Quality Excellence for Suppliers of  
Telecommunications Forum   
(QuEST Forum)

TL 9000

Quality Management System

Measurements Handbook

Release 5.0

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Throughout this document the term ‘Measurements Handbook’ refers to *TL 9000 Quality Management System Measurements Handbook, Release 5.0*, namely this volume. The term ‘Requirements Handbook’ refers to the latest version of the *TL 9000 Quality Management System Requirements Handbook.* The term ‘ISO 9001’ refers to ISO 9001:2008[8].

Any errors identified after printing will be posted to the TL 9000 website. See the Measurements Handbook Errata link at tl9000.org/links.html

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Foreword

The TL 9000 Quality Management System Measurements Handbook is a cooperative effort of the global members of the Quality Excellence for Suppliers of Telecommunications (QuEST) Forum. This handbook complements the TL 9000 Quality Management System Requirements Handbook with measurements that reflect the performance of the industry and its products (hardware, software and services).

QuEST Forum is committed to meeting the changing needs of the global information and communication technologies (ICT) industry by reflecting new technology, new concepts, greater emphasis in the service provider segment and general improvement of the TL 9000 standard. Based on input from TL 9000 users, existing measurements and counting rules in Release 5.0 of the Measurements Handbook were refined and clarified. Release 5.0 of the Measurements Handbook also contains new measurements based on user needs and verified by benchmarking.

Founded in 1998, QuEST Forum is a unique collaboration of ICT service providers, suppliers and liaison organizations around the world. QuEST Forum’s vision is to be the global force for improving quality of products and services delivered to customers of information and communication technologies (ICT). In support of this vision, QuEST Forum’s mission is to drive the adoption of TL 9000 through global collaboration, evolving the Requirements, Measurements, and third party registration process while sharing Best Practices.

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Preface

To reflect the ever-evolving nature of our industry, QuEST Forum broadened our scope in 2012 from communications/telecommunications to information and communication technologies (ICT). With broader involvement across the industry and increasing global participation, QuEST Forum is dedicated to the continual enhancement and development of the TL 9000 measurements and the quality management standard itself. As the basis for measuring performance and continual improvement throughout the supply chain, the TL 9000 measurements are the cornerstone of QuEST Forum’s mission and the fundamental tool by which we can continue to raise the level of quality across the ICT industry.

Building on ISO 9001, TL 9000 provides a consistent set of quality expectations that parallel rapid technology changes and customer expectations, resulting in a unique and robust quality management system that drives continual improvement and business excellence. Studies have shown that companies employing the TL 9000 quality management system are able to improve efficiency and on-time delivery, implement process improvements and reduce defects.

QuEST Forum is responding to customer expectations by incorporating measurements resulting from the Network and Service Reliability Strategic Initiative while also keeping abreast of changes in technology through the Measurements for Next Generation Networks Strategic Initiative. The addition of these measures increases QuEST Forum’s relevance in the industry, which will lead to the broader adoption of TL 9000 and improved services to our customers.

If you are not already a member of QuEST Forum, please consider joining us as we strive to improve operational and supply chain quality and performance in the ICT industry.

Trevor Putrah

QuEST Forum, 2012 Chair

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Acknowledgements

The strength of QuEST Forum comes from the combined knowledge and expertise of its member companies. The diverse perspectives, unique knowledge and combined experiences of these organizations ensure that TL 9000 is dynamic, leading edge and therefore, relevant to our industry. By having all regions of the world work together to develop TL 9000, this handbook is truly global in scope and universally accepted. QuEST Forum is confident that TL 9000 will continue to drive industry-wide improvements and positively impact the quality of future information and communication technologies (ICT) products and services.

On behalf of QuEST Forum, I would like to formally acknowledge and commend the following individuals and companies for their diligent work and direct contribution to Release 5.0 of the TL 9000 Quality Management System Measurements Handbook.



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# Section 1 Introduction

The TL 9000 handbooks, *TL 9000 Quality Management System Requirements Handbook[5]* and *TL 9000 Quality Management System Measurements Handbook*, are designed specifically for the global information and communication technologies (ICT) industry to document quality management system requirements and measurements.

The Requirements Handbook establishes a common set of quality management system requirements for suppliers of telecommunications products: hardware, software, and services. The requirements are built on existing industry standards, including ISO 9001.

The Measurements Handbook defines a minimum set of performance measurements that were selected to measure progress and evaluate results of quality management system implementation.

Certification to TL 9000 includes a demonstrated conformance to the Requirements Handbook, Measurements Handbook, and clarifications communicated through QuEST Forum Information Alerts.

The goals of TL 9000 are to

1.1 Goals

– foster quality management systems that effectively and efficiently protect the integrity and use of telecommunications products: hardware, software, and services;

– establish and maintain a common set of quality management system requirements;

– reduce the number of telecommunications quality management system standards;

– define effective performance-based measurements to guide progress and evaluate results of quality management system implementation;

– drive continual improvement;

– enhance customer-organization relationships; and

– leverage industry conformity assessment processes.

The purpose of TL 9000 is to define the telecommunications quality management system requirements for the design, development, production, delivery, installation, and maintenance of products: hardware, software, and services. TL 9000 includes performance-based measurements that quantify reliability and quality performance of these products.

1.2 Purpose

Suppliers of telecommunications, their customers, and the end subscribers will all benefit from the implementation of TL 9000.

1.3 Benefits of Implementation

Expected benefits are

– continual improvement of service to subscribers,

– enhanced relationships between the organization and its customers,

– standardization of quality management system requirements,

– efficient management of external audits and site visits,

– uniform measurements,

– overall cost reduction and increased competitiveness,

– enhanced management and improved organization performance, and

– industry benchmarks for TL 9000 measurements.

The QuEST Forum maintains compatibility with other sets of requirements and standards. TL 9000 provides a telecommunications-specific set of requirements built on ISO 9001. See the Bibliography and Endnote References for the standards and requirements that were considered during the development of TL 9000.[1][2][3][4]

1.4 Relationship to ISO 9001 and Other Requirements

Characteristics of the TL 9000 relationship to other requirements are:

– TL 9000 includes ISO 9001. Future revisions of ISO 9001 will be incorporated into this standard.

– Conformance to TL 9000 constitutes conformance to corresponding ISO 9001 requirements.

– It is the intent of the QuEST Forum that conformance to TL 9000 will eliminate the need for conformance to other telecommunications quality management standards.

The QuEST Forum is responsible for the development, publication, distribution, and maintenance of the TL 9000 handbooks. Change requests for the handbooks, following their initial publication, are to be submitted to the TL 9000 Administrator. Any user of the handbooks may submit change requests. Change requests will be sent to the appropriate QuEST Forum work group and will be considered for the next revision. Use the Contact Us function on either the QuEST Forum website (questforum.org) or the TL 9000 website (tl9000.org) to submit a requested change.

1.5 Developing and Maintaining the Handbook(s)

Final approval of all changes to TL 9000 handbooks will be by vote of the QuEST Forum members in accordance with the QuEST Forum’s bylaws. Re-issue of the TL 9000 handbooks will be determined by the QuEST Forum, but will not exceed five years from the last issue date. When the QuEST Forum determines there are changes necessary in TL 9000 that could impact third-party registration, then the QuEST Forum will inform the industry of corrections and updates to the TL 9000 handbooks. One of these communication mechanisms is an Information Alert issued to all TL 9000 registered organizations. Information Alerts, corrections, and updates to Appendix A are available on the TL 9000 website (tl9000.org/links.html).

# Section 2 Structure

TL 9000 is structured in layers (see Figure 2.1‑1):

2.1 Overall Structure

– International Standard ISO 9001,

– Common TL 9000 Requirements,

– Hardware, Software, and Services Specific Quality Management System Requirements,

– Common TL 9000 Measurements, and

– Hardware, Software, and Services Specific Quality Management System Measurements.

**International Standard ISO 9001**

Hardware

Software

Services

Common TL 9000 Measurements

Hardware

Software

Services

Common TL 9000 Requirements

Measurements Handbook

Requirements Handbook

TL  9000

##### Figure 2.1‑1 The TL 9000 Model

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The word **“shall”** indicates mandatory requirements. The word **“should”** indicates a preferred approach. Organizations choosing other approaches must be able to show that their approach meets the intent of TL 9000. Where the words **“typical”** and **“examples”** are used, an appropriate alternative for the particular commodity or process should be chosen.

Paragraphs marked **“NOTE”** are for guidance and are not subject to audit.

Endnotes denoted by [x] refer to bibliographic source material that is not auditable (see Bibliography).

The International Standard, *ISO 9000:2005 – Quality management systems – Fundamentals and vocabulary*[6], contains standard definitions of terms used within this handbook. These definitions are considered part of the provisions throughout all sections of this handbook.Figure 2.3‑1 illustrates the data flow and usage of TL 9000 Quality Management System Measurements as described in this handbook.

2.2 Terminology



2.3 Data Flow and Usage of Measurements

##### Figure 2.3‑1 TL 9000 Measurement Data Flow and Usage

The use of measurements should be designed to meet the principles of measurements usage, which are stated in subsection 3.3.

Usage Approach – Figure 2.3‑1 depicts an environment where improvement opportunities are identified by an organization and its customer through information exchanges and from TL 9000 Performance Data Reports.

a) Measurements may be used between an organization and its customer to set mutual targets to improve products. This helps build customer and organization relationships and establishes targets that best meet their needs.

b) Some of the TL 9000 measurements may be used as improvement measures by individual organizations. These measurements receive careful review to ascertain that the measures are indeed comparable. Measurements are monitored by the TL 9000 Administrator to assure that aggregation across organizations into summary performance data reports is valid and meaningful. The summary performance data report definitions will be revised as needed. The definition of these measurements includes the designation “compared data.”

c) Some measurements may be treated as research data. Research data shall not be used for comparison purposes. However, the TL 9000 Administrator will analyze the data to reveal possible industry trends. These analyses are reported only to the appropriate QuEST Forum work group for study to determine future uses.

d) Industry performance is improved as each organization compares its results to the TL 9000 performance data reports and each organization improves its performance.

e) The QuEST Forum TL 9000 Measurements Repository System (MRS) database is not intended for use as a management tool to manage an organization supplying products, but as a data repository. Output from the database shall consist of statistical summary reports derived from each measurement by product category.

# Section 3 Measurements Processing, Usage and Responsibilities

To fully meet the requirements of this handbook and the companion *TL 9000 Quality Management System Requirements Handbook*[5], the measurements defined here shall be used by the organization

3.1 Requirements for Measurements Usage

– internally as a part of their continual improvement programs and management reports,

– as appropriate, in customer-organization exchanges and continual improvement programs, and

– to report to the TL 9000 Administrator, where indicated.

TL 9000 registration requires the fulfillment of the TL 9000 Quality Management System Requirements and the reporting of the TL 9000 Quality Management System Measurements data specific for that TL 9000 registration to the TL 9000 Administrator.

3.2 Principles of Measurements Processing

The following principles for processing the measurements are meant to foster an environment where customers and organizations can work together to drive continual improvement.

a) All applicable measurements for a certification’s registration options and product category(ies) as shown in the in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2 shall be reported by the organization to the TL 9000 Administrator.

b) Valid reasons for the exclusion of specific measurements from the scope of registration shall be documented by the organization, approved by the Certification Body (Registrar), and available to the customer on request.

c) Organizations shall provide TL 9000 measurement data to the TL 9000 Administrator who will compile the data and calculate performance data reports for each measurement, for each product category, as appropriate. These performance data reports shall include the number of data points for each calculation. The TL 9000 Administrator will provide detailed information on the calculations, such as smoothing and data eligibility rules, along with the performance data reports. Results and reports produced by the TL 9000 Administrator will not identify individual organizations.

d) Customers who are members of the QuEST Forum or are TL 9000 certified shall provide the field performance information necessary to calculate the specific TL 9000 measurements to the registering organizations.

e) A customer may request organizations that directly supply products to provide the TL 9000 measurements specific to that customer. This information exchange and format of the data occurs per mutual agreement between the organization and customer. The TL 9000 Administrator is not involved in any way.

f) There will be no ranking of organizations by the TL 9000 Administrator.

g) The processing of measurements shall not compromise the proprietary nature of the data.

### 3.3.1 Intended TL 9000 Measurement Usage

The intended usage of TL 9000 measurements is to

3.3 Principles of Measurements Usage

– provide industry performance information suitable for benchmarking,

– identify improvement opportunities,

– improve telecommunications processes and products, and

– standardize customer report cards or assessments.

### 3.3.2 Benefits of Using TL 9000 Measurement Data

– The effectiveness of the measurements process is fundamental to successful quality management and continual improvement of business processes.

– The TL 9000 measurement system provides a standardized set of performance results that are useful for a variety of purposes in addition to establishing industry benchmarks.

– A common application for the measurements is to enhance the relationship between an organization, its customers, and its suppliers.

### 3.4.1 Product Selection and Aggregation of Products

3.4 Measurements Data Aggregation and Customer Base

If an organization registers a business unit or a location, the organization has the option to determine which products will be included within the scope of the registration.

If the scope of an organization’s registration includes multiple products in the same product category and clearly identifies them as separate, the organization may submit the data for each product separately. Alternatively, they may aggregate the data for two or more products into one or more combined submissions for that same product category. Aggregation of data for submission is not allowed for products in different product categories.

### 3.4.2 Customer Base

Customer base refers to the defined group of customers that the organization's measurement data encompasses. The organization shall be responsible for ensuring the data reported for a given measurement contains only data from customers who are providing all needed information for that measurement, including where the organization itself captures the customer information, such as through the organization’s Technical Assistance Center, Customer Service Center, or monitoring systems. For example, the organization's Field Replaceable Unit Returns data should exclude any data from customers who utilize a third-party repair agency that is not supplying data to the organization.

The organization should include data for all of its customers, regardless of the format in which it is received, except where the data has been determined to be incomplete or inaccurate. Identification of the customer base in the data submission is not required to be provided to QuEST Forum. However, the organization shall retain knowledge of the specific customer base used in each data submission, detailing from where the subset of available data comes, for a minimum of two years after the initial submission.

If it is determined that the customer base must consistently exclude all customers for a required measurement, an exemption shall be documented and the TL 9000 registration profile shall be updated (see section 4.2.8).

### 3.5.1 TL 9000 Administrator Responsibilities

3.5 Responsibilities

The TL 9000 Administrator shall

a) provide Internet accessible systems for documenting all TL 9000 registrations that permit the public to determine

1) the steps for obtaining a TL 9000 registration,

2) the current status of any certified TL 9000 registration including dates of effectivity and other such data as directed by the QuEST Forum,

3) the contact information for all authorized Accreditation Bodies and accredited Certification Bodies,

4) statistics on the implementation and adoption of TL 9000 by region and worldwide,

5) updates to TL 9000 registration requirements and their effective dates such as the periodic updates to the Product Category Tables,

6) the current Executive Board, Workgroup Leadership, and organizations that are members of the QuEST Forum;

b) provide Internet accessible systems that allow organizations with TL 9000 certified registrations to

1) create, maintain and update their registration parameters including scope statements, product categories, locations, etc., assuring that all pre-certified TL 9000 registration information remains confidential and secure,

2) track their registration and measurements data submission history,

3) permit secure access for TL 9000 measurements data submissions,

4) permit secure access for TL 9000 measurements resubmissions of corrected data, for any erroneous data submitted within the previous 24 months, using the requirements of the current handbook and current effective product category tables or using requirements and product category tables in effect at the time the data was originally submitted;

c) provide Internet accessible systems that allow TL 9000 Accreditation Bodies and Certification Bodies to

1) approve and maintain their client’s registration information online,

2) review full details of a client’s registration information including data submission history;

d) provide Internet accessible systems that document the TL 9000 data submission process and permit the submission of TL 9000 data that results in

1) the delivery of a TL 9000 Data Submission Receipt (DSR) or error report to the submitter of each TL 9000 measurements submission within a timeframe defined by the QuEST Forum,

2) maintenance of the integrity and confidentiality of all TL 9000 measurements data after receipt such that no submitted data are ever provided by the TL 9000 Administrator to anyone, including the submitter,

3) the ability of a data submitter to correct previously submitted data for a period defined by the QuEST Forum;

e) provide systems and access mechanisms that

1) determine when there is sufficient data for each measurement in each product category to publish statistically valid performance data reports,

2) protect all data submissions such that no person can derive another company’s data based on published processed data and their own data,

NOTE: Industry performance data reports may be published if there are valid data submissions from three or more companies. The full set of rules for determining the performance data report measurements is available on the TL 9000 website (tl9000.org/links.html).

3) calculate the performance data reports for each measurement, as appropriate, by product category, using the appropriate data elements for each compared data measurement,   
NOTE: These performance data reports shall include, but are not limited to, the monthly average and the number of data points for each calculation.

4) provide detailed information on the calculations, such as smoothing and data eligibility rules, along with the performance data reports,

5) post compared data output for web access on a schedule determined by the QuEST Forum,

6) permit authorized users to view and retrieve Performance Data Reports derived from processed TL 9000 data submissions,

7) notify organizations with certified registrations and affected companies when updates to Product Category Tables, Appendix A, are released,

8) notify organizations with certified registrations when data are not submitted within specified time frames (see 3.5.2 e);

f) propose system improvements such as

1) the splitting or aggregation of product categories to produce more meaningful measurement outputs,

2) ease-of-use of the systems,

3) extension of the system to include affiliated activities such as benchmarking, etc.;

g) provide business continuity functions consistent with ISO/IEC 27001[7] that

1) maintains complete security of an organization’s registration information,

2) can be audited and verified by an external agent,

3) defines, implements, and maintains a disaster recovery plan.

### 3.5.2 Organization Responsibilities

The organization shall

a) utilize documented processes to capture and validate applicable measurement data such that source data records are available,

b) collect, validate, and submit data per the defined measurement definitions to the TL 9000 Administrator using the provided tool(s),

c) submit data on measurements that are within its scope of registration,

d) submit a minimum of three consecutive months of data to the TL 9000 Administrator and receive TL 9000 Data Submission Receipts acknowledging valid submissions to obtain TL 9000 registration,

e) submit monthly data every calendar month after becoming registered not later than seven weeks after the end of the month,

f) provide measurement data for new updates, releases, or versions of existing products under registration starting at General Availability of the new update, release, or version (see 4.2.6),

g) provide measurement data for new products that are within the organization's TL 9000 scope and fall within an existing reported product category any time after General Availability of the product but not later than six months after General Availability of the product (see 4.2.6),

h) submit a minimum of three consecutive months of measurement data for products that expand the organization's TL 9000 scope into new product categories, receiving TL 9000 Data Submission Receipts acknowledging valid submissions prior to scope expansion,  
NOTE: Scope changes can be made only in conjunction with assessment by the Certification Body.

i) compare internal measurements to the available industry performance data reports and take steps to improve products and processes as appropriate,

j) provide regular TL 9000 Quality Management System Measurements reports to its responsible management,

k) correct any data errors, and resubmit corrected data for any month with erroneous data submitted within the previous 24 months.   
Data is considered to be in error if one or more of the following conditions apply and the error results in a material difference.

1) The measurement did not meet the requirements in force at the time of the submission,

2) data acquisition or validation procedures in use at the time were not followed,

3) data acquisition scripts or tools contained errors, or

4) changes to the source data are identified after the most recent submission.

A material difference occurs when the recalculated TL 9000 monthly measurement deviates more than 1% from the previously calculated value. That is, the recalculated TL 9000 measurement value is greater than the submitted TL 9000 measurement value multiplied by 1.01 or the recalculated TL 9000 measurement value is less than the submitted TL 9000 measurement value multiplied by 0.99.

l) resubmit corrected data not later than the 2nd data submission after identifying the problem when it is determined that a data resubmission is required,

m) investigate any advisories received on submitted data, correct any data errors found, and resubmit data as appropriate,

n) provide its suppliers all necessary information it possesses to allow those organizations to generate their TL 9000 measurements, and

o) use the available standardized data templates located on the TL 9000 website (tl9000.org/links.html) when the organization has the responsibility to provide that data to its suppliers.

NOTE: For those organizations using automated data collection data systems, validation of the data collection system is not required on a monthly basis. However, if there is any manual input of data to or from the automated system, the organization is still required to verify the data values.

### 3.5.3 Customer Responsibilities

The customer shall

a) provide the necessary information to allow organizations to generate the TL 9000 measurements using the standardized templates located on the TL 9000 website (tl9000.org/links.html),

b) utilize defined processes to capture and validate applicable measurement data,

c) use the TL 9000 measurements definitions for standardizing the performance review process of the organization, for example, report cards, etc.,

d) establish joint improvement teams and objectives based on TL 9000 measurements and other required performance objectives, and

e) consider using TL 9000 measurements as an input when determining life cycle costs.

### 3.5.4 QuEST Forum Responsibilities

The QuEST Forum shall

a) publish and administer the Measurements Handbook,

b) ensure that the Measurements Handbook is publicly available,  
NOTE: Publication, distribution and maintenance of the handbook is performed under the direction of the QuEST Forum, which retains its copyright.

c) assure the availability of appropriate training in all regions to help users correctly and consistently interpret the TL 9000 requirements and report the TL 9000 measurements,

d) provide measurements process oversight,

e) address all issues and concerns relating to the measurement process and provide a summary and recommendations to the appropriate QuEST Forum work group,

f) assure TL 9000 data submission methods are made available to registering organizations,

g) proactively inform impacted parties such as QuEST Forum members, organizations with TL 9000 certified registrations, Certification Bodies, Accreditation Bodies, and sanctioned training providers about new information available on the TL 9000 (tl9000.org) and QuEST Forum (questforum.org) websites via appropriate means, and

h) review proposed aggregation of various TL 9000 release submissions.

### 3.5.5 Certification Body Responsibilities

During each audit the Certification Body auditor shall

a) assure all of the organization’s responsibilities are met,

b) fulfill all the auditor requirements defined in the document " Qualification and Experience Requirements for TL 9000 Certification Body Auditors" available on the TL 9000 website (tl9000.org/links.html),

c) verify all measurement process non-conformances are corrected within the auditor-specified timeframe, and

d) verify and update, if needed, the registration records on the TL 9000 website (tl9000.org).

### 3.6.1 Information and Resources

3.6 Information   
and resources

Organizations should leverage the experience and knowledge provided by QuEST Forum. The resources listed below provide guidance and examples to assist both beginners and advanced users in maximizing the potential of their TL 9000 Quality Management System and measurements reporting.

There are two elements to this support: Links, which deal with specific TL 9000 certification support; and the Supplemental Measurements Library, which provides examples and support material designed to maximize the potential of the organization’s Quality Management System and measurements submission.

### 3.6.2 Links

Links in [tl9000.org/links.html](http://tl9000.org/links.html) point to documents and resources referred to on the TL 9000 website, associated with the Requirements and Measurements Handbooks and other documents in a centralized resource.

Examples of Requirements Handbook resources:

* Errata
* ESD Protection
* ASRP for TL 9000 Certification
* Code of Practice for TL 9000 Certified Bodies
* Guidance for Communication with Customers
* List of recognized TL 9000 accreditation bodies
* List of TL 9000 accredited certification bodies
* Migration Path, Audit Days and Requirements Origin
* Qualification and Experience Requirements for TL Certification Bodies
* Set Up and Operation of a Design Process Management System
* TL 9000 Registration Guidance
* List of authorized TL 9000 Training Providers

Examples of Measurements Handbook references in addition to material above also include:

* Errata
* Alerts
* Appendix A – Product Category Tables
* Changes and Updates
* Customer Satisfaction Sample Survey
* Measurement Example Usage
* PDR Calculations
* QuEST Forum General Information
* Requirements for 3rd Party participants in the TL 9000 registration process
* Standardized Data Submission Templates
* TL 9000 Measurements Outputs and Calculation
* TL 9000 Registration Records

As the web page is intended to be a dynamic resource, this list is likely to change, so users should reference the link for the latest material.

### 3.6.3 Supplemental Measurements Library

The library at [tl9000.org/resources/sup\_measurements.html](http://tl9000.org/resources/sup_measurements.html) is managed by the IGQ Work Group of QuEST Forum. The information provided in the library is not published in the current Measurements Handbook.

The library contains measurement definitions that may be useful to Organizations, but are not currently mandated by TL 9000. The measurements may serve as examples that individual Organizations may use in their own particular circumstances, are currently being used in benchmarking studies, or potentially be considered for future versions of the Measurements Handbook.

The included measurement(s) generally originate from working committees participating in QuEST Forum. The material has been reviewed, edited and formatted to be consistent in approach.

The measurement(s) are downloadable. However, QuEST Forum takes no responsibility for revisions of that downloaded material.

# Section 4 General Measurements Requirements

Organizations registered to TL 9000 are responsible for correctly gathering and reporting TL 9000 measurement data as described in this section. Specific information about each of the reported measurements is found in Sections 5 through 9.

Common Measurements

Number of Problem Reports (NPR) Section 5.1

Problem Report Fix Response Time (FRT) Section 5.2

Overdue Problem Report Fix

Responsiveness (OFR) Section 5.3

On-Time Delivery (OTD) Section 5.4

Outage Measurements

Service Impact Outage (SO) Section 6.1

Network Element Impact Outage (SONE) Section 6.2

Support Service Caused Outage (SSO) Section 6.3

Mean Time to Restore Service (MTRS) Section 6.4

Global Service Impact (GSI) Section 6.5

Hardware Measurements

Field Replaceable Unit Returns (FR) Section 7.1

Basic Return Rate (BRR) Section 7.2

Software Measurements

Software Fix Quality (SFQ) Section 8.1

Software Problem Report (SPR) Section 8.2

Service Quality Measurements

Service Quality (SQ) Section 9.1

End-Customer Complaint Report Rate (CCRR) Section 9.2

### 4.1.1 Conformance to Measurements Profile

4.1 Measurements Reporting Requirements

The organization shall generate and submit the measurement data to the TL 9000 Administrator and also distribute data internally and to customers according to the principles of measurements processing detailed in Section 3. The measurement data shall conform to the requirements in the measurements profiles for the applicable product categories.

The organization shall complete changes to reported data that are needed to comply with a new version of Appendix A or a new version of the Measurements Handbook by the seventh monthly data submission after the release date of the handbook or Appendix A. See Table 4.1‑1 for the effective dates of this release of the Measurements Handbook.

When an organization upgrades its registration to a new release of the measurements handbook as part of its surveillance or re-certification audit, at least the most recent month’s data submission shall use the new release of the handbook.

Organizations are encouraged to use the new version of Appendix A or a new version of the Measurements Handbook for the data submission for the month following the availability of the handbook release or the month following the availability of the new data submission methods, whichever is later if both are released. Organizations must use the new version(s) for the submission of data for the seventh and all subsequent months following the availability of the new Measurements Handbook release or the availability of the new data submission methods, whichever is later if both are released, until replaced by another release. The new version of Appendix A or a new version of the Measurements Handbook may be used for submission of data for the month in which the version is released, by arrangement with the TL 9000 Administrator. The new version of the data submission methods may be used for submission of data for the months up to and including the month in which the new version is released and available, by arrangement with the TL 9000 Administrator.

#### Table 4.1‑1 Release 5.0 Usage Dates

|  |  |
| --- | --- |
| **Date of Data** | **R5.0 Usage** |
| January 2013 | Recommended |
| July 2013 | Mandatory |

### 4.1.2 Applicable Product Categories

For each product, the organization shall assign the product to one of the product categories according to the Product Category Definitions, Appendix A, Table A‑1, and applicable measurements according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2. Appendix A is current on the release of this handbook but is subject to periodic updates. Current and prior versions of the Product Category Table are located on the TL 9000 website (tl9000.org/links.html). The organization shall identify the version of the Product Category Table in their registrations and TL 9000 data submittals.

4.2 Measurements Data and Reports

### 4.2.1 Customer Source Data

If the customer data required for a measurement is not available, the organization shall not include that customer’s data in that measurements submission. Organizations shall submit data for a measurement if any of their customers provide the information or if they can collect the necessary data internally.

Organizations are not required to submit data for the applicable measurement to the TL 9000 administrator if none of their customers provides the necessary information, except in those cases where the organization can generate the required data internally from its own systems. In this case, ’EXEMPT’ is entered in the data submission and the organization documents and retains the justification that the organization received no data from any of its customers (see 4.2.8).

### 4.2.2 Report Frequency and Method

The organization shall collect data monthly and report the monthly data to the TL 9000 Administrator utilizing formats and software tools specified by the TL 9000 Administrator. All data for the calendar month shall be submitted not later than seven weeks after the end of the month.

NOTE: For the purpose of determining whether a data submission is on time or late the TL 9000 system clocks utilize UTC, Coordinated Universal Time, and not the local time of the submitter.

The organization is free to choose appropriate time periods or formats for reporting internally and to its customers.

### 4.2.3 Reporting Periods

The organization shall report measurement data based on calendar months or defined fiscal months. For each measurement, the organization shall use the same chosen method in the data submission for all months reported. If changing methods from one data submission to the next, the organization shall account for any resulting overlap or gap in the data. The same method, calendar or fiscal, does not have to be used for all measurements within a data submission.

The term ‘month’ throughout this handbook refers to the reporting period for the data, whether calendar or fiscal.

The organization shall use calendar days for the measurements that involve number of days.

### 4.2.4 Reporting of Compared Data and Research Data

The organization shall report data for all applicable measurements defined in this handbook to the TL 9000 Administrator according to the counting rules. This reporting requirement applies whether the measurement includes the designation “compared data” or “research data.” See the Measurements Summary Listing, Appendix A, Table A‑6.

NOTE: The designation “compared data” in the Appendix A, Table A‑6, means that industry performance data reports may be available from the TL 9000 Administrator. However, the designation “research data” indicates that no comparable industry performance data reports are available and the TL 9000 Administrator will report analyses of industry performance data reports only to the appropriate QuEST Forum work group(s).

### 4.2.5 Product Exclusions

The organization may exclude data for products that are no longer supported for its general customer base. Formal notification of placement of the product, including generic or specific software releases, on Additions and Maintenance (A&M) or Manufacturing Discontinued (MD) status or New Service Supply Discontinued Status and/or formal notification of cessation of support for the product (End of Life) shall have been made to the customers for this exclusion to apply. This exclusion does not apply to individual field replaceable units that have been made obsolete by a later version unless those units are completely recalled from the field.

### 4.2.6 Product Measurement

Unless otherwise stated, measurements shall apply to products only during General Availability and Retirement Phases of their life cycle. The terms General Availability and Retirement Phase are defined in the glossary. To assist in a common understanding of a product’s life cycle, see Figure 4.2.6-1.

##### 

##### Figure 4.2.6-1 Product Life Cycle and TL 9000 Data Submission

### 4.2.7 Calculation of Normalization Units

Where the normalization unit is traffic capacity based, such as DS1, OC‑1, DSL or Terminations, the calculation shall be based on the true usable traffic capacity. Equipment within the system used to provide protection for the main traffic path shall not be included, as it does not add usable capacity to the system. See Transmission Standard Designations and Conversions, Appendix A, Table A‑4 for conversion factors from various traffic capacities to the normalization units.

Where the normalization factor contains the word “shipped,” the quantity shipped in the 12 months ending with the month being reported shall be used.

### 4.2.8 Data Submission and Exemptions

Data shall be submitted according to the format provided by the TL 9000 Administrator. When resubmitting corrected data, organizations will have the option of resubmitting the data using the current tools, requirements of the current handbook, and current effective product category tables or using the tools, requirements, and product category tables in effect at the time the data was originally submitted. The following measurements and all their sub-measurements may not be exempted: NPR, FRT, OFR, OTD, SFQ, SPR, and SQ. The following rules apply to those special cases where, even though there is deployed product, there may be no data to report.

a) If there is simply no data to report, such as no faults identified, no defects reported, no outages, etc., then a value of zero is entered. This can apply to both the numerators and the denominators.

b) In certain special instances, an organization may claim exemption from providing data for a required measurement. In this case, the word “EXEMPT” is entered in place of the required data. The organization shall document a valid reason for this exemption for review and approval by its certification body and update its TL 9000 registration profile to show the exemption for that measurement. One example of a valid reason for exemption includes the scope for the organization’s certified registration excluding the business division that generated the data for a particular measurement.

c) When making multiple submissions to the same registration in the same product category, if one or more of the measurements are combined into one of the other submissions, then there will be no data to be reported for the measurement for the remaining submission(s). When submitting data for this case, the organization shall enter “Combined” in the data fields of its data submission for those measurements reported by the other submission.

### 4.2.9 Linked Registrations

There may be a circumstance where all of an organization’s required data are combined with and reported by another organization within the same company. If so, the former organization is not required to make a separate data submittal. The TL 9000 Data Submission Receipt for the organization actually submitting the data shall be made available to the certification body auditor to show that the registering organization’s data was submitted to the TL 9000 Administrator. This is only allowed when the linked registrations are within the same company. Use of linked registrations with organizations or suppliers outside of the same company is not allowed.

If certain measurements, but not all measurements, for a linked registration are combined with the same measurement from another registration in the same company and submitted by the latter registration then the former registration shall enter Proxy-xxxx in the data fields of the data submission for those measurements reported by the latter registration. xxxx is the TL ID number of the latter TL 9000 registration.

### 4.2.10 TL 9000 Performance Data Reports

The TL 9000 performance data reports utilize a number of smoothing and inclusion/exclusion rules for creating the Best in Class, Industry Average, and Worst in Class data. A detailed specification defining these rules, titled “TL 9000 Measurement Outputs and Calculations” is available on the TL 9000 website (tl9000.org/links.html). Organizations may utilize these same rules when creating their internal TL 9000 measurement performance reports and when comparing their performance against the TL 9000 performance data reports.

# Section 5 Common Measurements

Common measurements apply to all products: hardware, software, and services.

## 5.1 Number of Problem Reports (NPR)

### 5.1.1 General Description and Title

The Number of Problem Reports measures the total problem reports.

### 5.1.2 Purpose

This measurement is used to evaluate the number of customer-originated problem reports related to the product and its associated processes during its General Availability (GA) and Retirement Phases. Problem reports may have a negative impact on the organization (such as rework), on the customer (such as scheduling repeat site visits) and may jeopardize or affect the customer's business operations. Problem reports contribute to loss of end-user loyalty and customer satisfaction. This measurement is intended to stimulate continuous improvements resulting in a reduction of the number of problem reports, associated costs and potential revenue losses.

The measurement does not include all customer calls or reported incidents. Only problem reports meeting the definition in the Glossary are evaluated for inclusion in the measurement, subject to the defined counting and exclusion rules.

Purely prototype products, such as releases, which are not commercially available (pre-GA), are excluded from TL 9000 reporting. However, the customer and organization may agree to use and share problem report data to track early product quality during the pre-GA test phase.

### 5.1.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 5.1.4 Detailed Description

a) Terminology

The Glossary includes definitions for

– Afactor (Annualization Factor)

– General Availability Phase

– Incident

– Normalization Factor

– Official Fix

– Problem Report

– Problem Report – Critical

– Problem Report – Major

– Problem Report – Minor

– Restoration

– Resolution

– Retirement Phase

– Severity

– Temporary Fix

b) Counting Rules

The following rules shall apply in counting problem reports for the NPR measurement for all product categories.

1) Only customer-originated problem reports shall be counted.

2) Problem reports where the reported problem cannot be duplicated during subsequent investigations shall be counted.

3) Identical problem reports. Multiple reports of the same occurrence of the same problem at the same location at the same time shall be counted as one problem report.

4) Duplicate problem reports. Problem reports of the same problem that occurred either at a different customer location or at a different time shall each be counted as separate problem reports.

5) Multiple problems recorded on the same problem report, as in a problem report form or screen, shall be counted separately, unless in the customer's view, these problems are all related to the same manifestation of failure experienced by the customer.

6) Problem reports are counted in the month they are received and only in the month they are received.

7) All problem reports associated with a generally available product shall be counted. (see Figure 4.2.6-1)

Rules 8) through 11) shall apply for Product Categories 1, 2, 3, 4, 5, 6, and 9.

8) To obtain a comparable measure, the organization and customers shall map the severity of problem reports according to the definitions contained in the glossary for critical, major, and minor problem reports. When a problem clearly belongs in a given severity classification per the glossary definition, then that severity shall be used. If it is not clear which severity applies, the customer’s assignment of severity shall be used.

9) Problem reports shall be counted in the severity classification as outlined in 5.1.4 b) 8) at the time the data are calculated for reporting to the TL 9000 Administrator. When reporting to the customer, the severity classification in effect at the time the data are calculated for the customer report shall be used.

10) Temporary fixes such as temporary patches or workarounds are frequently used to restore service or operation following an incident due to a critical problem. The official fix to resolve the problem is often developed under a subsequent or “follow up” major or minor problem report that references the original critical problem report. A critical problem report of this type shall not be reclassified and shall be reported as a critical problem report. The subsequent major or minor problem report shall not be counted in NPR, but it is included in Problem Report Fix Response Time (FRT) and Overdue Problem Report Fix Responsiveness (OFR) measurements. In other words, the restoration of service or operation does not reduce the criticality of the problem report for the purpose of the NPR measurement.

11) The software release on the system at the time the problem occurred shall be recorded.

Rules 12) and 13) shall apply for Product Categories 7 and 8.

12) Problem reports received during or after product delivery shall be counted.

13) Problem reports for these products are not reported by severity.

c) Counting Rule Exclusions

1) The problem report count for the NPR measurement for all product categories shall exclude the following because they do not meet the definition of a TL 9000 problem report

a) a report determined to represent an information request (IR), which need not be documented by the customer to the organization;

b) a report determined to be a feature request by agreement between the organization and customer;

c) a report related to use of the product in a manner not defined in the specification of the product by agreement between the organization and customer;

d) customer reports of routine events or incidents where there is no customer expectation of investigation and corrective or preventive action by the organization, such as

– expected maintenance,

– return of field replaceable units, and associated documentation, such as Returned Material Authorization (RMA),

– software upgrades,

– technical assistance unrelated to a product or process defect, or

– individual billing errors.

NOTE: In certain situations a routine event may still result in the generation of a problem report (e.g., a customer requesting further investigation for an RMA due to excessive returns).

e) reports of outages received after their occurrence without the request from the customer for investigation, such as reports from the Standard Outage Template System (SOTS);

f) engineering complaints submitted by the customer that the customer requests be handled in accordance with GR-230-CORE [2];

2) The following problem reports shall be excluded

a) problem reports received from indirect customers unless forwarded by a direct customer;

b) a problem report attributable to a customer procedural error or one associated with providing support for resolving issues caused by customer provided third party product(s); or

c) a report for which there is a fix available at no cost and the customer has decided not to deploy the fix.

d) Calculations and Formulas

The applicable NPR measurements shall be calculated monthly as shown in Table 5.1‑2.

#### Table 5.1‑1 NPR Notation

|  |  |  |
| --- | --- | --- |
| Identifier | Product Categories | Definition |
| Afactor | All except 7 | Number of calculation periods in a year |
| NPRs | All | Normalization factor; the total Normalization Unit (NU) count at the end of the month from Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2 |
| Np1 | 1, 2, 3, 4, 5, 6, and 9 | Number of critical problem reports in the month |
| Np2 | 1, 2, 3, 4, 5, 6, and 9 | Number of major problem reports in the month |
| Np3 | 1, 2, 3, 4, 5, 6, and 9 | Number of minor problem reports in the month |
| Np4 | 7 and 8 | Number of problem reports in the month |

#### Table 5.1‑2 NPR Measurement Identifiers and Formulas

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Identifier | Product Categories | Title | | Formula |
| NPR1 | 1, 2, 3, 4, 5, 6, and 9 | Critical problem reports  per NU per year | Np1 x Afactor / NPRs | |
| NPR2 | 1, 2, 3, 4, 5, 6, and 9 | Major problem reports  per NU per year | Np2 x Afactor / NPRs | |
| NPR3 | 1, 2, 3, 4, 5, 6, and 9 | Minor problem reports  per NU per year | Np3 x Afactor / NPRs | |
| NPR4 | 7 | Problem reports per NU | Np4 / NPRs | |
| NPR4 | 8 | Problem reports  per NU per year | Np4 x Afactor / NPRs | |

NOTE: In Product Category 7, the problem report measurement is problem reports per transaction and, in this case, the data are not annualized.

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The NPR measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 5.1‑3, 5.1‑4, or 5.1‑5.

#### Table 5.1‑3 NPR Data Table for Product Categories 1, 2, 3, 4, 5, 6, and 9

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | NPR |
| NPRa | Afactor |
| NPRs | Normalization factor |
| Np1 | Number of critical problem reports |
| Np2 | Number of major problem reports |
| Np3 | Number of minor problem reports |

#### Table 5.1‑4 NPR Data Table for Product Category 7

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | NPR |
| NPRs | Normalization factor |
| Np4 | Number of problem reports |

#### Table 5.1‑5 NPR Data Table for Product Category 8

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | NPR |
| NPRa | Afactor |
| NPRs | Normalization factor |
| Np4 | Number of problem reports |

3) The organization shall have the capability to supply the NPR measurement and its sub-elements by release for all releases in service at the time of the report. These data are not reported to the TL 9000 Administrator.

### 5.1.5 Sources of Data

Data for the NPR measurement are derived from information provided by customers and from analysis by the organization.

a) Customers

1) report problems to the organization,

2) report normalizing information for hardware or software categories to the organization according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2, and

3) confer with the organization to establish severity of each problem report on products in Product Categories 1, 2, 3, 4, 5, 6, and 9.

b) Organizations

1) count the number of problem reports by product category according to the applicable counting rules,

2) calculate the normalization factor,

3) calculate the normalization information, in the event of insufficient customer supplied data, based on internal records for products within the scope of the applicable registration and according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2, and

4) confer with the customer to establish severity for each problem report on products in Product Categories 1, 2, 3, 4, 5, 6, and 9.

### 5.1.6 Examples

Examples for applying the NPR measurements are located on the TL 9000 website (tl9000.org/links.html).

## 5.2 Problem Report Fix Response Time (FRT)

### 5.2.1 General Description and Title

Problem Report Fix Response Time (FRT) measures the organization’s overall responsiveness to customer-originated problem reports.

### 5.2.2 Purpose

This measurement is used to quantify the responsiveness to customer-originated problem reports and to facilitate prompt fixes and closures of these problem reports. This measurement does not reflect responsiveness to service or operation restoration requests for reported incidents.

### 5.2.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 5.2.4 Detailed Description

a) Terminology

The Glossary includes definitions for

– Fix

– Fix Response Time

– Incident

– Official Fix

– Overdue Problem Report

– Problem Report

– Problem Report – Critical

– Problem Report – Major

– Problem Report – Minor

– Restoration

– Resolution

– Severity

– Software Problem Report

– Temporary Fix

b) Counting Rules

1) Only problem reports that are originated by a customer and meet the criteria for Number of Problem Reports shall be included. All counting rules noted in 5.1.4 b) shall apply to the FRT measurement.

2) The start of the interval for calculating FRT shall be the date, and time when required by a Service Level Agreement (SLA), the problem is reported to the organization. If the severity of a problem report is modified, the FRT interval shall still start at the receipt of the problem report.

3) The end of the interval for calculating FRT shall be the date, and time when required by an SLA, that the official fix or closure criteria is made available. Everything required to implement the fix must be made available before the problem report can be considered closed. If the problem report originator later rejects the fix as incomplete because it was ineffective or unusable or had to be removed due to undesirable effects caused by the installation of the fix, the problem report shall be re-classified as open. All intervening time shall be included, subject to counting rule 5.2.4 b) 7), in determining on-time problem closure as if the fix had not been delivered.

4) For FRT, problem reports are counted once, ONLY in the month they are due and not in the month they are resolved or closed.

5) FRT shall be reported in the severity classification at the time the problem report is due to be closed for those problem reports classified by severity (Product Categories 1, 2, 3, 4, 5, 6, and 9).

6) The customer has the final determination that a problem report has been closed. All resolutions must be acknowledged by the customer that the solution provided by the organization meets the customer’s requirements. This is particularly relevant to the resolution of duplicate problem reports (see 5.1.4 b) 4)) where the criteria may vary by individual customer.

7) Since this measurement is intended to quantify the organization’s fix response time, any excessive delays in the closure of a problem report caused by the customer, as mutually agreed with the customer, may be excluded from the overall closure time. The organization shall keep records of such delays with specific start and stop dates. Examples of this type of event include

– excessive delay in testing a proposed solution due to customer resource constraints,

– customer delay in supplying sufficient information for the organization to commence problem report resolution after the organization requests needed data, and

– not being able to get access to a customer facility to resolve a problem report.

8) If the deployment of the fix is delayed or does not occur specifically at the customer’s request and not because of problems within the organization, the interval is defined as ending when the official fix is first made available for delivery. The delay interval shall not be included in the FRT calculation.

9) If, with customer consent, the implementation of a fix is deferred, such as waiting for the next software update versus a patch, then the deferral interval shall not be included. This deferral may be to an agreed scheduled date when the fix is to be delivered or simply to a specific new product release that will contain the fix. In either case, the effect is to move the date the fix is due to the date the fix is delivered to the customer in accordance with any agreed commitment for delivery of the problem report resolution.

10) The delivery of temporary or interim fixes or workarounds in response to critical problem reports shall not be counted in this measurement. Subsequent or “follow-up” major or minor problem reports opened to track the development and delivery of the official fix shall be included. When the official fix activity is tracked against the original critical problem report, then those problem reports shall be treated as major problem reports.

11) With customer approval, the time between the application of a temporary or interim fix and the commitment date for an official fix may be excluded in the fix response time calculation. The customer must agree that the temporary fix meets their needs. Failure to provide an acceptable official fix by the negotiated commitment date will result in the restoration of all the excluded time.

12) Delays attributable to the inability to exercise a disaster recovery plan due to government restrictions and/or concern for safety of personnel are not counted.

c) Counting Rule Exclusions

1) All counting rule exclusions in 5.1.4 c) shall apply.

2) If a problem report misses its fix due date, and time when required by an SLA, it is not counted in FRT again – even if a new due date is negotiated.

d) Calculations and Formulas

1) The applicable FRT measurements are calculated monthly as shown in Table 5.2‑2. Problem reports closed on time are those closed by the due threshold time as defined below.

For products in Product Categories 1, 2, 3, 4, 5, and 6 the due threshold time is

– 30 calendar days for major problem reports and

* + 180 calendar days for minor problem reports.

The above threshold times shall be modified to reflect the SLA obligations if a formal service level agreement exists between the customer and the organization.

For products in Product Category 9 the due threshold time is

* + 2 working days for major problem reports and
  + 5 working days for minor problem reports.

The above threshold times shall be modified to reflect the SLA obligations if a formal service level agreement exists between the customer and the organization.

For products in Product Categories 7 and 8, the due threshold time is

– the interval between the open date, and time when required by an SLA, of the problem report and the target closure date, and time when required by an SLA, as agreed by the customer and the organization, or

– an interval predetermined by a contractual agreement or formal service level agreement.

2) In cases where there are no problem reports due to be closed during the month, the FRT value is 100%.

#### Table 5.2‑1 FRT Notation

|  |  |  |
| --- | --- | --- |
| Identifier | Product Categories | Definition |
| Fr2c | 1, 2, 3, 4, 5, 6, and 9 | Number of major problem reports closed on time | |
| Fr2d | 1, 2, 3, 4, 5, 6, and 9 | Number of major problem reports due to be closed | |
| Fr3c | 1, 2, 3, 4, 5, 6, and 9 | Number of minor problem reports closed on time | |
| Fr3d | 1, 2, 3, 4, 5, 6, and 9 | Number of minor problem reports due to be closed | |
| Fr4c | 7 and 8 | Number of problem reports closed on time | |
| Fr4d | 7 and 8 | Number of problem reports due to be closed | |

#### Table 5.2‑2 FRT Measurement Identifiers and Formulas

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Identifier | Product Categories | Title | Formula | Note |
| FRT2 | 1, 2, 3, 4, 5, 6, and 9 | Major problem report fix response time | 100 x (Fr2c / Fr2d) | % closed on time |
| FRT3 | 1, 2, 3, 4, 5, 6, and 9 | Minor problem report fix response time | 100 x (Fr3c / Fr3d) | % closed on time |
| FRT4 | 7 and 8 | Problem report fix response time | 100 x (Fr4c / Fr4d) | % closed  on time |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The FRT measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 5.2‑3 or Table 5.2‑4.

#### Table 5.2‑3 FRT Data Table for Product Categories 1, 2, 3, 4, 5, 6, and 9

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | FRT |
| Fr2c | Number of major problem reports closed on time |
| Fr2d | Number of major problem reports due to be closed |
| Fr3c | Number of minor problem reports closed on time |
| Fr3d | Number of minor problem reports due to be closed |

#### Table 5.2‑4 FRT Data Table for Product Categories 7 and 8

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | FRT | |
| Fr4c | Number of problem reports closed on time | |
| Fr4d | Number of problem reports due to be closed | |

3) The organization shall have the capability to provide

– the FRT by release for all releases in service at the time of calculation,

* + the number of problem reports due during the month by severity that were not closed on time and the average number of days to closure for problem reports closed during the month by severity.

These data are not reported to the TL 9000 Administrator.

4) An organization shall have the capability to provide the FRT for the delivery of temporary or interim fixes or workarounds to restore service or operation following an incident due to a critical problem. The objective for this is 24 hours, or contractual agreement/SLA, where this is in place. These data are not reported to the TL 9000 Administrator.

### 5.2.5 Sources of Data

Data for the FRT measurement are derived from information provided by customers and from analysis by the organization.

a) Customers

1) confer with the organization to establish a due threshold time for problem report closure on products in Product Categories 7 and 8, and

2) agree with problem report closure decisions.

b) Organizations

1) track problem reports, their severity (Product Categories 1, 2, 3, 4, 5, 6, and 9), the due threshold time (Product Categories 7 and 8), and actual closure dates,

2) count due, overdue and on-time closures to problem reports, and compute the measurements according to the stated rules, and

3) confer with the customer if changing severity classification for problem reports on products in Product Categories 1, 2, 3, 4, 5, 6, and 9.

### 5.2.6 Examples

Examples for applying the FRT measurement are located on the TL 9000 website (tl9000.org/links.html).

## 5.3 Overdue Problem Report Fix Responsiveness (OFR)

### 5.3.1 General Description and Title

Overdue Problem Report Fix Responsiveness (OFR) measures the responsiveness to customer-originated problem reports that are not fixed on time according to the counting rules for the Fix Response Time measurement.

### 5.3.2 Purpose

This measurement is used to quantify the responsiveness to overdue customer-originated problem reports.

### 5.3.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 5.3.4 Detailed Description

a) Terminology

The Glossary includes definitions for

– Closure Criteria

– Closure Date

– Closure Interval

– Fix

– Fix Response Time

– Official Fix

– Overdue Problem Report

– Problem Report

– Problem Report – Major

– Problem Report – Minor

– Severity

– Temporary Fix

b) Counting Rules

In addition to all the counting rules in 5.2.4 b), the following rules shall apply.

1) Overdue problem reports are those that are open beyond the due threshold time defined in 5.2.4 d) 1).

2) Open problem reports shall be counted as overdue in each month during which they are open and overdue including the month they are closed.

For example, if a problem report is open and overdue in June and did not close by the last day of June, then it shall count as overdue in June and overdue in July, even if it closed on the first day of July.

3) If the deferral date is missed for an Overdue Problem Report, the problem report must be counted as overdue in all previously excluded months and those month’s OFR data must be resubmitted.

c) Counting Rule Exclusions

1) The counting rule exclusions in 5.2.4 c) shall apply.

2) If, with customer consent, the implementation of a fix is deferred, such as waiting for the next software update versus a patch, then the deferral interval shall not be included in OFR. This deferral may be to an agreed scheduled date when the fix is to be delivered or simply to a specific new product release that will contain the fix. Therefore, a customer-approved deferral of an overdue problem removes it from subsequent months until the month that marks the end of the deferral interval and then all of the above counting rules again apply.

d) Calculations and Formulas

The applicable OFR measurements are calculated monthly as shown in Table 5.3‑2.

In cases where there are no overdue problem reports during the month, the OFR value is 100%.

#### Table 5.3‑1 OFR Notation

|  |  |  |  |
| --- | --- | --- | --- |
| Identifier | Product Categories | Definition | |
| Of2c | 1, 2, 3, 4, 5, 6, and 9 | Number of overdue major problem reports closed | |
| Of2d | 1, 2, 3, 4, 5, 6, and 9 | Number of overdue major problem reports | |
| Of3c | 1, 2, 3, 4, 5, 6, and 9 | Number of overdue minor problem reports closed | |
| Of3d | 1, 2, 3, 4, 5, 6, and 9 | Number of overdue minor problem reports | |
| Of4c | 7 and 8 | Number of overdue problem reports closed |
| Of4d | 7 and 8 | Number of overdue problem reports |

#### Table 5.3‑2 OFR Measurement Identifiers and Formulas

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Identifier | Product Categories | Title | Formula | Note |
| OFR2 | 1, 2, 3, 4, 5, 6, and 9 | Major overdue problem  report fix responsiveness | 100 x (Of2c/Of2d) | % closed |
| OFR3 | 1, 2, 3, 4, 5, 6, and 9 | Minor overdue problem  report fix responsiveness | 100 x (Of3c/Of3d) | % closed |
| OFR4 | 7 and 8 | Overdue problem  report fix responsiveness | 100 x (Of4c/Of4d) | % closed |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The OFR measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 5.3‑3 or 5.3‑4.

#### Table 5.3‑3 OFR Data Table for Product Categories 1, 2, 3, 4, 5, 6, and 9

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | OFR |
| Of2c | Number of overdue major problem reports closed |
| Of2d | Number of overdue major problem reports |
| Of3c | Number of overdue minor problem reports closed |
| Of3d | Number of overdue minor problem reports |

#### Table 5.3‑4 OFR Data Table for Product Categories 7 and 8

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | OFR |
| Of4c | | Number of overdue problem reports closed |
| Of4d | | Number of overdue problem reports |

3) For product categories 1, 2, 3, 4, 5, 6, and 9, in addition to OFR, the organization shall be capable of reporting

– average days open for overdue problem reports by severity, and

– average days open for overdue software related problem reports by severity.

These data are not reported to the TL 9000 Administrator.

### 5.3.5 Sources of Data

Data for the OFR measurement are derived from analysis by the organization. The data are from the same sources as listed in 5.2.5.

### 5.3.6 Examples

Examples for applying the OFR measurement are located on the TL 9000 website (tl9000.org/links.html).

## 5.4 On-Time Delivery (OTD)

### 5.4.1 General Description and Title

On-Time Delivery (OTD) measures timeliness of delivery of products to customers.

### 5.4.2 Purpose

This measurement is used to evaluate the organization’s on-time delivery performance to meet the customer’s need for timely product delivery and to meet end-customer expectations. Organizations should be able to measure their capability to deliver orders on the Customer Requested Date (CRD) in a timely and effective way.

Additionally, organizations should be able to deliver to their Supplier Promised Date (SPD). Ability to consistently meet the SPD allows the customer to effectively plan based on expected delivery dates.

The OTD measurement covers on-time delivery performance for any customer-initiated product order. This measurement is not intended to measure the organization’s performance in meeting its commitments for release of new designs.

### 5.4.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 5.4.4 Detailed Description

a) Terminology

The Glossary includes definitions for

– Service Order

b) Counting Rules

1) Acceptance shall be defined according to purchase order and/or contract terms and conditions unless notified otherwise by the customer.

2) Order types can be a line item or service.

3) Due dates and delivery dates are considered to be one 24-hour period, the customer’s calendar day, unless a different delivery window is agreed to by the customer.

4) Early order completions or deliveries are considered to have missed the delivery date unless agreed to by the customer.

5) A service order is considered delivered on the date when service is complete at the job site and accepted by the customer and is not the date the customer completes their acceptance testing, unless so specified by contract.

6) The Customer Requested Date (CRD) is the desired delivery date of items or services as defined by the customer’s purchase order and/or contract at order acceptance. The CRD is the initial requested date as in the contract or, in the case of customer requested changes, the revised date. Changes to the CRD may not be initiated by the organization.

7) The Supplier Promised Date (SPD) is the date the Organization promises to deliver the product. SPD is the initial promise date provided to the Customer by the organization unless the Customer initiates change to the SPD.

8) The Supplier Promised Date (SPD) shall be set at the time the order is acknowledged to the Customer.

9) The monthly OTD data shall include all orders having the CRD or SPD occurring during the month being reported.

10) For service orders, the CRD is the customer requested date for completion of the service. For line item orders, the CRD is the customer requested date of delivery on site and is not the date the customer completes their acceptance testing, unless so specified by contract.

11) Line item delivery occurs on the date when the shipment was actually delivered to the ship-to address. This date may be derived by adding the transportation interval to the actual ship date. Where customer authorized early shipment(s) apply, delivery intervals may be adjusted to accommodate for the early shipment(s).

12) The delivery of a line item order may occur at the organization’s facility if the customer provides or specifies the shipper to be used for the order.

13) Compound orders designated by the customer for a single delivery, for example “must ship complete” orders, shall be treated in aggregate. If one line item is late, then all line items shall be counted as late.

14) Bulk orders, such as blanket purchase orders, shall be considered complete if all items committed to be delivered in the order are delivered within the timeframe specified in the bulk order agreement, for example, weekly, monthly, etc. Each scheduled delivery date should be treated as a separate line item.

15) Installations containing multiple products with a single customer completion date shall be considered a single service delivery.

c) Counting Rule Exclusions

1) Orders for which the CRD is earlier than the date the order is received by the organization are excluded from the measurement.

2) Software deliveries that are not physically shipped or downloaded by the organization to a customer location are not counted. (This is considered the release of a new software design.)

3) Material that is part of a service delivery by the organization should not be counted in the line item delivery measurement.

d) Calculations and Formulas

1) On-Time Delivery (OTD) is the percentage of deliveries/items accepted on the Customer Requested Date (CRD) or on the Supplier Promised Date (SPD). The applicable OTD measurements are calculated monthly as shown in Table 5.4‑2.

2) OTD is comprised of three measurements of order fulfillment:

– Percentage of line items accepted on the CRD (OTI)

* + Percentage of service deliveries accepted on the CRD (OTS)
  + Percentage of line items accepted on the SPD (OTIP)

#### Table 5.4‑1 OTD Notation

|  |  |  |
| --- | --- | --- |
| Identifier | Product Categories\* | Definition |
| DIa | 1, 2, 3, 4, 5, 6, 7, and 8 | Number of line items accepted on the CRD during the month |
| DId | 1, 2, 3, 4, 5, 6, 7, and 8 | Number of line items for which the CRD occurred during the month |
| DVa | 7 and 9 | Number of service orders accepted on the CRD during the month |
| DVd | 7 and 9 | Number of service orders for which the CRD occurred during the month |
| DIPa | 1, 2, 3, 4, 5, 6, and 8 | Number of line items accepted on the SPD during the month |
| DIPd | 1, 2, 3, 4, 5, 6, and 8 | Number of line items for which the SPD occurred during the month |

\* Each product category in Product Category 7 family reports either Line Items or Services. Refer to data submission template for the specific product category to determine which identifiers are reported.

#### Table 5.4‑2 OTD Measurement Identifiers and Formulas

|  |  |  |  |
| --- | --- | --- | --- |
| Identifier | Title | Formula | Note |
| OTI | On-time item delivery | 100 x (DIa / DId) | % accepted on the CRD |
| OTS | On-time service delivery | 100 x (DVa / DVd) | % accepted on the CRD |
| OTIP | On-time item delivery to supplier promised date | 100 x (DIPa / DIPd) | % accepted on the SPD |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The OTD measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, as shown in Table 5.4‑3.

#### Table 5.4‑3 OTD Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | OTD |
| DIa | Number of line items accepted on the CRD during the month reported |
| DId | Number of line items with a CRD during the month reported |
| DVa | Number of service orders accepted on the CRD during the month reported |
| DVd | Number of service orders with a CRD during the month reported |
| DIPa | Number of line items accepted on the SPD during the month reported |
| DIPd | Number of line items for which the SPD occurred during the month reported |

### 5.4.5 Sources of Data

Data for the OTD measurement are derived from

1) organization’s order tracking system,

2) installation teams, or

3) customer data.

### 5.4.6 Examples

Examples for applying the OTD measurement are located on the TL 9000 website (tl9000.org/links.html).

# Section 6 Outage Measurements

## Outage Measurements

### 6.0.1 Purpose

The outage measurements provide insight into levels and causes of service unavailability, network element reliability, and network support serviceeffectiveness. The frequency and duration of outages have a direct impact on customer satisfaction, revenue loss, operational costs and capital expenditures. The outage measurements must not be confused with Incident Restore Time, as incidents do not necessarily cause service or network element outages. The outage measurements focus strictly on cases that result in unavailability of the provided service or functionality.

The outage measurement section is subdivided into five measurements:

– 6.1 – Service Impact Outage (SO) measurements that focus on understanding the impact of outages to end-user service. These measure loss of primary functionality to the end user.

– 6.2 – Network Element Impact Outage (SONE) measurements that focus on understanding product related outages independent of the impact on the end user. These measure loss of any functionality above defined minimum levels.

– 6.3 – Support Service Caused Outage (SSO) measurements that focus on the frequency of organization-attributable network support service caused outages.

– 6.4 – Mean Time To Restore Service (MTRS) – Measures duration of an outage at the network level

* + 6.5 – Global Service Impact (GSI) – Measures network service performance from the end-customer perspective

The SO and SONE measures include outages attributable to both the customer and the product. The intent of the inclusion of customer-attributable outages is to help identify areas where the causes of repetitive customer-attributable outages might be alleviated by enhancements to the product design.

NOTE: All of the Outage measurements are independent. The evaluation of an outage event for inclusion in the reporting of a given measurement is done separately for each measurement. The inclusion of an event in one outage measurement does not preclude it from being reported in another outage measurement.

### 6.0.2 Applicable Product Categories

These measurements apply to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

## 6.1 Service Impact Outage Measurement (SO)

### 6.1.1 Purpose

The Service Impact Outage measurements guide organizations and customers in assessing the impact of outages on end-user service. These measurements provide insight into the primary function availability of the product. The units of these measurements are

– Frequency – outages / normalization unit / year

– Downtime – minutes / normalization unit / year

### 6.1.2 Applicable Product Categories

These measurements apply to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

NOTE: Bolded text in the definition column of the Product Category Definitions, Appendix A, Table A‑1, indicates the primary function of the product category. This is the function to use for the Service Impact Outage measurements.

### 6.1.3 Detailed Description

The Service Impact Outage measurements section consists of four measurements:

– All Causes Outage Frequency

– All Causes Outage Downtime

– Product-Attributable Outage Frequency

– Product-Attributable Outage Downtime

### 6.1.4 General Rules

a) Terminology

The Glossary includes definitions for

– Customer-Attributable Outage

– Outage Downtime

– Outage Frequency

– Product-Attributable Outage

– Service-Impact Outage

b) Counting Rules

1) Outages for submission under All Causes include

– customer-attributable outages and

– product-attributable outages.

2) All outages shall be counted that result in a complete loss of primary functionality, as shown in the in Product Category Definitions, Appendix A, Table A‑1, for all or part of the system for a duration greater than 15 seconds during the operational window, whether the outage was unscheduled or scheduled.

3) An outage shall be classified as a customer-attributable outage if an outage prevention capability, for example, redundant infrastructure or stand-alone mode, exists that would have prevented the outage condition for the network element and the capability is a generally accepted industry practice, but the customer has chosen not to equip the product with the capability.

4) An outage shall be classified as a customer-attributable outage if it is caused by a problem for which there is a fix available at no cost and:

– the customer has decided not to deploy the fix or

– the outage occurs six months after the date the fix is generally available or other deployment period as mutually agreed to by the organization and customer.

5) An outage shall be classified as product attributable if no cause can be determined.

6) For new products, releases, and/or updates being deployed within the organization’s scope of registration, outages shall be counted starting with the first live deployment of the new product.

7) If there is disagreement, doubt, or if the outage is due to multiple causes, the determination of whether an outage is a customer-attributable outage or a product-attributable outage shall be made by the customer.

8) Since the downtime measurements are intended to quantify service availability related to a product, any excessive delays in the restoration of service caused by the customer, as mutually agreed with the customer, may be excluded from the product-attributable outage downtime and included in the customer-attributable outage downtime and, by definition, the all causes outage downtime. The organization shall keep records of such delays with specific start and stop times as determined by the organization or provided by the customer. Examples of this type of event include excessive delays

– in the customer contacting the organization, or delegate, to assist with service restoration after an outage, provided the outage was properly alarmed by the product,

– between the dispatch of the customer technician and the arrival of the technician at the location of the network element,

– (security related or other) in the customer allowing the organization, or delegate, to gain access to a customer’s facility, either physically or via electronic access,

– due to the customer not having agreed to stock spare hardware,

– due to the customer not having adequately trained personnel available,

– due to the customer not implementing generally accepted functionality, e.g., network management systems, to aid in the recovery of the network element, or

– due to the customer not contacting the organization in a timely manner to aid in the restoration of a non-alarmed outage.

NOTE: See “NSPRC Guidelines on the Distribution of Duration Time” for guidance in determining excessive time. The document is available on the TL 9000 website (tl9000.org /links.html).

9) For Product Categories 1 – 8 delays caused by the inability to gain access to the product due to reasons beyond the customer’s control, for example, delays caused by natural disaster or commercial power failure shall be included in the external-attributable outage category.

10) In cases where the normalization unit for the service impact measurement as prescribed in Measurement Applicability Table (Normalization Units) Appendix A, Table A‑2 is Network Element (NE), the number of units affected by the outage shall be determined by the percent of the NE affected by the outage. In cases where the normalization unit as prescribed in Measurement Applicability Table (Normalization Units) Appendix A, Table A‑2 is System, the number of units affected by the outage shall be determined by the percentage of the system or end-user population affected by the outage.

c) Counting Rule Exclusions

1) Outages are counted in a product only when the failure is within the product itself. Outages caused by other products or conditions in the network are excluded. For example,

– a failure within an OC192 ring is counted against the OC192 product that caused the outage and excludes all the attached multiplexers,

– loss of capability due to a failure of a facility is not counted against the network element,

– end office isolation due to a STP failure is counted against the STP,

– network element isolation due to a transport failure is counted against the transport product and not the isolated network element,

– network element failure during an installation job due to the network element is counted against the network element and not the installer (not applicable for the SSO measurement),

– a product failure due to third-party software, hardware or platform issue where the third party is not part of the organization’s product or bundle is not counted, or

– loss of commercial power provided the product handled the transfer to back-up power, if applicable, and recovered as designed is not counted.

2) If, as a matter of policy, a customer does not make outage data available to the organization, then the number of network elements, systems, or service units (lines, DS1, etc.) deployed by that customer shall be excluded from the outage measurements.

3) Outages that occur in labs or other trials that do not carry live traffic are not counted. The organization shall also exclude labs and trials that do not carry live traffic from the normalization units included in SOs (see Table 6.1‑2).

4) Systems that are not continuously operational (24x7) shall exclude outages that occur outside the contracted operational window.

5) Scheduled outages are counted unless a maintenance window is allocated to the system and the system is not required to be in service during that window.

6) For Product Categories 1 – 8 external-attributable outages as defined in the glossary are excluded from the all causes outage measurements since they are beyond the control of the organization or the customer.

7) An outage that occurs on a product that is protected by one or more of the same product type is not counted if there is no impact to end-user service. Examples where this may occur include

– core router redundancy,

– transport rings,

– STP mated pairs,

– SCP mated pairs,

– HLR mated pairs,

– dual homed media gateways, or

– BTS coverage overlap.

d) Calculations and Formulas

The SO measurements shall be calculated monthly as shown in Table 6.1‑3 using the formulas in Table 6.1‑2.

#### Table 6.1‑1 SO Notation

|  |  |
| --- | --- |
| Identifier | Definition |
| Afactor | Number of calculation periods in a year |
| N | Number of systems in service at the end of the month |
| k | Number of outages during the month |
| Pi | Duration of the ith outage in minutes (i = 1,…, k) |
| Ai | Number of units (lines, DS1s, percentage of NE or system, etc.) affected in outagei |
| Sn | Number of units (lines, DS1s, systems, NEs, etc.) in system n (Sn equals 1 when the normalization unit is NE or system.) |
| SOs | Normalization factor; the number of normalization units (lines, DS1s, etc) in service at the end of the month as shown in the in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2 |
| SOea | Calculated outage frequency in events for all causes |
| SOda | Calculated downtime in NU minutes for all causes |
| SOep | Calculated outage frequency in events for product-attributable causes |
| SOdp | Calculated downtime in NU minutes for all product-attributable causes |

#### Table 6.1‑2 SO Measurement Identifiers and Formulas – Input Measurements

|  |  |  |
| --- | --- | --- |
| **Identifier** | **Title** | **Formula** |
| SOea | Calculated outage frequency in events for all causes |  |
| SOda | Calculated downtime in NU minutes for all causes |  |
| SOep | Calculated outage frequency in events for product-attributable causes |  |
| SOdp | Calculated downtime in NU minutes for all product-attributable causes |  |
| SOs | Normalization factor |  |

#### Table 6.1‑3 SO Measurement Identifiers and Formulas – Output Measurements

|  |  |  |
| --- | --- | --- |
| Identifier | Title | Formula |
| SO1 | Service impact all causes outage frequency per NU per year | SOea  Afactor x  SOs |
| SO2 | Service impact all causes outage downtime per NU per year | SOda  Afactor x  SOs |
| SO3 | Service impact product-attributable outage frequency per NU per year | SOep  Afactor x  SOs |
| SO4 | Service impact product-attributable outage downtime per NU per year | SOdp  Afactor x  SOs |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The SO measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 6.1‑4.

In most product categories the SO measurement data reported are shown in Table 6.1‑4. In some product categories the SO measurement is applied to both host and remote components. In these cases, the host and remote data are calculated using the formulas in Table 6.1-2 but the data are reported using the mnemonics in Table 6.1‑4 prefixed by an “h” and “r”, respectively. Both host and remote data are reported in the same data submission.

#### Table 6.1‑4 SO Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | SO |
| SOa | Afactor |
| SOs | Normalization Factor |
| SOea | Calculated outage frequency for all causes |
| SOda | Calculated downtime in NU minutes for all causes |
| SOep | Calculated outage frequency for product-attributable causes |
| SOdp | Calculated downtime in NU minutes for product-attributable causes |

### 6.1.5 Sources of Data

Data for the SO measurement are derived from information provided by customers and/or from analysis by the organization.

Where the Organization is dependent on customers for outage data:

a) Customers

1) report, via agreed methods, all outage data and normalization unit population data, for example, installed base, necessary to calculate the applicable outage measurements.

b) Organizations

1) receive and record outage related data, and

2) receive and record number of normalization units.

If the customer does not supply outage data, then the organization is not responsible for reporting this measurement. When the customer supplied normalization information is insufficient, organizations may calculate the normalizing information based on internal shipment or billing records for products within the scope of the applicable registration and according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

Where the Organization has direct access to outage data:

c) Organizations

1) record outage-related data from their internal network monitoring system and/or receive data directly from customers.

The Organization may calculate the normalizing information based on internal records for products within the scope of the applicable registration and according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

The use of the Standard Outage Template System (SOTS) for collecting outage data is encouraged. Information on SOTS is available on the TL 9000 website (tl9000.org/links.html).

### 6.1.6 Examples

Examples for applying the SO measurement are located on the TL 9000 website (tl9000.org/links.html).

## 6.2 Network Element Impact Outage Measurements (SONE)

### 6.2.1 Purpose

The Network Element Impact Outage measurements guide organizations and customers to effectively manage the costs required to maintain and service the product. Due to product configuration, network resiliency and network element redundancy, not all outages reported in these measurements cause the loss of service to an end user. However, each outage results in a maintenance effort for the customer and thereby impacts operation and maintenance costs. The units of the SONE measurements are:

– Frequency – outages / normalization unit / year

– Downtime – minutes / normalization unit / year

### 6.2.2 Applicable Product Categories

These measurements apply to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 6.2.3 Detailed Description

The Network Element Impact Outage measurements section consists of four measurements:

– Customer-Attributable Outage Frequency

– Customer-Attributable Outage Downtime

– Product-Attributable Outage Frequency

– Product-Attributable Outage Downtime

### 6.2.4 General Rules

a) Terminology

The Glossary includes definitions for

– Customer-Attributable Outage

– Network Element Impact Outage

– Outage Downtime

– Outage Frequency

– Product-Attributable Outage

b) Counting Rules

1) Counting rules 3, 4, 5, 6, 7, 8, and 9 in Section 6.1.4 b) shall be applied.

2) Definitions of Total and Partial outages specific to each product category are found in Network Element Impact Outage Definitions, Appendix A, Table A‑3.

3) Unless specified differently in Network Element Impact Outage Definitions, Appendix A, Table A‑3, all outages shall be counted for a complete loss of primary functionality, unscheduled or scheduled, of all or part of a system for a duration greater than 15 seconds.

4) Partial outages are combined with total outages. The organization shall have the capability to separate out partial outages on request.

5) In cases of the loss of the primary function of the NE, the weighting of the duration of a partial outage shall be determined by the percent of the NE affected by the outage. In cases where the normalization unit for the network element impact measurement as prescribed in Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2 is ‘System’, the weighting of the duration shall be determined by the percentage of the system and/or the percentage of the end-user population affected by the outage.

6) An outage that occurs on a product that is protected by one or more of the same product type shall be counted – regardless of the impact to end-user service. Examples where this may occur include

– core router redundancy,

– transport rings,

– STP mated pairs,

– SCP mated pairs,

– dual homed media gateways, and

– BTS coverage overlap.

7) Outages are reported for each entity affected by the total or partial outage. Therefore, the number of network elements counted in the calculation shall be the number of network elements, not the number of protected entities (see examples listed in counting rule 6.2.4 b) 6)).

c) Counting Rule Exclusions

1) All counting rule exclusions from 6.1.4 c), except 7), shall be applied.

2) Loss of feature functionality that is not explicitly listed in the outage definitions in Network Element Impact Outage Definitions, Appendix A, Table A‑3 is not counted.

d) Calculations and Formulas

The Network Element Impact Outage measurement shall be calculated monthly, as appropriate, for both customer-attributable and product-attributable outages by inserting either the customer-attributable or product-attributable outage data into the formulas in Tables 6.2‑1, 6.2‑2, and 6.2‑3.

#### Table 6.2‑1 SONE Notation

|  |  |  |
| --- | --- | --- |
| Identifier | Definition | |
| Afactor | | Number of calculation periods in a year |
| *m* | | Current calculation month |
| T*m* | | Number of total outages in month *m* |
| td*m,i* | | The duration in minutes of total outage *i* in month *m* |
| TD*m* | | Sum of the durations of all total outages in month *m* |
| P*m* | | Number of partial outages in month *m* |
| pd*m,i* | | The duration in minutes of partial outage *i* in month *m* |
| f*m,i* | | The fraction of the network element affected by partial outage *i* in month *m*. The fraction shall be determined based on the percentage of the system and/or the percentage of the end-user population affected by the outage, or the use of architectural considerations when capacity information is not available. |
| PD*m* | | Sum of the weighted durations of all partial outages in month *m* |
| N*m* | | The number of network elements in service at the end of month *m* |

#### Table 6.2‑2 SONE Measurement Identifiers and Formulas – Input Measurements

|  |  |  |
| --- | --- | --- |
| Identifier | Title | Formula |
| TD*m* | Sum of the durations of all  total outages in month *m* | td*m,i*  ∑  T*m*  *i*=1 |
| PD*m* | Sum of the weighted durations of all partial outages in month *m* | pd*m,i*f*m,i*  ∑  *i*=1  P*m* |

#### Table 6.2‑3 SONE Measurement Identifiers and Formulas – Output Measurements

|  |  |  |
| --- | --- | --- |
| Identifier | Title | Formula |
| NEO1 | NE impact customer-attributable outage frequency in month *m* | Afactor x  T*m* *+* P*m*  N*m*  ⎧ ⎫  ⎩ ⎭ |
| NEO2 | NE impact customer-attributable outage downtime in month *m* | Afactor x  TD*m* *+* PD*m*  N*m*  ⎧ ⎫  ⎩ ⎭ |
| NEO3 | NE impact product-attributable outage frequency in month *m* | Afactor x  T*m* *+* P*m*  N*m*  ⎧ ⎫  ⎩ ⎭ |
| NEO4 | NE impact product-attributable outage downtime in month *m* | Afactor x  TD*m* *+* PD*m*  N*m*  ⎧ ⎫  ⎩ ⎭ |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The outage frequency and duration data are further classified as attributable to the customer or to the product. The same formulas are applied in each case.

3) The SO Network Element Impact Outage (SONE) measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 6.2‑4.

In most product categories the SONE measurement data reported are shown in Table 6.2‑4. In some product categories the SONE measurement is applied to both host and remote components. In these cases, the host and remote data are calculated using the formulas in Table 6.2‑3 but the data are reported using the mnemonics in Table 6.2‑4 prefixed by an “h” and “r”, respectively. Both host and remote data are reported in the same data submission.

#### Table 6.2‑4 SONE Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | SONE |
| NEOa | Afactor |
| NEOs | N*m* (Normalization Factor |
| NEOec | Outages for customer-attributable causes– T*m* + P*m* |
| NEOdc | Weighted outage duration in minutes for customer-attributable causes– TD*m* + PD*m* |
| NEOep | Outages for product-attributable causes– T*m* + P*m* |
| NEOdp | Weighted outage duration in minutes for product-attributable causes– TD*m* + PD*m* |

4) The organization shall have the capability to provide data on

– procedural error outages,

– scheduled outages,

– product-attributable total and partial outage measures by release  
(outages that occur during retrofit shall be attributed to the new release),

– external outages, and

– total and partial outages for all causes.

These data are not reported to the TL 9000 Administrator.

### 6.2.5 Sources of Data

Data for the SONE measurement are derived from information provided by customers and/or from analysis by the organization.

Where the organization is dependent on customers for outage data:

a) Customers

1) report, via agreed methods, all outage data and system population of their end users to the organization.

b) Organizations

1) receive and record outage related data, and

2) receive and record number of normalization units.

If the customer does not supply outage data, then the organization is not responsible for reporting this measurement. When the customer supplied normalization information is insufficient, organizations may calculate the normalizing information based on internal shipment or billing records for products within the scope of the applicable registration and according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

Where the Organization has direct access to outage data:

c) Organizations

1) record outage-related data from their internal network monitoring systems and/or receive data directly from customers.

The Organization may calculate the normalizing information based on internal records for products within the scope of the applicable registration and according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

The use of the Standard Outage Template System (SOTS) for collecting outage data is encouraged. Information on SOTS is available on the TL 9000 website (tl9000.org/links.html).

### 6.2.6 Examples

Examples for applying the SONE measurement are located on the TL 9000 website (tl9000.org/links.html).

## 6.3 Support Service Caused Outage Measurement (SSO)

### 6.3.1 Purpose

The SSO measurement provides insight into the impact of the organization’s support service activities on the performance of the network. It is used to evaluate the downtime frequency delivered to the end user during productoperation with a goal of reducing the frequency of these events, their associated cost, and their impact on customer satisfaction and revenue.

### 6.3.2 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 6.3.3 Detailed Description

The Support Service Caused Outage (SSO) measurement monitors the frequency of incidents resulting in network element outages caused by organization-attributable network support service related actions and/or decisions. The SSO measurement expresses the outages per normalization unit on a monthly basis as a percentage of normalization units.

### 6.3.4 General Rules

a) Terminology

Support-service-attributable outage – an outage primarily caused by

– the product design or content from the organization’s network design function,

– an organization’s procedural error during or because of installation activities, or

– an organization’s supported activities including documentation, training, engineering, ordering, installation, maintenance, technical assistance, software or hardware change actions, etc., as they relate to any network support service.

b) Counting Rules

1) Counting rules 2, 3, 4, 6, and 7 in Section 6.1.4 b) shall be applied.

2) Outage measurements shall be calculated in accordance with Table 6.3‑2 using product-attributable outage data only.

3) All outages attributable to any network support activity shall be included.

4) Outages are reported in the data for the month the event is started.

c) Counting Rule Exclusions

Counting rule exclusions 6.1.4 c) 3), 4), and 5) shall be applied.d) Calculations and Formulas

The applicable SSO measurements shall be calculated monthly as shown in Table 6.3‑2.

#### Table 6.3‑1 SSO Notation

|  |  |
| --- | --- |
| Identifier | Definition |
| m | Current calculation month |
| Nso | Number of support service caused outages in month m |
| Ns | Normalization factor for month m |

#### Table 6.3‑2 SSO Measurement Identifiers and Formulas

|  |  |  |
| --- | --- | --- |
| Identifier | Title | Formula |
| SSO | Support Service caused outage frequency percent | 100 x (Nso*/*Ns) |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The SSO measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 6.3‑3.

#### Table 6.3‑3 SSO Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | SSO |
| Nso | Number of support service caused outages |
| Ns | Normalization Factor |

### 6.3.5 Sources of Data

Data for the SSO measurement are derived from information provided by customers and/or from analysis by the organization.

Where the organization is dependent on customers for outage data:

a) Customers

1) report, via agreed methods, all outage data and system population of their end users to the organization.

b) Organizations

1) receive and record outage related data, and

2) receive and record number of systems.

If the customer does not supply outage data, then the organization is not responsible for reporting this measurement. When the customer supplied normalization information is insufficient, organizations may calculate the normalizing information based on internal shipment or billing records for products within the scope of the applicable registration and according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

Where the Organization has direct access to outage data:

c) Organizations

1) record outage-related data from their internal network monitoring systems and/or receive data directly from customers.

The Organization may calculate the normalizing information based on internal records for products within the scope of the applicable registration and according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 6.3.6 Examples

Examples for applying the SSO measurements are located on the TL 9000 website (tl9000.org/links.html).

## 6.4 Mean Time To Restore Service (MTRS)

### 6.4.1 Description and Title

Mean Time to Restore Service (MTRS) measures the average service disruption duration in the service provider’s production environment.

### 6.4.2 Purpose

MTRS measures the service provider's efficiency in restoring service following disruptions and the effectiveness of their escalation processes. MTRS is measured against the service provider’s own production infrastructure.

### 6.4.3 Applicable Product Categories

The measurement applies to product categories as shown in the in the Measurement Applicability Table (Normalization Units), Appendix A, Table A-2.

### 6.4.4 Detailed Description

1. Terminology

The Glossary includes the definition for

– Service Disruption – Critical

– Service Disruption – Non-Critical – An event that meets the ticketing criteria of an organization’s event management process and is resolved through established prioritization and resolution procedures that is not defined as a Service Disruption - Critical. Non-critical Service Disruptions are those events classified as major, minor and/or informational as defined by the organization’s ticketing criteria.

b) Counting Rules

1) Acts of Nature and/or External Causes are counted.

2) Total duration shall be measured in minutes rounded up to the next minute for each event.

3) Event start time is the time recorded by an alarm, customer notification, or any method (whichever comes first) available to track the beginning of a network element/service outage separated into the following scales of impact: Critical or Non-critical.

4) Service restoration time is the time recorded when impact to all customers ends (service to customers has been restored with simplex acceptable).

NOTE: This includes elimination of backlog of traffic (streams).

5) Event end time is the time recorded when the equipment has been restored to the intended operational state as defined prior to event start.

NOTE: Event end is not used in the MTRS measurement.

6) Events in leased circuits or facilities are included.

7) Changes that exceed planned downtime in the maintenance window that affect service shall be counted.

c) Counting Rule Exclusions

1) Non-production systems such as lab equipment are not counted as production infrastructure.

2) Events intentionally caused or restorations delayed by the customer are not counted.

3) Outages in another service provider’s network are excluded if service delivery to the end-customer is supplied by that service provider.

4) Outages within a scheduled maintenance window shall be excluded.

d) Calculations and Formulas

The MTRS measurements shall be calculated monthly as shown in Table 6.4-1 using the formulas in Table 6.4-2.

#### Table 6.4‑1 MTRS Notation

|  |  |
| --- | --- |
| Identifier | Definition |
| TMc | Total outage minutes for all critical events in the reporting period |
| TEc | Total number of critical events in the reporting period |
| TMnc | Total outage minutes for all non-critical events in the reporting period |
| TEnc | Total number of non-critical events in the reporting period |

#### Table 6.4‑2 MTRS Measurement Identifiers and Formulas

|  |  |  |
| --- | --- | --- |
| Identifier | Title | Formula |
| MTRSc | Mean Time to Restore Service – Critical | TMc/TEc |
| MTRSnc | Mean Time to Restore Service – Non-Critical | TMnc/TEnc |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The MTRS measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 6.4‑3.

#### Table 6.4‑3 MTRS Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | MTRS |
| TMc | Total outage minutes for all critical events in the reporting period |
| TEc | Total number of critical events in the reporting period |
| TMnc | Total outage minutes for all non-critical events in the reporting period |
| TEnc | Total number of non-critical events in the reporting period |

### 6.4.5 Sources of Data

a) Customers

1) shall report, via agreed methods, all outage data necessary to calculate the applicable outage measurements. A customer ticket (problem report) can be escalated or correlated to determine an outage situation exists.

b) Organizations

1) Receive and record outage related data in accordance with ticketing criteria and escalation guidelines.

### 6.4.6 Examples

Examples for applying the MTRS measurement are located on the TL 9000 website (tl9000.org/links.html).

## 6.5 Global Service Impact (GSI)

### 6.5.1 Description and Title

Global Service Impact (GSI) measures service performance from a customer perspective as delivered by the Service Provider.

### 6.5.2 Purpose

GSI provides a measurement focusing on the customer experience related to the performance of a service, e.g., voice, high-speed access, video, E911, wireless.

GSI takes into account the impact of an outage, measures this against the total customer count using a particular service, and normalizes the measurement using a base of 1 million minutes of service.

The measurement has both a network and customer view. GSI performance measures the unavailable minutes per million minutes of use, based on the outage criteria, i.e., Service Units (SU) affected by the outage (total number of customer accounts who lost service), total minutes of the outage (per the service being measured) and the overall inventory of the SUs in the company (total customer accounts per the service being measured). This results in the number of unavailable minutes per million service minutes experienced by the Service Unit (customers) pool.

### 6.5.3 Applicable Product Categories

The measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A-2.

### 6.5.4 Detailed Description

a) Terminology

– Service Unit: One count of one account of the service that is being measured, e.g., High Speed Internet Service.

NOTE: One residential or business high-speed account counts as one SU for high-speed, regardless of the number of users within the house or business. The number of SUs impacted is the number of SUs that were without high-speed service.

– Service Inventory: The total number of service units for which a service provider collects revenue.

b) Counting Rules

1) All outages that meet the glossary definition of Service Disruption – Critical and meet ticket criteria of the service provider’s event management process are counted. This includes service disruptions caused by:

– Equipment failures within the service provider’s infrastructure

– Other service provider’s equipment failures

– Equipment and service failures caused by third party suppliers

c) Counting Rule Exclusions

None

d) Calculations and Formulas

The GSI measurements shall be calculated monthly as shown in Table 6.5-1 using the formulas in Tables 6.5-2 and 6.5-3.

#### Table 6.5‑1 GSI Notation

|  |  |
| --- | --- |
| Identifier | Definition |
| SMo | Service Minutes of Outage |
| SMt | Total Service Minutes possible or Total Service Minutes of Availability |
| Pi | Duration of the ith outage in minutes (i=1,…, m) |
| Ai | Number of service units affected by Outage Pi |
| SI | Service Inventory as of the 1st day of the reporting period |

#### Table 6.5‑2 GSI Measurement Identifiers and Formulas – Input Measurements

|  |  |  |
| --- | --- | --- |
| Identifier | Title | Formula |
| SMo | Service Minutes of Outage |  |
| SMt | Service Minutes of Availability | SI\*(# of days \* 24 \* 60) |

#### Table 6.5‑3 GSI Measurement Identifiers and Formulas – Output Measurements

|  |  |  |
| --- | --- | --- |
| Identifier | Title | Formula |
| GSI | Global Service Impact | 1000000\*(SMo/SMt) |

1) Minutes of duration are the times between the outage start time and the time the service is restored to the SUs. For example, an outage starts at 1300 and service restored to the SUs at 1600, total duration is 3 hours or 180 minutes.

2) The service count at the first day of each month is used.  
NOTE: The SU inventory will be different each month due to new added accounts to the inventory and/or closed or lost accounts (churn) being deducted from the inventory.

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The GSI measurements shall be reported for each month and each service category with data elements, or equivalent as defined by the TL 9000 Administrator, as shown in Table 6.5‑4.

#### Table 6.5-4 GSI Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | GSI |
| SMo | Service Minutes Outage (Time) |
| SMt | Service Minutes of Availability |

### 6.5.5 Sources of Data

GSI data input shall be gathered from the service provider’s MTRS ticket data (Service Disruption – Critical only) in accordance with ticketing criteria and escalation guidelines, along with the standard reporting for SUs within an organization. The data should be available through standard network data and incident management processes.

### 6.5.6 Examples

Examples for applying the GSI measurement are located on the TL 9000 website (tl9000.org/links.html).

# Section 7 Hardware Measurements

## 7.0 Return Rates

### 7.0.1 Purpose

This section contains return rate measurements for two types of products:

1) products whose reliability is tracked throughout their life cycle

2) products where returns or requests for replacements can only be tracked during the initial usage of the product.

## 7.1 Field Replaceable Unit Returns (FR)

### 7.1.1 General Description and Title

FR is comprised of four return rate measurements that cover the full life cycle of a product. These are:

1) Early Return Index (ERI) – a measure of the returns of units during the first six months after initial shipment. This is not a true return rate; see note in 7.1.3 below.

2) One-Year Return Rate (YRR) – return rate of units shipped seven to eighteen months prior to the reporting month.

3) Long-Term Return Rate (LTR) – return rate of units shipped nineteen or more months prior to the reporting month.

4) Normalized One-Year Return Rate (NYR) – the normalized return rate of units during the One-Year Return Rate period.

### 7.1.2 Purpose

The measurement

– provides a quantification of the quality of the product as initially received by all customers including equipment manufacturers and/or end-customers, and during subsequent in-service operations,

– determines areas needing corrective action or most likely benefiting from continual improvement activity, and

– provides input data needed to calculate equipment life cycle costs.

### 7.1.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2. In general, these measurements apply to

– any system comprised of field replaceable units (FRUs),

– a system which is a FRU, or

– the individual FRUs.

The FR measurements apply to equipment whose reliability needs to be tracked throughout its entire life cycle. These measurements apply equally to any FRU shipped either in a system or separately. These measurements are not intended for items shipped in bulk such as

– cable and optical fiber, or

– mechanical hardware such as metallic connectors, optical connectors, conduit, mounting hardware, labels, etc.

NOTE: The Early Return Index is used as a surrogate for the installation reject rate, including Dead On Arrivals (DOAs), because the quantity of units shipped is known whereas the number of units actually installed is not readily determined. The Early Return Index measurement for items warehoused outside of the organization’s control for an extended period before placement in service may not accurately reflect the actual returns for product in service. This may also be true of items sold through distributors.

NOTE: Early in a product's life, when shipments are low, the ERI may be unstable month-to-month and higher due to any returns against small volumes. **This may also occur as the product matures and shipments begin to decline**.

NOTE: Long-Term Return Rates may become inaccurate for older products as units are taken out of service without the knowledge of the organization.

NOTE: The return rate for low cost items after the expiration of any warranty period is likely to be inaccurate if purchasing a new item is no more expensive than repairing the failed one.

### 7.1.4 Detailed Descriptions

a) Terminology

The Glossary includes definitions for

– Afactor (Annualization Factor)

– Basis Shipping Period

– Field Replaceable Unit

– Return

b) Counting Rules

The following rules shall apply when counting returns and shipments for the return rate measurements:

1) All returns except as noted in 7.1.4 c), Counting Rule Exclusions, are counted.

2) Only returns from the basis shipping period corresponding to the specific measurement shall be counted.

3) Customer returns are counted when received by the selling organization or third-party repair/logistics agency.

4) The organization shall document the method of determining which of the returns are from which of the corresponding original basis shipping period. This determination shall be based on the initial shipment to the field of the individual returned unit. This may be determined by

– serialized shipment records of the returned unit,

– shipment or warranty start date code marked on the unit,

– shipment date associated with a customer order, or

– manufactured date associated with a lot number.

NOTE: The last method requires the determination of an accounting for a standard time delay between the date of manufacture and shipment.

5) Units that fail due to a problem corrected by a recall before they can be rotated are counted as returns.

6) Units damaged during normal shipping or handling where the container is not damaged due to abnormal shipping conditions are counted as returns.

7) No trouble found units, that is, returned units determined by the organization to meet its specifications, are counted as returns.

8) The date of original shipment to the end customer shall be used for determining the basis shipping period.

9) Returns and shipments should only be reported once when submitting data to the TL 9000 Administrator. When a unit is used in more than one product and those products span multiple product categories, it may not be practical or possible to identify with which product, and therefore which product category, a return or shipment is associated. In such cases, the organization should, if possible, apportion the returns and shipments appropriately among all product categories in which the unit is used. If accurate apportioning is not possible, the organization may apply all the data for that unit to the most appropriate product category.

10) If a returned product contains multiple FRUs, each individual FRU shall be counted separately.

c) Counting Rule Exclusions

Exclude from the return and shipment counts:

1) working or untested units returned as part of a formal rotation or recall program,

2) units damaged during shipping or while in service due to vehicular accidents, water leakage, electrical spikes outside of specified limits, misuse by the end user, or other environmental factors outside those conditions for which the equipment was designed,

3) items that were ordered in error, ordered in excess, consignment items, or canceled orders,

4) returns from laboratory systems or First Office Application (FOA) systems,

5) units returned voluntarily by the customer to install modifications to obtain optional features or functionality or to reconfigure the unit for another use, such as a change in operating frequency,

6) units that have been permanently removed from service by the customer, and

7) shipments to customers for products where

– defective units are not returned for repair by the customer or

– units are repaired by a third party or the customer and the return data is not made available after solicitation by the organization.

d) Calculations and Formulas

1) The FR measurements are annualized and shall be calculated monthly as shown in Table 7.1‑2.

2) Normalized One-Year Return Rate (NYR) – The NYR is normalized with units given in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

– A general formula for a normalized return rate is

Normalized return rate =   
Returns x Afactor / Normalization Factor

– The normalization of the One-Year Return Rate allows this return measurement to be compared between like products with different architecture.

* The basis shipping period covered by the NYR measurement is exactly the same as the YRR measurement, which is from 7 through 18 months prior to the month being reported.

– A problem reporting the normalization factor can occur with mature products. This problem occurs when the number of new normalization units being shipped drops off, but the number of field replaceable units being shipped to fill out existing systems stays high. A method which may be used to estimate FRs when this problem occurs is included in the example calculations.

– For those product categories where the Normalized One Year Return Rate normalization factor (FRs) is Unit, the value submitted for the total number of normalization units in the one-year basis shipping period (FRs) and the number of FRUs (units) shipped during the one-year basis shipping period (FRsy) should be equal.

3) The formulas for ERI, YRR and LTR are not normalized but are expressed in percentage returns per year.

4) Early Return Index (ERI) – The ERI in month n measures the rate of return of product during months n-6 through n-1. In addition to returns from months n-6 through n-1, returns from units shipped during the current month (n) are also included. This basis shipping period is assumed to represent the rate of return of the product during installation, turn-up, and testing. Any shipments in the month are deliberately excluded as only a few units are actually put into use during the month they are shipped.

5) One-Year Return Rate (YRR) – The YRR measures the rate of return of product shipped seven to eighteen months prior to the reporting month. It is based on the number of returns during the month from the population of units shipped seven to eighteen months prior to the month. This basis shipping period is assumed to represent the operation during the early life period.

6) Long-Term Return Rate (LTR) – The LTR measures the rate of return of product shipped nineteen or more months prior to the reporting month. It is based on the number of returns during the month from the population of units shipped more than eighteen months prior to the month. This rate represents the mature return rate of the product.

#### Table 7.1‑1 FR Notation

|  |  |
| --- | --- |
| Identifier | Definition |
| NU | Normalization Unit (NU) from the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2 |
| Afactor | Number of calculation periods in a year |
| FRs | Normalization factor – the total number of NUs shipped in the one-year basis shipping period |
| FRri | Number of returns from the ERI basis shipping period |
| FRry | Number of returns from the YRR basis shipping period |
| FRrt | Number of returns from the LTR basis shipping period |
| FRsi | Number of FRUs shipped during the ERI basis shipping period |
| FRsy | Number of FRUs shipped during the YRR basis shipping period |
| FRst | Number of FRUs shipped during the LTR basis shipping period |

#### Table 7.1‑2 FR Measurement Identifiers and Formulas

|  |  |  |  |
| --- | --- | --- | --- |
| Identifier | Title | Formula | Note |
| ERI | Early return index | 100 x Afactor x (FRri / FRsi) | % per year |
| YRR | One-year  return rate | 100 x Afactor x (FRry / FRsy) | % per year |
| LTR | Long-term  return rate | 100 x Afactor x (FRrt / FRst) | % per year |
| NYR | Normalized one-year return rate | Afactor x (FRry / FRs) | Returns per NU |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The FR measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 7.1‑3.

#### Table 7.1‑3 FR Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | FR |
| FRa | Afactor |
| FRs | Normalization Factor |
| FRri | Number of returns from the ERI basis shipping period |
| FRry | Number of returns from the YRR basis shipping period |
| FRrt | Number of returns from the LTR basis shipping period |
| FRsi | Number of FRUs shipped during the ERI basis shipping period |
| FRsy | Number of FRUs shipped during the YRR basis shipping period |
| FRst | Number of FRUs shipped during the LTR basis shipping period |

### 7.1.5 Sources of Data

As a part of its data systems, the organization should have available the information listed above needed to calculate these measurements. This includes:

a) FRU shipping records – These are required to determine which units received for repair are early returns, one-year returns, or long-term returns and to determine the respective populations.

b) FRU return records – The organization’s return records shall include the identifiers necessary to match returns with shipment records.

c) Third-party return records – Units returned to a third-party repair agency by the customer or repaired by the customer itself shall be included in the return counts when available. To have accurate measurements, it is necessary for the customer to include a contractual requirement of their third-party repair agencies to supply this data to the original equipment manufacturers.

### 7.1.6 Examples

Examples for applying the FR measurement are located on the TL 9000 website (tl9000.org/links.html).

## 7.2 Basic Return Rate (BRR)

### 7.2.1 General Description and Title

This section defines the return rate measurement used for equipment and services where returns and/or replacements are not tracked past the initial usage of the item. The Basic Return Rate (BRR) is measured for identified product categories where normal FRU returns over the full product life cycle do not apply. The measurement tracks returns during the first eighteen (18) months after shipment from the organization.

### 7.2.2 Purpose

This measurement provides insight into the quality and reliability of equipment and services where long-term tracking is not practical or expected.

### 7.2.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 7.2.4 Detailed Descriptions

a) Terminology

The Glossary includes definitions for

– Afactor (Annualization Factor)

– Basis Shipping Period

– Field Replaceable Unit

– Return

b) Counting Rules

The following rules shall apply when counting returns and shipments for the return rate measurements:

1) Counting rules 1, 2, 3, 5, 6, 7, 9, and 10 in Section 7.1.4 b) shall be applied.

2) The organization shall document the method of determining which of the returns are within the eighteen-month basis shipping period. This determination shall be based on shipment of the FRU to the customer. This may be determined by

– serialized shipment records of the returned unit,

– shipment or warranty start date code marked on the unit,

– shipment date associated with a customer order, or

– manufactured date associated with a lot number.

NOTE: The last method requires the determination of an accounting for a standard time delay between the date of manufacture and shipment.

3) The date of shipment to the customer shall be used for determining the basis-shipping period.

4) Units which are replaced in the field rather than returned shall be counted in the month the replacement request is received.

c) Counting Rule Exclusions

1) All of the counting rule exclusions s in Section 7.1.4 c) shall apply.

d) Calculations and Formulas

1) The BRR measurement is annualized and shall be calculated monthly as shown in Table 7.2‑2.

2) BRR is expressed in percentage returns per year.

3) Basic Return Rate (BRR) – The BRR in month n measures the rate of return of units during months n-18 through n-1. In addition to returns from months n-18 through n-1, returns from units shipped during the current month (n) are also included. Any shipments in the month are deliberately excluded as only a few units are actually put into use during the month they are shipped.

#### Table 7.2‑1 BRR Notation

|  |  |
| --- | --- |
| Identifier | Definition |
| Afactor | Number of calculation periods in a year |
| FRrb | Number of unit returns from the BRR basis shipping period |
| FRsb | Number of units shipped during BRR basis shipping period |

#### Table 7.2‑2 BRR Measurement Identifiers and Formulas

|  |  |  |  |
| --- | --- | --- | --- |
| Identifier | Title | Formula | Note |
| BRR | Basic return rate | 100 x Afactor x (FRrb / FRsb) | % per year |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The BRR measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 7.1‑3.

#### Table 7.2‑3 BRR Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | BRR |
| FRab | Afactor |
| FRrb | Number of unit returns from the BRR basis shipping period |
| FRsb | Number of units shipped during BRR basis shipping period |

### 7.2.5 Sources of Data

As a part of its data systems, the organization should have available the information listed above needed to calculate these measurements. This includes:

a) FRU shipping records – These are required to determine which units received for repair or replaced are within eighteen months since shipment.

b) FRU return records – The organization’s return records shall include the identifiers necessary to match returns with shipment records.

c) Third-party return records – Units returned to a third-party repair agency by the customer or repaired/replaced by the customer itself shall be included in the return counts when available. To have accurate measurements, it is necessary for the customer to include a contractual requirement of their third-party repair agencies to supply this data to the original equipment manufacturers.

### 7.2.6 Examples

Examples for applying the BRR measurement are located on the TL 9000 website (tl9000.org/links.html).

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# Section 8 Software Measurements

### 8.0.1 Purpose

Software measurements track

– the effectiveness of an organization’s software fix process by measuring the ratio of defective fixes to the number of fixes delivered, and

– the maintenance effort associated with the deployed software by measuring the incidence of customer found software problems associated with the products developed by the organization.

The measurements in this section are provided to aid the customer and the organization in understanding the quality of software releases, the quality of software fixes, the efforts involved in the installation and maintenance of the software release, and the risk of introducing a software fault, for example, a defective fix, into their network. For the purpose of these measurements, maintenance covers the activities to correct defects to a generally available release.

The treatment of firmware for use in software measurements is based on how the firmware is maintained in the field. If the firmware can be changed by means of a download without returning to the factory/repair facility for such download, then the firmware is to be treated as software and all applicable software measurements apply. If changes require rotation/replacement of hardware, specialized equipment for field installation of the new firmware, or a return to factory/supplier/repair facility, the firmware is treated as hardware for the purpose of measurement reporting and therefore the software measurements do not apply. Please note the above has no bearing on the applicability of any requirement in the Requirements Handbook applicable to the process used to develop the firmware.

## 8.1 Software Fix Quality Measurement (SFQ)

### 8.1.1 General Description and Title

The Software Fix Quality (SFQ) measurement is used to assess the effectiveness of an organization’s software fix processes.

This measurement is used to evaluate the defective fix percentage with a goal of minimizing customer risk of failure when introducing fixes to an in-service software release.

### 8.1.2 Purpose

Software Fix Quality measures the percentage of software fixes that are determined to be defective. Customers are concerned with the quality of the software fixes and the number of changes the organization makes during the product lifecycle. When using the SFQ measurement to set goals and drive continuous improvement, it is important to consider the TL 9000 Performance Data Reports smoothing rules (see Section 4.2.10 TL 9000 Performance Data Reports) and the use of smoothed averages. Monthly snapshots may demonstrate too much variability to provide an accurate representation of the software fix quality trend.

### 8.1.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 8.1.4 Detailed Description

a) Terminology

The Glossary includes definitions for

– General Availability Phase

– Official Fix

– Retirement Phase

– Software Fix

b) Counting Rules

1) Each individual fix delivered through software shall be counted whether delivered individually or in a package.

2) Fixes to correct defects found in any software release that is generally available, whether found internally or externally in a production or test environment, are counted.

3) When fixes are packaged together, only the fixes that are identified as defective shall be counted as defective.

4) Each individual fix is counted once regardless of the number of times that fix is replicated across machines/processors at customer site(s).

5) If several separate fixes are provided to effect a single change, such as covering different parts of the code, and these fixes are separately identifiable to the customer, they shall each be counted separately.

6) Fixes addressing the same or similar defects across multiple releases are counted separately.

7) A fix is counted on General Availability of the fix. For example, fixes are counted when

– on-site and ready for system installation,

– available for downloading by the customer to the site, or

– shipped to the customer.

8) A defective Fix meets one or more of the following criteria.

– cannot be installed

– does not correct the intended problem

– is withdrawn because of potential or actual problems, or

– causes a critical or major problem, attributable to the fix, within the first 6 months of the fix release date.

9) A defective fix shall be counted in the month during which the fix was found defective by the organization.

10) If one or more defective fixes are found during a month when no fixes are released, the corresponding SFQ will be considered to be 100%.

c) Counting Rule Exclusions

1) Fixes associated with problems found in software that is not yet available in any generally available release are not counted.

d) Calculations and Formulas

1) The SFQ measurement is calculated monthly as shown in Table 8.1‑2.

2) For SFQ, the organization shall provide the total monthly number of official software fixes delivered and the number of official software fixes identified as defective.

#### Table 8.1‑1 SFQ Notation

|  |  |
| --- | --- |
| Identifier | Definition |
| DFc | Number of defective software fixes for the month |
| Fc | Total number of software fixes that became available  for general release during the month |

#### Table 8.1‑2 SFQ Measurement Identifiers and Formulas

|  |  |  |  |
| --- | --- | --- | --- |
| Identifier | Title | Formula | Note |
| SFQ | Software fix quality | 100 x (DFc / Fc) | % Defective per month |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The SFQ measurements shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 8.1‑3.

#### Table 8.1‑3 SFQ Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | SFQ |
| DFc | Number of defective software fixes for the month |
| Fc | Total number of software fixes that became available for general release during the month |

1. The organization shall have the capability to provide cumulative number of software fixes by release. These data are not reported to the TL 9000 Administrator.
2. The SFQ measurements shall be reported by summing defective/available software fixes of all in-service software releases.
3. The SFQ measurement is unique because when fixes are declared generally available, it is up to the customer to choose whether or not to install the fix. Therefore, there is no customer specific reporting required due to this complexity of the SFQ measurement.

### 8.1.5 Sources of Data

Customers shall provide feedback to the organization on unsuccessful results of any customer installed software fixes. Organizations shall collect all data necessary to report these measurements to the TL 9000 Administrator.

### 8.1.6 Examples

Examples for applying the SFQ measurement are located on the TL 9000 website (tl9000.org/links.html).

## 8.2 Software Problem Report Measurement (SPR)

### 8.2.1 General Description and Title

The Software Problem Report (SPR) measurement tracks the software problems that are found and reported by customers. The problem reports included in SPR are a proper subset of those in NPR (see Section 5.1) but the problem reports shall be counted, tracked, and reported separately in order to focus effort on addressing the software component of these problem reports.

### 8.2.2 Purpose

The measurements in this section are provided to aid the customer and the organization in understanding the quality of software that is deployed in the field and the risk of introducing a software fault into their network.

This measurement is used to evaluate the number of customer-originated software problem reports that are indicative of the software quality of the product delivered during the operating life cycle of that product. Software problem reports may have a negative impact on the organization (such as rework), on the customer (such as scheduling repeat site visits), and may reduce end-user loyalty. This measurement is intended to stimulate ongoing improvements resulting in a reduction of the number of software problem reports, associated costs, and potential revenue losses.

### 8.2.3 Applicable Product Categories

This measurement applies to product categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 8.2.4 Detailed Description

a) Terminology

The Glossary includes definitions for

– Afactor (Annualization Factor)

– Normalization Factor

– Problem Report

– Problem Report – Critical

– Problem Report – Major

– Problem Report – Minor

– Software Problem Report

b) Counting Rules

The counting rules in 5.1.4 b) apply in counting problem reports for the SPR measurement for all product categories, with the following clarification:

1) Only customer-originated software problem reports shall be counted.

c) Counting Rule Exclusions

The counting rule exclusions in 5.1.4 c) apply in counting problem reports for the SPR measurement for all product categories, with the following clarifications:

1) A problem report that is determined to be a hardware problem shall not be counted when the design solution or workaround is implemented in software.

2) **Problem reports due to faults in subscriber data are excluded**.

d) Calculations and Formulas

The applicable SPR measurements are calculated monthly as shown in Table 8.2‑2.

#### Table 8.2‑1 SPR Notation

|  |  |
| --- | --- |
| Identifier | Definition |
| Afactor | Number of calculation periods in a year |
| SPRs | Normalization factor; the total NU count at the end of the from Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2 |
| Sp1 | Number of critical software problem reports in the month |
| Sp2 | Number of major software problem reports in the month |
| Sp3 | Number of minor software problem reports in the month |

#### Table 8.2‑2 SPR Measurement Identifiers and Formulas

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Identifier | Product Categories | Title | | Formula |
| SPR1 | 1, 2, 3, 4, 5, 6, and 9 | Critical software problem reports per NU per year | Sp1 x Afactor / SPRs | |
| SPR2 | 1, 2, 3, 4, 5, 6, and 9 | Major software problem reports per NU per year | Sp2 x Afactor / SPRs | |
| SPR3 | 1, 2, 3, 4, 5, 6, and 9 | Minor software problem reports per NU per year | Sp3 x Afactor / SPRs | |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The SPR measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 8.2‑3.

#### Table 8.2‑3 SPR Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | SPR |
| SPRa | Afactor |
| SPRs | Normalization Factor |
| Sp1 | Number of critical software problem reports |
| Sp2 | Number of major software problem reports |
| Sp3 | Number of minor software problem reports |

3) The organization shall have the capability to supply the SPR measurement and its sub-elements by release for all in service releases at the time of the report. These data are not reported to the TL 9000 Administrator.

### 8.2.5 Sources of Data

Data for the SPR measurement are derived from information provided by customers and from analysis by the organization.

a) Customers

1) report software problems to the organization,

2) report normalizing information for hardware or software categories to the organization according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2, and

3) confer with the organization to establish severity of each problem report on products in Product Categories 1, 2, 3, 4, 5, 6, and 9.

b) Organizations

1) count the number of reported software problems by product category according to the applicable counting rules,

2) calculate the normalization factor,

3) calculate the normalizing information, in the event of insufficient customer supplied data, based on internal records for products within the scope of the applicable registration and according to the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2, and

4) confer with the customer to establish severity for each problem report on products in Product Categories 1, 2, 3, 4, 5, 6, and 9.

### 8.2.6 Examples

Examples for applying the SPR measurement are located on the TL 9000 website (tl9000.org/links.html).

# Section 9 Service Quality Measurements

This section does not contain all the Service Measurements. Sections 5 and 6 also contain measurements associated with service, such as Problem Reports, Fix Response Time, Overdue Problem Reports, On-Time Service Delivery, and Support Service Caused Outages.

## 9.1 Service Quality (SQ)

### 9.1.1 Description and Title

Service Quality (SQ) measures performance of a service transaction to specified criteria.

### 9.1.2 Purpose

This measurement is used to provide quality measurement information for establishing the evaluation and continuous improvement of the service. The measurement is based on the number of defective service transactions and the total number of service transactions.

### 9.1.3 Applicable Product Categories

This measurement applies to service categories as shown in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 9.1.4 Detailed Description

a) Terminology

The Glossary includes definitions for

– Defective Service Transaction

– Service Transaction

b) Counting Rule

1) Organizations are to count the number of defective service transactions (numerators) and total number of service transactions (denominators) as described in the Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

c) Counting Rule Exclusions

None

d) Calculations and Formulas

The applicable SQ measurements are calculated monthly as shown in Table 9.1-2.

#### Table 9.1‑1 SQ Notation

|  |  |
| --- | --- |
| Identifier | Definition |
| SQd | Number of defective service transactions reported in the month |
| SQt | Total number of service transactions opened in the month |

#### Table 9.1‑2 SQ Measurement Identifier and Formula

|  |  |  |  |
| --- | --- | --- | --- |
| Identifier | Title | Formula | Note |
| SQ | Defective service transactions | **100 x SQd/SQt** | % defective transaction |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The SQ measurement shall be reported for each month and each product category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 9.1‑3.

#### Table 9.1‑3 SQ Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | SQ |
| SQd | Service quality numerator as shown in the in Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2 |
| SQt | Service quality denominator as shown in the in Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2 |

### 9.1.5 Sources of Data

Data for the SQ measurement are derived from analysis by the organization.

### 9.1.6 Examples

Examples for applying the SQ measurement are located on the TL 9000 website (tl9000.org/links.html).

## 9.2 End-Customer Complaint Report Rate (CCRR)

### 9.2.1 Description and Title

The End-Customer Complaint Report Rate is a measurement of quality of delivery of a service to an endcustomer.

Delivery means service delivery during availability of a service to an end-customer.

### 9.2.2 Purpose

This measurement is used to provide quality measurement information as a basis for evaluation in reducing cost and driving continual improvement of the service provider delivery process to the end-customers.

This measurement is an indicator leading to early problem detection, efficient problem resolutions, reducing the cost of poor quality (e.g., reduce cost at the service desk) and estimation of quality to the end customer. The measurement supports finding systemic root causes based on repeated end-customer calls (complaints) to drive corrective and preventive actions.

It is recommended to monitor the End-Customer Complaint Report Rate more frequently than monthly during rollout and early life-time of a service. Weekly monitoring will enable trends of service quality to be quickly ascertained.

### 9.2.3 Applicable Product Categories

This measurement applies to service categories as shown in Measurement Applicability Table (Normalization Units), Appendix A, Table A‑2.

### 9.2.4 Detailed Description

a) Terminology

The Glossary includes definitions for

– Afactor (Annualization factor)

– End-Customer

– End-Customer Complaint – A statement from an end-customer or on behalf of that end-customer expressing dissatisfaction with a product or delivery of that product. The statement may be issued via any medium (voice calls, email, chat service etc.). The statement may concern single or systematic dissatisfaction of the end-customer with an aspect of the product such as compliance with requirements, functionality, performance, usability, maintainability, reliability, safety or delivery.

– Non Technical End Customer Complaint – Any complaint against the product that is not of a technical nature such as billing, behavior of the service staff, or time of attending.

– Technical End Customer Complaint – Any complaint against the product due to availability, quality or functionality such as loss of service, service quality, or intermittent service

b) Counting Rules

1) The number of registered complaints are the complaints of the end-customers (i.e. complaints received from each customer are unique count items) about the quality of service.

2) The measuring period starts after service availability.

3) The installed base is counted as the number of end-customers during delivery of the service and shall be updated each month.

4) Complaints from a multiple use line (Voice, Internet, or Video Broadcast (TV)) will be counted once and recorded only in one of the product categories. The organization determines this default product category, however “internet access” is recommended.

5) Complaints from an individual customer shall be counted only once even if the customer complains again for the same problem within the agreed (Internal or external) restore time.

6) Repeat customer complaints (outside the agreed initial complaint restore time) are treated as new complaints. The organization shall maintain the ability to carry out repeat fault trend analysis to resolve systemic root causes.

c) Counting Rule Exclusions

1) During the service delivery only complaints of an end-customer are counted.

2) Concerns about issues, not yet manifested, which may or may not occur in the future are not counted.

d) Calculations and Formulas

The applicable CCRR measurements are calculated monthly as shown in Table 9.2-2.

#### Table 9.2‑1 CCRR Notation

|  |  |
| --- | --- |
| Identifier | Definition |
| Afactor | Number of calculation periods in one year. |
| CCRRs | Normalization factor, The total normalization units (NU) count from the Measurement Applicability Table (Normalization Units) Appendix A, Table A-2 at the end of the month |
| CCRRd | Total number of end-customer complaints, per month, related to the service. The sum of technical and non-technical complaints (CCRR1d + CCRR2d) |
| CCRR1d | Number of technical end-customer complaints per month related to the Service. |
| CCRR2d | Number of non-technical end-customer complaints per month related to the Service. |

#### Table 9.2‑2 CCRR Measurement Identifier and Formula

|  |  |  |  |
| --- | --- | --- | --- |
| Identifier | Title | Formula | Note |
| CCRR | End-Customer Complaint Report Rate | CCRRd x Afactor / CCRRs | End-customer complaint report rate by NU per year |
| CCRR1 | Technical End-Customer Complaint Report Rate | CCRR1d x Afactor / CCRRs | Technical End-Customer Complaint by NU per year |
| CCRR2 | Non-technical End-Customer Complaint Report Rate | CCRR2d x Afactor / CCRRs | Non-technical End-Customer Complaint by NU per year |

e) Reported Data and Format

1) Monthly data shall be reported per the frequency and method noted in Sections 3.5.2 and 4.2.2 of this document.

2) The CCRR measurements shall be reported for each month and each service category with data elements, or equivalent as defined by the TL 9000 Administrator, shown in Table 9.2‑3

#### Table 9.2‑3 CCRR Data Table

|  |  |
| --- | --- |
| Identifier | Value |
| MeasurementID | CCRR |
| CCRRa | Afactor |
| CCRRs | Normalization factor |
| CCRR1d | Number of technical end-customer complaints per month related to the Service. |
| CCRR2d | Number of non-technical end-customer complaints per month related to the Service. |

### 9.2.5 Sources of Data

Data for the CCRR measurement are derived from the organization’s complaint management process.

It is expected the service operator will update the number of commercial installed licenses/subscriptions of the service at the end of each month (number of “end customers with the service”).

### 9.2.6 Examples

Examples for applying the CCRR measurement are located on the TL 9000 website (tl9000.org/links.html).

# Appendix A Product Category Tables – Release 5.0

The Product Category Tables listed below are part of the TL 9000 standard. This is Release 5.0 of Appendix A of the Measurements Handbook. It may be used effective in February 2013 for submitting January 2013 TL 9000 data forward and must be used for submitting July 2013 data forward until superseded by the next revision.

Each revision is an approved release by the QuEST Forum and is identified by a release number. The latest release of these tables and their effective dates are available via the TL 9000 website and shall be used in conjunction with registrations per the rules noted in Section 4.1.1 of the Measurements Handbook.

Organizations shall classify their products and report measurements according to the product categories listed in Table A-1. The Measurement Applicability Table (Normalization Units), Table A‑2, lists specific measurements that apply to each category as well as the Normalization Units and other information necessary for compiling measurement reports.

a) List of Tables

Table A‑1 Product Category Definitions

Table A‑2 Measurement Applicability Table (Normalization Units)

Table A‑3 Network Element Impact Outage

Table A‑4 Transmission Standard Designations and Conversions

Table A‑5 Optical and Electrical Equivalency

Table A‑6 Measurements Summary Listing

Table A‑7 TL 9000 Data Submission Labels

b) Rules for Classification of Products

Please see the "Product Category Selection and Validation Guidelines" available on the tl9000.org website for more information on how to determine the correct category for your product.

1. The definitions of product categories in Table A-1 shall be used by organizations in categorizing their products.
2. An organization shall not classify a product in multiple product categories. Therefore, any product from an organization must be classified in exactly one product category.
3. General-purpose products, such as computers, shall be classified by specific function, e.g., signaling, when provided as a system designed for that function. Otherwise, they shall be classified in a separate category, for example, Common Systems-Computers, designed for the general-purpose product.
4. A product shall be classified according to its primary function. For example, a digital transmission facility product with performance monitoring will be classified as a transmission product instead of an operations and maintenance product.
5. The standard for classification is the product category, not the possible uses for the product. For example, if a product classification falls in the Outside Plant category, all products that are consistent with that category will be classified as such, even if the exact same product is sometimes used in the customer premises and even if a particular organization’s product is sold primarily into the customer premises market.

c) Principles for Construction of the Product Category Table

1) Product categories shall be defined so that they can be clearly assigned within a hierarchy of classification.

2) There are well-established rules for classification.

3) Product categories should not be separated artificially if they can be logically aggregated.

4) Product categories should have clear definitions, which lend themselves to unambiguous interpretation.

5) For each category, the level to which measurements may be aggregated shall be defined.

6) Each product category specification shall consist of standard elements.

7) The placement of the product in the hierarchy will reflect the dominant use of the product.

8) Terminology used shall reflect standard technical meanings and wherever possible aligned to relevant standards such as ITU-T, ETSI, ANSI, etc.

## Table A-1 Product Category Definitions

| Table A-1 Product Category Definitions | | | |
| --- | --- | --- | --- |
| Category Code | Category Name | Definition | Examples |
| 1 | Switching | Equipment used for the physical or virtual interconnection of communication channels in response to a signaling system. The switching category is broadly defined to include packet or circuit switched architectures. |  |
| 1.1 | Circuit Switch | Equipment used for the **termination of subscriber lines and/or trunk lines and the dynamic interconnection of these ports** or channels in a digital transmission facility. A circuit switch establishes a dedicated circuit, as opposed to a virtual circuit, in response to a signal. Stored Program Control (SPC) is the most common type of switching equipment used at end offices and tandem offices. These systems use either analog or digital switching. The switching system used must have the capability to send, receive and be actuated by signals, e.g., access line signals, or inter-office in-band or common-channel signaling. This category includes all circuit switches regardless of transmission medium, i.e., wireline or wireless. | End-office  Tandem  Tandem access  Remote  Service switching point (SSP)  Mobile switching center (MSC) |
| 1.2 | Packet Switch | Equipment used for switching or routing data on virtual, as opposed to dedicated, circuits. The service is packet switched in that the customer’s data are transported as a sequence of data blocks (packets) that do not exceed a specified size. This packetization permits data from many data conversations to share a given transmission facility economically through statistical multiplexing. Such data conversations are known as virtual circuits, which are full duplex and connection-oriented. |  |
| 1.2.1 | Legacy Packet Products | Equipment **providing X.25 packet or frame relay switch capability**. This includes Public Packet Switched Network (PPSN) equipment. The frame relay equipment is switching equipment that operates at Open Systems Interconnection (OSI) Level 2 (hardware) to move variable-length Frame Relay frames over virtual circuits from source to destination. | X.25 packet switch  Access concentrator/PAD  Frame relay switch |
| 1.2.2 | Access Multi-service | Equipment that switches **packetized data** from source to destination that **includes the capability to connect to the circuit switched traffic network.** The packet data may include variable length IP (Internet Protocol) and/or fixed length ATM packets. These systems include circuit switched trunks/network interfaces (DS1, E1, T1, DS#, STM-1, OC-x, VC-12, etc.), tributary interfaces and line/customer side interfaces (POTS, ISDN, xDSL, GigE, PBX, DS1/E1, etc.). | Access switch  ATM switch  Gateway GPRS support node  Serving GPRS support node  Packet data serving node  Services edge router  Multi-service data switch  Wireless gateway  Trunk gateway  Access gateway  Multi-service gateway  Line gateway |
| 1.2.3 | Media Gateways | Equipment that provides an interface between different network transport protocols. The primary function of this equipment is to **enable multimedia communications across networks** such as PSTN, IP, ATM, 2G, 2.5G, 3G or PBX. Media steaming functions such as echo cancellation, DTMF, and tone sender may also be located in the gateway. | Media Gateway |
| 1.2.4 | Not currently used |  |  |
| 1.2.5 | Not currently used |  |  |
| 1.2.6 | Not currently used |  |  |
| 1.2.7 | Application Servers | Equipment that provides **IP based multimedia services**. | Video over IP  Instant messaging  Voice features  Multi-media communications server |
| 1.2.8 | Service and Network Controller (SNC) | Equipment that combines a Call Connection Agent (CCA) and possibly a signaling gateway (SG) and/or a service agent into one system. The CCA provides the necessary call processing functionality to support voice traffic on the core packet network including call control commands and communication with billing systems. A service agent supports supplementary services and generates TCAP messages to interact with Service Control Points for intelligent network services such as 800 and Local Number Portability. (NOTE: if the signaling gateway is not integrated with the CCA, the product belongs in product category 2.2 Common Channel Signaling.) | Service and network controller (SNC)  Softswitch  Nextgen switch |
| 1.2.9 | Routers | Equipment that transports and/or routes packet data from source to destination. This may include variable length IP (Internet Protocol) and/or fixed length ATM packets. This equipment is connected to multiple physical packet networks and routes or delivers packets between the networks. Routing generally uses software algorithms to optimize one or a combination of data-transport “measurements” such as delay, the use of reliable paths, “hops” between servers, etc. Routers do not include termination of PSTN traffic or any other connection to the circuit switched network. |  |
| 1.2.9.1 | Core | Packet **transport and routing** equipment primarily intended for use in the core of the packet network connecting other packet network elements together. This equipment is intended to provide high reliability and availability. | IP core router  Broadband multi-service  Transport protocol converters |
| 1.2.9.2 | Edge | Packet **transport and routing** equipment primarily intended for use at the edge of the core network typically providing connection, for example, between metropolitan area and the backbone (Provider Core) network. Typically performance requirements are not as stringent as those for Core Routers but greater than those for Access Routers. | IP edge router  Multi-Service Access Node (MSAN) |
| 1.2.9.3 | Access | Packet **routing** equipment that primarily provide the access/aggregation entry point for customer premise equipment to the external network. | Access router |
| 2 | Signaling and Network Control | Equipment used for the provision of signaling, i.e., states applied to operate and control the component groups of a telecommunications circuit to cause it to perform its intended function. In generally, there are five basic categories of signals commonly used in the telecommunications network: supervisory signals, information signals, address signals, control signals, and alerting signals. This category includes those signaling products that function within the telecommunications network and excludes possibly similar products that normally provide enhanced services outside the network, or on the customer premises such as ACD, IVR, or voice messaging systems. |  |
| 2.1 | Service Control {formerly Service Control Point (SCP)} | A hardware and software system that provides a signaling point that functions as a **database to provide information to another service control network element or Service Switching Point (SSP)**. Transaction Capabilities Application Part (TCAP) queries and responses are used to communicate with the network element as is done for 800 Data Base Service and Alternate Billing Service (ABS). These may support one or more services per network element and they may be deployed singularly as stand-alone nodes, as mated pairs, or as multiple replicates (more than 2) to increase their availability. They are associated with applications that consist of service-specific software and a database of customer-related information. This product category includes conventional Service Control Point (SCP) equipment, plus other platforms such as service nodes, intelligent peripherals, or service resource facilities, which may combine capabilities of a SCP, SSP or that may be used to provide Advanced Intelligent Network (AIN) functionality or other enhanced services within the network. It also includes Source Based Routing (SBR) which consists of a Routing Database (RDB); a logical routing directory component that an originating Call Server accesses to convert external routing information, such as a dialed telephone number, into internal destination IP routing information. The Routing Database may be based around DNS and ENUM technology; the ENUM server may be used to provide a translation from dialed digits to corresponding SIP URI, from which the Call Server may provide the IP address which is used by call control to send a SIP message to a subsequent call server, which may or may not be an entity in the same network domain. | Service control point  Service nodes  Service resource facilities  Source based router |
| 2.2 | Common Channel Signaling {formerly Signaling Transfer Point (STP)} | Hardware/software signaling equipment with **common channel signaling (CCS) functionality** to support a variety of applications:  CCS Signal Transfer/Router (i.e. STP - MTP, SCCP)  CCS link terminations (i.e. end office, tandem office, wireless office, etc.)  CCS packet interconnect (MTP, IPS7) | Signaling transfer point  Signaling relay point  End/Tandem/Wireless office standalone CCS7 NE  Signaling gateway |
| 2.3 | Home Location Register (HLR) | Equipment that **provides a permanent database used in wireless applications to identify a subscriber and to contain subscriber data related to features and services**. It stores information such as service profiles, location and routing information for roamers, service qualification, interface for moves, adds and changes. It communicates with other HLRs and provides access to maintenance functions such as fault information, performance data, and configuration parameters. | Home location register |
| 2.4 | Service Logic (SL) | The set of software instructions stored in SCP for **handling TCAP messages**. (TCAP is the Transactional Capabilities Application Part of the CCS application protocol of ISDN providing the signaling function for network databases.) When triggered, these instructions execute the appropriate service logic for messages. Service Logic software may be provided by an entity other than the SCP supplier. | Service logic |
| 2.5 | Protocol Servers | Equipment operating at the application-layer that **provides control for creating, modifying, and terminating sessions** with one or more participants. These sessions include all forms of packet communications such as Internet telephone calls, multimedia distribution, and multimedia conferences. Also included are servers used to obtain IP addresses. | * Session Initiation Protocol (SIP) server * Dynamic Host Configuration Protocol (DHCP) server * Session Border Controller (SBC) |
| 2.6 | Network Access Control | Equipment used that **provides user authentication, authorization, and accounting (AAA) for network services** | Terminal Access Controller Access Control System (TACACS) or TACACS+ server  Remote Authentication Dial In User Service (RADIUS) server  (Diameter) server  AAA Subscriber Manager |
| 2.7 | Network Security | Equipment used to **secure packet communications by authenticating and/or encrypting the packets in a data stream**. This includes the use of tunnel control such as Generic Routing Encapsulation (GRE) or Layer 2 Tunneling Protocol (L2TP). | IP Security (IPsec) Control server  Secure Socket Layer (SSL) Server  Transport Layer Security (TLS) Server  Tunnel Control |
| 3 | Transmission Systems | Equipment used for the connection of the switched and interoffice networks with individual customers. An integral part of the distribution network is the loop that connects the customer to the local central office (CO), thus providing access to the interoffice network. |  |
| 3.1 | Transmission Media and Structure (Outside Plant) | Products used to interconnect and physically support the various parts of the telecommunications network. This includes products typically referred to as belonging to the “outside plant” such as cables, supporting structures, and certain equipment items such as load coils along with other equipment types as noted below. |  |
| 3.1.1 | Transmission Medium | Fiber optic cable, metallic cable, or other physical medium used for the transmission of analog or digital communications. |  |
| 3.1.1.1 | Metallic Products | Metallic as opposed to optical or wireless transmission media. |  |
| 3.1.1.1.1 | Metallic Conductor Cable | Metallic pairs of conductors housed in a protective cable. | Metallic cable  Central office coaxial cable  Hybrid coaxial/twisted pair drop |
| 3.1.1.1.2 | Metallic Connectors | Devices used to terminate a metallic cable. | Coaxial connectors  Coaxial distribution connectors |
| 3.1.1.2 | Fiber Optic Cable Products | Optical, as opposed to metallic or wireless transmission media. |  |
| 3.1.1.2.1 | Fiber Optic Cable | Cables wherein light is propagated and any associated covering. | Loose tube cable  Single tube bundled cables  Single tube ribbon cables  Tight buffered cables  Indoor fiber optic cables |
| 3.1.1.2.2 | Optical Connectors | Device used to terminate an optical cable. | Optical connectors (e.g., SC, ST, MT, etc.) |
| 3.1.1.3 | Transmission Sub-systems | Sub-systems embedded in the transmission medium other than cable or connectors |  |
| 3.1.1.3.1 | Active Sub-systems | Active sub-systems containing electronics. | Coaxial drop amplifiers  Fiber optic data links |
| 3.1.1.3.2 | Passive Optical Sub-systems | Optical sub-systems containing no electronics. This includes passive optical modules containing two or more individual passive optical sub-systems or systems. | Optical passive wavelength division multiplexer (PWDM)  Optical add drop multiplexers  Combined optical couplers/splitters/filters |
| 3.1.1.3.3 | Ancillary Sub-systems | Other transmission sub-systems not specifically covered in other transmission component categories. Typically passive. | Surge protectors  Bonding and grounding hardware or ground wire  Taps  Electronic line filters |
| 3.1.1.3.4 | Fixed Antenna Systems | Systems used for the transmission and receipt of telecommunication signals through the air. |  |
| 3.1.1.3.4.1 | Radio Antenna Systems | A system used for the transmission and receipt of terrestrial radio waves consisting of an antenna (dish or pole), supporting structure, LNA, transmit horn, coaxial cable and/or waveguide. | Microwave antenna system  Fixed wireless antenna system |
| 3.1.1.3.4.2 | Satellite Antenna Systems | A system used for the transmission and receipt of radio waves to and from satellites consisting of an antenna dish, supporting structure, LNA, transmit horn, and/or receiver/transmitter equipment. | Satellite antenna system |
| 3.1.1.3.4.3 | Optical Antenna Systems | A system used for the transmission and receipt of optical signals through free air consisting of an antenna, supporting structure, and/or receiver/transmitter equipment. | Optical antenna system |
| 3.1.2 | Physical Structure | Physical structures used for the support of telephone transmission media. |  |
| 3.1.2.1 | Enclosures | Enclosures used for network equipment located in the outside plant. | Fiber optic splice enclosures  Optical network unit (ONU) enclosures  Organizer assemblies  Seal assemblies  Controlled environment vaults  Pedestals |
| 3.1.2.2 | Support Structures | Products used for the physical support of transmission media or enclosures and associated items. | Telephone poles  Microwave/radio towers |
| 3.1.2.3 | Conduits | Channels used for the containment of optical fiber or metallic cable. | Innerduct  Multi-bore conduit  PVC pipe |
| 3.2 | Transport Equipment | Equipment located in the central office or at the customer premises, but inside the network demarcation point, for the transmission of digital or analog communication over transmission media. This product category includes equipment for terminating, interconnecting, and multiplexing communications circuits. |  |
| 3.2.1 | Cross Connect Systems | Equipment that provides a physical termination point for physical cables and individual conductors. They can be manual or automated, metallic or optical. Cross-connect systems, such as distributing frames, Digital Signal Cross Connects (DSXs) and Fiber Distributing Frames (FDFs) provide the following basic functions: cross-connection of network distribution facilities and equipment in the central office, electrical protection for conductive media, test access, temporary disconnection, and termination points for facilities and equipment. |  |
| 3.2.1.1 | Manual Cross Connect Systems | Equipment that provides a physical termination point for physical cables and individual conductors where changes in connections are performed manually. These can be metallic or optical systems such as distributing frames or Fiber Distributing Frames (FDFs) provide the following basic functions: cross-connection of network distribution facilities and equipment in the central office, electrical protection for conductive media, test access, temporary disconnection, and termination points for facilities and equipment. | Digital signal cross connect panel (DSX)  Fiber distribution frame (FDF)  Feeder distribution interface (FDI) |
| 3.2.1.2 | Digital Cross Connect Systems | Equipment that provides a physical termination point for physical cables and individual conductors where changes in connections are performed electronically. These systems provide **electrical cross-connection of network distribution facilities** and equipment in the central office, electrical protection for conductive media, test access, temporary disconnection, and termination points for facilities and equipment. They may interface to the network either optically or metallically. | Digital cross-connect system (DCS)  Electronic DSX |
| 3.2.1.3 | Optical Cross Connect Systems | Equipment that provides a physical termination point for physical cables and individual conductors where changes in connections are performed using an all-optical matrix according to an electronically alterable memory map. These systems provide **cross-connection of network distribution facilities and equipment** in the central office at an optical level. | Active optical DSX |
| 3.2.2 | Carrier Systems/ Multiplexers | Equipment used for transmitting multiple communication channels over a single transmission facility. This category includes equipment for transmission over interoffice trunks, for example, from central to remote offices. |  |
| 3.2.2.1 | Interoffice/ Long Haul | Equipment used for transmission between central offices, between exchanges, or between carriers, as opposed to transmission between an end office and a remote location, typical of a loop carrier. |  |
| 3.2.2.1.1 | Metallic Carrier Systems | **Carrier** system that uses metallic transmission medium. | Analog carrier (N-, L- carrier)  D4, D5 digital carrier |
| 3.2.2.1.2 | Optical Carrier Systems | Carrier systems that use optical transmission medium. |  |
| 3.2.2.1.2.1 | SONET/SDH Transport Systems | Fully featured **digital transmission** system using optical medium | OC-3, 12, 48, or 192 SONET equipment configurable as linear or ring  Similar for STM-x SDH equipment |
| 3.2.2.1.2.2 | WDM/DWDM/ Optical Amplification | Shelf level systems used for multiplexing, de-multiplexing, or amplification of **optical signals.** Lack the built in protection, electrical conversion and other features of a SONET Transport System. | Wavelength division multiplexer (WDM)  Dense wavelength division multiplexer (DWDM) |
| 3.2.2.1.2.3 | Reconfigurable Optical Add-Drop Multiplexer (ROADM) | An add-drop multiplexer with the ability to **network wavelengths** in a granular, automated fashion in metro and regional networks, **with integrated transport and switching at both the wavelength and the transport** (such as SONET/SDH or IP) **layers** in a single network element.  NOTE: SONET/SDH products which have added WDM capabilities or WDM products that have added SONET/SDH capabilities are to be classified in this product category | Reconfigurable Optical Add-Drop Multiplexer (ROADM)  Optical add-drop switches  Wavelength Switching Systems (WSS)  Optical Transport Network (OTN) elements |
| 3.2.2.1.3 | Microwave | Carrier system that employs fixed **microwave transmission**. | 6, 8, 11, 18, or 40 gigahertz microwave radio  2.4 or 5.8 gigahertz license free radio |
| 3.2.2.2 | Loop Carrier | Equipment used for deploying multiple **voice or digital channels** over fewer physical channels than would be otherwise required (a “pair gain” function). Loop carriers are typically digital systems that employ time-division multiplexing (TDM) but may include analog systems as well. Loop carrier systems consist of a Central Office Terminal (COT) located near the switching system, a Remote Terminal (RT) located near the customer to be served and a transmission facility connecting the COT to the RT. Individual communications circuits (such as POTS and Foreign Exchange (FX)) are accepted as separate inputs at the COT (RT), time-division multiplexed (in a digital loop carrier) by the loop carrier system and reproduced at the RT (COT).  There is an analog-to-digital (A/D) conversion of analog inputs to the DLC and these signals, which are carried digitally within the DLC, undergo a digital-to-analog (D/A) conversion when output at the COT or RT. The transmission facility used by a loop carrier may be metallic cable pairs, repeated metallic cable pairs, or optical fibers. | Digital loop carrier (DLC)  Universal digital loop carrier (UDLC)  Subscriber Line Concentrator (SLC) remote terminal  Integrated digital loop carrier  Analog loop carrier |
| 3.2.3 | Line Terminating Equipment/ Distributing Frames | Equipment that provides the termination point for voice-grade and voice-grade compatible facilities and equipment in a central office. It is composed of protectors, connectors and terminal strips or blocks. Distributing frames are categorized as either conventional or modular. | Tall conventional distributing frames  Low-profile conventional distribution frames (LPCDFs)  Conventional protector frames  Combined main distributing frame (CMDF)  Subscriber main distributing frame (SMDF)  Trunk main distributing frame (TMDF)  Intermediate distributing frame (IDF)  Tie-pair distributing frame (TPDF).  Office repeater bays |
| 3.2.4 | Digital Subscriber Line (DSL) | Equipment used for the transport of high-speed digital data on the embedded copper plant. DSL typically operates over non-repeatered, POTS-like, conditioned unloaded loops out to Carrier Serving Area (CSA) ranges. This includes central office and remote concentrator units along with supporting equipment. Simple regenerators or range extenders should be placed in another appropriate category such as 3.2.2.1.1 Metallic Carrier. |  |
| 3.2.4.1 | Legacy | Any first generation digital subscriber line technology. This includes equipment such as integrated services digital network (ISDN) systems. The reliability requirements for this equipment are low and there is very little redundancy in the deployed network elements. | DDS  ISDN  4-wire 2B1Q HDSL. |
| 3.2.4.2 | Symmetric | DSL equipment that offer symmetric upstream and downstream bandwidth. This equipment supports only data on a single line and does not support analog calls | HDSL2  HDSL4  SHDSL |
| 3.2.4.3 | Asymmetric | DSL equipment where the downstream bandwidth is much greater than the upstream bandwidth. This equipment also supports simultaneous analog voice traffic. | ADSL  VDSL |
| 3.2.4.4 | IP | DSL equipment where the interface to the network is IP based | IP DSLAM  OSP DSLAM |
| 3.2.5 | Fiber to the User | Equipment used for the bi-directional transport of telecommunications signals over optical fiber between the central office, remote digital loop carrier or other network node and the end user. This includes systems which may provide connections over copper in addition to the fiber connections. | Fiber to the home (FTTH)  Fiber to the user (FTTU)  Passive optical networks (PON)  Fiber to the “x” (FTTx) |
| 3.2.6 | Video Transmission | Equipment used for analog or digital video transmission. |  |
| 3.2.6.1 | Cable Modem Termination Equipment | Equipment that provides the **interface between cable modem subscribers and the network.** | Cable modem server |
| 3.2.6.2 | Analog Video Transmission Equipment | Equipment used in the **transmission of analog video signals.** This includes central office and remote based transmitters, receivers, and repeaters but not customer premise equipment. | Analog CATV transmitters  Analog CATV repeaters  Analog CATV head end equipment |
| 3.2.6.3 | Digital Video Transmission Equipment | Equipment used in the transmission and manipulation of MPEG formatted Video signals located at head end and hub locations but not customer premise equipment. | Digital video multiplexer  Digital video transrater  Digital video router  Digital video ad splicer  Cable video server  Digital video modulator  QAM modulators  Ad splicers |
| 3.2.6.4 | Ad Server | Equipment used for the insertion of advertisements into video streams | Ad server |
| 3.3 | Wireless Transmission | Equipment used for analog or digital transmission to the subscriber unique to wireless services. This category does not include interoffice or long haul wireless carrier systems such as long haul microwave transmission |  |
| 3.3.1 | Base Station Equipment | Equipment that provides the **interface between wireless systems and the Public Switched Telephone Network (PSTN).** It provides, for example, electrical signaling isolation as well as switching, routing, billing, and features capabilities. It provides subsystems for vocoding and selecting hand off decision. | BSC  BSS  LTE BSC  Radio Network Controller (RNC) |
| 3.3.2 | Base Transceiver System (BTS) | Equipment that provides the radio link to the mobile subscribers. It is connected to the BSC/RNC/MME (aggregation node) though a backhaul interface between the aggregation node and BTS for both vocoded and overhead packet traffic. This includes terminals and repeaters. |  |
| 3.3.2.1 | Basic | Second generation (2G) and earlier equipment that **provides the radio link to mobile subscribers.** | 2G BTS  2G Wireless repeater  Analog BTS |
| 3.3.2.2 | Advanced | Post second generation (2.5G) or third generation (3G) equipment that **provides the radio link to mobile subscribers.** This includes Radio Resource Control, Paging Control, Handoff/Handover Function, Context Function, Location Register, and Security Key Distribution in the control plane and, for the bearer plane, Backhaul Aggregation, QoS Policy Enforcement, IP Access Control, Data Path Function, and MIP Foreign Agent Capabilities. This includes systems with a distributed architecture for the BTS that has a digital baseband unit (BBU) separated from a remote radio unit (RRU). | 3G BTS  3G Wireless repeater  NodeB |
| 3.3.2.3 | 4G | Fourth generation (4G) equipment that **provides the radio link to mobile and nomadic subscribers**. This includes LTE and WiMAX BTS equipment. This includes systems with a distributed architecture for the BTS that has a digital baseband unit (BBU) separated from a remote radio unit (RRU). | LTE BTS  WiMAX BTS  eNodeB |
| 3.3.3 | Pilot Beacon Unit (PBU) | Equipment whose primary purpose is to **transmit an ANSI J-STD-008 Pilot channel and ANSI J- STD-008 Sync channel and a partial ANSI J-STD-008 Paging channel.** The PBU is intended to notify a mobile unit of a change in CDMA coverage and can be used to assist in the execution of cellular CDMA-AMPS and inter-frequency CDMA-CDMA hand-off. It is designed with the capability for extended temperature and environmental operation ranges. | * Pilot beacon unit (PBU) |
| 3.3.4 | WLAN Base Station Equipment | Equipment that provides the **wireless data interface (such as IEEE 802.11 or IEEE 802.16) to wireless data network mobile subscribers.** | * Wireless mesh point * Wireless data access point * Wireless mesh network access point * Worldwide Interoperability for Microwave Access (WiMAX) |
| 3.4 | Ancillary Products | Equipment that provides ancillary functionality within the transport network. |  |
| 3.4.1 | Location Services | Equipment that provides location-based services for wireless and/or VoIP networks. The primary function of this equipment is to **provide location information for emergency service calls such as E911** but may also be used for other location-based services. | * Mobile location center * IP location |
| 3.4.2 | Lawful Intercept | Equipment used for the lawful interception and monitoring of communication signals | * Lawful Intercept |
| 4 | Operations & Maintenance | Equipment and systems used for the management, upkeep, diagnosis and repair of the communications network. |  |
| 4.1 | Test Systems | Equipment used to support testing of the network. This category includes permanently installed equipment that provides a centralized test capability or local test access, as opposed to portable equipment, as might be carried by a craftsperson. Types of test systems are equipment that provides test access to transmission circuits, equipment to perform the tests or computer software used to communicate with the CO access and test equipment. | * In-line test equipment * Monitoring equipment * Parallel test equipment * Network test software |
| 4.1.1 | Not currently used |  |  |
| 4.1.2 | Not currently used |  |  |
| 4.1.3 | Not currently used |  |  |
| 4.2 | Operations Support Systems | Systems that provide TMN (Telecommunication Management Network) compliant, flexible, scalable, and interoperable solutions to automate service activation, service assurance, and network capacity management processes to worldwide existing and emerging network services and equipment providers. |  |
| 4.2.1 | On-line Critical | Real time **network management systems**, demanding high availability, typically 24 hours a day and 7 days per week. | Network traffic management  Surveillance of 911 |
| 4.2.2 | On-line Non-critical | Real time **network management systems** with lower availability demands than on-line critical systems. | Provisioning  Dispatch  Maintenance |
| 4.2.3 | Off-line | Traditional **business systems** that are run off line sometimes in batch mode, typically overnight, and do not have high availability expectations. | Inventory  Billing records  Service creation platform |
| 4.3 | Ancillary Operations and Maintenance | **Tools, test equipment,** and other **specialized products** used to support the operations and maintenance of the communications network but not part of the permanent network. | Optical splicers  Single fiber fusion splicers  Mass fiber fusion splicers  Mechanical splicers  Portable test equipment  Optical connector tools  Cleavers |
| 5 | Common Systems | Any of a variety of specialized generic, shared equipment used to support network elements. Common systems include power systems and the Network Equipment-Building System (NEBS) that provides space and environmental support for network elements. These systems are located in central offices and remote building locations. |  |
| 5.1 | Synchronization | Equipment used for operating digital systems at a common clock rate **(frequency synchronization).** This category includes primary reference sources and other timing signal generators that produce a timing signal traceable to Universal Coordinated Time (UTC). | Stratum 1, 2, 3E domestic, TNC, LNC and Type 1 International  GPS timing receivers, cesium, loran, or CDMA RF pilot timing reference generators. |
| 5.2 | General Purpose Computers | A category reserved for computer complexes (one or more interconnected machines) that perform **general business function**s but that do not provide any telephony transmission or storage service to telecom customers, or that may provide such services, but are not sold to the customer as part of a system designed exclusively for that purpose. The purposes to which such machines may be put include but are not limited to:  Accounting systems  Billing systems  Legal systems  Ordering systems  Business Information systems  HR functions  Engineering and support functions  Marketing and Sales functions | Terminals  PCs  Workstations  Mini, mid, mainframes |
| 5.3 | Power Systems | Equipment used for the provision of **power to network equipmen**t. Power systems provide two principal functions: the conversion of the commercial AC power source to DC voltages required by the network equipment and the generation and distribution of emergency (reserve) power when the commercial power is interrupted. This category also includes the ringing plant, a redundant plant that supplies the ringing voltage, frequency, tones, and interrupter patterns. | AC rectifiers/battery chargers  Battery systems  Uninterruptible power supplies (UPS)  DC to AC inverters  DC to DC bulk converters  AC and DC switch gear  Ring generator  Power distribution panels |
| 5.4 | Data Storage Systems | Equipment used for the **storage and retrieval of data files** such as video/music, message, on-line reference, or any other types of data files. | Video server  Message server |
| 6 | Customer Premise and Enhanced Services | Equipment installed beyond the network demarcation point. Although commonly installed on the subscriber’s premises, equipment with essentially identical function installed in the service provider’s facility may also be classified as customer premises equipment. |  |
| 6.1 | Enhanced Services (Intelligent Peripherals) | Hardware/Software systems that provide an environment in which service-specific application programs can execute and an infrastructure by which those application programs can provide enhanced services. Although each enhanced services platform has a corresponding service creation environment, that creation environment may be packaged separately and may execute on a different platform. This includes:  equipment used to allow menu **navigation and information retrieval**, often from legacy databases external to the IVR platform itself,  equipment for **storage and retrieval of voice and/or fax messages**,  unified/universal messaging systems that provide a subscriber the means, from a given device, to manipulate messages originated on like or different devices, and  Advanced Intelligent Network (AIN) nodes that add **voice band capabilities** to the AIN functional suite via communication with the SCP either directly or via message handoffs through the SSP running in the SCP through the invocation of IP related Service Independent Building Blocks (SIBBs).  Broadcast Service systems that provide Cell Broadcast Service messages, either emergency or commercial, to mobile devices | Interactive voice response IVR  Voice mail systems  Unified/universal messaging  Intelligent peripheral (AIN IP)  Broadcast Service systems |
| 6.2 | Terminal Equipment | Equipment connected to the network demarcation point that provides a service to the subscriber. Terminal equipment includes telephone sets, whether wireline, cordless, cellular, PCS, or other voice terminals, fax machines, answering machines, modems, data service units (DSUs), or ISDN terminal adapters. |  |
| 6.2.1 | Voice Terminals | Conventional, wireless, cellular, PCS, or other voice terminal equipment. |  |
| 6.2.1.1 | Wireline Telephone Sets | Telephone sets connected to conventional wireline (POTS) circuits. | POTS telephone sets  Cordless telephones |
| 6.2.1.2 | Wireless Subscriber User Terminals | The subscriber user terminal made to transmit and receive voice and/or data communication using Telecommunication Infrastructure equipment not requiring hard lines as a means of transport. User terminals may be of any functional technology available for public use. |  |
| 6.2.1.2.1 | Simple | A wireless subscriber user terminal that provides basic voice and text messaging functions. | Basic cell phone  Basic wireless single mode user terminal  Wireless multi-mode user terminal  Wireless Global user terminal |
| 6.2.1.2.2 | Complex | A wireless subscriber user terminal that provides web access, multimedia capability and/or other functionality in addition to basic voice and text messaging functions. | Wireless multi-purpose user terminal  Wireless video phone  Wireless user terminal with built-in camera  Tablet computers |
| 6.2.1.2.3 | Radios | Mobile radios, hand held or vehicle mount, providing wireless communication used for emergency and/or fleet services. | Hand Held Portable Two Way Radios  Vehicle mounted Mobile Two Way Radios |
| 6.2.1.2.4 | Wireless Terminal Software Applications | Application software (possibly after market) that provides enhanced user functionality or features for users of wireless subscriber user terminals | Application software for radios  Application software for mobile phones |
| 6.2.2 | Not currently used |  |  |
| 6.2.3 | Data Modems | Equipment used for digital communications between a computer or peripheral device and the network |  |
| 6.2.3.1 | Wired Modems | Equipment used for digital communications over copper lines (standard 4-wire, co-axial or power). | * DSL modem   V.90 modem  Cable modem  VoIP terminal adapter  BPL modem   * DSL/VoIP/Cable combined box * DSL/VoIP/Satellite combined box |
| 6.2.3.2 | Wireless Modems | Equipment used for wireless digital communications between a computer or peripheral device and the network | Wi-Fi modem  Wimax modem   * PCMCIA modem * DSL/VoIP/Cable combined box * DSL/VoIP/Satellite combined box |
| 6.2.4 | Digital Data Service Units | Equipment used for the interconnection of data terminal equipment (DTE) with a digital communications service. Such equipment typically provides a network interface and one or more DTE interfaces and may be configurable. | DDS CSU/DSU  ISDN CSU/DSU  ISDN terminal adapter  T1 CSU DSU |
| 6.2.5 | Passive Optical Network Termination Units | Equipment installed at the subscriber site used for connection to a passive optical network. | Optical Network Termination (ONT) |
| 6.2.6 | Set Top Box | Equipment that provides a consumer interface between their television and external signal source turning the signal into content, which is then displayed on the television screen. | * IP Set Top Box * QAM Set Top Box * Satellite Set Top Box * Set Top Unit |
| 6.2.7 | CPE Router | Packet routing equipment designed primarily for home or small office use to connect consumer computing, video, and IP phone equipment to the IP network. This equipment may have wireless network capability. | * 4 port router * Wireless home router * DSL/VoIP/Cable/Router (wired and/or wireless) combination box * DSL/VoIP/Satellite Router (wired and/or wireless) combination box * Intelligent Gateway |
| 6.2.8 | Home Base Station | Any CPE device designed to provide access via a wireless subscriber user terminal (cellular hand set) | * Home base station * Femtocell * Access point base station |
| 6.3 | Automatic Call Distribution (ACD) Systems | Equipment used for the **distribution of incoming calls** to any of a number of destinations based on some programmed logic. ACD systems are typically used in Customer Support service or sales centers. | * Automatic call distribution (ACD) system |
| 6.4 | Private Branch Exchange (PBX) | Equipment that provides **circuit switched voice and fax communications** services, optimized for medium to large sized customer sites. Now is evolving to utilize ATM and IP networks and support multimedia communications. | * Private branch exchange (PBX) |
| 6.5 | Small Communications System (Key Telephone System) | Equipment that provides **circuit switched voice and fax communications services**, optimized from small to medium sized customer sites. This is now evolving to utilize IP networks. | * Electronic key system * Simple attendant system |
| 6.6 | Internet Security Devices | Equipment that provides security solutions for enterprises and service providers. This includes hardware and/or software security applications to protect against Worms, Trojans, Viruses and other malware. | * Firewalls * Intrusion detection and prevention |
| 7 | Service Products | In addition to purchasing tangible hardware or software products, customers may also acquire service from an organization. Services include activities such as network engineering, installation and commissioning, product maintenance, network operation, etc., where the organization is responsible for the conduct of the activity in accordance with customer defined requirements. Services may be thought of as the result generated by activities at the interface between the organization and the customer and by the organization’s internal activities to meet the customer needs.  NOTES:  The interface between the customer and the organization may be represented by personnel or equipment.  Customer activities at the interface with the organization may be essential to the service delivery.  Delivery or use of tangible products may form part of the service delivery.  A service may be linked with the manufacture and supply of tangible product.  A contracted service is one where a legal agreement is reached between the customer and the organization to provide a service. Contracted services are services offered for sale to companies outside of the organization’s company or its subsidiaries.  An internal service is a service activity performed for internal customers within the same company as the organization. |  |
| 7.1 | Network Installation and Provisioning | Contracted or internal services to install and/or provision equipment within the network or to construct network facilities. |  |
| 7.1.1 | Installation | Contracted or internal services to position, configure, remove, and/or adjust a hardware/software product within the network. | New equipment installation  Expansion installation  Upgrade installation   * Equipment removal |
| 7.1.2 | Provisioning | Contracted or internal services to provision end-user services or end-use equipment. | Provisioning  Set-up |
| 7.1.3 | Construction | Contracted or internal service for the construction of buildings and/or outside plant infrastructure. | Construction |
| 7.2 | Engineering Services | Contracted or internal services that provide engineering activities. |  |
| 7.2.1 | Network Engineering Services | Contracted or internal services that provide engineering activities such as the layout, configuration, positioning, connecting, and adjusting of product modules to create a system. This activity may also include the writing of associated engineering documentation. These activities may be for network equipment or network infrastructure such as buildings or outside plant infrastructure. | ***Network or site engineering***  ***Outside plant engineering*** |
| 7.2.1.1 | Fixed Network | Contracted or internal network engineering services for fixed networks utilizing copper cable, fiber cable, or fixed microwave equipment. This includes power systems. | Network or site engineering  Outside plant engineering  Power system engineering |
| 7.2.1.2 | Mobile Network | Contracted or internal services that provide engineering services and activities that include but are not limited to RF Network Design, Drive Testing (including CW testing), Propagation Prediction Model Tuning, RF Network Performance, and Core Network Optimization. This service covers all major technologies including but not limited to CDMA (2G), IDEN (2G), GSM (2G), GPRS (2.5G), UMTS (3G), WIMAX (4G) and LTE (4G). | RF Design Engineering (Asset / Arieso)  RF Performance Engineering (performance statistics, parameter optimization)  Core Network Design and Optimization  Transmission Network Design and Optimization, Drive Testing (TEMS, XCAL, CW, E911, etc)  Model Tuning (Asset, etc) |
| 7.2.2 | Software Development Services | Contracted services to develop and/or test software programs or sub-routines. | Contracted software development |
| 7.2.3 | Hardware Development Services | Contracted services to develop and/or test electronic subassemblies, circuit packs, sub-systems or systems. | Contracted board design |
| 7.2.4 | Telecom Network Integration | Contracted or internal services to manage the selection and integration of products into a network. | Network integration |
| 7.2.5 | Metrology and Calibration | Contracted or internal services that provide measurement standards and/or test equipment calibration. | Metrology  Calibration |
| 7.2.6 | Telecom Test Laboratory | Contracted or internal services for verification, certification and/of network compatibility testing. | Verification lab  Certification lab  Network compatibility lab |
| 7.3 | Maintenance Services | Contracted or internal services to maintain network equipment and/or systems. These services are limited to activities typically considered part of the service provider’s standard maintenance efforts |  |
| 7.3.1 | Network Maintenance | Contracted or internal services to maintain network equipment in the field or by remote access methods. This excludes warranty and standard maintenance activities performed in support of a particular product by the product OEM. | Field maintenance  FRU replacement |
| 7.3.2 | Network Operations Center | Contracted or internal services to operate a Network Operations Center (NOC) | Network Operations Center (NOC)  Network Reliability Center (NRC) |
| 7.3.3 | Network Performance Services | Contracted services to perform projects to conduct network audits including benchmarking, improve network performance, and/or migrate telecom service and network data. | Network Audit  Network Benchmarking  Service and Data Migration |
| 7.4 | Repair Services | Contracted services to repair customer’s equipment and/or systems. | Repair of returned FRUs or systems |
| 7.5 | Customer Support Services | Contracted services to process customer requests. This service may include call answering, response to general inquiries, information requests, information sharing and technical support. When the customer support service center also handles product problem reports, those problem reports shall be included in the appropriate product category measurements and not in this category. | Call center  Web-based support  Technical support |
| 7.6 | Purchasing Services | Services for the procurement of material, equipment and services |  |
| 7.6.1 | Procurement Services | Contracted services for the procurement of reuse and new equipment. | Refurbishment/retest |
| 7.6.2 | Sourcing/ Purchasing Services | Services provided by internal organizations for the procurement of products on behalf of their parent organizations. These activities may include preparation of contracts, product and/or supplier qualification, and ongoing supplier management. | Purchasing department  Supply chain organization |
| 7.6.3 | Communications Services Acquisition | Contracted service to procure or broker the acquisition of communication services. These organizations work with a network service provider to arrange for new or modified communication services on behalf of a third party | Communications service procurement |
| 7.7 | Manufacturing Services | Services for the manufacture or distribution of assemblies and equipment |  |
| 7.7.1 | Small assemblies | Contracted services for the manufacture of small electronic or electromechanical assemblies having no more than ten major components. | Contract manufacturer |
| 7.7.2 | Printed Circuit Board Assembly | Contracted services for the manufacture of electronic printed circuit board assemblies. | Contract PCB manufacturer |
| 7.7.3 | Cable Assembly | Contracted services for the manufacture of internal and/or external connectorized metallic or fiber optic cable assemblies. | Contract cable manufacturer |
| 7.7.4 | Electromechanical Assembly | Contracted services for the manufacture of electromechanical or mechanical assemblies. Typically these assemblies contain printed circuit board assemblies, backplanes, cables, shelves and/or cabinets. These assemblies may be complex and could include fully equipped and populated racks or enclosures. | Contract manufacturing of  Fan assemblies  Cabinets  Equipment shelves  Cellular telephones  Customer Premise Equipment (CPE) |
| 7.7.5 | Logistical Services | Services for the storage and distribution of products and materials |  |
| 7.7.5.1 | Logistical Services, Third Party | Contracted services for the distribution of products between suppliers and customers. This includes logistical services such as warehousing, transportation and delivery or general distribution services where the order for the product is placed with the distributor and not the original supplier. | Warehousing  Electronic parts distributors  System distributors  Plug-in Inventory Control (PIC) center |
| 7.7.5.2 | Logistical Services, Internal | Internal services for the storage and distribution of material within the organization or to its customers. This includes logistical services such as receiving, warehousing, transportation, shipping, and delivery. | Logistics department  Shipping and receiving department |
| 7.7.5.3 | Reverse Logistics | Contracted services for the management of spare units including inventory storage, dispatch, and retrieval. | Reverse logistics  Spare unit management |
| 7.8 | Business Services | Services that provide general business support functions |  |
| 7.8.1 | Financial Services | Contracted or internal services that provide financial support functions such as pricing, accounts payable, accounts receivable, payroll and human resources databases. | Finance |
| 7.8.2 | Contract/Temporary Staffing | Contracted services that provide short term staffing. | “Temp” agency |
| 7.8.3 | Training | Contracted or internal services to develop and/or conduct employee or customer training. | Training |
| 7.8.4 | Fleet Logistics | Contracted or internal services to operate and maintain the vehicles used by a telecom company. | Fleet logistics  Motor pool |
| 7.8.5 | Facilities Management | Contracted or internal services for the acquisition, construction, management, and maintenance of land, properties, buildings, or other facilities for company offices, production, and/or network facilities | Facilities |
| 7.9 | General Support Services | Contracted or internal services that is not included in another product category. |  |
| 7.10 | Consulting Services | Contracted services offered on an assignment basis, with or without association to specific products or services, to support business/public organizations in the deployment or support of quality/information/data systems as well as other web-based applications. | Consulting |
| 7.11 | Customer Assistance | Services offered to all customer types that provide service support and information, to aid in the finding of call recipients and in making calls. | Directory assistance  Yellow pages  Operator assistance |
| 8 | Components and Subassemblies | Individual components or assemblies provided for use in telecommunications systems excluding those already covered by a specific product category in another product family. These items are typically used by other suppliers and not sold directly to service providers except as replacement parts. |  |
| 8.1 | Hardware Components | Individual self-contained active or passive devices without separable parts not included in another product category |  |
| 8.1.1 | Discrete semiconductors | Components typically performing a single function in electronic circuits, the purpose of which is switching, amplifying, or rectifying and transmitting signals. | Diodes  Transistors  Optoelectronic devices |
| 8.1.2 | Integrated circuits | A single structure containing many circuits and functions on a chip. These devices typically contain a considerable amount of intellectual property. | ASICs  FPGAs  Microprocessors |
| 8.1.3 | Passive Components | Components that are used to store electrical charges, to limit or resist electrical current, and for filtering, surge suppression, measurement, timing, and tuning. | Resistors  Capacitors  Inductors |
| 8.1.4 | Electromechanical | Electromechanical devices not covered by another Product Category such as 3.1.1.1.x, 3.1.1.2.x, 8.1.1, 8.1.2, 8.1.3, 8.5.2.1, or 8.5.2.2 | Relays  Bare PCBs  Switches |
| 8.2 | Electronic Assemblies | A device made up of a number of components for use in a telecommunications system. This device is a portion of the completed system, but does not comprise the entire system. |  |
| 8.2.1 | Simple | Less than 11 components or 49 electrical connections excluding connectors | VCXOs  Bandpass filters  MW circulators |
| 8.2.2 | Medium Complexity | More than 10 components or 48 electrical connections but less than 51 components or 241 electrical connections excluding connectors. | Multi die hybrids  DC/DC converter “bricks” |
| 8.2.3 | High Complexity | More than 50 components or 240 electrical connections but less than 501 components or 2401 electrical connections excluding connectors | Medium sized printed circuit assemblies  Backplane assemblies |
| 8.2.4 | Very High Complexity | More than 500 components or 2400 electrical connections excluding connectors | Single board computers |
| 8.3 | Cable Assemblies | Internal and/or external connectorized metallic or fiber optic cable assemblies | Telco  D-Sub  Coax  Harnesses |
| 8.4 | Electromechanical Assemblies | Devices or assemblies that are mechanical or electrical-mechanical in nature. Typically, the electromechanical assemblies contain PCBAs, backplanes, cables and/or cable assemblies. These assemblies may be complex and could include fully equipped and populated racks or enclosures. | Fan assembly  Rack assemblies  Cabinets  Equipment shelves |
| 8.5 | Optical Fiber and Devices | This category of products includes optical fiber utilized in the manufacture of telecommunications cabling media and devices, opto-electronics components modules and subassemblies deployed in optical networks and ancillary electronic devices. They are used specifically to support the functioning of optical networks and are typically supplied to optical cablers or optical equipment system integrators. They are generally not sold directly to telecommunication service organizations. |  |
| 8.5.1 | Optical Fiber | A filament of transparent dielectric material, usually glass or plastic and usually circular in cross section that guides light. | Single Mode Fiber  Multimode Fiber |
| 8.5.2 | Optical Devices | Devices that are used specifically to support the functioning of optical networks |  |
| 8.5.2.1 | Optoelectronic Devices | A device that is responsive to, or that emits or modifies electro-magnetic radiation, in the visible, infrared, and/or ultraviolet spectral regions. JEDEC Standard No. JESD 77-B 2/2000. | Lasers (VCSELs, LEDs, DFBs, FP)  Laser diodes  Photodetectors  Photo diodes  OSAs (ROSAs and TOSAs) |
| 8.5.2.2 | Passive Optical Devices | A class of optical devices that either channels or filters an optical signal among ports in a non-variable predetermined fashion. It does not contain an optical source, detector or optoelectronic transducer of any kind and does not require external power. TIA/EIA 6200000 of 12/94 or Telcordia 1209. | Isolators  Filters  Splitters  Mirrors  Lenses  Passive multiplexer  Passive demultiplexer |
| 8.5.2.3 | Optical Subassemblies | Stand-alone or “drop-in” products that perform a complete optical operation and may contain passive and/or optoelectronic devices. These subassemblies generally contain passive optical devices (8.5.2.1), active optical devices (8.5.2.2) and/or other types of components such as heaters, TECS, and standard electronic devices (8.1). These subassemblies are then used as part of an electronic assembly (8.2.x). | Optical transmitter  Optical transceivers  Optical receiver  External modulator (packaged with a laser)  Fiber optic amplifiers/EDFAs  Repeaters  Transponders  Optical MEMs |
| 8.6 | Software Components and Tools | Software programs, routines or sub-routines for use within other software programs or systems or for use in the development of other programs or systems. |  |
| 8.6.1 | Software Components | Software programs, routines or sub-routines sold for use in other software programs or systems. | Protocol stacks  Operating systems  Sort routines  Database programs  Interface programs  Drivers |
| 8.6.2 | Software Development Tools | Software programs for use in the development or testing of other programs or systems. | Compilers  Configuration management  Problem tracing and management  Complexity measurement tools  Website tools  Multimedia tools  Static analysis tools  Simulators  Measurement tools  Code coverage tools  Porting and conversion tools/services |
| 9 | End-Customer Services | End-user consumer and business customers acquire a vast variety of products from a service provider organization. These may be supplied on a buy, lease or rental basis and comprise services from simple pre-paid wireless phone service to complex solutions or outsourced facilities management of a customer organization’s entire telecommunications facilities. |  |
| 9.1 | Voice | Service products offered to business/public customers and to consumers, to support voice communications and supplementary services. | Fixed voice access  Local services calls  Long distance and international calls  Chargecard/calling cards  Voice over IP (VoIP) |
| 9.2 | Wireless | Service products offered to business/public customers and to consumers, to support mobile communications and service needs. | Mobile voice  Paging  Small message service (SMS)  GPRS/3G message/visuals  WAP protocol services |
| 9.3 | Transport Networks | Service products provided to business customers or other operators, to allow them to connect two or more physical sites as a communications network, either through multiple point-to-point services, or via a multi-point network. | International private leased circuit  Analogue private circuit  Managed bandwidth  X25 packet switching  Unbundled local loop |
| 9.4 | Private Networks | Service products designed and provided to allow business and/or public customer organizations that provide communications connections using specific network platforms or protocols, or to operate internal communications networks, whether for voice and/or data use. This may include a private network operated by an organization entirely internal to the company. | VPN MPLS services  Metropolitan network services  Local area network (LAN)  Wide area network (WAN)  Virtual LAN (VLAN)  LAN extension (Gigabit Ethernet)  IP VPN  Frame relay services  Cell/ATM services  Short haul data services  Switched multi-megabit data  IP connectivity |
| 9.5 | Internet Access | Service products offered to business, public organizations and to consumers, that provide them with access to Internet services and networks, at speeds and levels of availability appropriate to their needs. | Fixed access – ISDN, DSL  Dial solutions  Fixed and dial VPNs  Security, e.g., firewalls  Certification  Internet service provider (ISP) |
| 9.6 | e-Business and Content Hosting | Chargeable service products offered separately or as part of a solution to customers with data, Internet/Intranet and information systems needs. | Hosting – dedicated, managed storage, co-location  Managed firewalls  Content distribution  Applications – eCRM, supply chain, e-learning, e-government  Subscription services – video, audio, or data  Cloud computing |
| 9.7 | Bulk Transport | Services provided to other licensed operators or carriers to allow them to operate networks or services, without necessarily owning 100% of their operating network. |  |
| 9.7.1 | Infrastructure | Service products that provide network infrastructure on a lease or rental basis, on long or short-term contracts. | Wavelength  Dark fiber  Duct  Satellite services |
| 9.7.2 | Wholesale | Service products provided to allow operators to trade traffic on a correspondent basis or to offer services without having to maintain a network of their own. | Wholesale voice  Wholesale long distance  Wholesale IP  Outbound voice  Inbound voice |
| 9.8 | Video Broadcast Services | Service products that provide broadcast video to subscribers | Cable TV  Satellite TV  Video over fiber  IPTV |
| 9.9 | Emergency Service Network | Service to provide an emergency services network | E911 network  E112 network |

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## Table A-2 Measurement Applicability Table (Normalization Units)

1. Measurements Without Normalization Factors

The measurements Fix Response Time (FRT), Overdue Fix Responsiveness (OFR), and On-Time Delivery (OTD) are applicable and required for ALL product categories. The measurements FRT, OFR and OTD do not require product specific normalization. In the interest of saving space, they are not listed in the following table, but data must be submitted for each of these three measurements in all product categories. Table A-2 defines the normalization units and applicability of the other measurements.

1. Other Rules and References

i) Where the normalization factor is traffic capacity based, such as DS1, OC-1, DSL or Terminations, the calculation shall be based on the true usable traffic capacity. Equipment within the system used to provide protection for the main traffic path shall not be included, as it does not add usable capacity to the system.

ii) The column headings in Table A‑2 are general descriptions covering several sub-measurements in some cases. For cross-references to the detailed descriptions of the measurements elsewhere in this document, refer to the measurement and sub-measurement symbols in Table A‑6 and Table A-7.

iii) For some product categories it may not be clear what is to be considered a unit. The following is added as an aid for the listed categories:

7.6.1 – total quantity of items procured

7.9 – total quantity of items provided or supported

8.6.1 – copies/licenses issued

8.6.2 – simultaneous licensed users

iv) An optical channel, for the purposes of TL 9000 normalization factor calculation, is defined as an individual wavelength of light.

v) The measurements examples on the tl9000.org website contain specific examples of techniques and methods for calculating normalization factors.

1. Measurement Summary Listing

Table A‑6 is a listing of the measurements included in this handbook with the symbols used in data reporting, the applicability to hardware, software, and/or services (H, S, V), and a reference to the table in this handbook with data reporting details. The symbols listed here are referenced by the normalization unit and applicability table to clarify the general descriptions used as column headings.

| Table A-2 Measurement Applicability Table (Normalization Units) | | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Product Category** | | **Problem  Reports**  **H,S,V** | **Outage Measurements** | | | | | **Return Rate** | | | **Software Measurements** | | | | | | | | |
| **Code** | **Description** | **Service Impact**  **H,S** | **Network Element Impact**  **H,S** | | | | **Field Replaceable Unit Returns**  **H** | | **Basic Return Rate**  **H** | **Software Fix Quality**  **S** | | | **Software Problem Reports**  **S** | | | | | |
| TL 9000 Measurement Symbols (see Table A‑6) | | **NPR** | **SO** | **SONE** | | | | **FR** | | **BRR** | **SFQ** | | | **SPR** | | | | | |
| 1 | Switching |  | | | | | | | | | | | | | | | | | |
| 1.1h | Circuit Switch – all non-remotes including host systems | Network Element | Termination | Network Element | | | | Termination | | NA | Required | | | Same as NPR | | | | | |
| 1.1r | Circuit Switch – remotes only | NA | Termination | Network Element | | | | NA | | NA | NA | | | NA | | | | | |
| NOTE : | All organizations registering in 1.1 shall report data for 1.1h and 1.1r in one data submission. If there are no remote applications for their particular product, then “EXEMPT” shall be entered in the 1.1r data. Data for measurements indicated “EXEMPT” for 1.1r is to be reported in combination with the host data in 1.1h. | | | | | | | | | | | | | | | | | | |
| NOTE : | For MSC, terminations should equate to configured channels. | | | | | | | | | | | | | | | | | | |
| 1.2 | Packet Switch |  | | | | | | | | | | | | | | | | | |
| 1.2.1 | Legacy Packet Products | Network Element | Network Element | NA | | | | Termination | | NA | Required | | | Same as NPR | | | | | |
| 1.2.2 | Access Multi-service | Network Element | Network Element | Network Element | | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 1.2.3 | Media Gateways | Network Element | Network Element | Network Element | | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 1.2.4 | Not currently used |  | | | | | | | | | | | | | | | | | |
| 1.2.5 | Not currently used |  | | | | | | | | | | | | | | | | | |
| 1.2.6 | Not currently used |  | | | | | | | | | | | | | | | | | |
| 1.2.7 | Application Servers | Network Element | Network Element | Network Element | | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 1.2.8 | Service and Network Controller (SNC) | Network Element | Maximum Configured Call Capacity | Network Element | | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 1.2.9 | Routers |  |  | | | | | | | | | | | | | | | | |
| 1.2.9.1 | Core | Network Element | Network Element | | Network Element | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 1.2.9.2 | Edge | Network Element | Network Element | | Network Element | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 1.2.9.3 | Access | Network Element | Network Element | | Network Element | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 2 | Signaling and Network Control |  |  | | | | | | | | | | | | | | | | |
| 2.1 | Service Control {Formerly Service Control Point (SCP)} | Network Element | Network Element | | Network Element | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 2.2 | Common Channel Signaling {formerly Signaling Transfer Point (STP)} | Network Element | Network Element | | Network Element | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 2.3 | Home Location Register (HLR) | Network Element | Network Element | | Network Element | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 2.4 | Service Logic (SL) | Network Element | Network Element | | Network Element | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 2.5 | Protocol Servers | Network Element | Network Element | | Network Element | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 2.6 | Network Access Control | Network Element | Subscriber | | Network Element | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 2.7 | Network Security | Network Element | Network Element | | Network Element | | | Network Element | | NA | Required | | | Same as NPR | | | | | |
| 3 | Transmission Systems |  | | | | | | | | | | | | | | | | | |
| 3.1 | Transmission Media and Structure (Outside Plant) |  | | | | | | | | | | | | | | | | | |
| 3.1.1 | Transmission Medium |  | | | | | | | | | | | | | | | | | |
| 3.1.1.1 | Metallic Products |  | | | | | | | | | | | | | | | | | |
| 3.1.1.1.1 | Metallic Conductor Cable | Finished product ,million meters shipped | NA | | NA | | | NA | | NA | | NA | | | | NA | | | |
| 3.1.1.1.2 | Metallic Connectors | Units shipped | NA | | NA | | | NA | | NA | | NA | | | | NA | | | |
| 3.1.1.2 | Fiber Optic Cable Products |  | | | | | | | | | | | | | | | | | |
| 3.1.1.2.1 | Fiber Optic Cable | Finished product million meters shipped | NA | | NA | NA | | | | NA | | | NA | | | | NA | | |
| 3.1.1.2.2 | Optical connectors | Units shipped | NA | | NA | NA | | | | NA | | | NA | | | | NA | | |
| 3.1.1.3 | Transmission Sub-systems |  | | | | | | | | | | | | | | | | | |
| 3.1.1.3.1 | Active Sub-systems | Units shipped | NA | | NA | NA | | | | Required | | | NA | | | | NA | | |
| 3.1.1.3.2 | Passive Optical Sub-systems | Units shipped | NA | | NA | NA | | | | Required | | | NA | | | | NA | | |
| 3.1.1.3.3 | Ancillary Sub-systems | Unit shipped | NA | | NA | NA | | | | Required | | | NA | | | | NA | | |
| 3.1.1.3.4 | Fixed Antenna Systems |  | | | | | | | | | | | | | | | | | |
| 3.1.1.3.4.1 | Radio Antenna Systems | Network Element | NA | | NA | | | | NA | Required | | | NA | | | | | NA | |
| 3.1.1.3.4.2 | Satellite Antenna Systems | Network Element | NA | | NA | | | | NA | Required | | | NA | | | | | NA | |
| 3.1.1.3.4.3 | Optical Antenna Systems | Network Element | NA | | NA | | | | NA | Required | | | NA | | | | | NA | |
| 3.1.2 | Physical Structure |  | | | | | | | | | | | | | | | | | |
| 3.1.2.1 | Enclosures | Units shipped | NA | | NA | NA | | | | Required | | | NA | | | | | NA | |
| 3.1.2.2 | Support Structures | Units shipped | NA | | NA | NA | | | | Required | | | NA | | | | | NA | |
| 3.1.2.3 | Conduits | Meters shipped | NA | | NA | NA | | | | Required | | | NA | | | | | NA | |
| 3.2 | Transport Equipment |  | | | | | | | | | | | | | | | | | |
| 3.2.1 | Cross Connect Systems |  | | | | | | | | | | | | | | | | | |
| 3.2.1.1 | Manual Cross Connect Systems | Network Element | NA | | NA | DS1 | | | | NA | | | NA | | NA | | | | |
| 3.2.1.2 | Digital Cross Connect Systems | Network Element | DS1 | | Network Element | DS1 | | | | NA | | | Required | | Same as NPR | | | | |
| 3.2.1.3 | Optical Cross Connect Systems | Network Element | OC1 | | Network Element | OC1 | | | | NA | | | Required | | Same as NPR | | | | |
| 3.2.2 | Carrier Systems/Multiplexers |  | | | | | | | | | | | | | | | | | |
| 3.2.2.1 | Interoffice/Long Haul |  | | | | | | | | | | | | | | | | | |
| 3.2.2.1.1 | Metallic Carrier Systems | Network Element | DS1 | | Network Element | DS1 | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.2.1.2 | Optical Carrier Systems |  |  | |  |  | | | |  | | | | | | | | |  |
| 3.2.2.1.2.1 | SONET/SDH Transport Systems | Network Element | OC-1 | | Network Element | OC-1 | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.2.1.2.2 | WDM/DWDM/Optical Amplification | Network Element | Optical Channel | | Network Element | Optical Channel | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.2.1.2.3 | Reconfigurable Optical Add-Drop Multiplexer (ROADM) | Network Element | Optical Channel | | Network Element | Optical Channel | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.2.1.3 | Microwave | Network Element | DS1 | | Network Element | DS1 | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.2.2 | Loop Carrier | Network Element | DS1 | | Network Element | DS1 | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.3 | Line Terminating Equipment/Distributing Frames | Network Element | NA | | NA | Termination | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.4 | Digital Subscriber Line (DSL) |  | | | | | | | | | | | | | | | | | |
| 3.2.4.1 | Legacy | Network Element | DSL | | Network Element | DSL | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.4.2 | Symmetric | Network Element | DSL | | Network Element | DSL | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.4.3 | Asymmetric | Network Element | DSL | | Network Element | DSL | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.4.4 | IP | Network Element | DSL | | Network Element | DSL | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.5 | Fiber to the User | Network Element | Subscriber | | NA | Subscriber | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.6 | Video Transmission |  | | | | | | | | | | | | | | | | | |
| 3.2.6.1 | Cable Modem Termination Equipment | Network Element | Network Element | | NA | Network Element | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.6.2 | Analog Video Transmission Equipment | Network Element | Network Element | | Network Element | Network Element | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.6.3 | Digital Video Transmission Equipment | Network Element | Network Element | | Network Element | Network Element | | | | NA | Required | | | Same as NPR | | | | | |
| 3.2.6.4 | Ad Server | Network Element | Network Element | | Network Element | Network Element | | | | NA | Required | | | Same as NPR | | | | | |
| 3.3 | Wireless Transmission |  | | | | | | | | | | | | | | | | | |
| 3.3.1 | Base Station Equipment | Network Element | Network Element | | Network Element | Unit | | | | NA | Required | | | Same as NPR | | | | | |
| 3.3.2 | Base Transceiver System (BTS) |  | | | | | | | | | | | | | | | | | |
| 3.3.2.1 | Basic | Network Element | Network Element | | Network Element | Unit | | | | NA | Required | | | Same as NPR | | | | | |
| 3.3.2.2 | Advanced | Network Element | Network Element | | Network Element | Unit | | | | NA | Required | | | Same as NPR | | | | | |
| 3.3.2.3 | 4G | Network Element | Network Element | | Network Element | Unit | | | | NA | Required | | | Same as NPR | | | | | |
| 3.3.3 | Pilot Beacon Unit (PBU) | Network Element | Network Element | | Network Element | Unit | | | | NA | Required | | | Same as NPR | | | | | |
| 3.3.4 | WLAN Base Station Equipment | Network Element | Network Element | | Network Element | Unit | | | | NA | Required | | | Same as NPR | | | | | |
| 3.4 | Ancillary Products |  | | | | | | | | | | | | | | | | | |
| 3.4.1 | Location Services | Network Element | Network Element | | Network Element | Unit | | | | NA | Required | | | Same as NPR | | | | | |
| 3.4.2 | Lawful Intercept | Network Element | NA | | NA | Unit | | | | NA | Required | | | Same as NPR | | | | | |
| 4 | Operations & Maintenance |  | | | | | | | | | | | | | | | | | |
| 4.1 | Test Systems | Network Element | NA | | NA | | Unit | | | NA | Required | | | Same as NPR | | | | | |
| 4.2 | Operations Support Systems |  | | | | | | | | | | | | | | | | | |
| 4.2.1 | On-line Critical | System | System | | System | | System | | | NA | Required | | | Same as NPR | | | | | |
| 4.2.2 | On-line Non-Critical | System | System | | System | | System | | | NA | Required | | | Same as NPR | | | | | |
| 4.2.3 | Off-line | System | System | | System | | System | | | NA | Required | | | Same as NPR | | | | | |
| 4.3 | Ancillary Operations and Maintenance | Units shipped | NA | | NA | | Unit | | | NA | NA | | | NA | | | | | |
| 5 | Common Systems |  | | | | | | | | | | | | | | | | | |
| 5.1 | Synchronization | Network Element | Network Element | | NA | | Network Element | | | NA | NA | | | NA | | | | | |
| 5.2 | General Purpose Computers | Network Element | Network Element | | NA | | Network Element | | | NA | Required | | | Same as NPR | | | | | |
| 5.3 | Power Systems | Network Element | Network Element | | NA | | Unit | | | NA | NA | | | NA | | | | | |
| 5.4 | Data Storage Systems | Network Element | Network Element | | NA | | Network Element | | | NA | Required | | | Same as NPR | | | | | |
| 6 | Customer Premise and Enhanced Services |  | | | | | | | | | | | | | | | | | |
| 6.1 | Enhanced Services (Intelligent Peripherals) | Network Element | Network Element | | Network Element | | Network Element | | | NA | Required | | | Same as NPR | | | | | |
| 6.2 | Terminal Equipment |  | | | | | | | | | | | | | | | | | |
| 6.2.1 | Voice Terminals |  | | | | | | | | | | | | | | | | | |
| 6.2.1.1 | Wireline Telephone Sets | Units shipped | NA | | NA | | NA | | | Required | Required | | | Same as NPR | | | | | |
| ***6.2.1.2*** | ***Wireless Subscriber User Terminals*** |  | | | | | | | | | | | | | | | | | |
| 6.2.1.2.1 | Simple | Units shipped | NA | | NA | NA | | | | Required | Required | | | Same as NPR | | | | | |
| 6.2.1.2.2 | Complex | Units shipped | NA | | NA | NA | | | | Required | Required | | | Same as NPR | | | | | |
| 6.2.1.2.3 | Radios | Units shipped | NA | | NA | NA | | | | Required | Required | | | Same as NPR | | | | | |
| 6.2.1.2.4 | Wireless Terminal Software Applications | Licenses | NA | | NA | NA | | | | Required | Required | | | Same as NPR | | | | | |
| 6.2.2 | Not currently used |  | | | | | | | | | | | | | | | | | |
| 6.2.3 | Data Modems |  | | | | | | | | | | | | | | | | | |
| 6.2.3.1 | Wired Modems | Units shipped | NA | | NA | | | | NA | Required | Required | | | Same as NPR | | | | | |
| 6.2.3.2 | Wireless Modems | Units shipped | NA | | NA | | | | NA | Required | Required | | | Same as NPR | | | | | |
| 6.2.4 | Digital Data Service Units | Units shipped | NA | | NA | | | | NA | Required | Required | | | Same as NPR | | | | | |
| 6.2.5 | Passive Optical Network Termination Units | NEs shipped | NA | | NA | | | | Network Element | NA | Required | | | Same as NPR | | | | | |
| 6.2.6 | Set Top Box | Units shipped | NA | | NA | | | | Unit | NA | Required | | | Same as NPR | | | | | |
| 6.2.7 | CPE Router | Units shipped | NA | | NA | | | | Unit | NA | Required | | | Same as NPR | | | | | |
| 6.2.8 | Home Base Station | Units shipped | NA | | NA | | | | Unit | NA | Required | | | Same as NPR | | | | | |
| 6.3 | Automatic Call Distribution (ACD) Systems | Network Element | Network Element | | NA | | | | Network Element | NA | Required | | | Same as NPR | | | | | |
| 6.4 | Private Branch Exchange (PBX) | Network Element | Network Element | | NA | | | | Network Element | NA | Required | | | Same as NPR | | | | | |
| 6.5 | Small Communications System (Key Telephone System) | Network Element | Network Element | | NA | | | | Network Element | NA | Required | | | Same as NPR | | | | | |
| 6.6 | Internet Security Devices | Network Element | NA | | NA | | | | Network Element | NA | Required | | | Same as NPR | | | | | |

| Table A-2 Measurement Applicability Table (Normalization Units) | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Product Category** | |  | | | | | | | | | |
| **Code** | **Description** | **Problem Reports**  **H,S,V** | | **Outage Frequency**  **V** | **Mean Time to Restore Service**  **V** | **Basic Return Rate**  **H** | **Service Quality V** | | | | |
| **SQ** | | | | |
| TL 9000 Measurement Symbols (see Table A‑6) | | **NPR** | | **SSO** | **MTRS** | **BRR** | **Numerator** | | **Denominator** | **Notes/Comments** | |
| 7 | Service Products |  | | | | | | | | | |
| ***7.1*** | Network Installation and Provisioning |  | |  |  |  |  | |  | |  |
| 7.1.1 | Installation | Job | | Job | NA | NA | Non-conforming audits | | Audits | Based on audits performed by the organization or on its behalf prior to customer acceptance. Defects shall include organization caused installation engineering defects and installation defects. A nonconforming audit is one that fails to satisfy specified acceptance requirements. These audits may be performed on a sample basis.  NOTE: An installation audit performed by the customer is not included unless the organization requested the customer perform the audit | |
| 7.1.2 | Provisioning | Job | | Job | NA | NA | Defective Transactions | | Transactions | Transaction is a provisioning task for a customer | |
| 7.1.3 | Construction | Job | | Job | NA | NA | NA | | |  | |
| 7.2 | Engineering Services |  | | | | | | | | | |
| ***7.2.1*** | ***Network Engineering Services*** |  | | | | | | | | | |
| 7.2.1.1 | Fixed Network | Job | | Job | NA | NA | NA | | NA |  | |
| 7.2.1.2 | Mobile Network | Job | | Job | NA | NA | NA | | NA |  | |
| 7.2.2 | Software Development Services | Contracted Items Delivered | | NA | NA | NA | NA | | NA |  | |
| NOTE: | The contracted items delivered are likely to be the same items tracked for the OTD measure. | | | | | | | | | | |
| 7.2.3 | Hardware Development Services | Contract | | NA | NA | NA | NA | | |  | |
| 7.2.4 | Telecom Network Integration | Contract | | NA | NA | NA | NA | | |  | |
| 7.2.5 | Metrology and Calibration | Contract | | NA | NA | NA | Defective Transactions | | Transactions |  | |
| 7.2.6 | Telecom Test Laboratory | Contracted Test | | NA | NA | NA | NA | | |  | |
| ***7.3*** | ***Maintenance Services*** |  | | | | | | | | | |
| 7.3.1 | Network Maintenance | Network Elements maintained | | Maintenance Actions | NA | NA | Maintenance Callbacks | | Maintenance Actions | Maintenance actions or callbacks shall not be counted if it is determined that they were attributable to incorrect information supplied by the customer as mutually agreed between parties. A maintenance action is a site visit to a customer’s location or remote intervention either through telephone/electronic contact with local customer personnel or through remote system access for the purpose of performing maintenance. A maintenance callback is a site visit to a customer’s location or remote access for the purpose of maintenance rework. | |
| 7.3.2 | Network Operations Center | Network Elements under management | | Network Elements under management | Required | NA | NA | | |  | |
| 7.3.3 | Network Performance Services | Job | | Job | NA | NA | NA | | |  | |
| 7.4 | Repair Services | Units repaired | | NA | NA | NA | Units returned in the report month that were shipped by the repair organization within the last 12 months | | Number of units shipped by the repair organization in the previous12 months | The glossary definition of “return” applies. Returns are counted when received by the organization. | |
| 7.5 | Customer Support Services | Support requests | | Support requests | NA | NA | Unsatisfactory Support Request Responses | | Support Requests | Customer Support Center activities that become customer originated problem reports are not included in this measure. | |
| 7.6 | Purchasing Services |  | | | | | | | | | |
| 7.6.1 | Procurement Services | Unit | NA | | NA | NA | Units returned in the report month that were procured within the last 12 months | | Number of units procured in the previous 12 months | The glossary definition of “return” applies. Returns are counted when received by the organization. | |
| 7.6.2 | Sourcing/Purchasing Services | Transactions | NA | | NA | NA | Defective Transactions | | Transactions |  | |
| 7.6.3 | Communications Services Acquisition | Orders | NA | | NA | NA | NA | | |  | |
| 7.7 | Manufacturing Services |  | | | | | | | | | |
| 7.7.1 | Small assemblies | Units shipped | NA | | NA | Required | NA | | |  | |
| 7.7.2 | Printed Circuit Board Assembly | Units shipped | NA | | NA | Required | NA | | |  | |
| 7.7.3 | Cable Assembly | Units shipped | NA | | NA | Required | NA | | |  | |
| 7.7.4 | Electromechanical Assembly | Units shipped | NA | | NA | Required | NA | | |  | |
| 7.7.5 | Logistical Services |  |  | |  |  |  | | |  | |
| 7.7.5.1 | Logistical Services, Third Party | Order | NA | | NA | NA | NA | | |  | |
| 7.7.5.2 | Logistical Services, Internal | Order | NA | | NA | NA | NA | | |  | |
| 7.7.5.3 | Reverse Logistics | Units shipped | NA | | NA | NA | NA | | |  | |
| 7.8 | Business Services |  | | | | | | | | | |
| 7.8.1 | Financial Services | Transaction | NA | | NA | NA | Defective Transactions | | Transactions |  | |
| 7.8.2 | Contract/Temporary Staffing | Position filled | NA | | NA | NA | Defective Transactions | | Transactions |  | |
| 7.8.3 | Training | Courses conducted | NA | | NA | NA | Defective Transactions | | Courses conducted |  | |
| 7.8.4 | Fleet Logistics | Vehicle | NA | | NA | NA | Defective Transactions | | Vehicles |  | |
| 7.8.5 | Facilities Management | Indoor Square Meters Managed | NA | | NA | NA  NA | NA | | |  | |
| 7.9 | General Support Services | Transaction | NA | | NA | NA  NA | Defective Transactions | Transactions | |  | |
| 7.10 | Consulting Services | Assignment | NA | | NA | NA  NA | NA | | |  | |
| 7.11 | Customer Assistance | Transaction | NA | | NA | NA  NA | NA | | |  | |

| Table A-2 Measurement Applicability Table (Normalization Units) | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Product Category** | |  | | | | |
| **Code** | **Description** | **Problem Reports**  **H,S,V** | **Return Rate**  **H** | | **Software Measures**  **S** | |
| TL 9000 Measurement Symbols (see Table A‑6) | | **NPR** | **FR** | **BRR** | **SFQ** | **SPR** |
| 8 | Components and Subassemblies |  | | | | |
| 8.1 | Hardware Components |  | | | | |
| 8.1.1 | Discrete semiconductors | Units shipped | NA | NA | NA | NA |
| 8.1.2 | Integrated circuits | Units shipped | NA | NA | NA | NA |
| 8.1.3 | Passive Components | Units shipped | NA | NA | NA | NA |
| 8.1.4 | Electromechanical | Units shipped | NA | NA | NA | NA |
|  | Important information for the categories noted. | ***Formerly the products in*** ***8.2.1, 8.2.2, 8.2.3, 8.2.4, 8.3, and 8.4 were provided by two types of organizations:***   1. ***Organizations that design and develop the product for general sale on the open market. The activities of these organizations include full support of the product before and after the sale*** 2. ***Contract manufacturing organizations that build these products for another company. The receiving company is responsible for support of the product.***   The type b organizations were moved to Section 7 – Services and are no longer included in the Section 8 categories. This is to better reflect that contract manufacturing is a service. Including these activities in the Components and Subassemblies Section 8 led to confusion. | | | | |
| 8.2 | Electronic Assemblies |  |  | |  | |
| 8.2.1 | Simple | Units shipped | NA | Required | NA | NA |
| 8.2.2 | Medium Complexity | Units shipped | NA | Required | NA | NA |
| 8.2.3 | High Complexity | Units shipped | NA | Required | NA | NA |
| 8.2.4 | Very High Complexity | Units shipped | Unit | NA | NA | NA |
| 8.3 | Cable Assemblies | Units shipped | NA | NA | NA | NA |
| 8.4 | Electromechanical Assemblies | Units shipped | Unit | NA | NA | NA |
| 8.5 | Optical Fiber and Devices |  |  | |  | |
| 8.5.1 | Optical Fiber | Finished product meters shipped | NA | NA | NA | NA |
| 8.5.2 | Optical Devices |  | | | | |
| 8.5.2.1 | Optoelectronic Devices | Units shipped | NA | Required | NA | NA |
| 8.5.2.2 | Passive Optical Devices | Units shipped | NA | Required | NA | NA |
| 8.5.2.3 | Optical Subassemblies | Units shipped | Unit | NA | NA | NA |
| 8.6 | Software Components and Tools |  |  | |  | |
| 8.6.1 | Software Components | Unit | NA | NA | NA | NA |
| 8.6.2 | Software Development Tools | Unit | NA | NA | NA | NA |

| Table A-2 Measurement Applicability Table (Normalization Units) | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Product Category** | |  | | | | | | | | |
| **Code** | **Description** | **Problem Reports**  **H,S,V** | **Service Impact Outages**  **H,S,V** |  | **Software Measures**  **S** | | **Service Measures**  **V** | | | |
| **Global Service Impact**  **H,S,V** | **SQ** | | |  |
| TL 9000 Measurement Symbols  (see Table A‑6) | | **NPR** | **SO** | **GSI** | **SFQ** | **SPR** | **Numerator** | **Denominator** | **Notes/ Comments** | **CCRR** |
| 9 | End-Customer Services |  | | | | | | | | |
| 9.1 | Voice | Active Phone Numbers | Terminations | Active Phone Numbers | NA | NA | Unsuccessful Calls | Call Attempts | Unsuccessful calls may also be known as “blocked” calls | Active phone numbers |
| 9.2 | Wireless | Active Subscribers | Active Subscribers | NA | NA | NA | Dropped Calls | Total Call Minutes |  | NA |
| 9.3 | Transport Networks | Trunk | Trunk | NA | NA | NA | NA | |  | NA |
| 9.4 | Private Networks | 10 MB Bandwidth | 10 MB Bandwidth | NA | NA | NA | NA | |  | NA |
| 9.5 | Internet Access | Subscriber Port | Subscriber Port | Subscriber port | Required | Same as NPR | NA | |  | Subscriber port |
| 9.6 | e-Business and Content Hosting | Hosted Customer Sites | Hosted Customer Sites | NA | Required | Same as NPR | Maintenance Callbacks | Maintenance Visits |  | NA |
| 9.7 | Bulk Transport |  | | | | | | | | |
| 9.7.1 | Infrastructure | Channel | Channel | NA | NA | NA | NA | |  | NA |
| 9.7.2 | Wholesale | Channel | Channel | NA | NA | NA | NA | |  | NA |
| 9.8 | Video Broadcast Services | Subscribers | Subscribers | Subscribers | NA | NA | NA | |  | Subscribers |
| 9.9 | Emergency Service Network | End Users | End Users | End Users | NA | NA | NA | |  | NA |

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## Table A-3 Network Element Impact Outage Definitions

| Table A-3 Network Element Impact Outage Definitions | | | |
| --- | --- | --- | --- |
| Product Category | | Total Outage | Partial Outage |
| Number | Name |
| All |  | A failure that results in the loss of functionality of the entire Network Element. | The loss of part of the capability or services of the network element but not all of the capability or services. Events, which qualify as total outages, are not counted as partial outages. |
| All | All where NE outage applicable | Unless otherwise stated below, an unscheduled event must be longer than 15 seconds to be considered an NE Impact outage | Unless otherwise stated below, an unscheduled event must be longer than 15 seconds to be considered an NE Impact outage |
| All | All where NE outage applicable | Unless otherwise stated below, a scheduled event must be longer than 15 seconds to be considered an NE Impact outage | Unless otherwise stated below, a scheduled event must be longer than 15 seconds to be considered an NE Impact outage |
| All | All where NE outage applicable |  | **Unless otherwise stated below, in cases of the loss of the primary function of the NE, the weighting of the duration of a partial outage shall be determined by the percent of the NE affected by the outage.** |
| All | All where NE outage applicable |  | **Unless otherwise stated below, the partial outage weight for all special services, functions or features are to be negotiated between the organization and the customer.** |
| 1.1 | Circuit Switch | Varies according to switch type as noted in the following | Default weight for loss of access to emergency services (i.e. 911) is 25% |
| 1.1, cont’d | End Office (host or remote) and Tandem | Loss of origination and termination capability in all lines. | Partial outages includes:  Switch Isolation  Remote operating in isolation (default weight is 50%)  Loss of origination or termination capability in more than 64 terminations  Loss of access to one or more critical services  Loss of stable calls  System congestion problem that results in call blocking greater than 0.3% of call attempts  85% or more of the service subscribers experience a dial tone delay of 3 seconds or greater  Loss of CCS (default weight is 50%) |
| 1.1, cont’d | Combined Tandem/ End Office | Loss of origination and termination capability in all terminations. | Same as End Office |
| 1.1, cont’d | Hybrid Voice Over Packet (HVOP) | Loss of capability to originate and terminate all traffic. | Partial TDM outage – same as End office above  Partial Packet outage -  loss of an aggregate service bandwidth over 5% of the provisioned bandwidth **for more than 10 seconds**  interface switchovers that last **longer than 60 milliseconds**  Loss of access to one or more critical services  System congestion problem that results in call blocking greater than 0.3% of call attempts  Loss of stable connections  Total loss of a non-critical service  Total loss of one or more Operation, Administration, & Maintenance (OA&M) functions (default weight is 5%)  Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 1.1, cont’d | MSC/ISC | Loss of all capacity for origination and/or termination of voice and data traffic. | Loss of greater than 5% of the provisioned capacity for origination and/or termination of combined voice and/or data traffic.  Loss of access to one or more critical services  Loss of stable connections  Total loss of a non-critical service  Total loss of one or more OA&M functions (default weight is 5%)  Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 1.2.2 | Access Multi-service | Total network element outage is constituted by any of the following events:   * Loss of all ability to transport packets between all interface points including loss of stable connections for a period **longer than one second**; * Total network element isolation **for more than 10 seconds** * Loss of all services for **longer than 10 seconds** * For a connection based network element, total loss of ability to set up or tear down connections for a period **longer than 10 seconds**. | Loss of capability to originate and terminate more than 64 lines or trunks (DS0)   * Loss of an aggregate service bandwidth over 5% of the provisioned bandwidth **for more than 10 seconds** or loss of more than 4MB of service bandwidth **for more than 5 minutes**   System congestion problem that results in call blocking greater than 0.3% of call attempts  System congestion which impacts greater than 5% of all session set-up attempts  Loss of all stable calls or sessions   * 85% or more of the service subscribers experience a session delay of 3 seconds or greater for a period **longer than 30 seconds** Interface switchovers lasting **longer than 60 milliseconds**   Total loss of one or more but not all services (such as ISDN capability, DS1, POTS, etc.) **for more than 10 seconds**   * Total loss of one or more OA&M functions (default weight is 5%) * Total loss of visibility from Element Management System (EMS) (default weight is 10%) |
| 1.2.3 | Media Gateways | Total loss of ability to provide multimedia communications across networks | * Loss of more than 5% of multimedia services * Loss of stable service sessions * Total loss of one or more but not all services * System congestion which impacts greater than 5% of all session set-up attempts * 85% or more of the service subscribers experience a session delay of 3 seconds or greater for a period longer than 30 seconds * Interface switchovers lasting **longer than 60 milliseconds** * Total loss of one or more OA&M functions (default weight is 5%) * Total loss of visibility from Element Management System (EMS) (default weight is 10%) |
| 1.2.7 | Application Servers | Total loss of ability to provide IP based multimedia services | * Loss of more than 5% of the IP based multimedia services * Loss of stable service sessions * Total loss of one or more but not all services * System congestion which impacts greater than 5% of all session set-up attempts * 85% or more of the service subscribers experience a session delay of 3 seconds or greater for a period longer than 30 seconds * Interface switchovers lasting **longer than 60 milliseconds** * Total loss of one or more OA&M functions (default weight is 5%) * Total loss of visibility from Element Management System (EMS) (default weight is 10%) |
| 1.2.8 | Service and Network Controller | Total loss of capability to originate and terminate all traffic | Includes any of the following:  Loss of capability to originate and terminate more than 5% of the packet traffic  Loss of access to one or more critical services  Loss of all stable calls or sessions  System congestion which results in call blocking of greater than 0.3% of all call attempts  85% or more of the service subscribers experience a dial tone delay of 3 seconds or greater for a period longer than 30 seconds  Total loss of a non-critical service   * Total loss of one or more OA&M functions (default weight is 5%) * Total loss of visibility from Element Management System (EMS) (default weight is 10%) * Loss of CCS (default weight is 50%) |
| 1.2.9.1 | Core (Routers) | Total network element outage is constituted by any of the following events:   * Loss of all ability to transport packets between all interface points including loss of stable connections for a period **longer** **than one second** * Total network element isolation for **more than 10 seconds** * Loss of all services for **longer than 10 seconds**   For a connection based network element, total loss of ability to set up or tear down connections for a period **longer than 10 seconds.** | * Loss of an aggregate service bandwidth over 5% of the provisioned bandwidth **for more than 10 seconds** or loss of more than 4MB of service bandwidth **for more than 5 minutes** * Interface switchovers lasting **longer than 60 milliseconds** * Total loss of a service(s) for **more than 10 seconds** * Total loss of one or more OA&M functions (default weight is 5%) * Total loss of visibility from Element Management System (EMS) (default weight is 10%) |
| 1.2.9.2 | Edge (Routers) | Total network element outage is constituted by any of the following events:   * Loss of all ability to transport packets between all interface points including loss of stable connections for a period **longer** **than one second** * Total network element isolation for **more than 10 seconds** * Loss of all services for **longer than 10 seconds**   For a connection based network element, total loss of ability to set up or tear down connections for a period **longer than 10 seconds.** | * Loss of an aggregate service bandwidth over 5% of the provisioned bandwidth **for more than 10 seconds** or loss of more than 4MB of service bandwidth **for more than 5 minutes** * Interface switchovers lasting **longer than 60 milliseconds** * Total loss of a service(s) for **more than 10 seconds** * Total loss of one or more OA&M functions (default weight is 5%) * Total loss of visibility from Element Management System (EMS) (default weight is 10%) |
| 1.2.9.3 | Access (Routers) | Total network element outage is constituted by any of the following events:   * Loss of all ability to transport packets between all interface points including loss of stable connections for a period **longer** **than one second** * Total network element isolation for **more than 10 seconds** * Loss of all services for **longer than 10 seconds**   For a connection based network element, total loss of ability to set up or tear down connections for a period **longer than 10 seconds.** | * Loss of an aggregate service bandwidth over 5% of the provisioned bandwidth **for more than 10 seconds** or loss of more than 4MB of service bandwidth **for more than 5 minutes** * Interface switchovers lasting **longer than 60 milliseconds** * Total loss of a service(s) for **more than 10 seconds** * Total loss of one or more OA&M functions (default weight is 5%) * Total loss of visibility from Element Management System (EMS) (default weight is 10%) |
| 2.1 | Service Control (Formerly Service Control Point (SCP)) | Loss of all links and/or all applications within the single network element (node). When considering just the Service Logic portion of the SCP, loss of the ability to process any queries. | Loss of one or more applications or the loss of 20% or more of the links on the single network element (node). When considering just the Service Logic portion of the SCP, loss of ability to process a query |
| 2.2 | Common Channel Signaling (formerly Signaling Transfer Point (STP)) | Loss of all CCS capability within the single network element (node). | * Loss of 10% or more of the links on the single network element (node) * Loss of provisioning (default weight is 5%) * Total loss of one or more OA&M functions (default weight is 5%) |
| 2.3 | Home Location Register (HLR) | Total inability to respond to any Transactional Capabilities Application Part (TCAP) of CCS7 message. This failure results solely from a non-hardware related fault, since any hardware related problems are measured as part of the SCP. | Not reported |
| 2.4 | Service Logic | Loss of the SCP ability to process all queries due to a Service Logic fault. | An event caused by a Service Logic fault where the SCP loses the ability to process one or more queries. This includes events for which a single service or group of services loses the ability to process queries. It also includes events, such as degraded performance, for which some or all services lose the ability to process one or more queries. |
| 2.5 | Protocol Servers | Loss of all capability to create, modify and terminate sessions | * Loss of one or more protocol processing functions * Total loss of one or more OA&M functions (default weight is 5%) * Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 2.6 | Network Access Control | Loss of all capability to provide user authentication, authorization, and accounting services | * Loss of one or more protocol access control functions * Total loss of one or more OA&M functions (default weight is 5%) * Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 2.7 | Network Security | Loss of all security functionality | * Loss of one or more network security functions * Total loss of one or more OA&M functions (default weight is 5%) * Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 3.2.1.2 | Digital Cross Connect Systems | Loss of all network element service capabilities for **more than 60 milliseconds.** | Includes any of the following:   * Loss of network element service capabilities affecting at least 5 DS1 equivalent network signals for **more than 60 milliseconds.**   Total loss of one or more OA&M functions (default weight is 5%)   * Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 3.2.1.3 | Optical Cross Connect Systems | Loss of all network element service capabilities for **more than 60 milliseconds.** | Includes any of the following:   * Loss of network element service capabilities affecting at least 5 DS1 equivalent network signals for **more than 60 milliseconds.**   Total loss of one or more OA&M functions (default weight is 5%)   * Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 3.2.2.1.1 | Metallic Carrier System | Loss of all network element service capabilities for **more than 60 milliseconds.** | Loss of network element service capabilities affecting at least 5 DS1 equivalent network signals for **more than 60 milliseconds.** |
| 3.2.2.1.2.1 | SONET/ SDH Transport Systems | Loss of all network element service capabilities for **more than 60 milliseconds.** | Includes any of the following:   * Loss of network element service capabilities affecting at least 5 DS1 equivalent network signals for **more than 60 milliseconds.**   Total loss of one or more OA&M functions (default weight is 5%)   * Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 3.2.2.1.2.2 | WDM/ DWDM/ Optical Amplifier | Loss of all wavelengths for **more than 60 milliseconds.** | Includes any of the following:   * Loss of one or more wavelengths for **more than 60 milliseconds.**   Total loss of one or more OA&M functions (default weight is 5%)   * Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 3.2.2.1.2.3 | Reconfigurable Optical Add-Drop Multiplexer (ROADM) | Loss of all network element service capabilities for **more than 60 milliseconds.** | Includes any of the following:   * Loss of network element service capabilities affecting at least 5 DS1 equivalent network signals for **more than 60 milliseconds.** * Loss of one or more wavelengths for **more than 60 milliseconds.**   Total loss of one or more OA&M functions (default weight is 5%)   * Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 3.2.2.1.3 | Microwave | Loss of all network element service capabilities for **more than 60 milliseconds.** | Loss of network element service capabilities affecting at least 5 DS1 equivalent network signals for **more than 60 milliseconds.** |
| 3.2.2.2 | Loop Carrier | Loss of all network element service capabilities for **more than 60 milliseconds.** | Includes any of the following:  Loss of 3 or more DS1 equivalents **for more than 60 milliseconds**  Loss of 72 or more subscriber lines  Total loss of one or more OA&M functions (default weight is 5%)  Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 3.2.4.1 | Legacy | Loss of capability to provide connectivity for all traffic for more than 10 seconds or total NE isolation for more than 10 seconds | Loss of capability to provide connectivity for16 subscribers for a period **longer than 10 seconds** |
| 3.2.4.2 | Symmetric | Loss of capability to provide connectivity for all traffic for more than 10 seconds or total NE isolation for more than 10 seconds | Loss of capability to provide connectivity for16 subscribers for a period **longer than 10 seconds** |
| 3.2.4.3 | Asymmetric | Loss of capability to provide connectivity for all traffic for more than 10 seconds or total NE isolation for more than 10 seconds | Loss of capability to provide connectivity for16 subscribers for a period **longer than 10 seconds** |
| 3.2.4.4 | IP | Loss of capability to provide connectivity for all traffic for more than 10 seconds or total NE isolation for more than 10 seconds | Loss of capability to provide connectivity for16 subscribers for a period **longer than 10 seconds** |
| 3.3.1 | Base Station Controller (BSC) and Base Station System (BSS) | Total loss of voice and data traffic capability | Loss of greater than 5% of the provisioned capacity for origination and/or termination of voice and/or data traffic. |
| 3.3.2.1 | Basic Base Transceiver System (BTS) | Total loss of voice and data traffic capability | Loss of greater than 5% of the provisioned capacity for origination and/or termination of voice and/or data traffic. |
| 3.3.2.2 | Advanced Base Transceiver System (BTS) | Total loss of voice and data traffic capability | Loss of greater than 5% of the provisioned capacity for origination and/or termination of voice and/or data traffic. |
| 3.3.2.3 | 4G Base Transceiver System (BTS) | Total loss of voice and data traffic capability | Loss of greater than 5% of the provisioned capacity for origination and/or termination of voice and/or data traffic. |
| 3.3.4 | WLAN Base Station Equipment | Total loss of an Access Point (AP) or Network Access Point (NAP) | Loss of greater than 10% of the provisioned capacity for origination and/or termination of voice and/or data traffic. |
| 3.4.1 | Location Services | Total loss of ability to provide location-based services | * Loss of more than 5% of the of the location-based services * Loss of all stable service sessions * Total loss of one or more services but not all services for more than 10 seconds * System congestion which impacts greater than 5% of all session set-up attempts * 85% or more of the service subscribers experience a session delay of 3 seconds or greater for a period longer than 30 seconds * Interface switchovers lasting longer than 60 milliseconds * Loss of one of more OA& M functions (default weight is 5%) * Total loss of visibility from the Element Management System (EMS) (default weight is 10%) |
| 4.2.1 | On Line Critical | Complete loss of all FCAPS (Fault Configuration Accounting Performance Security) functionality for **more than 1 minute.** | Loss of some FCAPS functionality for **more than 1 minute.** Partial outage time is weighted by % of users impacted and by amount of functionality lost by the outage. |
| 4.2.2 | On Line Non-Critical | Complete loss of all FCAPS (Fault Configuration Accounting Performance Security) functionality for **more than 1 minute.** | Loss of some FCAPS functionality for **more than 1 minute.** Partial outage time is weighted by % of users impacted and by amount of functionality lost by the outage. |
| 6.1 | Enhanced Services | Loss of all functionality | Loss of one or more applications or loss of more than 20% of the end mail boxes in use or loss of more than 25% of the ports |

NOTE: Tables A-4 and A-5 are included for convenience only.

## Table A-4 Transmission Standard Designations and Conversions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table A-4 Transmission Standard Designations and Conversions | | | | | |
| ***Electrical*** | ***Frequency*** | | ***Equivalent*** | | |
| ***NORTH AMERICAN*** |  | | ***Terminations*** | ***DS1s*** | ***OC-1s*** |
| DS0 | 64 Kb | | 1 | 1/24 | 1/672 |
| DS1 | 1.544 Mb | | 24 | 1 | 1/28 |
| VT 1.5 | 1.728 Mb | | 24 | 1 | 1/28 |
| DS1C | 3.152 Mb | | 48 | 2 | 1/14 |
| DS2 | 6.312 Mb | | 96 | 4 | 1/7 |
| DS3 | 44.736 Mb | | 672 | 28 | 1 |
| STS-1 | 51.84 Mb | | 672 | 28 | 1 |
| STS-3 | 155.52 Mb | | 2016 | 84 | 3 |
| STS-12 | 622.08 Mb | | 8064 | 336 | 12 |
| STS-48 | 2488.32 Mb | | 32256 | 1344 | 48 |
| STS-192 | 9953.28 Mb | | 129024 | 5376 | 192 |
| ***INTERNATIONAL (PDH)*** | |  |  |  |  |
| E1 – 2 Mbits/sec | 2,048 Mb | | 30 | 1 ¼ | 5/112 |
| E2 – 8 Mbits/sec | 8,448 Mb | | 120 | 5 | 5/28 |
| E3 – 34 Mbits/sec | 34,368 Mb | | 480 | 20 | 5/7 |
| E4 – 140 Mbits/sec | 139,264 Mb | | 1920 | 80 | 2 6/7 |
| 565 Mbits/sec | 636,000 Mb | | 7680 | 320 | 11 3/7 |

## Table A-5 Optical and Electrical Equivalency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table A-5 Optical and Electrical Equivalency | | | | |
| Optical | Electrical | | Frequency | Equivalent |
| *NORTH AMERICAN (SONET)* | | | | |
| OC‑1 | STS‑1 | 51.84 Mb | | 1 OC‑1, 1 DS3, 28 DS1, 672 DS0 |
| OC‑3 | STS‑3 | 155.52 Mb | | 3 OC‑1, 3 DS3, 84 DS1, 2,016 DS0 |
| OC‑12 | STS‑12 | 622.08 Mb | | 12 OC‑1, 12 DS3, 336 DS1, 8,064 DS0 |
| OC‑48 | STS‑48 | 2,488.32 Mb | | 48 OC‑1, 48 DS3, 1,344 DS1, 32,256 DS0 |
| OC‑192 | STS‑192 | 9,953.28 Mb | | 192 OC‑1,192 DS3, 5,376 DS1, 129,024 DS0 |
| OC‑768 | Not available | 39,680 Mb | | Not available |
| OC‑1536 |  | 158,720Mb | | Not available |
| *INTERNATIONAL (SDH)* | | | | |
| STM‑1o (OC‑3) | STM‑1e | 155.52 Mb | | 1 E4, 4 E3, 64 E1, 1,920 Channels |
| STM‑4o (OC‑12) | STM‑4e | 622.08 Mb | | 4 E4, 16 E3, 256 E1, 7,680 Channels |
| STM‑16o (OC‑48) | STM‑16e | 2,488.32 Mb | | 16 E4, 64 E3, 1,024 E1, 30,720 Channels |
| STM‑64o (OC‑192) | STM‑64e | 9,953.28 Mb | | 64 E4, 192 E3, 4,096 E1, 122,024 Channels |
| Not applicable | VC‑11 (VT1.5) | 1.644 Mb (1.544 Mb) | | 1 DS1 |
| Not applicable | VC‑12 (E1) | 2.240 Mb (2.048 Mb) | | 1 E1 (2 Mb) |
| Not applicable | VC‑2 (VT6) | 6.784 Mb (6.312 Mb) | |  |
| Not applicable | VC‑3 (E3) | 48.960 Mb (34.368 Mb) | | 1 E3 (34 Mb) |
| Not applicable | VC‑4 (E4) | 150.336 Mb (139.264 Mb) | | 1 E4 (140 Mb) |

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## Table A‑6 Measurements Summary Listing

Table A‑6 is a listing of the measurements included in this handbook showing

1) the symbols used in data reporting,

2) the applicability to hardware, software, and/or services (H, S, V), and

3) a reference to the table with data reporting details.

The symbols listed here are also included in Table A‑2, Measurement Applicability Table (Normalization Units), to clarify the general descriptions in the column headings.

| Table A‑6 Measurements Summary Listing | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Para-graph | **Measurement** Sub-Measurement | Measurement Symbol | Sub – measurement Symbol | Applic- ability (H/S/V) | Reported Items (Table) | Compared or Research Data |
| 5.1 | Number of Problem Reports  Formulas: Table 5.1‑2 | NPR |  | H,S,V | 5.1‑3, 5.1‑4, 5.1‑5 |  |
|  | Critical Problem Reports per Normalization Unit per year |  | NPR1 | H,S,V |  | compared |
|  | Major Problem Reports per Normalization Unit per year |  | NPR2 | H,S,V |  | compared |
|  | Minor Problem Reports per Normalization Unit per year |  | NPR3 | H,S,V |  | compared |
|  | Problem Reports per Normalization Unit per year |  | NPR4 | H,S,V |  | compared |
| 5.2 | Problem Report Fix Response Time  Formulas: Table 5.2‑2 | FRT |  | H,S,V | 5.2‑3, 5.2‑4 |  |
|  | Major Problem Report Fix Response Time |  | FRT2 | H,S,V |  | compared |
|  | Minor Problem Report Fix Response Time |  | FRT3 | H,S,V |  | compared |
|  | Problem Report Fix Response Time |  | FRT4 | H,S,V |  | compared |
| 5.3 | Overdue Problem Report Fix Responsiveness Formulas: Table 5.3‑2 | OFR |  | H,S,V | 5.3‑3, 5.3‑4 |  |
|  | Major Overdue Problem Report Fix Responsiveness |  | OFR2 | H,S,V |  | compared |
|  | Minor Overdue Problem Report Fix Responsiveness |  | OFR3 | H,S,V |  | compared |
|  | Overdue Problem Report Fix Responsiveness |  | OFR4 | H,S,V |  | compared |
| 5.4 | On-Time Delivery  Formulas: Table 5.4‑2 | OTD |  | H,S,V | 5.4‑3 |  |
|  | On-Time Items Delivery |  | OTI | H,S,V |  | compared |
|  | On-Time Service Delivery |  | OTS | V |  | compared |
|  | On-Time Item Delivery to Supplier Promised Date |  | OTIP | H,S,V |  | compared |
| 6.1 | Service Impact Outage  Formulas: Table 6.1‑2, 6.1‑3 | SO |  | H,S | 6.1‑4 |  |
|  | Service Impact All Causes Outage Frequency per NU per year |  | SO1 | H,S |  | compared |
|  | Service Impact All Causes Outage Downtime per NU per year |  | SO2 | H,S |  | compared |
|  | Service Impact Product-attributable Outage Frequency per NU per year |  | SO3 | H,S |  | compared |
|  | Service Impact Product-attributable Outage Downtime per NU per Year |  | SO4 | H,S |  | compared |
| 6.2 | Network Element Impact Outage Formulas: Table 6.2‑2, 6.2‑3 | SONE |  | H,S | 6.2‑4 |  |
|  | Network Element Impact Outage Frequency – Customer Attributable |  | NEO1 | H,S |  | compared |
|  | Network Element Impact Outage (Weighted) Downtime – Customer Attributable |  | NEO2 | H,S |  | compared |
|  | Network Element Impact Outage Frequency – Product attributable |  | NEO3 | H,S |  | compared |
|  | Network Element Impact Outage (Weighted) Downtime – Product attributable |  | NEO4 | H,S |  | compared |
| 6.3 | Support Service Caused Outage  Formulas: Table 6.3‑2 | SSO |  | V | 6.3‑3 |  |
|  | Support Service Caused Outage Frequency |  | SSO | V |  | compared |
| 6.4 | Mean Time to Restore Service Formulas: Table 6.4-2 | MTRS |  | V | 6.4-3 |  |
|  | Mean Time to Restore Service – Critical |  | MTRSc | V |  | compared |
|  | Mean Time to Restore Service – Non-Critical |  | MTRSnc |  |  | compared |
| 6.5 | Global Service Impact Formulas: Table 6.5-3 | GSI |  | V | 6.5-4 |  |
|  | Global Service Impact |  | GSI | V |  | compared |
| 7.1 | Field Replaceable Unit Returns  Formulas: Table 7.1‑2 | FR |  | H | 7.1‑3 |  |
|  | Early Return Index |  | ERI | H |  | compared |
|  | One-Year Return Rate |  | YRR | H |  | compared |
|  | Long-Term Return Rate |  | LTR | H |  | compared |
|  | Normalized One-Year Return Rate |  | NYR | H |  | compared |
| 7.2 | Basic Return Rate Formulas: Table 7.2-2 | BRR |  |  | 7.2-3 |  |
|  | Basic Return Rate |  | BRR | H |  | compared |
| 8.1 | Software Fix Quality  Formulas: Table 8.1‑2 | SFQ |  | S | 8.1‑3 |  |
|  | Software Fix Quality |  | SFQ | S |  | compared |
| 8.2 | Software Problem Reports Formulas: Table 8.2‑2 | SPR |  | S | 8.2‑3 |  |
|  | Critical Software Problem Reports per Normalization Unit per year |  | SPR1 | S |  | compared |
|  | Major Software Problem Reports per Normalization Unit per year |  | SPR2 | S |  | compared |
|  | Minor Software Problem Reports per Normalization Unit per year |  | SPR3 | S |  | compared |
| 9.1 | Service Quality  Formulas: Table 9.1‑2 | SQ |  | V | 9.1‑3 |  |
|  | Defective Service Transactions |  | SQ | V |  | compared |
| 9.2 | End-Customer Complaint Report Rate  Formulas: Table 9.2‑2 | CCRR |  | V | 9.2‑3 |  |
|  | End-Customer Complaints per  Normalization Unit per year |  | CCRR | V |  | compared |
|  | End-Customer Complaints-Technical per  Normalization Unit per year |  | CCRR1 | V |  | compared |
|  | End-Customer Complaints- Non-technical per  Normalization Unit per year |  | CCRR2 | V |  | compared |

## Table A‑7 Data Submission Labels

Table A‑7 is a listing of the labels used when submitting TL 9000 data to the Measurements Repository System.

| Table A‑7 Data Submission Labels | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Section** | **Measurement** | **Data Table** | **Label** | **Item** |
| 5.1 | Number of Problem Reports – NPR |  |  |  |
|  |  | Table 5.1-3 Product Categories 1, 2, 3, 4, 5, 6, and 9 | NPRa NPRs Np1 Np2 Np3 | Afactor  Normalization factor Number of critical problem reports Number of major problem reports Number of minor problem reports |
|  |  | Table 5.1‑4 Product Category 7 | NPRs Np4 | Normalization factor Number of problem reports |
|  |  | Table 5.1‑5 Product Category 8 | NPRa NPRs Np4 | Afactor Normalization factor Number of problem reports |
| 5.2 | Problem Report Fix Response Time – FRT |  |  |  |
|  |  | Table 5.2‑3 Product Categories 1, 2, 3, 4, 5, 6, and 9 | Fr2c Fr2d Fr3c Fr3d | Number of major problem reports closed on time Number of major problem reports due to be closed Number of minor problem reports closed on time Number of minor problem reports due to be closed |
|  |  | Table 5.2‑4 Product Categories 7 and 8 | Fr4c Fr4d | Number of problem reports closed on time Number of problem reports due to be closed |
| 5.3 | Overdue Problem Report Fix Responsiveness – OFR |  |  |  |
|  |  | Table 5.3‑3 Product Categories 1, 2, 3, 4, 5, 6, and 9 | Of2c Of2d Of3c Of3d | Number of overdue major problem reports closed Number of overdue major problem reports Number of overdue minor problem reports closed Number of overdue minor problem reports |
|  |  | Table 5.3‑4 Product Categories 7 and 8 | Of4c Of4d | Number of overdue problem reports closed Number of overdue problem reports |

| Table A‑7 Data Submission Labels | | | | | |
| --- | --- | --- | --- | --- | --- |
| 5.4 | On-time Delivery – OTD |  |  |  |
|  |  | Table 5.4‑3 | DIa  DId  DVa  DVd  DIPa  DIPd | Number of line items accepted on the CRD during the month reported Number of line items with a CRD during the month reported Number of services orders accepted on the CRD during the month reported Number of service orders with a CRD during the month reported Number of line items accepted on the SPD during the month reported Number of line items for which the SPD occurred during the month reported |
| 6.1 | Service Impact Outage – SO |  |  |  |
|  |  | Table 6.1‑4 | SOa SOs SOea SOda SOep  SOdp | Afactor Normalization factor Calculated outage frequency for all causes Calculated downtime in NU minutes for all causes Calculated outage frequency for product-attributable causes Calculated downtime in NU minutes for product-attributable causes |
| 6.2 | Network Element Impact Outage – SONE |  |  |  |
|  |  | Table 6.2-4 | NEOa NEOs NEOec NEOdc  NEOep NEOdp | Afactor Normalization factor Outages for customer-attributable causes Weighted outage downtime in minutes for customer-attributable causes Outages for product-attributable causes Weighted outage downtime in minutes for product-attributable causes |
| 6.3 | Support Service Caused Outage – SSO |  |  |  |
|  |  | Table 6.3-3 | Nso Ns | Number of support service caused outages Number of support service jobs |

| Table A‑7 Data Submission Labels | | | | | |
| --- | --- | --- | --- | --- | --- |
| 6.4 | Mean Time to Restore Service – MTRS |  |  |  |
|  |  | Table 6.4-3 | TMc  TEc  TMnc  TEnc | Total outage minutes for all critical events in the reporting period Total number of critical events in the reporting period Total outage minutes for all non-critical events in the reporting period Total number of non-critical events in the reporting period |
| 6.5 | Global Service Impact – GSI |  |  |  |
|  |  | Table 6.5-4 | SMo SMt | Service Minutes Outage (Time) Service Minutes of Availability |
| 7.1 | Field Returns – FR |  |  |  |
|  |  | Table 7.1‑3 | FRa FRs FRri  FRry  FRrt  FRsi  FRsy  FRst | Afactor Normalization factor Number of returns from the ERI basis shipping period Number of returns from the YRR basis shipping period Number of returns from the LTR basis shipping period Number of FRUs shipped during the ERI basis shipping period Number of FRUs shipped during the YRR basis shipping period Number of FRUs shipped during the LTR basis shipping period |
| 7.2 | Basic Return Rate – BRR |  |  |  |
|  |  | Table 7.2-3 | FRab FRrb  FRsb | Afactor Number of unit returns from the BRR basis shipping period Number of units shipped during BRR basis shipping period |
| 8.1 | Software Fix Quality – SFQ |  |  |  |
|  |  | Table 8.1‑3 | DFc Fc | Number of defective software fixes in the month Total number of software fixes that became available for general release in the month |
| 8.2 | Software Problem Report – SPR |  |  |  |
|  |  | Table 8.2‑3 | SPRa SPRs Sp1 Sp2 Sp3 | Afactor Normalization factor Number of critical software problem reports Number of major software problem reports Number of minor software problem reports |
| 9.1 | Service Quality – SQ |  |  |  |
|  |  | Table 9.1‑3 | SQd SQt | Service quality numerator as shown in the in Measurement Applicability Table (Normalization Units), Table A-2 Service quality denominator as shown in the in Measurement Applicability Table (Normalization Units), Table A‑2 |
| 9.2 | End-Customer Complaint Report Rate – CCRR |  |  |  |
|  |  | Table 9.2‑3 | CCRRa  CCRRs  CCRR1d CCRR2d | Afactor  Normalization factor  Number of Technical Complaints  Number of Non-technical Complaints |

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# Appendix B TL 9000 Customer Satisfaction Measurements Guidelines

The Requirements Handbook contains requirements for measuring customer satisfaction. The design of the mechanism for collecting data from customers will necessarily be unique to each organization. This appendix offers guidelines to assist organizations in the design or review of their own customer feedback program.

Profile for Customer Satisfaction Measurements

B. Measurements Profile for Customer Satisfaction Mechanism

The following measurements profile provides basic guidelines for a customer feedback mechanism and references a detailed example of a customer satisfaction survey. Results may be provided to customer organizations that have direct experience with the supplier organization’s products or performance. These organizations may include Quality, Purchasing, Operations, Engineering, Planning, Logistics, and Technical Support.

1) Purpose

These measurements are used to determine and improve the degree of customer satisfaction with an organization and its products from the customer’s point of view.

2) Applicable Product Categories

All products delivered through a purchase order and fulfillment process are applicable. This includes stock items as well as items that are made-to-order.

3) Detailed Description

Feedback is obtained through various mechanisms, such as satisfaction surveys and front line customer technical support input. The surveys should determine the importance of the items surveyed as well as how satisfied customers are. Analysis should include trends and rates of improvement.

4) Sources of Data

Both customer and supplier organizations collect satisfaction data on an organization’s products.

5) Method of Delivery or Reporting

Both the customer and the organization should administer the mechanism for determining customer satisfaction. Results should be obtained at least once per year and reported according to each customer or organization firm’s own formats and procedures.

6) Example

A sample survey is located on the TL 9000 website ([tl9000.org/links.html](http://tl9000.org/)). The following are typical survey topics:

a) Quality of Delivery

– Delivers on time

– Meets due date without constant follow-up

– Lead-time competitiveness

– Delivers proper items

– Delivers proper quantities

– Accurate documentation and identification

– Handles emergency deliveries

b) Quality of Pricing

– Competitive pricing

– Price stability

– Price accuracy

– Advance notice on price changes

c) Quality of Customer Service

– Compliance to contract terms

– Organization representatives have sincere desire to serve

– Provides feedback from factory

– Recognizes cost effectiveness

– Market insight

– Training provided on equipment/products

– Support on professional and technical matters

– Invoicing efficiency

– Issuing credit notes

– Order acknowledgement

– Adherence to company policy

d) Quality of Product

– Product reliability/durability/meets specifications

– Product documentation, instructions, technology

– Product packaging, suitability, environmental aspects

– Contract service quality

# 

# Glossary Abbreviations, Acronyms and Definitions

This Glossary contains a list of abbreviations and acronyms followed by definitions of terms. For inclusion in the Glossary, a word must be used more than once in one section in this Measurements Handbook.

| **ABBREVIATIONS and ACRONYMS** | |
| --- | --- |
| ACD | Automatic Call Distribution |
| ADSL | Asynchronous Digital Subscriber Line |
| Afactor | Annualization Factor |
| AIN | Advanced Intelligent Network |
| ATM | Asynchronous Transfer Mode |
| BRR | Basic Return Rate |
| BSC | Base Station Controller |
| BSS | Base Station System |
| BTS | Base Transceiver System |
| CATV | Cable Television |
| CCA | Call Connection Agent |
| CCRR | Customer Complaint Report Rate |
| CCS | Common Channel Signaling |
| CDMA | Code Division Multiple Access |
| CO | Central Office |
| COT | Central Office Terminal |
| CRD | Customer Requested Date |
| CSU | Customer Service Unit |
| DDS | Digital Data Service |
| DLC | Digital Loop Carrier |
| DOA | Dead On Arrival |
| DS(x) | Digital Signal Level |
| DSL | Digital Subscriber Line |
| DSU | Digital Service Unit |
| DSX | Digital Signal Cross Connect |
| DWDM | Dense Wavelength Division Multiplexer |
| E(x) | International Digital Rate |
| ERI | Early Return Index |
| FCAPS | Fault Configuration Accounting Performance Security |
| FDF | Fiber Distribution Frame |
| FR | FRU (field replaceable unit) Returns |
| FRT | Fix Response Time |
| FRU | Field Replaceable Unit |
| FTTH | Fiber To The Home |
| FTTU | Fiber To The User |
| GSI | Global Service Impact |
| H | Hardware |
| HDSL | High bit rate Digital Subscriber Line |
| HLR | Home Location Register |
| IP | Internet Protocol |
| ISDN | Integrated Services Digital Network |
| IVR | Interactive Voice Response |
| LNA | Low Noise Amplifier |
| LTR | Long-term Return Rate |
| MRS | Measurements Repository System |
| MSC | Mobile Switching Center |
| MTP | Message Transfer Part |
| MTRS | Mean Time to Restore Service |
| N/A | Not Applicable |
| NA | Not Applicable |
| NE | Network Element |
| NPR | Number of Problem Reports |
| NTF | No Trouble Found |
| NU | Normalization Unit |
| NYR | Normalized One-Year Return Rate |
| OA&M | Operation, Administration and Maintenance |
| OC-(xxx) | North American Equivalent Optical Rate |
| OFR | Overdue Fix Responsiveness |
| OSS | Operational Support System |
| OTD | On-Time Delivery |
| OTI | On-Time Item Delivery |
| OTIP | On-Time Item Delivery to Promised Date |
| OTS | On-Time Service Delivery |
| PAD | Packet Assembler/Disassembler |
| PBU | Pilot Beacon Unit |
| PBX | Private Branch Exchange |
| PCS | Personal Communications Service |
| PDH | Plesiochronous Digital Hierarchy |
| PO | Purchase Order |
| POTS | Plain Old Telephone Service |
| PSTN | Public Switched Telephone Network |
| RMA | Returned Material Authorization |
| RT | Remote Terminal |
| S | Software |
| SCP | Service Control Point |
| SDH | Synchronous Digital Hierarchy |
| SFQ | Software Fix Quality |
| SL | Service Logic |
| SLA | Service Level Agreement |
| SMA | Service Minutes of Availability |
| SMO | Service Minutes of Outage (time) |
| SNC | Service and Network Controller |
| SO | System Outage |
| SONET | Synchronous Optical Network Element |
| SOTS | Standard Outage Template System |
| SPD | Supplier Promise Date |
| SPR | Software Problem Report |
| SQ | Service Quality |
| SS7 | Signaling System 7 |
| SSO | Support Service Caused Outages |
| SSP | Service Switching Point |
| STM-(x)e | Synchronous Transport Module, Electrical |
| STM-(x)o | Synchronous Transport Module, Optical |
| STP | Signaling Transfer Point |
| STS | Synchronous Transport Signal |
| SU | Service Unit |
| T(x) | North American Standard Signal Rates |
| TCAP | Transactional Capabilities Application Part |
| V | Service |
| VC | Virtual Container |
| VT | Virtual Tributary |
| WDM | Wave Division Multiplexers |
| YRR | One-Year Return Rate |

NOTE: The following terms are used in this handbook or in the companion Requirements Handbook*.*

|  |  |
| --- | --- |
| Afactor (Annualization Factor) | Factor applied to annualize various measurements (return rate, number of problem reports, etc.). It is the number of calculation periods in one year.  **Report Period Type Afactor**  Calendar Month 12  4 Week Fiscal Month 13  5 Week Fiscal Month 10.4  6 Week Fiscal Month 8.7  28 Day Month 13.04  29 Day Month 12.59  30 Day Month 12.17  31 Day Month 11.77 |
| Availability | The ability of a unit to be in a state ready to perform a required function at a given instant in time or for any period within a given time interval, assuming that the external resources, if required, are provided. |
| Average | Ordinarily the average or arithmetic mean is a quotient obtained by dividing the sum of a series of numbers by the number of numbers in the series. As applied to TL 9000 measurements, average has a special meaning that is different from the arithmetic mean as shown in the following example. Suppose NPR2 is measured for three different products: a, b, and c. NPR2 for product a is Np2 for a divided by NPRs for a. Likewise for b and c. The arithmetic mean of NPR2 for the three products is (NPR2a + NPR2b +NPR2c)/3. That is ((Np2a/NPRsa) + (Np2b/NPRsb) + (Np2c/NPRsc))/3. The average for TL 9000 measurements is not the arithmetic mean but is the sum of the numerators divided by the sum of the denominators. That is, the TL 9000 average for NPR2 in this case is (Np2a + Np2b + Np2c)/(NPRsa + NPRsb + NPRsc). |
| Basis Shipping Period | A length of time during which Field Replaceable Units (FRUs) are shipped to the customer. Specifically it is the period during which the FRUs were shipped that comprises the population for determining the return rate. |
| Certification | Procedure(s) by which a third party gives written assurance that a product, process or quality management system conforms to specified requirements. |
| Closure Criteria | Specific results of actions that the customer agrees are sufficient to close the customer’s problem report. |
| Closure Date | The date on which a problem report is closed, as acknowledged by the customer. |
| Closure Interval | The reference point is the length of time from origination of a problem report to the agreed closure date. |
| Compared Data | Measurements that are adequately consistent across organizations and appropriately normalized so that comparisons to aggregate industry performance data reports are valid. Only industry performance data reports based on “compared data,” as designated within each measurement profile, are provided by the TL 9000 Administrator. See also Research Data. |
| Contract Manufacturer | An organization whose product is the building and/or testing of equipment for other companies. |
| Customer Base | The defined group of customers that the organization’s measurement data encompasses. |
| Customer-Attributable Outage | An outage that is primarily attributable to the customer’s equipment or support activities triggered by  a) customer procedural errors,  b) office environment, for example power, grounding, temperature, humidity, or security problems, or  c) one or more of the above.  Outages are also considered customer attributable if the customer refuses or neglects to provide access to the necessary information for the organization to conduct root cause determination. |
| Dead On Arrival | A newly produced hardware product that is found to be defective at delivery or installation (usage time = 0). The detection of a DOA typically results in a return that is included in the ERI measurement. In the event the time between the date of detection of the defect at installation and the shipping date exceeds six months (eighteen) prior to the reporting month, the DOA will be included in YRR (LTR). |
| Disaster Recovery | The response to an interruption in the ability to recreate and service the product and service throughout its life cycle by implementing a plan to recover an organization’s critical functions. |
|  |  |
| Emergency Services | A single number access to police, fire, and other emergency dispatch service, such as 911 in North America. |
| End-Customer | The final customer of a Service Provider. |
| Engineering Complaint | A mechanism used to document a problem to the supplier for resolution. Problems reported may include unsatisfactory conditions or performance of a supplier’s products or services, as defined in GR-230-CORE [2]. |
| Engineering/Installation Audit | Same as Installation/Engineering Audit. |
| External-Attributable Outage | Outages caused by natural disasters such as tornadoes or floods, and outages caused by third parties not associated with the customer or the organization such as commercial power failures, third-party contractors not working on behalf of the organization or customer. |
| Field Replaceable Unit | A distinctly separate part that has been designed so that it may be exchanged at its site of use for the purposes of maintenance or service adjustment. |
| Fix | A correction to a problem that either temporarily or permanently corrects a defect. |
| Fix Response Time | The interval from the receipt of the original problem report to the organization’s first delivery of the official fix. |
| General Availability Phase | The period of time that starts when a product is commercially available to one or more of the organization’s customers and ends when the product is Manufacturing or New Service Supply Discontinued. This applies to both the system product level as well as a specific release of the product. |
| Incident | An unplanned interruption to a communication service or reduction in the quality of a service, or an event or condition that has not yet impacted service or functionality of the network element. Every customer request for service is counted as an incident. Incident reports related to a product or process defect may also qualify as a TL 9000 problem report. An incident may lead to a loss of service that qualifies as a TL 9000 reported outage. |
| Incident Restoration | Action to return service or functionality to standard quality operation after being impacted by an incident. Restoration does not necessarily include resolution of the underlying problem. |
| Indirect Customer | A user of the product who purchased it from someone other than the organization, its distributors, subsidiaries, parent or joint partner(s). |
| Information Request | An inquiry for which a customer with appropriate technical expertise and acquaintance with the product could have answered on their own. A request for information may have one or more of the following characteristics:  a) It documents an issue that the customer could have resolved independently of the organization but asked for assistance in troubleshooting.  b) The customer asks a question on procedures that are covered in the documentation shipped with or contained in the product.  c) The customer asks for information on the product that will be used to help interface the product with a competitor's product.  d) The customer asks for help on a problem that turns out not to be a problem, bug or failure, but is due to a lack of understanding of the product. |
| Initial Shipment | First time a unit is shipped to the purchasing customer. |
| Installed Base | Population data representing the chargeable installed base of the product for the customer(s). This is not the number of normalization units shipped, but rather the number of normalization units that are installed and providing end-customer service. Normalization units that are installed solely for redundancy should not be counted in the installed base. |
| Job | A job is a set of tasks, performed over one or more days, which must be carried out to achieve a defined change of operational state of some subset of the network. The completion of any single task of a job does not achieve the defined change. The job is complete only when all associated tasks have been completed.  Where a particular organization feels this will not clearly define the total number of Jobs for a particular program of work, then the actual number of Jobs will be discussed and agreed by both parties in advance of the start of work. |
| Maintenance | Any activity intended to keep a functional hardware or software unit in satisfactory working condition. The term includes tests, measurements, replacements, adjustments, changes and repairs. |
| Manufacturing Discontinued | A product that is no longer being manufactured, marketed, sold or delivered; Product support continues until Product Discontinued is declared and appropriate notification provided to the customer by the organization. |
| Maximum Configured Call Capacity | The maximum number of simultaneous calls that can be handled by the installed equipment based on the configured capacity of the equipment for the reporting period. |
| Method | A means by which an activity is accomplished which is not necessarily documented but which is demonstrated to be consistent and effective throughout the organization. |
| Network Element | A system device, entity or node including all relevant hardware and/or software components located at one location. The Network Element (NE) must include all components required to perform the primary function of its applicable product category. If multiple FRUs, devices, and/or software components are needed for the NE to provide its product category’s primary function, then none of these individual components can be considered an NE by themselves. The total collection of all these components is considered a single NE.  NOTE: While an NE may be comprised of power supplies, CPU, peripheral cards, operating system and application software to perform a primary function, no individual item can be considered an NE is its own right. |
| Network Element Impact Outage | A failure where a certain portion of a network element functionality/capability is lost/down/out of service for a specified period of time. Complete outage definitions are in Network Element Impact Outage Definitions, Appendix A, Table A-3. |
| Network Support Service | Any service product involved with the creation, installation, operation, or maintenance of a communications network. |
| New Service Supply Discontinued | A service that is no longer being marketed, newly sold, or delivered. Support continues until it is formally withdrawn at Product Discontinued and appropriate notification provided to the customer by the organization. |
| No Trouble Found | Organization tested returned item where no trouble is found. |
| Normalization Factor | The total number of normalization units in the product or product population to which a measurement is applied. The measurement denominator reduces measurements on different populations to comparable per unit values. |
| Normalization Unit | The unit of measure used to make measurements comparable based on the product category population or capacity. |
| Official Fix | A fix made available for general distribution by the organization as the resolution of a problem. |
| Outage | Incident that causes the unavailability of service or functionality. |
| Outage Downtime | The sum, over a given period, of the weighted minutes, a given population of a systems, network elements or service entities was unavailable divided by the average in-service population of systems, networks element or service entities. |
| Outage Frequency | The sum, over a given period, of the number outages, a given population of a systems, network elements or service entities experiences divided by the average in-service population of systems, networks element or service entities. |
| Overdue Problem Report | A problem report that has not been closed on or before its due date. |
| Patch | An interim software change between releases delivered or made available for delivery to the field. It consists of one or more changes to affected parts of the program. |
| Plan | A scheme or method of acting, proceeding, etc., developed in advance. |
| Problem Report | A report from a customer or on behalf of the customer concerning a product or process defect requesting an investigation of the issue and a resolution to remove the cause. The report may be issued via any medium. Problem reports are systemic deficiencies with hardware, software, documentation, delivery, billing, invoicing, servicing or any other process involved with the acquisition, operation, or performance of a product. An incident reported simply to request help to bring back the service or functionality to normal without the intent to investigate and provide a resolution to the cause of the incident is not a problem report. |
| Problem Report - Critical | Conditions that severely affect the primary functionality of the product and because of the business impact to the customer requires non-stop immediate corrective action, regardless of time of day or day of the week as viewed by a customer on discussion with the organization such as  a) product inoperability (total or partial outage),  b) a reduction in the capacity capability, that is, traffic/data handling capability, such that expected loads cannot be handled,  c) any loss of emergency capability (for example, emergency 911 calls), or  d) safety hazard or risk of security breach. |
| Problem Report - Major | Product is usable, but a condition exists that seriously degrades the product operation, maintenance or administration, etc., and requires attention during pre-defined standard hours to resolve the situation. The urgency is less than in critical situations because of a lesser immediate or impending effect on product performance, customers and the customer’s operation and revenue such as  a) reduction in product’s capacity (but still able to handle the expected load),  b) any loss of administrative or maintenance visibility of the product and/or diagnostic capability,  c) repeated degradation of an essential component or function, or  d) degradation of the product’s ability to provide any required notification of malfunction. |
| Problem Report - Minor | Other problems of a lesser severity than “critical” or “major” such as conditions that have little or no impairment on the function of the system. |
|  |  |
| Procedural Error | An error that is the direct result of human intervention or error. Contributing factors can include but are not limited to  a) deviations from accepted practices or documentation,  b) inadequate training,  c) unclear, incorrect, or out-of-date documentation,  d) inadequate or unclear displays, messages, or signals,  e) inadequate or unclear hardware labeling,  f) miscommunication,  g) non-standard configurations,  h) insufficient supervision or control, or  i) user characteristics such as mental attention, physical health, physical fatigue, mental health, and substance abuse.  Examples of a Procedural Error include but are not limited to  a) removing the wrong fuse or circuit pack,  b) not taking proper precautions to protect equipment, such as shorting out power, not wearing ESD strap, etc.,  c) unauthorized work,  d) not following Methods of Procedures (MOPs)  e) not following the steps of the documentation,  f) using the wrong documentation,  g) using incorrect or outdated documentation,  h) insufficient documentation,  i) translation errors,  j) user panic response to problems,  k) entering incorrect commands,  l) entering a command without understanding the impact, or  m) inappropriate response to a Network Element alarm. |
| Product Category | The recognized grouping of products for calculating TL 9000 measurements. |
| Product Commercially Available | Product that is available for purchase and deployment. |
| Product Discontinued (End of Life) | A product or specific release of that product that is no longer supported and appropriate notification provided to the customer by the organization. |
| Product-Attributable Outage | An outage primarily triggered by  a) the system design, hardware, software, components or other parts of the system,  b) scheduled outage necessitated by the design of the system,  c) support activities performed or prescribed by an organization including documentation, training, engineering, ordering, installation, maintenance, technical assistance, software or hardware change actions, etc.,  d) procedural error caused by the organization,  e) the system failing to provide the necessary information the to conduct a conclusive root cause determination, or  f) one or more of the above. |
| Program | A planned, coordinated group of activities, procedure(s), etc., often for a specific purpose. |
| QuEST Forum | Quality Excellence for Suppliers of Telecommunications Forum (questforum.org) |
| Release | A complete version of all of the hardware/software required for operation of the product. Also see Software Release and Software Update. |
| Reliability | The ability of an item to perform a required function under stated conditions for a stated time period. |
| Research Data | Measurements that are not consistent from one organization to another and/or are not possible to normalize and consequently cannot be compared to aggregate industry performance data reports. Industry performance data reports from research data are analyzed for trends and reported to the appropriate QuEST Forum work group. See also Compared Data. |
| Resolution | See Official Fix |
| Restoration | See Incident Restoration |
| Retirement Phase | The period of time in between Manufacturing Discontinued and Product Discontinued. Products in Retirement Phase can no longer be purchased, but are still supported (see Figure 4.2.6-1). This applies to both the system product level as well as a specific release of the product. |
| Return | Any unit returned for repair or replacement due to any suspected mechanical, electrical, or visual defects occurring during normal installation, testing, or in-service operation of the equipment. |
| Scheduled Outage | Results from a scheduled or planned maintenance, installation, or manual initialization. This includes such activities as parameter loads, software/ firmware changes, and NE growth/update, cutover (for example, switch replacement or absorption), hardware or software growth, preventive maintenance, routine or scheduled diagnostics, data table change, software patching or updates, software generic upgrade, program backup, and data backup.  Outages resulting from corrective actions should not be counted as scheduled outages, including deferred maintenance. Examples include:  a) a deferred hardware repair or a deferred restart to clean up memory errors,  b) diagnostics to isolate a detected fault,  c) hardware fault repair,  d) fixing an error or omission in a data table, or  e) an omission in a recent data table change. |
| Service Categories | Product categories that refer to services. |
| Service Disruption – Critical | An event that requires immediate, non-stop corrective action, potentially disregarding all other events, until resolution is achieved. Critical Service Disruptions are events that severely affect the primary functionality and/or delivery of a service as defined by the organization’s ticketing criteria. Examples include but are not limited to:  a) product inoperability (resulting in a total or partial service outage),  b) reduction in available traffic/data handling capacity below the minimum level required to handle expected loads,  c) any loss of emergency service or function, for example emergency 911 calls,  d) events impacting enterprise customers that are deemed a critical priority for service restoration due to the functions that they perform, for example hospitals, airports, police departments,  e) identified safety hazards, risks or security breaches impacting the organization’s infrastructure and/or its customers,  f) events impacting top enterprise or business customers as identified by the organization, or  g) events that are escalated internally for immediate action. |
| Service Order | An order for service received by an organization including a Service Provider or Network Operator from a customer. A Service Order includes any request for service comprising a combination of new product installation including the installation of a complete new system, addition or change to existing products, or cessation/termination of product. A Service Order normally contains a Customer Requested Date (CRD), which applies to all order line items within the order. |
| Service Provider | A company that provides telecommunications services. |
| Service-Impact Outage | A failure where end-user service is directly impacted. End-user service includes one or more of the following, but is not limited to  a) hi-speed fixed access (DSL, cable, fixed wireless),  b) broadband access circuits (OC-3+), and  c) fixed line voice service,  d) narrow band access circuits (T1/E1, T3/E3)  e) wireless data service, and  f) wireless voice service. |
| Service Restoration | See Incident Restoration |
| Service Transaction | The complete cycle from a service request through the completion of the service by the organization. |
| Severity | The classification of a problem report as critical, major or minor. See Problem Report – Critical, Problem Report – Major, and Problem Report – Minor. |
| Software Fix | A software change delivered or made available for delivery to the field to correct a problem(s). |
| Software Problem Report | **A problem report due to a fault in program code, design of data structures or firmware.** |
| Software Release | A release that introduces initial and significant new functionality, may include significant internal and/or external architectural changes, and is usually identified by the primary number changing on the release identifier. |
| Software Update | A minor type of Software Release that provides fixes for defects and may include additional functionality. This software is commonly referred to as a point or dot release. A Software Update completely replaces the existing code in the product as opposed to a patch, which replaces only a small portion of the code. |
| Standard Outage Template System (SOTS) | The template developed by QuEST Forum to allow the standardized reporting of outage data from customers to the organization. |
| Subscriber | A telecommunication’s services customer. |
| System | A collection of hardware and/or software items located at one or more physical locations where all of the items are required for proper operation. No single item can function by itself. |
| Temporary Fix | A fix that is delivered to a limited number of systems in the field for the purposes of verification or to restore system services on an interim basis. A temporary fix is usually followed by an official fix that resolves the underlying problem. |
| Termination | The points on a switching network to which a trunk or line may be attached. |
| Third Party | A company separate from the organization's company or the organization's customers. |

ISO 9000:2005 Defined Terms [6]

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