and benchmarks in multiple dimensions and categories already exists in the industry today. Service providers (SPs) regularly report their "performance" in different areas to different stakeholders using a variety of parameters and venues. For example, they share their business and financial performance data with the investment community, their compliance-related performance data with government/regulatory bodies and their network and service-related performance (e.g., SLAs) data with customers/users. In addition, they have numerous internal metrics they use to monitor and manage their own internal operations. However, when it comes to measuring, analysing and understanding the "performance" of any given "network operations"¹ work group or work centre, it is difficult to point to a standard set of metrics and benchmarks as representing the "best in class" measures. A set of such "Best in Class" metrics, along with target values and an understanding of the forces impacting the results, will enable a service provider to fine-tune their network operations and quickly quantify the impact of any changes in modes of operation, such as potential cost reductions or customer satisfaction.

1.2 Metrics framework and business value

A variety of operations metrics exists in the industry. Service providers routinely monitor, collect and analyse metrics associated with their internal operations functions, processes and work centres. These are generally custom-defined for specific internal use at corporate or group levels. Many of them are used to "roll up" into higher-level measurements related to customer SLAs, organization objectives, costs, customer satisfaction, etc. Currently, there is no specific set or sets of "operations metrics" that one can point to as an industry standard set.

A review of the different standards organizations and industry forums activities reveals that although there is a need and desire to establish a standardized set of "operations metrics", minimal

¹ In this Recommendation, the term "network operations" is intended to cover both the network and the service operations functions.

progress has been made. In key influential industry forums, there is some definition activity in progress but not at the operations function/task level.

A fundamental construct underlying the "operations metrics" is that they can be viewed as building blocks that can be used individually or in combination to measure or assess a broader functional area of an operations environment. For example, to determine the "efficiency" of a Network Operations Centre (NOC), one can measure "efficiency" of different processes and tasks performed in a NOC, assign different weights to them and calculate the "NOC efficiency". The individual process/task metrics would be the building blocks. Here the complexity lies in determining the critical processes and tasks that should be included in the calculation, the weighting to be applied and the measurements to be collected. There will be different measurement values for different technologies, product types, locations, etc. depending on the service provider's network type and types of services carried on them. As networks evolve with new technologies and services, the number and variety of metrics grow and as business priorities change with market conditions, different aspects of business operations and operations metrics become critical. It is clear that to identify a "meaningful" set of metrics they need to be associated with some meaningful set of "business drivers" or "business needs". Hence, we see some of the efforts in industry forums focused on identifying the "Key Business Objectives (KBOs)" followed by identifying supporting "Key Performance Objectives (KPOs)" (see ITU-T Rec. E.419).

Numerous private and public enterprises, worldwide, have adopted and continue to adopt a performance measurement framework called the "Balanced Score Card (BSC)"² system. This framework employs performance metrics from financial, customer, and business processes and technology perspectives and helps managers understand the interrelationships and trade-offs between alternative performance dimensions and business values or objectives. The three key performance dimensions that represent "**business value**" are: "**results** (financial and customer)", "**business operations**" (which include processes, innovation, learning, etc.) and "**organization capacity**"³. A key consideration in identifying and defining Total Operation Confidence/Competency (TOC) metrics is that of linkages to service provider "business values". The TOC metrics are a subset of what would be covered by a BSC framework and by definition focus only on "operations" and operations related to "results" and "capacity" dimensions of business values. The remaining aspects are covered by other related efforts.

2 Terms and definitions

This Recommendation defines the following terms:

2.1 metric: A standard of measurement.

2.2 operations metrics: A set of metrics/gauges that measure characteristics such as quality, competency, efficiency, productivity, etc. of a service provider's "network and service operations" functions. These characteristics are often referred to as "operations performance" throughout this Recommendation.

2.3 TOC metrics: "Total Operations Confidence/Competency" (TOC) metrics – A set of operations metrics identified and defined through technical expertise and operations insights. TOC Metrics are **not** measurements of the health or performance (e.g., network reliability) of a network or performance services supported (e.g., packet loss) on the networks.

² Balanced Score Card is a performance measurement framework by Kaplan & Norton, adopted by numerous private and public enterprises.

³ Developing & Using Balance Score Card – Perform, Volume 2, Issue 2, Howard Rohm.

2.4 metric value: An actual data point for a metric. Example: "Mean Time to Respond (MTTR) for a given Service Provider's FR service" or "percentage of automation of a given SP's wireless provisioning".

2.5 best-in-class value: The reference value for a particular metric, determined as the highest value in the available data (or lowest, depending on which direction is "best" for a particular metric). This value will vary depending on the subset of data being reviewed, for example, the best-in-class for MTTR for POTS will be different for NAR than APAC, and will be different for ATM than POTS.)

2.6 benchmark: A statistically or qualitatively determined reference value. The determination of benchmark values requires large sample sizes and mathematical determination of confidence levels. Since necessary sample size will not be available in this phase of the project, only metric values or best-in-class reference values, where available, will be included.

3 Abbreviations

This Recommendation uses the following abbreviations:

3G	Third Generation
3G1X	Third Generation-One Carrier
3rd Party	Third Party Vendor (normally relates to Lucent provided sub-contracted other technology vendor)
ASR	Automatic Send/Receive
ATM	Asynchronous Transfer Mode
BLAT	Bell Labs Advanced Technologies
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
CDR	Charging Data Record
CO	Central Office
CTT	Customer Trouble Ticket
DB	Data Base
EMS	Enterprise Management System
eTOM	enhanced Telecom Operations Map
EV_DO	1X – Evolution_Data Only
FCC	Federal Communications Commission
FM	Field Maintenance
FRU	Field Replaceable Unit
FTE	Full Time Equivalent
GNOC	Global Network Operations Centre
IP	Internet Protocol
LD	Low Delay
LEC	Local Exchange Carrier
LGX	Light Guide cross-connect

MS	Managed Services
MSA	Managed Services Architecture
MSC	Mobile Switching Centre
MTTA	Mean Time To Arrive
MTTR	Mean Time To Repair
NTT	Network Trouble Ticket
O&M	Operations and Management
OS	Operations Support
OSC	Operations Support Centre
OSP	OutSide Plant
OSS	Operations Support System
OSWF	On-Site Work Force
PCA	Physical Configuration Audit
PM	Product Management
POTS	Plain Old Telephone System
RF	Radio Frequency
SLA	Service Level Agreement
SME	System Management Engineer
SNMP	Simple Network Management Protocol
SP	Service Provider
TDMA	Time Division Multiple Access
TSS	Technical Support Services
VPN	Virtual Private Network
YPE	Years of Professional Experience

4 TOC metric categories and structure

4.1 TOC metrics categories

Of all possible metrics that could be addressed, 150 specific metrics were identified as being the ones most representative of the quality and competence of an operations infrastructure, organized into nine work categories or "types". Each metric is assigned a type based on what the metric intends to measure. Currently the following types are identified:

- Process metrics;
- SLA/service quality metrics;
- Resources and staffing metrics;
- Productivity and unit cost metrics;
- IT/OS infrastructure metrics;
- Regulatory compliance metrics;
- Organization metrics;

- General support metrics;
- Technology specific metrics.

In greater detail, these types are defined in the following way:

- **Process**

The quality and efficiency of service providers' network and services operations are highly dependent on their underlying processes. With ever-escalating operations expenditures, service providers are looking to increase levels of automation in their processes to reduce or contain cost, to shorten cycle time and work time. This set of metrics measures the operational robustness of the activities the SP performs, including provisioning, fault management, security management, performance management, account management, supply chain processes, inventory lifecycle management, and data centre operations.

- **SLA/service quality**

The metrics in this category measure the quality of the services performed by the service provider, and include such areas as MTTR statistics, call-out-intervals, trouble escalation statistics, trouble resolution statistics.

- **Resources & staffing**

This category measures the size and handling of the human resources in the operations organizations. Key metrics in this area include such items as: staffing ratios, skills and training, staff turnover.

- **Productivity & unit cost**

This category measures the efficiency factors of operations. Key metrics in this area include: costs and result statistics, access to centralized databases, access to work sites.

- **IT/OS infrastructure**

Information technology and operations support infrastructure is an integral part of service provider operations. This category measures the robustness of the supporting IT/OS infrastructure, including number of systems in the infrastructure, number of different vendor components, reliability and downtime statistics, remote and off-line availability of functions, levels of interface standardization, amount of GUI support.

- **Regulatory compliance**

The metrics in this category measure how heavily driven the operations are by compliance with outside agencies. Key metrics include: number of regulatory agencies overseeing this work, percentage of compliance with these requirements, percentage of automation of reporting and filing, average yearly cost of reporting and filing. As regulations tend to differ from nation to nation, and region to region, these metrics will be critical in pursuing business globally.

- **Organization**

The structure of an organization has significant impact on its efficiency. Key metrics include: chain of reporting, number of organizational interfaces and management layers, and complexity of hierarchical structure.

- **General support**

This category focuses on those support activities not specifically captured in one of the above, including dispatch activities, customer premises' activities, and physical plant support.

- **Technology specific**
This category focuses on those support activities associated with a single technology. Examples of this category include number of cell sites per repair technician, and miles of cable per head end distribution.

4.2 TOC metrics structure

At the individual metric level, each metric can be modelled as a data entity/object characterized by the following attributes, also shown in Figure 1:

- **Metric type**
As described above.
- **MetricID**
An intelligence-coded identifier for the metric.
- **Metric description**
A short textual description of the metric.
- **Metric definition**
The definition of what specific measurement the metric is for; what are the data by which the metric is assessed or calculated. Any variations associated with each applicable operations work group are included.
- **Metric formula**
The precise measurements to be collected/calculated.
- **Applicable operations workforce**
The operations areas where the metric is applicable – Field Operations/Maintenance, NOC, Transport Operation and Management, etc.
- **Metric technical domain**
The technology specific information governing this metric, e.g., wireless network component, core component, video communications, etc.
- **Benchmark/metric value**
Metric values by service provider, service/product type and country. The database will include other attributes to capture items such as source of data, calendar year of measurement (historical data), any comments, etc. Benchmarks will be established when sufficient samples are available.
- **e-TOM mapping**
Corresponding/applicable e-TOM category. This object can be repeated for any other necessary mapping, e.g., to an internal quality or business standard.

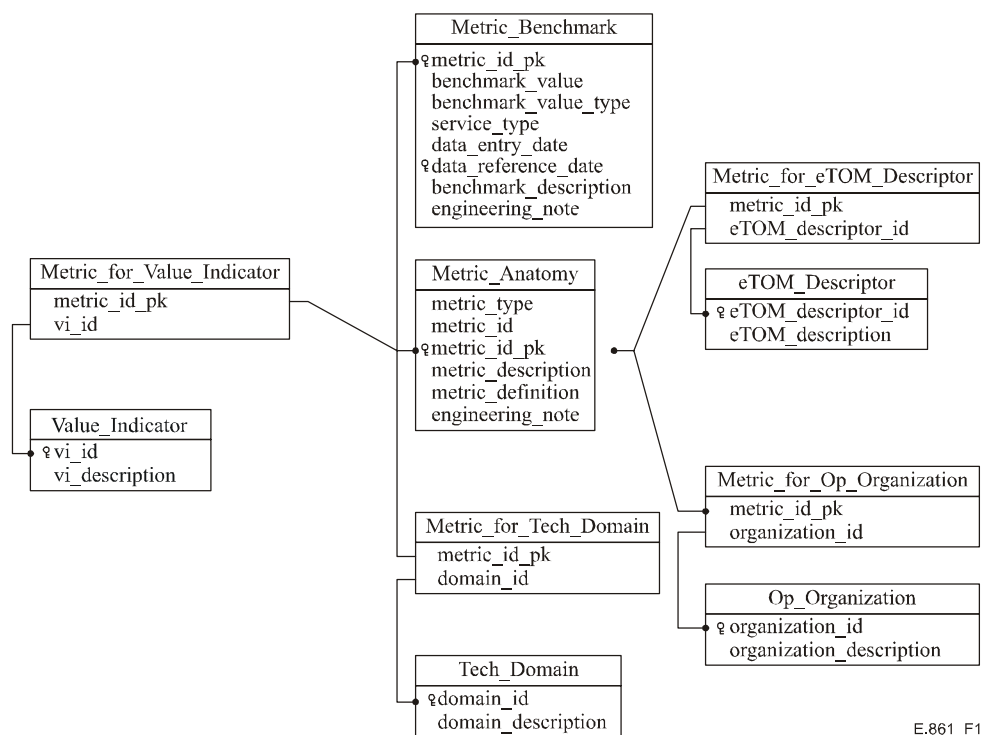


Figure 1/E.861 – Data anatomy of TOC metric

5 TOC metric structure and definitions

This clause gives detailed information about each metric in the nine work groups.

5.1 Process metrics

Metric Type:	Process
Metric ID:	TOC-PP1.1.1
Metric Description:	Degree of automation for network provisioning
Metric Definition:	General: Percentage of automation in network/resource provisioning. This metric includes the major steps of provisioning: – order entry; – design; – implementation; – test and turn up. Wireline FM: Applicable Wireless FM: Field maintenance covers only a subset – primarily test and turn up – of the provisioning process. Wireless NOC: Percentage of automation in network/resource provisioning. This metric includes the major steps of provisioning: – order entry; – design; – implementation; – test and turn up.
Metric Formula:	Metric = Percentage of total function points in the process performed non-manually across the above steps.

Metric Type:	Process
Metric ID:	TOC-PP1.1.2
Metric Description:	Degree of automation of service provisioning process
Metric Definition:	General: Percentage of automation in service provisioning: percentage of function points (tasks) which are not manually performed based on the following steps: – order entry; – design; – implementation; – test and turn up. Wireline FM: Field maintenance covers only a subset – primarily test and turn up – of the provisioning process, and only for certain services, e.g., private line. Wireless FM: N/A Wireless NOC: Applicable
Metric Formula:	Metric = Percentage of total function points in the process performed non-manually across the above steps.

Metric Type:	Process
Metric ID:	TOC-PP1.2.1
Metric Description:	Network provisioning cycle time
Metric Definition:	General: N/A Wireline FM: Field maintenance covers only a subset – primarily equipment acceptance testing – of the provisioning process. Does not include equipment installation. Wireless FM: Field maintenance covers the on-site workforce components of the provisioning process. This includes: – equipment installation; – pre-service acceptance testing. Wireless NOC: Cycle time of network/resource provisioning in time units: (hours/days). This metric is based on the following steps: – order validation; – design; – implementation; – test and turn up.
Metric Formula:	Metric = Average total elapsed time to complete an ESO type.

Metric Type:	Process
Metric ID:	TOC-PP1.2.2
Metric Description:	Service provisioning cycle time
Metric Definition:	General: N/A Wireline FM: Field maintenance covers only a subset – test and turn up – of the provisioning process. Does not include equipment installation. Wireless FM: N/A Wireless NOC: Cycle time of service provisioning, in time units: (hours/days). This metric is the total elapsed time based on the following steps: – order validation; – design; – implementation; – test and turn up.
Metric Formula:	Metric = Average total elapsed time to complete an ESO type.

Metric Type:	Process
Metric ID:	TOC-PP1.2.3
Metric Description:	Network provisioning work time
Metric Definition:	General: N/A Wireline FM: This metric measures the total amount of resources (e.g., Full Time Equivalent – minutes) required per service order for this set of tasks. This metric is the total resource per service order used based on the following step: – equipment installation testing. Wireless FM: This metric measures the total amount of resources (e.g., Full Time Equivalent – minutes) required per engineering service order for this set of tasks. This metric is the total resource per service order used based on the following steps: – installation; – equipment acceptance testing. Wireless NOC: This metric measures the total amount of resources (e.g., Full Time Equivalent – minutes) required per service order for this set of tasks. This metric is the total resource per service order used based on the following steps: – order validation; – design; – implementation; – test and turn up.
Metric Formula:	Metric = Sum (over all tasks) of FTE – minutes for that task for an ESO type.

Metric Type:	Process
Metric ID:	TOC-PP1.2.4
Metric Description:	Service provisioning work time
Metric Definition:	General: N/A Wireline FM: This metric measures the total amount of resources (e.g., Full Time Equivalent – minutes) required per service order for this set of tasks. This metric applies to certain services, e.g., private line. This metric is the total resource per service order used based on the following step: – pre-service acceptance testing. Wireless FM: N/A Wireless NOC: This metric measures the total amount of resources required for this set of tasks, measured in time units (hours/days). This metric is the total elapsed time based on the following steps: – order validation; – design; – implementation; – test and turn up.
Metric Formula:	Metric = Sum (over all tasks) of full time equivalent – minutes for that task for an ESO type.

Metric Type:	Process
Metric ID:	TOC-PP1.3.1
Metric Description:	Degree of standardization of provisioning process interfaces with suppliers
Metric Definition:	General: N/A Wireline FM: Nowadays, a typical end-to-end service involves many suppliers. For example, wireline test and turn up involves coordination of activities between the LEC and IXC. The standardization of the data set and the implementation of electronic exchange mechanism will greatly boost the process efficiency. This metric is calculated as follows: For each supplier interface, a maximum Score of 2 will be assigned: – 1 point if data set is standardized; – 1 point if electronic data exchange is implemented. The volume across each supplier interface is then weighted by the interface score. Wireless FM: Nowadays, a typical end-to-end service involves many suppliers. For example, installation of wireless equipment may involve coordination of activities between the backhaul provider and the service provider. The standardization of the data set and the implementation of an electronic exchange mechanism will greatly boost the process efficiency. This metric is calculated in the same way as Wireline FM. Wireless NOC: Nowadays, a typical end-to-end service involves many suppliers. For example, an LD service provider has to order access services from a local service provider, via ASR. The standardization of the data set and the implementation of electronic exchange mechanism will greatly boost the process efficiency. This metric is calculated in the same way as Wireline FM.
Metric Formula:	Metric = Sum (over all suppliers) of score × volume/sum (over all suppliers) volume.

Metric Type:	Process
Metric ID:	TOC-PP1.4.1
Metric Description:	Percentage of network provisioning orders requiring rework
Metric Definition:	General: N/A Wireline FM: N/A Wireless FM: N/A Wireless NOC: There are multiple reasons why a service order requires rework: 1) Order data in error; 2) Errors made by provisioning system or provisioning technician during the provisioning process; 3) Network inventory database out of sync with the network; 4) The subscriber change his/her mind before the service is in-effect, causing a supplement to the original order to be issued.
Metric Formula:	Metric = Percentage of service orders reworked per quarter, without differentiating the cause(s) of rework.

Metric Type:	Process
Metric ID:	TOC-PP1.4.2
Metric Description:	Percentage of service provisioning orders requiring rework
Metric Definition:	General: N/A Wireline FM: N/A Wireless FM: N/A Wireless NOC: There are multiple reasons why a service order requires rework: 1) Order data in error; 2) Errors made by provisioning system or provisioning technician during the provisioning process; 3) Network inventory database out of sync with the network; 4) The subscriber change his/her mind before the service is in-effect, causing a supplement to the original order to be issued.
Metric Formula:	Metric = Percentage of service orders reworked per quarter, without differentiating the cause(s) of rework.

Metric Type:	Process
Metric ID:	TOC-PP1.4.3
Metric Description:	Percentage of network provisioning orders supplemented
Metric Definition:	General: N/A Wireline FM: N/A Wireless FM: N/A Wireless NOC: An order can require rework because of supplemental change requested by network planning/design.
Metric Formula:	Metric = Percentage of service orders per quarter requiring rework because of supplement.

Metric Type:	Process
Metric ID:	TOC-PP1.4.4
Metric Description:	Percentage of service provisioning orders supplemented
Metric Definition:	General: N/A Wireline FM: N/A Wireless FM: N/A Wireless NOC: An order can require rework because of supplemental change requested by the customer.
Metric Formula:	Metric = Percentage of service orders per quarter requiring rework because of supplement.

Metric Type:	Process
Metric ID:	TOC-PP1.5.1
Metric Description:	Percentage of network provisioning orders completed on time
Metric Definition:	General: N/A Wireline FM: Field maintenance covers only a subset – primarily equipment acceptance testing – of the provisioning process. Does not include equipment installation. Wireless FM: Field maintenance covers the on-site workforce components of the provisioning process. This includes equipment installation and pre-service acceptance testing. Wireless NOC: Network orders are created with a due date, which is either met (completed on time) or missed.
Metric Formula:	Metric = Percentage of service orders completed on time per quarter.

Metric Type:	Process
Metric ID:	TOC-PP1.5.2
Metric Description:	Percentage of service provisioning orders completed on time
Metric Definition:	General: N/A Wireline FM: Field maintenance covers only a subset – primarily equipment acceptance testing – of the provisioning process. Does not include equipment installation. Wireless FM: N/A Wireless NOC: Service orders are created with a due date, which is either met (completed on time) or missed.
Metric Formula:	Metric = Percentage of service orders completed on time per quarter.

Metric Type:	Process
Metric ID:	TOC-PF2.1.1
Metric Description:	Percentage of automation of alarm forwarding to NOC
Metric Definition:	General: For a centralized work group, e.g., NOC, to have total surveillance of the network, faults/alarms that are detected by the network elements must be transmitted to the NOC instantly via a networked OS infrastructure. Wireline FM: N/A Wireless FM: N/A Wireless NOC: For a centralized work group, e.g., NOC, to have total surveillance of the network, faults/alarms that are detected by the network elements must be forwarded to the NOC instantly via a networked OS infrastructure.
Metric Formula:	Metric = Sum of scores over all instances of major equipment types divided by total instances of all major equipment in the network.

Metric Type:	Process
Metric ID:	TOC-PF2.1.2
Metric Description:	Degree of automation of fault management process
Metric Definition:	General: N/A Wireline FM: N/A Wireless FM: N/A Wireless NOC: Percentage of automation in the fault/alarm process. This metric includes the major steps of: – detection; – reporting/trouble administration; – trouble analysis and sectionalization, including alarm correlation; – dispatch and repair; – verify and test.
Metric Formula:	Metric = Percentage of total function points in the process performed non-manually across the above steps.

Metric Type:	Process
Metric ID:	TOC-PF2.1.3
Metric Description:	Percentage of faults resolved remotely by NOC (without dispatch)
Metric Definition:	General: NOTE 1 – Should the faults that are escalated to equipment vendors be excluded? NOTE 2 – There are two ways to calculate the value for this metric: 1) Each priority of fault has its metric, i.e., Priority 1: 60% Priority 2: 70% Priority 3: 80% Priority > 3: 90% 2) A priority-weighted metric, i.e., Priority 1: weight 5 Priority 2: weight 3 Priority 3: weight 2 Priority > 3: weight 1 Wireline FM: N/A Wireless FM: N/A Wireless NOC: Applicable
Metric Formula:	

Metric Type:	Process
Metric ID:	TOC-PF2.1.4
Metric Description:	Percentage of network faults detected by the service provider
Metric Definition:	General: N/A Wireline FM: N/A Wireless FM: N/A Wireless NOC: This metric measures the percentage of networks faults that are detected and reported first by the service provider itself, not by an outside agency, e.g., customer. The higher the percentage, the better the service provider's fault management. By raising the percentage, the tangible benefits are: 1) Not having to react to subscriber's report, more flexibility in repair schedule. 2) Reduced cost. The intangible benefit is improved, customer satisfaction.
Metric Formula:	