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EXECUTIVE OF THE SECRETARY

AT&T

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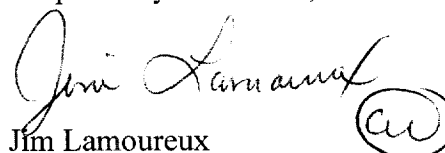FAX: 404 810-8629

March 13, 1998

David Waddell
Executive Secretary
Tennessee Regulatory Authority
460 James Robertson Parkway
Nashville, Tennessee 37243

> **Re:** *Dkt. 97-00309BellSouth Telecommunications' Entry into Long Distance Service*

Dear Mr. Waddell:

Please find enclosed for filing in the above-referenced docket AT&T's proposed performance measures and comments. This document is filed pursuant to the Tennessee Regulatory Authority's procedural order dated March 6, 1998.

Respectfully Submitted,

Jim Lamoureux

Encls.

Cc: All parties of record

BEFORE THE
TENNESSEE REGULATORY AUTHORITY
Nashville, Tennessee

In re: BellSouth Telecommunications, Inc.'s)
Entry Into Long distance (InterLATA) Docket No. 97-00309
Service in Tennessee pursuant to Section)
271 of the Telecommunications Act of 1996.)

AT&T COMMUNICATIONS OF THE SOUTH CENTRAL STATES, INC.'s
PROPOSED PERFORMANCE MEASUREMENTS AND STANDARDS

Pursuant to the Tennessee Regulatory Authority's (TRA) Procedural Order of March 6, 1998 in the above-referenced docket, AT&T Communications of the South Central States, Inc. (AT&T) hereby submits its proposed performance measures and standards.

I. INTRODUCTION

A consistent set of measurements capable of monitoring the nature of support provided by BellSouth to Tennessee CLECs is required to insure parity of treatment in accordance with the Telecommunications Act of 1996 (the Act) and spur the development of competition. The determination of parity treatment requires that a set of performance measurements (what is to be measured and how), be established and implemented, and that the data collected as a result of those measurements be compared against performance standards (the level of performance required). Sections III and IV of these comments discuss a comprehensive set of performance

measurements that AT&T supports as the foundation for a plan designed to monitor for nondiscriminatory, parity treatment by BellSouth while at the same time supporting on-going operations of individual interconnection agreements. They discuss practical considerations for the implementation of these measures and offer potential solutions. Section V discusses appropriate standards for evaluating BellSouth's performance and also addresses the surveillance reporting necessary to administer a performance monitoring system. Section VI discusses penalties and remedies and their potential value for assuring compliance with ILEC nondiscrimination obligations. Section VII contains AT&T's comments with respect to Issue 3 of the BellSouth/AT&T/MCI Consolidated Arbitration, Docket Nos. 96-01152 and 96-01271.

II. A CONSISTENT SET OF MEASUREMENTS FOR MONITORING SUPPORT PROVIDED TO ALL CLECs BY BELLSOUTH IS NECESSARY TO INSURE PARITY

ILEC nondiscriminatory support of CLECs is a legislative mandate of the Federal Telecommunications Act of 1996 (Act). The obligation to perform in a nondiscriminatory manner is virtually meaningless, however, if no provisions exist to monitor performance and assure on-going compliance. A factual showing is required to demonstrate that the ILEC support of CLECs is at least equivalent to the quality of support provided to its own retail operation (see Second Order on Reconsideration, *Implementation of Local Competition Provisions in the Telecommunications Act of 1996,* CC Docket No. 96-98 (December 13, 1996) (Second Order on Reconsideration) para. 9). Direct comparison of ILEC and CLEC results are, therefore, absolutely essential.

In its Ameritech Michigan Order, the FCC summarized the operational aspects where nondiscriminatory performance must be demonstrated: "The

Commission [has] concluded that, in order to meet the nondiscriminatory standard for OSS, [operational support systems] an incumbent LEC must provide to competing carriers access to OSS functions for pre-ordering, ordering, provisioning, maintenance and repair, and billing that is equivalent to what it provides itself, its customers or other carriers. Additionally, the Commission [has] concluded that incumbent LECs must generally provide network elements, including OSS functions, on terms and conditions that 'provide an efficient competitor with a meaningful opportunity to compete'." (Ameritech Michigan Order, para. 130) The FCC went on to say: "In determining whether a BOC has met it OSS obligation under section 271, the Commission generally must determine whether access to OSS functions provided by the BOC to competing carriers sufficiently supports each of the three modes of competitive entry strategies established by the Act: interconnection, unbundled network elements, and services offered for resale." (Id., para. 131)

Thus, in order to design a performance measurement plan to monitor for parity on the part of BellSouth four basic questions should be answered:

--What is to be measured?

--How is the measurement defined and calculated?

--How is unsatisfactory performance detected?

--When unsatisfactory performance is detected, how will satisfactory performance be re-established?

Each of these issues is discussed below.

III. WHAT IS TO BE MEASURED?

AT&T proposes that the TRA use measurements proposed by the Local

Competition Users Group (LCUG)[1] as a starting point for monitoring performance parity. The LCUG performance measurements that AT&T recommends are attached as Attachment 1. They represent the "critical few" measurements upon which a truly effective measurement plan can be constructed. Because the LCUG measurements are specifically designed to permit direct comparison of CLEC and BellSouth experience, they also permit conclusions to be drawn regarding nondiscrimination. Direct comparison of performance results is clearly the means that will best accomplish a demonstration of parity. Likewise, when utilized in conjunction with mutually agreed upon minimum performance standards, these same measurements can be employed in the administration of individual interconnection agreements.

Attachment 1 provides a synopsis of the measurements and arranges them into generally the same functional categories where nondiscriminatory performance must be demonstrated: pre-ordering, ordering and provisioning, maintenance and repair, general support, billing, and unbundled network elements and UNE combinations. Within each of these functional categories, a limited number of measurements are identified that monitor the quality of support delivered by BellSouth to the CLECs. When equivalent measurements are generated and reported for BellSouth operations, direct comparison of results can be made and, in turn, fact-based conclusions can be drawn regarding whether or not the ILEC has satisfied its nondiscrimination obligation.

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[1] LCUG is a group of CLECs that has sought to develop workable solutions to common operational issues related to local market entry. LCUG membership includes AT&T, MCI, Sprint, WorldCom, and LCI International. One subcommittee of LCUG is specifically charged with addressing performance standards. AT&T worked both internally and with the LCUG to develop an appropriate set of performance measurements that would permit CLECs and regulators to assess whether or not ILECs are providing nondiscriminatory support and access to their services and systems.

IV. HOW IS THE MEASUREMENT DEFINED AND CALCULATED?

As previously indicated, an effective measurement plan must, among other things, accomplish the following: (1) fully document each measurement, and (2) collect and mark the data used to calculate the measurement so that direct and meaningful comparisons of results between the ILEC and CLECs is possible.

Attachment 2 is the most recent version of the LCUG documentation Service Quality Measurements (SQM), dated September 26, 1997 (Version 6.1). This document provides details for each LCUG measurement and specifically reflects information related to three key implementation areas: measurement methodology, reporting dimensions, and excluded situations. The "measurement methodology" section addresses the measurement calculation and the meaning of data elements incorporated in the measurement formula. The "reporting dimensions" section identifies the minimum detail that must be addressed in the underlying data to support meaningful comparisons of results. Finally, the "excluded situations" section specifies business conditions, if any, that are deemed appropriate for exclusion from the reporting process. Attachment 2, therefore, provides a solid basis for the TRA to implement the proposed LCUG measurements.

From a practical standpoint, it is not reasonable to expect that every possible implementation detail could be anticipated and documented in advance. Expansion beyond the minimal set of measurements should be encouraged to the extent the TRA identifies now, or at a later date, additional appropriate measurements.

V. HOW IS UNSATISFACTORY PERFORMANCE DETECTED?

Two factors must first be clarified before one can determine whether or not BellSouth performance meets parity requirements. First, for each measurement result, the standard for comparison must be established. Second, each measurement must have a precise methodology for determining whether the CLEC performance is at least equal to the comparative standard selected.

A. THE STANDARD OF COMPARISON

Parity performance requires a demonstration that the performance delivered to a CLEC is at least equal to the quality of performance BellSouth delivers to its own operations for reasonably and broadly defined analogous functions. For example, when CLECs resell residential local service, the comparative analog for the service delivery interval is the time it takes BellSouth to deliver residential local service to its own retail customers.

If no comparative analog is identified, the preferred methodology is to conduct a special study to establish the benchmark performance levels. When BellSouth undertakes such a benchmarking study, it should rely heavily upon experiences drawn from its own operations. Furthermore, the study should conform to the following minimum requirements: (1) a benchmark result is provided for each reporting dimension established for the measurement; (2) the mean, standard error, and number of sample points are disclosed whenever a sample methodology is employed; (3) the study methodology and benchmark results are fully disclosed with independent audit permitted; and, (4) benchmark updates occur every six months or whenever operational changes may reasonably be expected to impact the

study results, whichever occurs earlier.

Attachment 2 includes default levels of performance that can be used in instances where no analog is identified and no benchmarking study is produced. These default levels are reflected in the "Performance Standard In Absence of ILEC Results" section of the documentation for each performance measurement. The levels are based upon LCUG members' experience in the long distance market, combined with their expectations for the provision of local services. LCUG benchmark comparisons apply only if: (1) BellSouth cannot identify an analogous retail functions for comparison within its own operations, or (2) BellSouth refuses to or cannot quantify an alternative benchmark level through a verifiable study using the ILEC's actual experiences as input.

B. EVALUATING THE ILECS' PERFORMANCE

An approach, which could be used and would be very simple to apply, is to find that parity BellSouth performance is achieved only if the CLEC results are equal to or better than BellSouth's performance for each comparative standard. The comparative procedures would employ generally accepted statistical procedures. Statistical procedures accommodate measurement variability, allow performance comparisons each month, and support the critical determination whether or not the CLEC performance is no worse than the comparative standard.

The processes and systems that BellSouth utilizes to support the CLECs are complex. Moreover, the performance results are influenced by many factors, not the least of which are daily load, accuracy of records, and other conditions unique to the activity being undertaken. Therefore, precisely the same performance level will not likely be achieved each and every time

performance is measured nor will the average performance for one party be precisely identical to that of the other. Although adequate disaggregation of results will control for much of the variability within a broad area of measurement, results variations will still exist. Because some degree of variability is to expected when repeated measurements are made, the question to be addressed is how much difference in the results, when the CLEC's result is compared to the BellSouth, will be tolerated before the difference is declared unacceptable. Comparative methodologies, reflecting accepted statistical procedures, move this key consideration from the realm of qualitative explanation of results to a quantitative comparison. By employing such quantitative procedures, as described in Attachment 3, the TRA's risk of an inappropriate conclusion, due to the inherent variability of measurement data, can be controlled.

Application of the recommended comparative procedures will allow the TRA to focus its attention on the operational areas where attention is warranted. Any CLEC measurement result reflecting worse performance (statistically significant) than the comparative standard may indicate that BellSouth was acting in a discriminatory manner. The bigger the difference in the performance results or a repeated (month-to-month) indication of worse performance for a measurement area adds credence to the possibility that discrimination is occurring. The TRA should therefore require monthly surveillance data that permits the TRA to institute a process that considers the number of ILEC measurements that indicate potential discrimination, the extent of difference between the CLEC result and the comparative standard, and the extent of repeated indications of ILEC unsatisfactory performance from period-to-period.

Such surveillance data would permit the TRA to draw conclusions regarding the following:

(1) Whether or not a particular measurement result or group of measurements is consistently flagged across a number of CLECs, potentially indicating a broadly impacting but specific operational problem.

(2) Whether a greater than expected threshold number of measurements are flagged, indicating that discrimination is broadly indicated for either one CLEC or a number of CLECs.

(3) Whether a particular measurement or a group of measurements has repeatedly been flagged, indicating that the potential discrimination reflects a fundamental operational problem or, in the worst case, that the discrimination is focused and possibly intentional.

(4) Whether a particular measurement or a group of measurements is flagged for widely disparate performance, indicating not only potential discrimination but a high likelihood of retail customer impact.

Under AT&T's proposal, BellSouth would also provide CLECs with surveillance data, but the nature of the data would be different. First, each CLEC should receive a monthly report representing not only its own performance result for each measurement, but also the aggregate result for all CLECs, and the applicable comparative performance standard (whether BellSouth's result or a performance benchmark). The monthly report also should specifically show which CLEC and/or aggregate CLEC measurement results are flagged for a potential violation, the reason for each flag, and whether the result was also flagged in the prior month.

BellSouth should supply sufficiently detailed data to permit CLEC validation of performance results reported by the ILEC for that CLEC. CLECs, if they so choose, must be able to audit the accuracy of the BellSouth-reported performance results by comparing internally generated data to the data relied upon by BellSouth. For example, the CLEC should be capable of

confirming, in the data relied upon when BellSouth reports the average completion interval for orders, that the appropriate set of CLEC orders are reflected and that the critical dates and time used to establish delivery intervals agree. The data necessary for such confirmation is addressed in the discussion of each LCUG measurement (see "Data Retained Relating to CLEC Experience") provided in Attachment 2.

Further, the TRA should grant CLECs, as a part of monitoring nondiscrimination, reasonable auditing rights. Should a CLEC detect potential discrepancies between the CLEC's internally generated data and the data relied upon by BellSouth in the reporting process, the affected CLEC should be permitted to audit the data collection, computation and reporting processes of BellSouth.

VI. WHEN UNSATISFACTORY PERFORMANCE IS DETECTED, HOW WILL SATISFACTORY PERFORMANCE BE RE-ESTABLISHED?

If a measurement is flagged as reflecting potentially discriminatory performance, AT&T believes BellSouth should analyze the associated performance and conduct a review with the affected CLEC(s).

The review should clearly identify whether the performance defect is a reporting anomaly, or if results indicate that corrective action is required. If corrective action is indicated, BellSouth should identify the necessary actions, commit to a schedule for instituting the changes, and communicate the material to the affected CLEC(s).

Moreover, specific self-enforcing penalties would also help assure that potentially discriminatory performance is promptly addressed. If the TRA considers and adopts penalties, the following points should be addressed: (1) The penalties should supplement, rather than supersede or invalidate, any

provisions embodied within existing interconnection agreements; (2) The penalties should not preclude a CLEC from seeking damages or other appropriate remedies through other legal or regulatory recourse; (3) The penalties should impose a meaningful incentive to promptly re-establish conforming performance; and, (4) The penalties should escalate with repeated nonperformance or individual results well outside the range of reasonableness (e.g., more than two standard deviations from the mean).

VII. AT&T'S COMMENTS REGARDING ISSUE 3 OF THE BELLSOUTH/AT&T/MCI CONSOLIDATED ARBITRATION, DOCKET NOS. 96-01152 AND 96-01271.

In the AT&T/MCI arbitration, the TRA ordered that if the parties could not agree on interim performance and reporting standards and requirements by November 21, 1996, the parties had to submit Final Best Offers. AT&T and BellSouth could not reach agreement and each filed proposed Final Best Offers. On December 3, 1996, the TRA adopted AT&T's Final Best Offer. The executed AT&T/BellSouth Interconnection Agreement filed with the TRA on February 24, 1997, contained that language.

Subsequently after arbitration decisions in a number of other jurisdictions, AT&T and BellSouth negotiated a nine-state agreement on an initial set of performance measurements that differed from the measurements AT&T proposed in its Tennessee Final Best Offer and included in the Interconnection Agreement. A joint BellSouth/AT&T Petition for Approval of the Amendment to the Interconnection Agreement was filed with the TRA on September 5, 1997 to amend the agreement to include the nine-state agreement on performance measures. The agreement reflected the impact of various state decisions on the issue as well as the parties' business needs at the time. Both AT&T and BellSouth understood that the agreement was to serve only as a starting point, and that additional revision
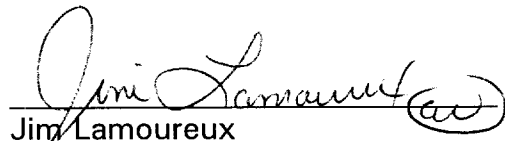
and negotiation were necessary.[2]

Since then, AT&T, as well as the rest of the industry and several regulatory bodies have made much progress on the issue of performance measures and standards. Indeed, BellSouth is now offering a different set of measurements than it did in its Final Best Offer in November, 1997.

For the reasons outlined in these comments, AT&T believes the LCUG performance measurements represent the types of measurements required to satisfy the ILEC nondiscriminatory support of CLECs required by the Act. It is therefore AT&T's position that the LCUG measurements should be adopted by the TRA. The LCUG standards should supplement, rather than supercede interconnection agreement measurements. Many existing interconnection agreements contain specific measurements that are useful for and adequate to enforcement of the specific business arrangements between parties. Such measurements should not be superceded. Existing negotiated measurements, however, should be superceded in those instances where the measurements are more lenient or directly conflict with measurements ultimately adopted by the TRA.

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[2] Section 12.2 of the AT&T/BellSouth Interconnection agreement as amended states "The Parties acknowledge that the need will arise for changes to the measurements specified in Attachment 12 during the term of this Agreement. Such changes may include the addition or deletion of measurements or a change in the performance standard for any particular metric, as well as the provision of target performance levels, as set forth in Attachment 12. Unless otherwise specified in Attachment 12, the parties agree to review all measurements on a quarterly basis to determine if any changes are appropriate, and may include the provision to AT&T of any additional measurements BellSouth may provide itself."

Respectfully submitted,

**AT&T COMMUNICATIONS OF
THE SOUTH CENTRAL
STATES, INC.**

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Attorney for AT&T
Communications
of the South Central States,
Inc.

Dated: March 13, 1998

Synopsis of Parity Measurement Definitions

Pre-ordering Measurements

Average Response Interval

Goal: Monitor the ILEC speed of response to real time informational queries submitted by the CLEC. The response interval for each query is determined by computing the elapsed time from the ILEC receipt of a query from the CLEC, whether or not syntactically correct, to the time the ILEC returns the requested data to the CLEC. Elapsed time is accumulated for each major query (separately by pre-ordering/ maintenance) type and by subtype (e.g., telephone number selection) and then divided by the associated total number of query received by the ILEC during the reporting period.

Ordering and Provisioning Measurements

Average Completion Interval

Goal: To track the actual completion interval for each order processed during the reporting period. The completion interval is the elapsed time from the ILEC receipt of a syntactically correct order from the CLEC to the ILEC's return of a valid completion notification to the CLEC. Elapsed time for each order is then divided by the associated total number of orders completed within the reporting period.

Percent Orders Completed on Time

Goal: To report on the proportion of orders completed by the committed due date. Both the total numbers of orders completed within the reporting interval and the number of orders completed by the committed due date (as specified on the initial FOC returned to the CLEC). The resulting count of orders completed no later than the committed due date is divided by the total number of orders completed with the resulting fraction expressed as a percentage.

Percent Order Accuracy

Goal: To assess the accuracy work performed by the ILEC in response to CLEC orders. The original account profile and the CLEC order (and any supplements) sent to the ILEC are compared to the services and features reflected upon the account profile following completion of the order by the ILEC. An order is "completed without error" if all service attributes and account detail changes completely and accurately reflect the activity

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Note: Measurements are described from a CLEC perspective, different terminology may apply for the equivalent comparative measurement of the ILEC

specified on the original and supplemental CLEC orders. The count of orders completed without errors is divided by the total number of orders completed in the reporting period.

Reject Interval

Goal: *To monitor that the ILECs promptly returns notices to CLECs, whenever transactions submitted to the ILEC fail to pass agreed upon edits.* For ordering, the reject interval is the elapsed time between the ILEC receipt of an order from the CLEC to the ILEC return of a notice of a syntax rejection to the CLEC. The time measurement starts when the ILEC accepts (acknowledges) the order from the CLEC and stops when the ILEC returns a rejection notice to the CLEC. The elapsed time is accumulated and then divided by the count of rejected CLEC orders during the reporting period.

FOC Interval

Goal: *To report on the promptness with which the ILEC either confirms that a CLEC's order will be worked as specified or identifies the changes necessary in order to work the order submitted by the CLEC.* The Firm Order Confirmation (FOC) Interval is the elapsed time between the ILEC acceptance of a syntactically correct order and the return of a confirmation to the CLEC that the order will be worked as submitted or worked with the modifications specified on the confirmation. The time measurement starts when the ILEC accepts (acknowledges) the order from the CLEC and stops when the ILEC returns a valid firm order confirmation to the CLEC. The elapsed time is accumulated and then divided by the count of CLEC orders confirmed in the reporting period.

Jeopardy Interval

Goal: *To monitor how far in advance of due dates that the ILEC provides notices that the due date commitment will be missed.* The Jeopardy Interval is the remaining time between the pre-existing committed order completion date and time (communicated via the FOC) and the date and time the ILEC issues a notice to the CLEC indicating an order is in jeopardy of missing the due date. The jeopardy interval is accumulated and then divided by the count of CLEC orders placed in "jeopardy" by the ILEC during the report period.

% Jeopardies

Goal: *To monitor the frequency with which the ILEC cannot fulfill CLEC orders as originally committed by the ILEC.* This measurement result is the total number of jeopardy notices (the ILEC issues to the CLEC) divided by the total number of order confirmations (FOCs) returned by the ILEC during the identical period.

Note: Measurements are described from a CLEC perspective, different terminology may apply for the equivalent comparative measurement of the ILEC

Synopsis of Parity Measurement Definitions

Completion Interval

Goal: To report the average delay between the completion of physical work and the notice given to the CLEC that service is ready for use. The Completion Notice Interval is the elapsed time between the ILEC technician's reported completion of physical work and the issuance of a valid completion notice to the CLEC. The elapsed time is accumulated and then divided by the count of CLEC orders for which the ILEC returned completion notices in the reporting period.

Held Order Interval

Goal: To report the delay for orders that are uncompleted and past the due date at the end of the report period. The held order interval is established by first identifying all orders, at the close of the reporting interval, that both have not been reported as "completed" via a valid completion notice and have passed the currently "committed completion date" for the order. The number of calendar days between the committed completion date and the close of the reporting period is established for each order, accumulated then divided by the total number of held (pending and past due) orders.

Percentage of Orders Held

Goal: To monitor the relative size of the inventory of backlogged orders that have remained in a backlog state for an extended period of time. This measure utilizes a subset of the data accumulated for the "held order interval" measure. All orders, for which the "held order interval" equals or exceeds 90 (or 15) days, are counted and divided by the total number of pending and past due orders.

Maintenance and Repair Measures

Mean Time To Restore

Goal: To monitor the actual restoral interval for customer requested maintenance. The restoral interval is the elapsed time from the CLEC logging a trouble ticket with the ILEC, regardless of the ultimate resolution of the trouble, to the time the ILEC returns a valid trouble resolution notification to the CLEC. The elapsed time is accumulated and divided by the count of maintenance tickets reported as resolved by the ILEC during the report period.

Note: Measurements are described from a CLEC perspective, different terminology may apply for the equivalent comparative measurement of the ILEC

Synopsis of Parity Measurement Definitions

Repeat Trouble Rate

Goal: *To monitor the effectiveness and accuracy of ILEC repair activities.* The repeat trouble rate measure is computed by accumulating the number of trouble ticket submitted by a CLEC (to the ILEC) for a service arrangement that had at least one prior trouble ticket within the 30 calendar days preceding the creation of the current trouble ticket. The count of repeat troubles is divided by the count of initial trouble reports received by the ILEC from the CLEC during the report period.

Trouble Rate

Goal: *To report on the overall quality of the service capabilities delivered by the ILEC to the CLEC.* The trouble rate metric is computed by accumulating the total number of maintenance tickets logged by a CLEC (with the ILEC) during the reporting period and then dividing the total number of tickets by the total number of "service access lines" in service for the CLEC at the end of the report period.

Percentage of Customer Troubles Resolved Within Estimate

Goal: *To report on the reliability of repair time estimates provided by the ILEC.* The initial ILEC estimate for repair completion date and time is compared to the actual repair date and time (ticket closure as defined in Time to Restore metric). When the actual repair date and time is on or before the initially provided estimate, the count of "troubles resolved within estimate" is incremented by one. The resulting total is divided by the total number of troubles resolved for the report period and expressed as a percentage.

General and Support Center Measurements

% System Availability

Goal: *To monitor that individual CLEC-ILEC interfaces are available and operable according to pre-established schedules.* The cumulative actual hours OSS functionality is available to a CLEC is compared to the cumulative number of that the ILEC planned to offer and support CLEC access to ILEC OSS functionality during the reporting period.

Mean Time to Answer Calls

Goal: *To establish that CLECs' calls for assistance are promptly answered by ILEC support center personnel.* Speed of Answer is determined by measuring and accumulating the elapsed time from the entry of a CLEC call into the ILEC call management system until the CLEC call is transferred to the ILEC personnel assigned to handling CLEC calls for assistance. The accumulated time is divided by the number of calls answered by the ILEC personnel in the support center being monitored.

Note: Measurements are described from a CLEC perspective, different terminology may apply for the equivalent comparative measurement of the ILEC

Synopsis of Parity Measurement Definitions

Call Abandonment Rate

Goal: To monitor the proportion of CLEC calls for assistance (from the support center of the ILEC) that are terminated before an ILEC support person answers the call. The number of calls received by the call distribution system of the ILEC center is accumulated for the reporting period, regardless whether the call actually is transferred to ILEC personnel for processing. In addition, a count is accumulated of all calls that are subsequently terminated by the calling party or dropped due to equipment failure before transfer to the service agent for processing. The accumulated count of calls abandoned (terminated) is divided by the total count of all call received at the center being monitored.

Billing Measurements

Mean Time to Provide Recorded Usage Records

Goal: To report on the average amount of time between the recording of a usage record and its delivery to the CLEC. This measure captures the elapsed time between the AMA recording of usage data, generated either by CLEC retail customers or by CLEC access customers, and the time when the data set, in a compliant format, is successfully transmitted to the CLEC. For each usage record, the calendar date and time of usage recording is compared to the calendar date and time of successful transmission of the data set to the CLEC. The elapsed delivery time is accumulated for each usage record with the resulting total being divided by the number of complete usage records in all the data sets transmitted.

Mean Time to Deliver Invoices

Goal: To monitors the elapsed number of days between the scheduled close of a Bill Cycle and the ILEC's successful transmission of the associated invoice to the CLEC. For each invoice, the calendar date of the scheduled close of Bill Cycle is compared to the calendar date that successful invoice transmission to the CLEC completes is accumulated and then the accumulated result is divided by the number of complete invoices sent in the reporting period.

Note: Measurements are described from a CLEC perspective, different terminology may apply for the equivalent comparative measurement of the ILEC

Synopsis of Parity Measurement Definitions

Invoice Accuracy
Usage Accuracy

Goal: To report on the quality and completeness of usage records and invoices that the ILEC delivers to the CLEC. The completeness of content, accuracy of information and conformance of formatting is determined based upon the terms of the individual CLEC interconnection agreements with the ILECs. The ILEC will establish a quality control process (disclosed to CLEC) that is no less rigorous than the most rigorous quality monitoring established in the ILEC billing service contracts for long distance service providers. The records and invoices delivered by the ILEC must simultaneously meet the standards relating to content, accuracy and formatting in order to be counted as accurate. Each of the above measurements, is expressed as a ratio (percentage) of accurate records (or invoices) to the total records (or invoices) delivered.

Operator Service and Directory Assistance Measures

Mean Time To Answer

Goal: To report on the promptness with which OS and DA calls are answered by the ILEC when the ILEC provides such services on behalf of the CLEC. Speed of answer is monitored through the call management technology used to distribute calls to ILEC agents (i.e., call receipt personnel staffing Directory Assistance or Operator Service Positions). Speed of Answer is determined by measuring and accumulating the elapsed time from the entry of a CLEC retail customer call into the ILEC call management system queue until the CLEC retail customer call is transferred to the ILEC personnel assigned to handling CLEC calls for assistance (whether DA or OS). The accumulated answering time is divided by the total number of calls transferred to the ILEC OS or DA service agent.

Network Performance Measurements

Network Performance Parity

Goal: To monitor the key performance parameters (i.e., engineered characteristics) to assure the quality of the network infrastructure delivered to CLECs. Based upon a random and statistically reliable (at a preset level) sample of network configurations employed by the CLEC, the network performance is monitored, for generally accepted parameters (e.g., loss, blocking, etc.) based upon generally accepted testing procedures and the resulting parameter value(s) recorded. The measured values are accumulated across the sample base and the mean and associated variance computed.

Note: Measurements are described from a CLEC perspective, different terminology may apply for the equivalent comparative measurement of the ILEC

<div align="center">**Synopsis of Parity Measurement Definitions**</div>

<div align="center">**Unbundled Network Element Measures**</div>

Function Availability

Goal: *To monitor the availability of UNE functionality requested by a CLEC.* Availability is measured for each unique UNE functionality (or combination of UNEs). The number of times that the functionality executes properly is shown divided by the number of times that the execution of the functionality was requested or initiated and expressed as a percentage.

Timeliness of Element Performance

Goal: *To monitor the frequency that UNE functionality operates in a timely manner. Timeliness will be measured for each unique UNE (or combination of UNEs).* The number of times that the functionality executes properly within the established standard time frame is accumulated, divided by the number of times that the execution of the functionality was requested or initiated with the result expressed as a percentage.

Note: Measurements are described from a CLEC perspective, different terminology may apply for the equivalent comparative measurement of the ILEC

LOCAL COMPETITION USERS GROUP (LCUG)

SERVICE QUALITY MEASUREMENTS (SQM)

September 26th, 1997

Membership: AT&T, Sprint, MCI, LCI, WorldCom

Version 6.1

Service Quality Measurements
Introduction

Background:

On August 8, 1996, the Federal Communications Commission released its First Report and Order (the Order) in CC Docket No. 96-98 (Implementation of the Local Competition Provisions of the Telecommunications Act of 1996). The Order establishes regulations to implement the requirements of the Telecommunications Act of 1996. Those regulations are intended to enable potential competitive local exchange carriers (CLECs) to enter and compete in the local telecommunications markets. One requirement found to be "absolutely necessary" and "essential" to successful entry is that the incumbent local exchange carriers (ILECs) provide nondiscriminatory access to their operations support systems (OSSs). Many variations of interim OSS GUIs (graphic user interfaces), and electronic gateways have been or are being offered by the ILECs. These interim systems have not provided the capability for the CLECs to provide the same customer experience for their customer as compared to what the ILECs do for theirs. The timeliness and accuracy of information processed by the ILEC for pre-ordering, ordering and provisioning, maintenance and repair, unbundled elements, and billing have not, to date, been satisfactory. The service delivery problems exist regardless whether total service resale or unbundled elements are utilized. Final solutions for application-to-application real time system interfaces are evasive because of the complexity, the diversity of committed implementation schedules and lack or inconsistent use of industry guidelines.

On February 12, 1997 the Local Competition Users Group (LCUG) issued their "Foundation For Local Competition: Operations Support Systems Requirements For Network Platform and Total Services Resale. The core principles contained in the document are: Service Parity, Performance Measurement, Electronic Interfaces, Systems Integrity Notification of Change, and Standards Adherence. Each of these are significant to ensure CLEC customers can receive at least equal levels of service to those the ILEC provides to its own customers. The LCUG group indicated that is was essential that a plan be developed to measure the ILECs performances for all the essential OSS categories (e.g. pre-ordering, ordering and provisioning, maintenance and repair, network performance, unbundled elements, operator services and directory assistance, system performance, service center availability and billing). To that end, an LCUG sub-committee was formed with a charter to address measurements and metrics. The subcommittee jointly developed a comprehensive list of potential measurements which was developed and shared among the team members for review. Each committee member researched an assigned measurement group for the purpose of proposing consolidation and other modifications. The subcommittee discussed each measurement and considered existing regulatory requirements (minimum service standards) as well as good business practices in arriving at the recommended measurement and extent of detail to be reported. The service quality measurement (SQM) goals, or benchmark levels of performance, were established to provide a nondiscrimination standard in the absence of directly comparative ILEC results. Establishing precise benchmark level was difficult because the ILECs have been reluctant to share actual results. The goals, therefore, were based upon best of class and/an assessment of the necessary performance to support a meaningful opportunity for CLECs to compete. The SQM goals may change if the ILECs share historical and/or self report current results.

Measurement Plans:

A measurement plan, capable of monitoring for discriminatory behavior, must incorporate at least the following characteristics; 1) it permits direct comparisons of the CLEC and CLEC industry experience to that of the ILEC though recognized statistical procedures, 2) it accounts for potential performance variations due to differences in service and activity mix, 3) it measures not only retail services but experiences with UNEs and OSS interfaces, and 4) it produces results which demonstrate the nondiscriminatory access to OSS functionality is being delivered across all interfaces and a broad range of resold services and unbundled elements. The measures employed must address availability, timeliness of execution, and accuracy of execution.

Service Quality Measurements
Introduction

It is essential that the CLECs be able to determine that they are receiving at least equal treatment to that ILECs provide to their own retail operations or their local service affiliates. Benchmarks and performance standards that are voluntarily adopted by the CLECs and ILECs, or ordered by commissions, need to clearly demonstrate that new service providers are receiving nondiscriminatory treatment.

This document discusses measurements at both a summary level (Executive Overview) and at a level suitable for starting the implementation process (Measurement Detail)

Service Quality Measurements
Business Rules

Test for Parity:

ILEC Reports Results For Own Local Operations:
Both the average (mean) result and the variance of the measurement result for the ILEC and the CLEC should be compared to establish that the CLEC result is no worse than the ILEC's result.

ILEC Results Are Not Reported Or Results Are Incomplete:
The mean result for CLEC must be compared and a determination made that the CLEC result is no worse than the benchmark performance level. The benchmark performance to be employed in the comparison is the result produced via special study by an ILEC (as described below) or, in the absence of such a study result, the LCUG default performance benchmarks.

Benchmarking Study Requirements:

A special study may be optionally utilized by the ILEC to establish the benchmark performance level whenever a reasonable ILEC retail analog does not exist. When the ILEC performs a benchmarking study, it must be based upon equivalent experiences of that ILEC and conform to the following minimum requirements: (1) a benchmark result is provided for each reporting dimension described for the measurement; (2) the mean, standard error, and number of sample points are disclosed for each benchmark result; (3) the study process and benchmark results may be subjected to independent audit; (4) update to the benchmark result will be submitted whenever changes may reasonably be expected to impact the study results or six months has elapsed since the conduct of the prior study, whichever occurs earlier. Unless directly ordered by the appropriate regulatory commission, no ILEC benchmark will be utilized in lieu of an LCUG benchmark without mutual agreement of the CLECs impacted by use of the benchmark

Reporting Expectations and Report Format:

CLEC results for the report month are to be shown in comparison to the ILEC result for the same period with an indication, for each measurement result, where the CLEC result is lesser in quality compared to the ILEC (based upon the test for parity described in the preceding). Such detailed results will be reported only to the CLEC unless written permission is provided to do otherwise. Furthermore, reporting to the individual CLECs should include, for each measure, a representation of the dispersion around the average (mean) of the measured results for the reporting period (e.g. percent of 1-4 lines installed in the 1st day, 2nd day, 3rd day, and > 10 days, etc.) In addition to providing the preceding detailed results, the ILEC must also supply, to each interested CLEC, a report showing the ILEC performance for each measure in comparison to both CLEC industry in aggregate and the performance delivered to any affiliate(s) of the ILEC.

Delivery of Reports and Data:

Reports are to be made available to CLEC by the 5th scheduled business day following the close of the calendar report month. If requested by the CLEC, data files of raw data are to be transmitted by the ILEC to the CLEC on the 5th scheduled business day pursuant to mutually acceptable format, protocol and transmission media.

Geographic Reporting:

Measurement data should be reported on a natural geographic area that allows prudent operational management decisions to be made and does not obscure actual performance levels. Presently ILECs report at levels as discrete as indiviual exchanges (Central Office) to as aggregated as the Region level. The recommended default level of reporting is the MSA although further detail should be required where it improves the ability to make meaningful comparisons..

Service Quality Measurements
Business Rules

Verification and Auditing:

By joint request of more than one CLEC, an audit of the data collecting, computing and reporting processes must be permitted by the ILEC. The ILEC must also permit an individual CLEC to audit or examine its own results pursuant to terms no more restrictive than those established between the CLEC and the ILEC in the interconnection agreement for the operating area underlying the reported results.

During implementation of the measurement reporting, validation of results of data collection, measurement result computation and report production will be necessary. The ILEC must permit such validation activities and not subsequently contend that an individual CLEC has undertaken an audit either under the terms of the measurement plan or pursuant to the terms of the CLEC's interconnection agreement.

Adaptation:

Technology, market conditions and industry guidelines/standard continue to evolve. LCUG reserves the right to modify the content of this document, adding, deleting or making modification, as necessary to reflect such changes.

Service Quality Measurements
Executive Overview

This Executive Overview section:

- Provides a summary of the detailed requirements
- Enables a quick overview and understanding of the proposed LCUG measurements
- Summarizes the Business Implications associated with each measurement
- Accommodates a target audiences who have a need to know about the measurements but not the specific details

Service Quality Measurements
Executive Overview

Pre-Ordering (PO)

Function:
Average Response Interval for Pre-Ordering Information
Business Implications:
• The CLEC customer service agent must establish such basic facts as availability of desired features, likely service delivery intervals, the telephone number to be assigned and the validity of the street address while the customer (or potential customer) is on the phone • It is critical that the CLEC be perceived as equally competent, knowledgeable and fast as an ILEC customer service agent • This measure is designed to monitor the time required for CLECs to obtain the pre-ordering information necessary to establish and modify service • Comparison to the ILEC results allow conclusions whether an equal opportunity exists for the CLEC to deliver a comparable customer experience (compared to the ILEC) when a retail customer calls the CLEC with a service inquiry

Measurements:	Results Detail:
• Average Response Interval for Pre-Ordering Information	• Major Pre-ordering Query Type

Ordering and Provisioning (OP)

Function:
Order Completion Intervals
Business Implications:
• When the CLEC commits to a due date for service delivery, the customer plans for service availability at that point and will be dissatisfied if the requested service or feature is not delivered when promised • The "average completion interval" measure monitors the time required by the ILEC to deliver integrated and operable service components requested by a CLEC, regardless of whether services resale or unbundled network elements are employed • When the service delivery interval of the ILEC is measured for comparable services, then conclusion can be drawn regarding whether or not CLECs have a reasonable opportunity to compete for customers • The "average completion interval" and "percent completed on time" may prove useful in detecting developing capacity issues

Measurements:	Results Detail:
• Mean Completion Interval • Percent Orders Completed on Time	• By Major Service Family and Order Type

Service Quality Measurements
Executive Overview

Function:	
Order Accuracy	
Business Implications:	
• Customers expect that their service provider will deliver precisely the service ordered and all the features specified • This measurement monitors the accuracy of the provisioning work performed by the ILEC in response to CLEC orders	
Measurements:	**Results Detail:**
• Percent Order Accuracy	• By Major Service Family

Function:	
Order Status	
Business Implications:	
• When a customers calls their service providers, they expect to be able to promptly get the information regarding the progress on their order(s) • When changes must be made, such as to the expected delivery date, customers expect that they will be immediately notified so that they may modify their own plans • The order status measurements monitor, when compared to the ILEC result, that the CLEC has timely access to order progress information so that the customer may be updated or notified, early on, when changes and rescheduling are necessary	
Measurements:	**Results Detail:**
• Mean Reject Interval • Mean FOC Interval • Mean Jeopardy Interval • Mean Completion Interval • Percent Jeopardies Returned	• By Status Type and Order Type

Function:	
Held Orders	
Business Implications:	
• Customers expect that work will be completed when promised • There must be assurances that the average period that CLEC orders are held, due to a delayed completion, is no worse for the CLEC when compared to ILEC orders	
Measurements:	**Results Detail:**
• Mean Held Order Interval • Percent Orders Held ≥ 90 Days • Percent Orders Held ≥ 15 Days	• By Major Service Family and Reason for Hold

Service Quality Measurements
Executive Overview

Maintenance and Repair (MR)

Function:	
Time To Restore	
Business Implications:	
• Customers expect prompt restoral of service to the normal operating parameters whenever troubles are detected • The longer the time required to correct a service problem, the greater the customer dissatisfaction	
Measurements:	**Results Detail:**
• Mean Time to Restore	• By Major Service Family and Trouble Type

Function:	
Frequency of Repeat Troubles	
Business Implications:	
• This measurement, when gathered for both the ILEC and CLEC can establish whether or not CLECs are competitively disadvantaged (vis-à-vis the ILEC) as a result of experiencing more frequent occurrence of customer troubles not being resolved in the first attempt to repair the trouble • Differences in this measure may indicate that the CLEC is receiving inferior maintenance support in the initial resolution of troubles or, in the alternative, it may indicate that the network components supplied are of inferior quality	
Measurements:	**Results Detail:**
• Repeat Trouble Rate	• By Major Service Family and Trouble Type

Function:	
Frequency of Troubles (Troubles per 100 Lines)	
Business Implications:	
• Customers demand high quality service performance from their supplier and differentials in performance are quickly recognized throughout the market place • When measured for both the ILEC and CLEC and compared, this measure can be used to establish that CLECs are not competitively disadvantaged, compared to ILEC, as a result of experiencing more frequent incidents of trouble reports • Disparity in this measure may indicate differences in the underlying quality of the network components supplied	
Measurements:	**Results Detail:**
• Trouble Rate	• By Major Service Family and Trouble Type

Service Quality Measurements
Executive Overview

Function:	
Estimated Time To Restore Met	
Business Implications:	
• When customers experience trouble on working services, they naturally expect the services to be restored within the time frame promised • When this measure is collected for the ILEC and CLEC and then compared, it can be used to establish that CLECs are receiving equally reliable (as compared to the ILEC operations) estimates of the time required to complete service repairs	
Measurements:	**Results Detail:**
• Percentage of Customer Troubles Resolved Within Estimate	• By Major Service Family and Trouble Type

Service Quality Measurements
Executive Overview
General (GE)

Function:	
Systems Availability	
Business Implications:	
• Access to essential business functionality, supported by OSS of the ILEC, is absolutely essential to CLEC operations • This measure monitors that such OSS functionality is at least as accessible to the CLEC as to the ILEC	
Measurements:	**Results Detail:**
• Percent System Availability	• By Function Interface

Function:	
Center Responsiveness	
Business Implications:	
• When CLECs experience operational problems dealing with ILEC processes or interfaces, prompt support by the ILEC is required in order to assure that the CLEC customers are not adversely impacted • Any delay in responding to CLEC center requests for support (e.g., request for a vanity telephone number) will, in turn, adversely impact the CLEC retail customer who may be holding on-line with the CLEC customer service agent • This measure, when gathered for both the CLEC and ILEC, supports monitoring that ILEC handling of support calls from CLECs is at least as responsive as for calls by ILEC retail customers seeking assistance (e.g., calling the business office of the ILEC or call the ILEC to report service repair issues)	
Measurements:	**Results Detail:**
• Mean Time to Answer Calls • Call Abandonment Rate	• By Support Center Provided

Service Quality Measurements
Executive Overview

Billing (BI)

Function:	
Timeliness Of Billing Record Delivery	
Business Implications:	
• Regardless whether the billing is for retail customer or exchange access service, the timing of ILEC delivery of billing records must provide CLECs with the opportunity to deliver timely bills in as timely a manner as the ILEC; otherwise artificial competitive advantage would be realized by the ILEC	
Measurements:	**Results Detail:**
• Mean Time to Provide Recorded Usage Records • Mean Time to Deliver Invoices	• By Type of Usage (End User Direct Bill, End User Alternately Billed, or Access) or By Type of Invoice (TSR or UNE)

Function:	
Accuracy of Billing Records	
Business Implications:	
• The accuracy of billing records affects the accuracy of the billing ultimately delivered to local service customers, whether retail service or exchange access service customers • Billing for the elements from which CLEC services are constructed must be validated to assure that only correct charges are paid	
Measurements:	**Results Detail:**
• Percent Invoice Accuracy • Percent Usage Accuracy	• By Type of Usage (End User Direct Bill, End User Alternately Billed, or Access) or By Type of Invoice (TSR or UNE)

Service Quality Measurements
Executive Overview
Operator Services and Directory Assistance (OS, DA)

Function:	
Speed To Answer	
Business Implications:	
• In order to assure that an unjustified competitive advantage is not created for the ILEC, the speed of answer delivered to CLEC retail customers, when the ILEC provides Operator Services or Directory Services on behalf of the CLEC, must be no slower than the speed of answer that the ILEC delivers to its own retail customers of equivalent local services	
Measurements:	**Results Detail:**
• Mean Time to Answer	• Operator Services and Directory Service Separately Reported Detailed, for eeach Service by Machine and Human Answer Time

Service Quality Measurements
Executive Overview
Network Performance (NP)

Function:	
Network Performance Parity	
Business Implications:	
• The perceived quality of CLEC retail services, particularly when either ILEC services are resold or UNE combinations are employed, will be heavily influenced by the underlying quality of the ILEC network performance • Customers experience the quality of the service provider each time services are used	
Measurements:	**Results Detail:**
• Network Performance Parity	• Transmission Quality • Speed Of Connection • Reliability

Service Quality Measurements
Executive Overview
Interconnect / Unbundled Elements and Combos (IUE)

Function:	
Availability of Network Elements	
Business Implications:	

- Because CLECs use individual elements as well as element combinations to deliver unique services, it is essential that the UNE functionality operate properly due to the crucial role played by such elements in providing quality retail services
- This measure monitors individual network element or element combinations, that do not have an apparent retail analog, to assure that CLECs have a meaningful opportunity to compete through access to and use of element (or combination) functionality

Measurements:	Results Detail:
• Availability of Network Elements	• By Unique UNE or UNE Combination employed (e.g., A-Link, D-Link, SCPs/Databases, SCPs/Databases Correctly Updated, Loop Combo Availability)

Function:	
Performance of Network Elements	
Business Implications:	

- As CLECs use individual elements (as well as element combinations) to deliver unique services, it is essential that the UNE functionality operates in a timely manner because of the crucial role played by such elements in providing quality retail services

Measurements:	Results Detail:
• Timeliness of Element Performance	• By Unique UNE or UNE Combination employed (e.g.,LIDB Query time out)

Service Quality Measurements
Formula Quick Reference

	Measurement Description By Business Process:	Measurement Formula:
	Pre-Ordering (PO)	
PO-1	Average Response Interval for Pre-Ordering Information	Average Response Interval = Σ[(Query Response Date & Time) - (Query Submission Date & Time)]/(Number of Queries Submitted in Reporting Period
	Ordering and Provisioning (OP)	
OP-1	Average Completion Interval	Average Completion Interval = Σ[(Completion Date & Time) - (Order Submission Date & Time)]/(Count of Orders Completed in Reporting Period)
OP-2	Percent Orders Completed on Time	Percent Orders Completed on Time = (Count of Orders Completed within ILEC Committed Due Date) / (Count of Orders Completed in Reporting Period) x 100
OP-3	Percent Order Accuracy	Percent Order Accuracy = (Σ Orders Completed w/o Error) / (ΣOrders Completed) x 100
OP-4	Mean Reject Interval	Mean Reject Interval = Σ[(Date and Time of Order Rejection) - (Date and Time of Order Acknowledgment)]/(Number of Orders Rejected in Reporting Period)
OP-5	Mean FOC Interval	Mean FOC Interval = Σ[(Date and Time of Firm Order Confirmation) - (Date and Time of Order Acknowledgment)]/(Number of Orders Confirmed in Reporting Period)
OP-6	Mean Jeopardy Interval	Mean Jeopardy Interval = Σ[(Date and Time of Committed Due Date for the Order) - (Date and Time of Jeopardy Notice)]/(Number of Orders Jeopardized in Reporting Period)
OP-7	Mean Completion Interval	Completion Interval = Σ[(Date and Time of Notice of Completion Issued to the CLEC) - (Date and Time of Work Completion by ILEC)]/(Number of Orders Completed in Reporting Period)
OP-8	Percent Jeopardies Returned	Percent Jeopardies Returned = (Number of Orders Jeopardized in Reporting Period)/(Number of Orders Confirmed in Reporting Period)
OP-9	Mean Held Order Interval	Mean Held Order Interval = Σ(Reporting Period Close Date - Committed Order Due Date) / (Number of Orders Pending and Past The Committed Due Date) for all orders pending and past the committed due date
OP-10	Percent Orders Held ≥ 90 Days	(# of Orders Held for > 90 days) / (Total # of Orders Pending But Not Completed) x 100
OP-11	Percent Orders Held ≥ 15 Days	(# of Orders Held for > 15 days) / (Total # of Orders Pending But Not Completed) x 100

Service Quality Measurements
Formula Quick Reference

	Maintenance and Repair (MR)	
MR-1	Mean Time to Restore	**Mean Time To Restore = Σ[(Date and Time of Ticket Closure)-(Date and Time of Ticket Creation)] / (Count of Trouble Tickets Closed in Reporting Period)**
MR-2	Repeat Trouble Rate	**Repeat Trouble Rate = (Count of Service Access Line Generating More Than One Trouble Within a Continuous 30 Day Period) / (Number of Reports in the Report Period) x 100**
MR-3	Trouble Rate	**Trouble Rate = (Count of Initial & Repeated Trouble Reports in the Current Period) / (Number of Service Access Line in Service at End of the Report Period) x 100**
MR-4	Percentage of Customer Troubles Resolved Within Estimate	**Percentage of Customer Troubles Resolved Within Estimate = (Count of Customer Troubles Resolved By The Quoted Resolution Time and Date) / (Count of Customer Troubles Tickets Closed) x 100**
	General (GE)	
GE-1	Percent System Availability	**% System Availability = [(Hours Functionality is Available to CLECs During Report Period) / (Number of Hours Functionality was Scheduled to be Available During the Period)] x 100**
GE-2	Mean Time to Answer Calls	**Mean Time to Answer Calls = Σ [(Date and Time of Call Answer) - (Date and Time of Call Receipt)]/(Total Calls Answered by Center)**
GE-3	Call Abandonment Rate	**Call Abandonment Rate = (Count of Calls Terminated Before Answer During the Reporting Period)/(Count of All Calls Placed in Queue During the Reporting Period)**
	Billing (BI)	
BI-1	Mean Time to Provide Recorded Usage Records	**Mean Time to Provide Recorded Usage Records ={ Σ[(Data Set Transmission Date)-(Date of Message Recording)]}/(Count of All Messages Transmitted in Reporting Period)**
BI-2	Mean Time to Deliver Invoices	**Mean Time to Deliver Invoices = Σ[(Invoice Transmission Date)-(Date of Scheduled Bill Cycle Close)]/(Count of Invoices Transmitted in Reporting Period)**
BI-3	Percent Invoice Accuracy	**Percent Invoice Accuracy = [(Number of Invoices Delivered in the Reporting Period that Have Complete Information, Reflect Accurate Calculations and are Properly Formatted) / Total Number of Invoices Issued in the Reporting Period] x 100**
BI-4	Percent Usage Accuracy	**Percent Usage Accuracy = [(Number of Usage Records Delivered in the Reporting Period That Reflected Complete Information Content and Proper Formatting) / (Total Number of Usage**

		Records Transmitted)] x 100

Service Quality Measurements
Formula Quick Reference

	Operator Services and Directory Assistance (OS, DA)	
OS/DA-1	Mean Time To Answer	Mean Time To Answer =[Σ(Date and Time of Call Answer) - (Date and Time of Call Receipt)]/(Total Calls Answered on Behalf of CLECs in Reporting Period)
	Network Performance (NP)	
NP-1	Network Performance Parity	Network Performance Parity = Σ(Network Performance Parameter Result)/(Number of Tests Conducted)
	Interconnect / Unbundled Elements and Combos (IUE)	
IUE-1	Function Availability	Function Availability[1] = (Amount of Time[2] a Functionality is Useable[1] by a CLEC in a Specified Period)/(Total Time[2] Functionality Was Intended to Be Useable) Notes: 1. These measure may also be expressed in the negative, that is, in term of unavailability. 2. In some instances, rather than time, the availability will be express in terms of transactions executed successfully compared to transactions attempted.
IUE-2	Timeliness of Element Performance	Timeliness of Element Performance = (Number of Times Functionality Executes Successfully Within the Established Timeliness Standard)/(Number of Times Execution of Functionality was Attempted)

Service Quality Measurements
Measurement Detail

The Measurement Detail section:
- Provides explicit detail information for each measurement
- Provides business reasons for the measurement, required data elements, analogs to the existing ILEC business function and comparative results suggestions
- Is targeted at those individuals who need to know and understand the detail categories and measurement methodologies

Service Quality Measurements
Measurement Detail

Pre-Ordering (PO)

Function:	Average Response Interval for Pre-Ordering Information
Business Implications:	As an initial step of establishing service, the customer service agent must establish such basic facts as availability of desired features, likely service delivery intervals, the telephone number to be assigned, the current products and features the customer has, and the validity of the street address. Typically, this type of information is gathered from supporting OSS while the customer (or potential customer) is on the telephone with the customer service agent. Because pre-ordering activities are the first tangible contact that a customer may have with a CLEC, it is critical that the CLEC be perceived as equally competent, knowledgeable and fast as and ILEC customer service agent. This measure is designed to monitor the time required for CLECs to obtain the pre-ordering information necessary to establish and modify service. Comparison to the ILEC results allow conclusions whether an equal opportunity exists for the CLEC to deliver a comparable customer experience (compared to the ILEC) when a retail customer calls the CLEC with a service inquiry.
Measurement Methodology:	**Average Response Interval = Σ[(Query Response Date & Time) - (Query Submission Date & Time)]/(Number of Queries Submitted in Reporting Period)** **For CLEC Results:** The response interval for each pre-ordering query is determined by computing the elapsed time from the ILEC receipt of a query from the CLEC, whether or not syntactically correct, to the time the ILEC returns the requested data to the CLEC. Elapsed time is accumulated for each major query type, consistent with the specified reporting dimension, and then divided by the associated total number of query received by the ILEC during the reporting period. **For ILEC Results:** The ILEC computation is identical to that for the CLEC with the clarifications noted below. **Other Clarifications and Qualification:** • The elapsed time for an ILEC query is measured from the point in time when the ILEC customer service agent submits the request for identical or similar information into the ILEC OSS until the time when the ILEC OSS returns the requested information to the ILEC customer service agent. • As additional pre-ordering functionality is established by industry, for example with respect to unbundled network elements, the reporting dimensions may be expanded. • Elapsed time is measured in seconds and tenths of seconds rounded to the nearest tenth of a second • Elapsed time is to be measured through automated rather than manual monitor and logging. • The ILEC service agent entry of a request for pre-ordering information (to the ILEC OSS) is considered to be the equivalent of the ILEC receipt of a query from the CLEC. • The ILEC OSS return of information, whether in hard copy or by display on the ILEC service agent's terminal is considered equivalent to the return of requested information to the CLEC.

Service Quality Measurements
Measurement Detail

Reporting Dimensions:	Excluded Situations:
• Pre-Ordering Query Types (See Appendix A) Geographic Scope	• None

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Report Month • Query Identifier (e.g., unique tracking number) • Query Receipt Date by ILEC • Query Receipt Time by ILEC • Query Type (per reporting dimension) • Data Response Date • Data Response Time • Geographic Scope	• Report Month • Query Type (per reporting dimension) • Mean response interval • Standard error of the mean response interval • Geographic Scope

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • Other than a query when 30 or more telephone numbers are requested, the response interval will be less than or equal 2 seconds for 98% of the CLEC's queries received by the ILEC during the reporting period and no query will take more than 5 seconds. • For queries requesting 30 or more telephone numbers, the response interval is never to exceed two hours.

Service Quality Measurements
Measurement Detail
Ordering and Provisioning (OP)

Function:	Order Completion Intervals
Business Implications:	In order to be successful in the marketplace, CLECs must be capable of delivering service in time frames equal or better than what the ILEC delivers for comparable service configurations. Likewise, when the CLEC commits to a due date for service delivery, the customer plans for service availability has been established and the customer will be dissatisfied if the requested service or feature is not delivered when promised. The "average completion interval" measure monitors the time required by the ILEC to deliver integrated and operable service components requested by the CLEC, regardless of whether services resale or unbundled network elements are employed. When the service delivery interval of the ILEC is measured for comparable services, then conclusion can be drawn regarding whether or not CLECs have a reasonable opportunity to compete for customers. The "orders completed on time" measure monitors the reliability of ILEC commitments with respect to committed due dates to assure that CLECs can reliably quote expected due dates to their retail customer. In addition, when monitored over time, the "average completion interval" and "percent completed on time" may prove useful in detecting developing capacity issues.
Measurement Methodology:	**Average Completion Interval = Σ [(Completion Date & Time) - (Order Submission Date & Time)]/(Count of Orders Completed in Reporting Period)**
	Percent Orders Completed on Time = (Count of Orders Completed w/o ILEC Committed Due Date) / (Count of Orders Completed in Reporting Period) x 100
	For CLEC Results: The actual completion interval is determined for each order processed during the reporting period. The completion interval is the elapsed time from the ILEC receipt of a syntactically correct order from the CLEC to the ILEC's return of a valid completion notification to the CLEC. Elapsed time for each order is accumulated for each reporting dimension (see below). The accumulated time for each reporting dimension is then divided by the associated total number of orders completed within the reporting period.
	The percentage of orders completed on time is determined by first counting, for each specified reporting dimension, both the total numbers of orders completed within the reporting interval and the number of orders completed by the committed due date (as specified on the initial FOC returned to the CLEC). For each reporting dimension, the resulting count of orders completed no later than the committed due date is divided by the total number of order completed with the resulting fraction expressed as a percentage.
	For ILEC Results: The ILEC computation is identical to that for the CLEC with the clarifications noted below.
	Other Clarifications and Qualification:
	• The elapsed time for an ILEC order is measured from the point in time when the ILEC customer service agent enters the order into the ILEC order processing system until the date and time reported by the ILEC installation personnel log actual completion of all work necessary to permit service initiation, whether or not the ILEC initiates customer billing at that point in

Service Quality Measurements
Measurement Detail

time.
- Results for the CLECs are captured and reported at the order level (e.g., unique PON).
- The Completion Date is the date upon which the ILEC issues the Order Completion Notice to the CLEC.
- If the CLEC initiates a supplement to the originally submitted order and the supplement reflects changes in customer requirements (rather than responding to ILEC initiated changes), then the order submission date and time will be the date and time of the ILEC receipt of a syntactically correct order supplement.
- No other supplemental order activities will result in an update to the order submission date and time used for the purposes of computing the order completion interval.
- See "Order Status" metric sheet for discussion of ILEC analogs receipt of a syntactically correct and return of a valid completion notice.
- Elapsed time is measured in hours and hundredths of hours rounded to the nearest tenth of an hour.
- Because this should be a highly automated process, the accumulation of elapsed time continues through off-schedule, weekends and holidays.

Reporting Dimensions:	Excluded Situations:
• Service - Standard Service Groupings (See Appendix A) • Activity - Standard Order Activities (See Appendix A) • Geographic Scope	• Canceled orders • Initial Order when supplemented by CLEC • ILEC Orders associated with internal or administrative use of local services

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Report Month • CLEC Order Number • Order Submission Date • Order Submission Time • Order Completion Date • Order Completion Time • Service Type • Activity Type • Geographic Scope	• Report Month • Average Order Completion Interval • Standard Error for the Order Completion Interval • Service Type • Activity Type • Geographic Scope

| Performance Standard in Absence of ILEC Results: | If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete:
• Unless otherwise noted, the order completion interval for installations that do not require a premise visit and do not require anything beyond software updates is 1 business day.
• Unless otherwise noted, the order completion intervals for installations that involve a premise visit or physical work is three business days.
• Installation Interval Exceptions:
    • UNE Platform (at least DS0 loop + local switching + common transport elements) installation interval is 1 business day whether or not premise work is required.
    • The installation interval for unbundled loops is always 1 business day. |

	- UNE Channelized DS1 (DS1 unbundled loop + multiplexing) installation interval is within 2 business days. - Unbundled Switching Element installation interval is within 2 business days - DS0/DS1 Dedicated Transport installation interval is within 3 business days - All other Dedicated Transport installation interval is within 5 business days. • The installation interval for all order involving only feature modification is 5 hours. • Order completion interval for all disconnection orders is 1 business day.

Service Quality Measurements
Measurement Detail

Function:	Order Accuracy
Business Implications:	Customers expect that their service provider will deliver precisely the service ordered and all the features specified. Any service provider that is unreliable, with respect to fulfilling orders, will not only generate ill-will with customers where errors are made, but will also incur higher cost due to rework and processing of customer complaints. This measurement monitors the accuracy of the provisioning work performed by the ILEC, in response to CLEC orders. When the ILEC provide the comparable measure for its own operation then it is possible to know if provisioning work performed for CLECs is at least as that performed by the ILEC for its own retail local service operations.
Measurement Methodology:	**Percent Order Accuracy = (Σ Orders Completed w/o Error) / (ΣOrders Completed) x 100** **For CLEC Results:** For each order completed during the reporting period, the original account profile and the order that the CLEC sent to the ILEC are compared to the services and features reflected upon the account profile as it existed following completion of the order by the ILEC. An order is "completed without error" if all service attribute and account detail changes (as determined by comparing the original and the post order completion account profile) completely and accurately reflect the activity specified on the original and supplemental CLEC orders. "Total number of orders completed" refers to order completions received by the CLEC from the ILEC for each reporting dimension identified below. **For ILEC Results:** Same computation as for the CLEC with the clarifications noted below. **Other Clarifications and Qualification:** • **Order Supplements -** If the CLEC initiates any supplements to the originally submitted order, for the purposes of reflecting changes in customer requirements, then the cumulative effect of the initial order and all the supplemental orders will be the compared with differences determined by comparison of the pre- and post order completion account profiles. • **Completion Notices -** To the extent that the ILEC supplies a completion notice containing sufficient information to perform validation of the order accuracy, then the Completion Notice information can be utilized in lieu of the comparison of the "before" and "after" account profiles. Use of the completion notice for this purpose would need to be at the mutual agreement of the ILEC and the CLEC. **All Orders -** The comparison is between the CLEC order and the account profile as it existed before and after order completion. • **Service Profile -** If a sample is employed for this measurement, then the ILEC should also be prepared, if requested, to provide the percentage distribution of order activity types represented within each service type for both the ILEC and CLEC sample. Sampling may be utilized to establish order accuracy provided the results produced are consistent with the reporting dimensions specified, the sample methodology is disclosed in advance and reflects generally accepted sampling methodology, and the sampling process may be audited by the CLEC.

Service Quality Measurements
Measurement Detail

Reporting Dimensions:	Excluded Situations:
• Service - Standard Service Groupings (See Appendix A)	• Orders canceled by the CLEC • Order Activities of the ILEC associated with internal or administrative use of local services.
Data Retained Relating To CLEC Experience:	**Data Retained Relating To ILEC Performance:**
• Report Month • Percentage Order Accuracy • Service Type • Geographic Scope	• Report Month • Percentage Order Accuracy • Service Type • Geographic Scope
Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • Completed CLEC orders, by reporting dimension, are accurate no less than 99% of the time.

Service Quality Measurements
Measurement Detail

Function:	Order Status
Business Implications:	When a customer calls their service provider, they expect to get information promptly regarding the progress on their order(s). Likewise, when changes must be made, such as to the expected delivery date, customers expect that they will be immediately notified so that they may modify their own plans. A service provider that cannot fulfill such expectations will generate customer dissatisfaction. Lengthy delays in exchange of status information will result in the delay of other customer affecting activities: Inside wiring activity is often not confirmed until the firm order confirmation is returned, and customer billing will not be initiated until the CLEC receives the order completion notice, to cite two examples of impact. The order status measurements monitor, when compared to the ILEC result, that the CLEC has timely access to order progress information so that the customer may be updated or notified, early on, when changes and rescheduling are necessary. Furthermore, the "% jeopardies returned" measure for the CLEC, when reported in comparison to the ILEC result, will gauge whether initial commitments to the CLEC for order processing are at least as reliable as the commitments the ILEC makes for its own operations.
Measurement Methodology:	Order status intervals measure the elapsed time necessary to provide a notice to the CLEC that an "unexpected" condition has been encountered when processing an order. Order status includes notification of order <u>rejection</u> due to violation of order content or syntax requirements, <u>confirmation</u> of order acceptance, <u>jeopardy</u> of an order due to the inability to complete work as originally committed and work <u>completion</u> notification. The interval required to supply each of these four preceding major categories of status must be separately monitored and reported. **Reject Interval = Σ[(Date and Time of Order Rejection) - (Date and Time of Order Acknowledgment)]/(Number of Orders Rejected in Reporting Period)** <u>Reject Interval</u> is the elapsed time between the ILEC receipt of an order from the CLEC to the ILEC return of a notice of a syntax rejection to the CLEC. The time measurement starts when the ILEC accepts (acknowledges) the order from the CLEC. The time measurement stops when the ILEC returns a rejection notice to the CLEC. The elapsed time is accumulated by order type with the resulting accumulated time then divided by the count of rejected orders associated with the particular service and order type. **FOC Interval = Σ[(Date and Time of Firm Order Confirmation) - (Date and Time of Order Acknowledgment)]/(Number of Orders Confirmed in Reporting Period)** <u>Interval for Return of a Firm Order Confirmation (FOC Interval)</u> is the elapsed time between the ILEC acceptance of a syntactically correct order and the return of a confirmation to the CLEC that the order will be worked as submitted or worked with the modifications specified on the confirmation. The time measurement starts when the ILEC accepts (acknowledges) the order from the CLEC. The time measurement stops when the ILEC returns a valid firm order confirmation to the CLEC. The elapsed time is accumulated by order type with the resulting accumulated time then divided by the count of orders associated with the particular service and order type. **Jeopardy Interval = Σ[(Date and Time of Committed Due Date for the Order) -**

(Date and Time of Jeopardy Notice)]/(Number of Orders Jeopardized in Reporting Period)

<u>Jeopardy Interval</u> is the remaining time between the pre-existing committed order completion date and time (communicated via the FOC) and the date and time the ILEC issues a notice to the CLEC indicating an order is in jeopardy of missing the due date. The scheduled completion time will be assumed to be 5:00 p.m. local time unless other information is communicated in the FOC. The date and time of the jeopardy notice delivered by the ILEC is subtracted from the scheduled completion date to establish the jeopardy interval for any order placed in jeopardy. The jeopardy interval is accumulated by standard order activity with the resulting accumulated time then divided by the count of orders associated with the particular service and standard order activity.

Completion Interval = Σ[(Date and Time of Notice of Completion Issued to the CLEC) - (Date and Time of Work Completion by ILEC)]/(Number of Orders Completed in Reporting Period)

<u>Completion Notice Interval</u> is the elapsed time between the ILEC technician's reported completion of physical work and the issuance of a valid completion notice to the CLEC. Where physical work is not required, such as in the case of software-only changes, the elapsed time will be measured beginning at 5:00 p.m. local time of the date for the committed completion and will end when the ILEC returns a valid completion notice to the CLEC. If a valid completion notice is returned before 5:00 p.m. on the committed completion date and no physical work is involved, then the elapsed time will be recorded as 1/10 hour. The elapsed time is accumulated by order type with the resulting accumulated time then divided by the count of orders associated with the particular service and order type.

% Jeopardies = (Number of Orders Jeopardized in Reporting Period)/(Number of Orders Confirmed in Reporting Period)

<u>Percentage Jeopardies Returned</u> is the percentage of total orders processed for which the ILEC notifies the CLEC that the work will not be completed as committed on the original FOC. The measurement result is derived by dividing the count of jeopardy notices the ILEC issues to the CLEC by the count of FOC returned by the ILEC during the identical period. Both the "Number of Orders Jeopardized in Reporting Period" and "Number of Orders Confirmed in Reporting Period" are utilized in other status measurement computations.

For ILEC Results: Same computation as the CLEC with the clarifications outlined below.

Other Clarifications and Qualification:

- When the ILEC processes orders for a CLEC via different interfaces (e.g., ASR and EDI) then the preceding measurement must be computed for each interface arrangement.
- All intervals are measured in hours and hundredths of hour rounded to the nearest hundredth.
- Because this should be a highly automated process, the accumulation of elapsed time continues through off-schedule, weekends and holidays.
- "Syntactically correct" means all fields required to process an order are

Service Quality Measurements
Measurement Detail

populated and reflect the correct format.

- The ILEC service agent's attempt to submit an order for processing by the ILEC OSS is considered equivalent to the ILEC acknowledgment of the CLEC's order.
- The ILEC OSS return of any indication to the service agent that an order cannot be processed as submitted is considered equivalent to the ILEC return of a rejection notice to the CLEC.
- Return of any information (e.g., order recapitulation) to the ILEC customer service agent that indicates the order can be processed, is the equivalent of the ILEC return of a FOC to the CLEC.
- Logging of information in the ILEC OSS, whether manual or automatic, that indicates an order may not be completed by the existing due date, is equivalent of the return of a jeopardy notice to the CLEC regardless of whether or not the ILEC takes action based upon such information.
- Automatic logging of work completion and manual logging of work completion, whether input to directly to the ILEC OSS or into an intermediate storage devise, is consider the equivalent of the return of a completion notice to the CLEC.

Reporting Dimensions:	Excluded Situations:
• Standard Order Activities (See Appendix A) • Geographic Scope	• Rejection Interval - None • Jeopardy Interval - None • Firm Order Confirmation Interval - None • Completion Notification Interval - None • Percentage Jeopardies Returned - None

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Report Month • CLEC Order Number • Order Submission Date • Order Submission Time • Status Type (Rejection, FOC, Jeopardy Type, Completion Notice) • Status Notice Date • Status Notice Time • Standard Order Activity • Geographic Scope	• Report Month • Status Type (Rejection, FOC, Jeopardy Type, Completion Notice) • Average Status interval • Standard error of status interval • Standard Order Activity • Geographic Scope

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • no less than 97% of Rejects in a reporting period are returned within 15 seconds • all Firm Order Confirmations are returned within 4 hours • no less than 97% of order completions are returned within 30 minutes of work completion • no less than 97% of Jeopardies should be received by the CLEC a minimum of 2 business days prior to the due date indicated on the final FOC • no more than 5% of the total number of orders should result in a Jeopardy in any given report period

Service Quality Measurements
Measurement Detail

Function:	Held Orders
Business Implications:	Customers expect that work will be completed when promised. Therefore, when delays occur in completing CLEC orders, there must be assurances that the average period that CLEC orders are held, pending a delayed completion, is no worse for the CLEC when compared to ILEC orders.
Measurement Methodology:	**Held Order Interval = Σ(Reporting Period Close Date - Committed Order Due Date) / (Number of Orders Pending and Past The Committed Due Date) for all orders pending and past the committed due date** **For CLEC Results:** This metric is computed at the close of each report period. The held order interval is established by first identifying all orders, at the close of the reporting interval, that both have not been reported as "completed" via a valid completion notice and have passed the currently "committed completion date" for the order. For each such order the number of calendar days between the committed completion date and the close of the reporting period is established and represents the held order interval for that particular order. The held order interval is accumulated (by standard service grouping and reason for the order being held, if identified.) The total number of day accumulated in a category is then divided by the number of held orders within the same category to produce the mean held order interval. **(# of Orders Held for $\geq$ 90 days) / (Total # of Orders Pending But Not Completed) x 100** **(# of Orders Held for $\geq$ 15 days) / (Total # of Orders Pending But Not Completed) x 100** This "percentage orders held" measure is complementary to the held order interval but is designed to detect orders continuing in a "non-completed" state for an extended period of time. Computation of this metric utilizes a subset of the data accumulated for the "held order interval" measure. All orders, for which the "held order interval" equals or exceeds 90 (or 15) days, are counted by service type. The total number of pending and past due orders for the same service type are counted (as was done for the held order interval) and divided into the count of orders held past 90 (or 15) days. **For ILEC Results:** Same computation as for the CLEC with the clarifications provided below.. **Other Clarifications and Qualification:** • The "held order" measure established by some state commissions as part of minimum service standards is analogous to this proposed measure but, because it is typically limited to monitoring only those orders held because of facility shortages, needs to be expanded to include all reasons that an order is past due. • **Order Supplements** - If the CLEC initiates a supplement to the originally submitted order for the purpose of reflecting changes in customer requirements, then the due date returned on the FOC will be the basis for the preceding calculations. No other supplemental order activities will result in an update to the committed due date. • See "Order Status" measurement definitions for discussion of the ILEC analog to a completion notice.

Service Quality Measurements
Measurement Detail

	• The held order interval is measured in calendar rather than business days.
Reporting Dimensions:	**Excluded Situations:**
• Service - Standard Service Groupings (See Appendix A) • Reason for Hold (no facilities, no equipment, workload, other) • Geographic Scope	• Any orders canceled by the CLEC will be excluded from this measurement. • Order Activities of the ILEC associated with internal or administrative use of local services
Data Retained Relating To CLEC Experience:	**Data Retained Relating To ILEC Performance:**
• Report Month • CLEC Order Number • Committed Due Date • Order Submission Date • Service Type • Hold Reason • Geographic Scope	• Report Month • Average Held Order Interval • Standard Error for Average Held Order. Interval • Service Type • Hold Reason • Geographic Scope
Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • Less than 0.1% of orders held for more than 15 calendar days • No orders held for more than 90 calendar days

Service Quality Measurements
Measurement Detail

Maintenance and Repair (MR)

Function:	Time To Restore
Business Implications:	Customers expect prompt restoral of service to the normal operating parameters whenever troubles are detected. The longer the time required to correct a service problem, the greater the customer dissatisfaction. This measure, when collected for both the CLEC and ILEC and compared, monitors that CLEC maintenance requests at least as quickly as ILEC maintenance requests.
Measurement Methodology:	**Mean Time To Restore = Σ[(Date and Time of Ticket Closure)-(Date and Time of Ticket Creation)] / (Count of Trouble Tickets Closed in Reporting Period)** **For CLEC Results:** The restoral interval for resolution of customer requested maintenance and repair is the elapsed time, measured in hours and tenths of hours, measured from the CLEC logging a trouble ticket with the ILEC, regardless of the ultimate resolution of the trouble, to the time the ILEC returns a valid trouble resolution notification to the CLEC. The elapsed time is accumulated by service type and trouble disposition for the reporting period. The accumulated time is divided by the count of maintenance tickets reported as resolved by the ILEC (by service type and trouble disposition and cause) during the report period. **For ILEC Results:** Same computation as for the CLEC. **Other Clarifications and Qualification:** • This measure is analogous to the Out Of Service Measure of the ILEC with the exception that all trouble causes are monitored and that the average time to restore is reported rather than a comparison to a target (the same underlying data is required for both computations) • Elapsed time is measured on a 24 hour day, seven days a week basis. The time is measured in hours and hundredths of hours rounded to the nearest hundredth hour. • Multiple reports for the same customer service are treated as separate incidents. • "Restore" means to return to the normally expected operating parameters for the service regardless of whether or not the service, at the time of trouble ticket creations, was operated in a degraded mode or was completely unusable. • A trouble ticket or trouble report is any record (whether paper or electronic) by the ILEC for the purpose of monitoring action and disposition of a service repair or maintenance situation. • ILEC acceptance of a trouble by the call receipt agent is considered equivalent to the CLEC logging or submitting a trouble to the ILEC. • The ILEC closure of a trouble ticket (whether automatic or manual) is considered equivalent to returning a trouble resolution notice to the CLEC.

Reporting Dimensions:	Excluded Situations:
• Service - Standard Service Groupings (See Appendix A) • Disposition and Cause (See Appendix A) • Geographic Scope	• Trouble tickets that are canceled at the CLEC request • ILEC trouble reports associated with administrative service • Instances where the CLEC or an ILEC customer requests that a ticket be "held

Service Quality Measurements
Measurement Detail

	open" for monitoring. • Subsequent Reports (additional reports on an already open ticket).
Data Retained Relating To CLEC Experience:	**Data Retained Relating To ILEC Performance:**
• Report Month • CLEC Ticket # • Ticket Submission Time • Ticket Submission Date • Ticket Completion Time • Ticket Completion Date • Service Type • WTN or CKTID (a unique identifier for elements combined in a service configuration) • Disposition and Cause • Geographic Scope	• Report Month • Average Restoral Interval • Standard Error for the Average Restoral Interval • Service Type • Disposition and Cause • Geographic Scope

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete:
	• Out of Service conditions where dispatch is required:
	  • $\geq$90% resolved within 4 hours
	  • $\geq$95% resolved within 8 hours
	  • $\geq$99% resolved within 16 hours
	• Out of Service conditions where no dispatch is required:
	  • $\geq$85% resolved within 2 hours
	  • $\geq$95% resolved within 3 hours
	  • $\geq$99% resolved within 4 hours
	• $\geq$ all other troubles resolved within 24 hours

Service Quality Measurements
Measurement Detail

Function:	Frequency of Repeat Troubles
Business Implications:	Customers are keenly aware of the effectiveness of repair activities. First time troubles are sufficiently annoying and disruptive. When the trouble recurs within a short time frame it is even more dissatisfying. This measurement, when gathered for both the ILEC and CLEC can establish whether or not CLECs are competitively disadvantaged (vis-à-vis the ILEC) as a result of experiencing more frequent occurrence of customer troubles not being resolved in the first attempt to repair the trouble. Differences in this measure may indicate that the CLEC is receiving inferior maintenance support in the initial resolution of troubles or, in the alternative, it may indicate that the network components supplied are of inferior quality.
Measurement Methodology:	**Repeat Trouble Rate = (Count of Service Access Line Generating More Than One Trouble Within a Continuous 30 Day Period) / (Number of Reports in the Report Period) x 100** **For CLEC Results:** The repeat trouble rate measure is computed by accumulating the number of instances where a trouble ticket is submitted by a CLEC to the ILEC for a service arrangement that had at least one prior trouble ticket any time in the 30 calendar days preceding the creation of the current trouble ticket. The number of repeat troubles are accumulated for the reporting period by service type. The count of repeat troubles, by service type, is divided by the count of initial trouble reports (by service type) received during the report period. **For ILEC Results:** Same computation as for CLECs. **Other Clarifications and Qualification:** • No trouble types excluded (for example, trouble dispositions of "no access" are included) • Unbundled loops or UNE combination involving and unbundled loops are considered a "service access line". • The "same service arrangement" means a trouble report being reported for the same telephone number or the same circuit identifier. • The trouble resolution need not be identical between the repeated reports for the incident to be counted as a repeated trouble.

Reporting Dimensions:	Excluded Situations:
• Service - Standard Service Groupings (See Appendix A) • Disposition and Cause (See Appendix A) • Geographic Scope	• Trouble tickets that are canceled at the CLEC request • ILEC trouble reports associated with administrative service • Instances where the CLEC or an ILEC customer requests that a ticket be "held open" for monitoring. • Subsequent trouble report(s) on a maintenance ticket that has (have) not been reported as resolved (or closed)

Service Quality Measurements
Measurement Detail

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Report Month • CLEC Ticket # • Ticket Submission Time • Ticket Submission Date • Ticket Completion Time • Ticket Completion Date • Service Type • WTN or CKTID (a unique identifier for elements combined in a service configuration) • Disposition and Cause • Geographic Scope	• Report Month • % repeat trouble • Service Type • Disposition and Cause • Geographic Scope

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • Less than 1% of trouble reports, by service type, experience a repeat report, regardless of the trouble disposition, within a 30 day period.

Service Quality Measurements
Measurement Detail

Function:	Frequency of Troubles (Troubles per 100 lines)
Business Implications:	Customers demand high quality of service performance from their supplier and differentials in performance are quickly recognized throughout the market place. Poor performance is difficult to overcome and may require lengthy periods of sustained superb performance in order to re-establish a product image that has been tarnished. When measured for both the ILEC and CLEC and compared, this measure can be used to establish that CLECs are not competitively disadvantaged, compared to ILEC, as a result of experiencing more frequent incidents of trouble reports. Disparity in this measure may indicate differences in the underlying quality of the network components supplied.
Measurement Methodology:	**Trouble Rate = (Count of Initial & Repeated Trouble Reports in the Current Period) / (Number of Service Access Line in Service at End of the Report Period) x 100** **For CLEC Results:** The frequency of trouble metric is computed by accumulating, by standard service grouping and disposition and cause, the total number of maintenance tickets logged by a CLEC (with the ILEC) during the reporting period. The resulting number of tickets for each disposition and cause is accumulated within each standard service grouping, is divided by the total number of "service access lines" existing for the CLEC at the end of the report period. **For ILEC Results:** Same calculation as for the CLEC with the clarifications provided below. **Other Clarifications and Qualification:** • This measure is frequently a minimum service standard required by state commissions for monitoring ILEC performance. • There are no trouble types that are excluded from this measurement. • Unbundled loops or UNE combinations involving unbundled loops would be counted as a "service access line". • See the "Time to Restore" measurement for a discussion of the ILEC equivalent of "trouble tickets" and "trouble logging".

Reporting Dimensions:	Excluded Situations:
• Standard Service Groupings (See Appendix A) • Disposition and Cause (See Appendix A) • Geographic Scope	• Trouble tickets that are canceled at the CLEC request • ILEC trouble reports associated with administrative service • Instances where the CLEC or an ILEC customer requests a ticket be "held open" for monitoring.

Service Quality Measurements
Measurement Detail

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Report Month • CLEC Ticket # • Ticket Submission Time • Ticket Submission Date • Ticket Completion Time • Ticket Completion Date • Service Type • WTN or CKTID (a unique identifier for elements combined in a service configuration) • Disposition and Cause • Geographic Scope	• Report Month • Trouble Rate • Service Type • Disposition and Cause • Geographic Scope

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • Less than 1.5% of lines, by service type, experience a trouble in a report period.

Service Quality Measurements
Measurement Detail

Function:	Estimated Time To Restore Met
Business Implications:	When customers experience trouble on working services, they naturally expect the services to be restored within the time frame promised. When such commitments are not fulfilled, an already unsatisfactory condition, in the customer's eyes, becomes even worse. When this measure is collected for the ILEC and CLEC and then compared, it can be used to establish that CLECs are receiving equally reliable (as compared to the ILEC operations) estimates of the time required to complete service repairs.
Measurement Methodology:	**Percentage of Customer Troubles Resolved Within Estimate = (Count of Customer Troubles Resolved By The Quoted Resolution Time and Date) / (Count of Customer Troubles Tickets Closed) x 100** **For CLEC Results:** The computation of the measure is as follows: The quoted repair completion date and time is compared to the actual repair date and time (ticket closure as defined in Time to Restore metric). In each instance where the actual repair date and time is on or before the initially provided estimated or quoted date and time to restore, the count of "troubles resolved within estimate" is incremented by one for the relevant "service type" and "disposition and cause". The resulting count is divided by the total number of troubles resolved (for the consistent service type - disposition and cause), for the report period, where a estimated interval was provided or a standard interval existed. **For ILEC Results:** Same as for CLEC. **Other Clarifications and Qualification:** • The ILEC analog for this measure is derived by comparing the actual date and time of ILEC trouble ticket closure compared to the projected trouble clearance date and time established through the ILEC agent's on-line interaction with the work management system of the ILEC, regardless of whether or not the ILEC currently quotes this information to its retail customer. • There are no trouble types that are excluded from this measurement. • See the "Time To Restore" measurement for discussion of analogous ILEC maintenance activities (e.g., trouble resolution). • The "quoted" or "estimated" time to restore is the actual schedule time projection returned by the ILEC work management system or the standardized repair interval that the ILEC uses for its own operations when equivalent service arrangements are involved. • If the ILEC supplies only the estimated repair interval, then the estimated date and time of repair is determined by adding the repair interval to the date and time that the CLEC logged the repair request with the ILEC.

Reporting Dimensions:	Excluded Situations:
• Service - Standard Service Groupings (See Appendix A) • Disposition and Cause (see Appendix A) • Geographic Scope	• Trouble tickets that are canceled at the CLEC request • ILEC trouble reports associated with administrative service • Instances where the CLEC or an ILEC customer requests a ticket be "held open" for monitoring.

Service Quality Measurements
Measurement Detail

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Report Month • CLEC Ticket # • Ticket Submission Time • Ticket Submission Date • Ticket Completion Time • Ticket Completion Date • Service Type • WTN or CKTID (a unique identifier for elements combined in a service configuration) • Disposition and Cause • Geographic Scope	• Report Month • Percentage of Customer Troubles Resolved Within Estimate • Service Type • Disposition and Cause • Geographic Scope

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • Greater than 99% of a maintenance problems, by service type, are corrected by the quoted or estimated date and time of repair.

Service Quality Measurements
Measurement Detail

General (GE)

Function:	Systems Availability
Business Implications:	Access to essential business functionality, supported by OSS of the ILEC, is absolutely essential to CLEC operations. This measure monitors that such OSS functionality is at least as accessible to the CLEC as to the ILEC.
Measurement Methodology:	**% System Availability = [(Hours Functionality is Available to CLECs During Report Period) / (Number of Hours Functionality was Scheduled to be Available During the Period)] x 100** **For CLEC Results:** The total "number of hours functionality was scheduled to be available" is the cumulative number of hours (by date and time on a 24 hour clock) over which the ILEC planned to offer and support CLEC access to ILEC OSS functionality during the reporting period. The ILEC must provide a minimum advance notice of one reporting period regarding availability plans and such plans must be interface-specific. If scheduled availability is not provided with at least one report period advance notice then the default availability for the subsequent reporting period will be seven days per week, 24 hours per day. "Hours Functionality is Available" is the actual number of hours, during scheduled available time, that the ILEC gateway or interface is capable of accepting CLEC transactions or data files for processing in the gateway / interface and supporting OSS. The actual time available is divided by the scheduled time available and then multiplied by 100 to produce the "% system availability" measure. The "% system availability" measure is required for each unique interface type offered by the ILEC . **For ILEC Results:** Each OSS of the ILEC that is employed in the support of CLEC operations must first be identified by supported functional area (e.g., pre-ordering, ordering and provisioning, repair and maintenance and billing) with such mapping disclosed to the CLECs. The "available time" and "scheduled available time" is gathered for each of the identified ILEC OSS during the report period. The OSS function availability is computed based upon the weighted average availability of the subtending support OSS. That is, the available time for each OSS supporting a functional area is accumulated over the report period and then divided by the summation of the scheduled available time for those same supporting OSS. **Other Clarifications and Qualification:** • The ILEC analogs for this performance measure are the internal measures of system downtime (up time) typically established between the ILEC Systems Management Organization and the client organizations. • OSS scheduled and available time may be utilized in the computation of more than one functional area. • Parity exists if the CLEC "% system availability" $\geq$ ILEC function availability for the functionality accessed by the CLEC. • "Capable of accepting" must have a meaning consistent with the ILEC definition of down time, whether planned or unplanned, for internal ILEC systems having a comparable potential for customer impact. • Time is measured in hours and tenths of hours rounded to the nearest tenth of an hour.

Service Quality Measurements
Measurement Detail

Reporting Dimensions:	Excluded Situations:
• Interface type offered for each functional area (See Appendix A) • Business Period (8:00AM to 8:00PM local time versus 8:00PM to 8:00AM , weekends and holidays)	• None

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Report Month • Interface Type (Identifies each unique interface available to CLECs) • Scheduled Hour Available • Actual Hours Available	• Report Month • Functionality Identification • % Availability of Functionality

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • Less than 0.1% of unplanned down time, by interface type, during either business period .

Service Quality Measurements
Measurement Detail

Function:	Center Responsiveness
Business Implications:	When CLECs experience operational problems dealing with ILEC processes or interfaces, prompt support by the ILEC is required in order to assure that the CLEC customers are not adversely impacted. Any delay in responding to CLEC center requests for support (e.g., request for a vanity telephone number) will, in turn, adversely impact the CLEC retail customer who may be holding on-line with the CLEC customer service agent. This measure, when gathered for both the CLEC and ILEC, monitors that ILEC handling of support calls from CLECs is at least as responsive as for calls by ILEC retail customers seeking assistance (e.g., calling the business office of the ILEC or call the ILEC to report service repair issues).
Measurement Methodology:	**Mean Time to Answer Calls = Σ [(Date and Time of Call Answer) - (Date and Time of Call Receipt)]/(Total Calls Answered by Center)** **Call Abandonment Rate = (Count of Calls Terminated Before Answer During the Reporting Period)/(Count of All Calls Placed in Queue During the Reporting Period)** **For CLEC Results:** Speed of answer (mean time to answer calls) and call abandonment rates are monitored through the call management technology utilized to distribute calls to ILEC agents supporting CLEC activities (i.e., call receipt personnel staffing ILEC support centers intended for CLEC use). Results for each measure are to be provided separately for each center handing CLEC inquiries. If centers deployed by the ILEC support multiple functions (e.g., both maintenance and provisioning) then the results for each function supported should be separately reported, if feasible. Speed of Answer is determined by measuring and accumulating the elapsed time from the entry of a CLEC call into the ILEC call management system until the CLEC call is transferred to the ILEC personnel assigned to handling CLEC calls for assistance. The elapsed time is measured in seconds and tenths of seconds rounded to the nearest tenth of a second. The Call Abandonment Rate is also monitored through the call management technology for the CLEC service agents. The number of calls received by the call distribution system is counted for the reporting period, regardless whether the call actually is transferred to an agent for processing. In addition, a count is accumulated of all calls received into the call distribution system that are subsequently terminated by the calling party or due to equipment failure before transfer to the service agent for processing. This call termination may occur at any point (e.g., the call may be within an Automatic Call Distributor, within a Voice Response Unit, in an answer queue, or at any other point in the call management system.) **For ILEC Results:** Both Speed of Answer and Call Abandonment Rate, as it relates to the ILEC, will be measured in an identical manner as described for the CLEC. The results for the ILEC business office operations and its repair bureau operations should be separately accumulated, computed and retained. Where call receipt for such operations are commingled and inseparable, then only a single results for each

Service Quality Measurements
Measurement Detail

<table>
<tr><td></td><td>measure will be generated and serve as the comparative result for both the CLEC repair support and the CLEC provisioning support results.

Other Clarifications and Qualification:
- Speed of Answer minimum service standards, established in many states for business office, maintenance center, and/or operator services represent a similar ILEC measure and are derived from identical data (although the result displayed may be in comparison to a pre-established standard performance minimum)
- For ILEC and CLEC calls, an ILEC Agent answering and placing the caller on hold does not stop timing for purposes of the speed of answer interval.
- A Voice Response Unit does not stop the timing for purposes of the speed of answer interval. For a call to be considered answered, the live ILEC Agent must handle the CLEC request.
- Results may be reported for the CLEC industry in aggregate to the extent separate carrier-specific support centers are not provided. If separate centers are provided (either for an individual CLEC or a group of CLECs) then results should be gathered and supplied for each center and reported to the CLEC(s) based upon the center providing the specific CLEC's support.
- If the ILEC call management technology cannot measure speed of answer for on a call-specific basis, then an alternate methodology that simulates speed of answer based upon the average time for component parts of the call (e.g., queue to IVR + IVR to queue + queue to agent answer) can be utilized by mutual consent of the ILEC and CLECs.</td></tr>
</table>

Reporting Dimensions:	Excluded Situations:
• Support Center Type (i.e., Center supporting CLEC maintenance, Center supporting CLEC provisioning, ILEC Center supporting retail customer maintenance calls, ILEC Center supporting business office inquiries).	• None

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Month • Center Type • Mean Speed of Answer • Standard Error for Mean Speed of Answer • Call Abandonment Rate	• Month • Center Type • Mean Speed of Answer • Standard Error for Mean Speed of Answer • Call Abandonment Rate

| Performance Standard in Absence of ILEC Results: | If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete:
• Greater than 95% of the calls, by center, are answered within 20 seconds
• All calls are answered within 30 seconds. |

Service Quality Measurements
Measurement Detail

Billing (BI)

Function:	Timeliness Of Billing Record Delivery
Business Implications:	Regardless whether the billing is for retail customer or exchange access service, the timing of ILEC delivery of billing records must provide CLECs with the opportunity to delivery timely bills in as timely a manner as the ILEC; otherwise artificial competitive advantage would be realized by the ILEC. The "mean time to provide recorded usage" and the "mean time to deliver invoices" monitor this situation.
Measurement Methodology:	**Mean Time to Provide Recorded Usage Records ={ Σ[(Data Set Transmission Date)-(Date of Message Recording)]}/(Count of All Messages Transmitted in Reporting Period)** **Mean Time to Deliver Invoices = Σ[(Invoice Transmission Date)-(Date of Scheduled Bill Cycle Close)]/(Count of Invoices Transmitted in Reporting Period)** **For CLEC Results:** Usage Records: This measure captures the elapsed time between the recording of usage data generated either by CLEC retail customers or by CLEC access customers (by the AMA recording equipment associated with the ILEC switch) and the time when the data set, in a compliant format, is successfully transmitted to the CLEC. For each usage record, the calendar date and time of usage recording is compared to the calendar date and time of successful completion of data set transmission to the CLEC. The number of hours and tenths of hours elapsed between message recording and data set transmission will constitute the elapsed delivery time. The elapsed delivery time is accumulated for each usage record with the resulting total number of hours accumulated being divided by the number of complete usage records in all the data sets transmitted. Invoices: This measure captures the elapsed number of days between the scheduled close of a Bill Cycle and the ILEC's successful transmission of the associated invoice to the CLEC. For each invoice, the calendar date of the scheduled close of Bill Cycle is compared to the calendar date that successful invoice transmission to the CLEC completes. The number of calendar days elapsed between scheduled Bill Cycle close and completion of invoice transmission will constitute the elapsed delivery time. The elapsed delivery time is accumulated for each invoice with the resulting total number of days accumulated being divided by the number of complete invoices sent in the reporting period. **For ILEC Results:** Identical computations are made for the ILEC with the clarifications provided below. **Other Clarifications and Qualification:** • The elapsed time for delivery of ILEC usage records is measured from the time of message recording, as captured on the AMA tape of the ILEC, to the time the reformatting of the AMA tape to an EMR format (or equivalent) is completed.

	• The elapsed time for ILEC invoice delivery is measured from the scheduled close date of the retail customer bill cycle to the production of the customer bill in electronic format (i.e., bill is ready for printing) appropriate for delivery to retail customers regardless whether or not such a distribution is immediately undertaken. • Mean time to deliver usage records is to be reported separately for end user usage, access related usage. • Alternately billed usage (e.g., bill-to-third party, collect, credit card usage processed through CMDS), although commingled on the daily usage feeds to the CLEC, is to be monitored separately from the directly billed usage with respect to timeliness because of the different and more time consuming settlements and clearing process associated with such usage.

Reporting Dimensions:	Excluded Situations:
• End user usage records • Access usage records • Alternately billed usage records • Wholesale Bill Invoices (TSR) • Unbundled Element Invoices (UNE)	• Any usage records or invoices rejected due to formatting or content errors.

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Report Monthly • Record Type or Invoice Type • Mean Delivery Interval • Standard Error of Delivery Interval	• Report Month • Record Type or Invoice Type • Mean Delivery Interval • Standard Error of Delivery Interval

| Performance Standard in Absence of ILEC Results: | If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete:
• For usage records, separately for access usage and end user usage:
  • Greater than 99.9% records received within 24 hours or usage recording
  • All usage is received within 48 hours of usage recording
• Greater than 99.95% of services resale invoices received within 10 calendar days of bill cycle close
• Greater than 99.95% of wholesale (UNE) invoices received within 10 calendar days of bill cycle close. |

Service Quality Measurements
Measurement Detail

Function:	Accuracy of Billing Records
Business Implications:	The accuracy of billing records affects the accuracy of the billing ultimately delivered to local service customers, whether retail service or exchange access service customers. Billing for the elements from which CLEC services are constructed must be validated to assure that only correct charges are paid. This validation is necessary to assure that the cost structure for services is not inflated. Furthermore, charges such as "time and material" related charges may be on the invoice and need to be promptly passed on to customers (by CLECs) to avoid dissatisfaction regarding the timeliness of CLEC billing and to minimize customer inquiries on late billing. Fair competition requires that the accuracy of billing records (both usage and invoices) delivered by the ILEC to the CLEC must provide CLECs with the opportunity to delivery bills at least as accurate as those delivered by the ILEC. Producing and comparing this measurement result for both the ILEC and CLEC allows a determination as to whether or not parity exists.
Measurement Methodology:	**Invoice Accuracy = [(Number of Invoices Delivered in the Reporting Period that Have Complete Information, Reflect Accurate Calculations and are Properly Formatted) / Total Number of Invoices Issued in the Reporting Period)] x 100** **Usage Accuracy = [(Number of Usage Records Delivered in the Reporting Period That Reflected Complete Information Content and Proper Formatting) / (Total Number of Usage Records Transmitted)] x 100** **For CLEC Results:** The completeness of content, accuracy of information and conformance of formatting will be determined based upon the terms of the individual CLEC interconnection agreements with the ILECs. The ILEC will establish a quality control process that is disclosed to CLECs and that is no less rigorous than the most rigorous quality monitoring established in the ILEC billing service contracts for long distance service providers. The quality monitoring process must be disclosed in advance and process auditing must be permitted. The records and invoices delivered by the ILEC must simultaneously meet the standards relating to content, accuracy and formatting in order to be counted as accurate. Each of the above measurements, is expressed as a ratio (expressed as a percentage) of accurate records (or invoices) to the total records (or invoices) delivered. **For ILEC Results:** The results computation for the ILEC is identical to that described for the CLECs. The usage accuracy determination is based upon comparison of the usage records, following conversion to the EMR (or equivalent) format as compared to the internally established content and formatting requirements. Likewise, the accuracy measure for invoice delivery will be based upon a statistically reliable comparison of ILEC invoices to the content, calculation methodology and formatting standards of the ILEC. Separate comparisons are to be made for retail service invoices and access invoices with the results compared to wholesale (TSR) and UNE invoices, respectively. **Other Clarifications and Qualification:** • The usage accuracy measure identified here is similar to the type of measures that the ILEC commonly has instituted in service contracted established with long distance service suppliers who use ILEC billing

<table>
<tr><td colspan="2">services.
• The wholesale invoice accuracy identified here is analogous to the measures contained within the Billing Quality Assurance Programs that the ILECs have with IXCs for monitoring access billing quality. If a sampling process is used to monitor accuracy, then the study results must be reconfirmed no less than quarterly</td></tr>
</table>

Reporting Dimensions:	Excluded Situations:
• End user usage records • Access usage records • Alternately billed usage records • Wholesale Bill Invoices (TSR) • Unbundled Element Invoices (UNE)	• None

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Report Month • Record or Invoice Type (per Reporting Dimensions) • Accuracy	• Report Month • Record or Invoice Type (per Reporting Dimensions) • Accuracy

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • Greater than 98% of usage records transmitted, by usage type, reflect the agreed upon format and contain complete information. • Greater than 98% of wholesale bill, by invoice type, are financially accurate

Service Quality Measurements
Measurement Detail

Operator Services and Directory Assistance (OS, DA)

Function:	Speed To Answer
Business Implications:	In order to assure that an unjustified competitive advantage is not created for the ILEC, the speed of answer delivered to CLEC retail customers, when the ILEC provides Operator Services or Directory Services on behalf of the CLEC, must be no slower than the speed of answer that the ILEC delivers to its own retail customers of equivalent local services.
Measurement Methodology:	**Mean Time To Answer =[Σ(Date and Time of Call Answer) - (Date and Time of Call Receipt)]/(Total Calls Answered on Behalf of CLECs in Reporting Period)** **For CLEC Results:** Speed of answer and call abandonment rates are monitored through the call management technology used to distribute calls to ILEC agents supporting CLEC activities (i.e., call receipt personnel staffing Directory Assistance or Operator Service Positions). Speed of Answer is determined by measuring and accumulating the elapsed time from the entry of a CLEC retail customer call into the ILEC call management system queue until the CLEC retail customer call is transferred to the ILEC personnel assigned to handling CLEC calls for assistance (whether DA or OS). The elapsed time is measured in seconds and tenths of seconds rounded to the nearest tenth of a second. **For ILEC Results:** Identical measures as described for the CLEC with the clarification provided below. **Other Clarifications and Qualification:** • This measure is directly analogous to speed of answer minimum service standards established within many states. • Results may be reported for the CLEC industry in aggregate. • See the "Center Responsiveness" measurement for the treatment of the situation where ILEC call management technology cannot measure speed of answer on a call basis from receipt to answer.

Reporting Dimensions:	Excluded Situations:
• Operator Services in Aggregate • Directory Assistance • Processing Method (human versus machine processes)	• Call abandoned by customers prior to answer by the ILEC OS or DA operator

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Month • Call Type (OS or DA) • Mean Speed of Answer • Standard Error for Mean Speed of Answer	• Month • Call Type (OS or DA) • Mean Speed of Answer • Standard Error for Mean Speed of Answer

Service Quality Measurements
Measurement Detail

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • More than 90% of call involving answer by a "live" agent, separately for OS and DA services, are answered within 10 seconds. • All calls involving answer by a Voice Response Unit, separately for OS and DA services, are answered within 2 seconds.

Service Quality Measurements
Measurement Detail

Network Performance (NP)

Function:	Network Performance Parity
Business Implications:	The perceived quality of CLEC retail services, particularly when either ILEC services are resold or UNE combinations are employed, will be heavily influenced by the underlying quality of the ILEC network performance. Customers experience the quality of the service provider each time services are used. This metric monitors, when collect for both the CLEC and ILEC and then compared will help show whether CLEC network performance is at least at parity with ILEC network performance.
Measurement Methodology:	**Network Performance Parity = Σ(Network Performance Parameter Result)/(Number of Tests Conducted)** **For CLEC Results:** Based upon a random and statistically reliable (at a preset level) sample of network configurations employed by the CLEC, the network performance parameter (as indicated in the reporting dimension) is monitored based upon generally accepted testing procedures and the resulting parameter value(s) recorded. The measured values are accumulated across the sample base and the mean and associated variance computed **For ILEC Results:** The approach is identical to that described for the CLEC, except that the network performance is measured only for representative ILEC service configurations. **Other Clarifications and Qualification:**

Reporting Dimensions:	Excluded Situations:
• Transmission Quality (See Appendix A) • Speed of Connection (See Appendix A) • Reliability (See Appendix A)	• None

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Report Month • Reporting Dimension • Mean Performance Result • Standard Error of Mean Performance • Number of Data Points • Geographic scope	• Report Month • Reporting Dimension • Mean Performance Result • Standard Error of Mean Performance • Number of Data Points • Geographic scope

| Performance Standard in Absence of ILEC Results: | If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete:
• Performance Standards in this area are yet to be published. |

Service Quality Measurements
Measurement Detail

Interconnection/Unbundled Elements and Combinations (IUE)

Function:	Availability of Network Elements
Business Implications:	As CLECs use individual elements as well as element combinations to deliver unique services, it is essential that the UNE functionality operate properly due to the crucial role played by such elements in providing quality retail services. This measure monitors individual network element or element combinations, that do not have an apparent retail analog, to assure that CLECs have a meaningful opportunity to compete through access to and use of element (or combination) functionality.
Measurement Methodology:	**Function Availability[1] = (Amount of Time[2] a Functionality is Useable[1] by a CLEC in a Specified Period)/(Total Time[2] Functionality Was Intended to Be Useable)** **Notes:** **1. These measure may also be expressed in the negative, that is, in term of unavailability.** **2. In some instances, rather than time, the availability will be express in terms of transactions executed successfully compared to transactions attempted.** For CLEC Results: Availability will be measured for each unique UNE functionality (or combination of UNEs) that deliver a unique functionality that does not have a reasonable retail service analog. The number of times that the functionality executes properly will be shown in comparison to the number of times that the execution of the functionality was requested or initiated. Availability can apply to both physical and logical (e.g., database) elements. Physical element availability (e.g., links to databases, dedicated transport, etc.) will typically be expressed as the % of time that the functionality is useable compared to the total time in the period being observed. "Useable" will typically means that, when monitored, the element indicates readiness to operate (e.g., an electrical (or equivalent) continuity is detected, expected signaling is returned, etc.). Logical element availability will typically be expressed in terms of the number of transactions successfully executed (e.g., successful database updates, success query responses) compared to the number of transactions attempted. Illustrative examples of availability measures are shown below • A-link: minutes unavailable per year • D-link: seconds unavailable per year • databases: percentage of queries receiving a response • databases: percentage of transactions experiencing time-outs • databases: percentage of queries experiencing a return of unexpected values • routing: percentage of calls blocked For ILEC Results: Identical measurements are performed where the ILEC employs the same or reasonably comparable functionality. Where such analogs do not exist, the ILEC is expected to establish benchmark performance levels jointly with the CLEC requesting the functionality. **Other Clarifications and Qualification:**

	• The preceding list of elements is illustrative and is not to be considered exhaustive • ILEC failure to provide timeliness performance that is no worse than what its own operations experience when using comparable functionality or, where comparable functionality is not employed, failure to meet or exceed parameters established as result of negotiation with the CLEC, constitutes failure to deliver nondiscriminatory access. • For each element or element combination requested, where a retail analog is not identified, the ILEC is expected to establish both a availability measure and an availability standard (ILEC functional analog or negotiated) unless the CLEC waives its right for such a measure. • Typical databases for which standards are currently expected are AIN, LIDB and 800 Number.

Reporting Dimensions:	Excluded Situations:
• By unique UNE or UNE combinations requested by the CLECs	• None

Data Retained Relating To CLEC Experience:	Data Retained Relating To ILEC Performance:
• Month • Element or Element Combination Identification • Result for Agreed Upon Availability Parameter	• To Be Determined

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • Performance Standards in this area are yet to be published.

Service Quality Measurements
Measurement Detail

Function:	Performance of Network Elements
Business Implications:	As CLECs use individual elements (as well as element combinations) to deliver unique services, it is essential that the UNE functionality operates in a timely manner because of the crucial role played by such elements in providing quality retail services. This measure monitors individual network element (or element combinations), that do not have an apparent retail analog, to assure that CLECs are afforded a meaningful opportunity to compete when element (or combination) functionality is utilized.
Measurement Methodology:	**Timeliness of Element Performance = (Number of Times Functionality Executes Successfully Within the Established Timeliness Standard)/(Number of Times Execution of Functionality was Attempted)** **For CLEC Results:** Timeliness will be measured for each unique UNE (or combination of UNEs) that delivers unique. The number of times that the functionality executes properly within the established standard time frame will be accumulated and shown in comparison to the number of times that the execution of the functionality was requested or initiated. Illustrative examples of timeliness measures are shown below: • Database Updates: % completed within 24 hours • Post Dial Delay: % calls routed to CLEC OS platform within 2 seconds **For ILEC Results:** Identical measurements are performed where the ILEC employs the same or reasonably comparable functionality. Where such analogs do not exist, the ILEC is expected to establish benchmark performance levels jointly with the CLEC requesting the functionality. **Other Clarifications and Qualification:** • The preceding list of elements is illustrative and is not to be considered exhaustive • ILEC failure to provide timeliness performance that is no worse than what its own operations experience when using comparable functionality or, where comparable functionality is not employed, failure to meet or exceed parameters established as result of negotiation with the CLEC, constitutes failure to deliver nondiscriminatory access. • For each element (or element combination) requested where a retail analog is not identified, the ILEC is expected to establish both a timeliness measure and a timeliness standard (ILEC functional analog or negotiated) jointly with the requesting CLEC unless that CLEC waives its right for such a measure. • Typical databases for which standards are currently expected are AIN, LIDB and 800 Number. • Comparisons of performance should be based upon the criteria for which the element was engineered. For example, if the element was engineered based upon average busy hour criteria, the comparison should be based upon the CLEC busy hour period (likewise for criteria such as busy day, busy season, or ten high days).

Service Quality Measurements
Measurement Detail

Reporting Dimensions:	Excluded Situations:
• By unique UNE or UNE combinations requested by the CLECs	• None
Data Retained Relating To CLEC Experience:	**Data Retained Relating to ILEC Performance:**
• Month • Element or Element Combination Identification • Result for Agreed Upon Availability Parameter	• To Be Determined

Performance Standard in Absence of ILEC Results:	If the ILEC does not deliver direct comparative results or the ILEC has not produced benchmark levels based upon a verifiable study of its own operation as agreed to with the CLEC, then result(s) related to the CLEC operation should be provided according to the following levels of performance in order to provide the CLEC with a meaningful opportunity to compete: • Performance Standards in this area are yet to be published.

Service Quality Measurements
Measurements Detail
Appendix A: Reporting Dimensions

Standard Service Groupings:	• Resold Residence POTS • Resold Business POTS • Resold Residence ISDN • Resold Business ISDN • Resold Centrex/Centrex-like • Resold PBX trunks • Resold Channelized T1.5 service • Other Resold Services • UNE Platform (at least DS0 loop + local switch + transport elements) • UNE Channelized DS1 (DS1 loop + multiplexing) • Unbundled DS0 Loop • Unbundled DS1 Loop • Other Unbundled Loops • Unbundled Switch • Other UNEs
Standard Order Activities:	• New Service Installations • Service Migrations Without Changes • Service Migrations With Changes • Local Number Porting • Move and Changes Activities • Feature Changes • Service Disconnects
Pre-Ordering Query Types:	• Due Date Reservation • Feature Function Availability • Facility Availability • Street Address Validation • Service Availability Information • Appointment Scheduling • Customer Service Records • Telephone Number • Rejected of Failed Queries (regardless of type)
Transmission Quality Parameter:	• Subscriber Loop Loss • Signal to Noise Ratio • Idle Channel Circuit Noise • Loop-Circuit Balance • Circuit Notched Noise • Attenuation Distortion

Service Quality Measurements
Measurements Detail
Appendix A: Reporting Dimensions

Speed of Connection Parameters:	• Dial Tone Delay • Post Dial Delay • Call Completion/Delivery Rate
Reliability Parameters:	• Network Incident Affecting >5000 Blocked Calls • Network Incidents Affecting >100,000 Blocked Calls
Disposition and Cause:	• Out of Service No Dispatch • Out of Service With Dispatch • Hold Open for Monitoring • Customer Premise Equipment Trouble (including Inside Wire) • No Trouble Found • Central Office Equipment • Interoffice Facilities • Loop/Access Line • All Other Troubles • No access *"Out of Service" means that the customer has no dial tone.* *"Dispatch" means that ILEC repair personnel must be dispatched to a location outside an ILEC building (to customer premises or other off-site facilities) to resolve the trouble.*

Service Quality Measurements
Measurements Detail
Appendix B: Glossary

A

Abandoned Call: An abandoned call occurs when the caller hangs up after the call has been delivered, but before the receiving party has answered the call.

Attenuation Distortion: Attenuation Distortion" should measure the variation in loss at different frequencies across the voice frequency spectrum (200Hz - 3400 Hz).

B

Call Completion Rate The call completion rate for CLEC customers is determined by calculating the total number of calls placed by CLEC customers that were completed to the calling destination. The number of completed calls is then divided by the total # of call attempts made by CLEC customers during the reporting period.

Call Delivery Rate The **call delivery rate** for CLEC customers is determined by calculating the total # of calls received by CLEC customers. This number of delivered calls is then divided by the total # of call attempts received by the ILEC for termination CLEC customers.

Completion: A "completion" is the transaction that the ILEC sends to the CLEC to inform the CLEC that a requested order has been completed.

D

Data Response:

Dial Tone Delay: The "Dial tone delay" is determined for each trial completed during the reporting period by computing the time that transpires from a customer's going off-hook and the receipt of dial tone from the servicing central office. It should be measured in seconds and tenths of seconds. "Post dial delay" for each trial is determined for each trial completed during the reporting period by computing the time that transpires from when the last digit is dialed until a valid response is received by the customer. It should be measured in seconds and tenths of seconds

E

F

FOC A "FOC" is a Firm Order Confirmation notification, which is the transaction that the ILEC will send to the CLEC to confirm that an order can be completed.

G

H

Held Orders: "Held orders" are orders that the ILEC has confirmed (an FOC was returned to the CLEC) and that are overdue.

I

Idle Channel Circuit Noise   The idle channel circuit noise for each trial is determined for each trial completed during the reporting month by computing the difference between the noise that exists in the channel when no signals are present and the reference noise. The resulting accumulated idle channel circuit noise for all trials is divided by the total # of trials completed during the reporting period.

Interface: The "interface" is the ILEC interface that allows the CLEC to access the ILEC system

Internal or Administrative Use:

J

Jeopardy   A "jeopardy" is a transaction that the ILEC sends to the CLEC to inform the CLEC that a previously FOC'd order cannot be processed as specified in the original FOC.

K

Loop-circuit Balance   "Loops-circuit balance" should be measured in decibels and tenths of decibels above the reference noise. "Attenuation Distortion" should measure the variation in loss at different frequencies across the voice frequency spectrum (200Hz - 3400 Hz). It should be measured from the NID to the switch, and from the switch to the NID. It is measured by subtracting the loss at 1004 Hz from the loss at the frequency of interest, and should be reflected in tenths of decibels.

M

N

Network Incident: A "Network incident" is an unplanned network occurrence that results in blocked calls

O

P

Post Dial Delay: "Post dial delay" is the time that transpires from when the last digit is dialed until a valid response is received by the customer

Q

R

Receipt of Order:

Return of Valid
Completion:

S

Signal to Noise Ratio: Signal to Noise ratio is the ratio of usable signal being transmitted to the noise or undesired signal.

Subscriber Loop Loss: The subscriber loop loss is by computing the difference between the strength of the signal as it enters the loop and the strength of the transmitted signal. Signal strength is measured in decibels rounded to the nearest tenth of a decibel. The resulting accumulated decimal strength is divided by the total number of trials completed during the reporting period.

Subsequent Reports: Customer trouble reports where the customer calls to check on the status of a previous trouble report (initial or repeat) that has not been cleared (closed or resolved) at the time of the call.

Syntax Reject: A "syntax reject" is the transaction that an ILEC will return to a CLEC when a the CLEC has submitted an order transaction that the ILEC's gateway cannot process due to violation of published rules for formatting or content.

System: The "system" is the combination of ILEC gateways, communications links, hardware and software that, in combination, is used to perform or support business functions or execute supporting transactions.

T

Troubles

"Troubles" include all reported difficulties with performance of resold services or UNEs, whether the report is the initial or a repeated report, that the CLEC refersto the ILEC repair process/interface for resolution. Subsequent reports are categorized seperately.

Trouble Appointment:

A "trouble appointment" is a commitment made by the ILEC (to CLEC or to customer) to resolve a trouble.

U

V

W

X

Y

Z

Local Competition Users Group

Statistical Tests for Local Service Parity

February 6, 1998
Membership: AT&T, Sprint, MCI, LCI, WorldCom

Version 1.0

Executive Summary

The Local Competition Users Group has drafted 27 Service Quality Measurements (SQMs) that will be used to measure parity of service provided by incumbent local exchange carriers (ILECs) to competitive local exchange carriers (CLECs). This set of measures includes means, proportions, and rates of various indicators of service quality. This document proposes statistical tests that are appropriate for determining if parity is being provided with respect to these measurements.

Each month, a specified report of the 27 SQMs will be provided by the ILEC, broken down by the requested reporting dimensions. The SQMs are to be systematically developed and provided by the ILECs as specified. Test parameters will be calculated so that the overall probability of declaring the ILEC to be out of parity purely by chance is very small. For each SQM and reporting dimension reported, the difference between the ILEC and CLEC results is converted to a z-value. Non-parity is determined if a z-value exceeds a selected critical value.

Introduction

Purpose

The Local Competition Users Group (LCUG) is a cooperative effort of AT&T, MCI, Sprint, LCI and WorldCom for establishing standards for the entry of new companies (competitive local exchange carriers, or CLECs) into the local telecommunications market. A key initiative of the LCUG is to establish measures of parity for services provided by incumbent local exchange carriers (ILECs). In short, parity means that the support ILECs provide on behalf of the CLECs is no lesser in quality than the service provided by the ILECs to their own customers.

The LCUG has drafted a document listing service quality measurements (SQMs) that must be reported by the ILECs to insure that CLECs are given parity of suppport. The SQM document has been submitted to the FCC and made available to PUCs in all 50 states and is pending approval by many of these regulatory agencies. This document has been drafted to describe statistical methodology for determining if parity exists based on the measurements defined in the SQM document.

Service Quality Measurements

The LCUG has identified 27 service quality measurements for testing parity of service. These are:

Category	ID	Description
Pre-Ordering	PO-1	Average Response Interval for Pre-Ordering Information
Ordering and Provisioning	OP-1	Average Completion Interval
	OP-2	Percent Orders Completed on Time
	OP-3	Percent Order Accuracy
	OP-4	Mean Reject Interval
	OP-5	Mean FOC Interval
	OP-6	Mean Jeopardy Interval
	OP-7	Mean Completion Interval
	OP-8	Percent Jeopardies Returned
	OP-9	Mean Held Order Interval
	OP-10	Percent Orders Held >= 90 Days
	OP-11	Percent Orders Held >= 15 Days
Maintenance and Repair	MR-1	Mean Time to Restore
	MR-2	Repeat Trouble Rate
	MR-3	Trouble Rate
	MR-4	Percentage of Customer Troubles Resolved Within Estimate
General	GE-1	Percent System Availability
	GE-2	Mean Time to Anser Calls
	GE-3	Call Abandonment Rate
Billing	BI-1	Mean Time to Provide Recorded Usage Records
	BI-2	Mean Time to Deliver Invoices
	BI-3	Percent Invoice Accuracy

	BI-4	Percent Usage Accuracy
Operator Services and Directory Assistance	OSDA-1	Mean Time to Answer
Network Performance	NP-1	Network Performance Parity
Interconnect / Unbundled Elements and Combos	IUE-1	Function Availability
	IUE-2	Timeliness of Element Performance

The Service Quality Measurements document describes the importance of each measure as an indicator of service parity. The SQM document also describes reporting dimensions that will be used to break each measure out by like factors (*e.g.*, major service group).

Why We Need to Use Statistical Tests

The Telecommunications Act of 1996 requires that ILECs provide nondiscriminatory support regardless of whether the CLEC elects to employ interconnection, services resale, or unbundled network elements as the market entry method. It is essential that CLECs and regulators be able to determine whether ILECs are meeting these parity and nondiscriminatory obligations. In order to make such a determination, the ILEC's performance for itself must be compared to the ILEC's performance in support of CLEC operations; and the results of this comparison must demonstrate that the CLEC receives no less than equal treatment compared to that the ILEC provides to its own operations. Where a direct comparison to analogous ILEC performance is not possible, the comparative standard is the level of performance that offers an efficient CLEC a meaningful opportunity to compete.

When making the comparison of ILEC results to CLEC results, it is necessary to employ comparative procedures that are based upon generally accepted statistical procedures. It is important to use statistical procedures because all of the ILEC-CLEC processes that will be measured are processes that contain some degree of randomness. Statistical procedures recognize that there is measurement variability, and assist in translating results data into useful decision-making information. A statistical approach allows for measurement variability while controlling the risk of drawing an inappropriate conclusion (*i.e*, a "type 1" or "type 2" error, discussed in the next section).

Basic Concepts and Terms

Populations and Samples

Statistical procedures will permit a determination whether the support that the ILECs provide to CLECs is indistinguishable from the support provided by the ILECs to their own customers. In statistical terms, we will determine whether two "samples", the ILEC sample and the CLEC sample, come from the same "population" of measurements.

The procedures described in this paper are based on the following assumption: *When parity is*

provided, the ILEC data and CLEC data can both be regarded as samples from a common population of possible outcomes. In other words, if parity exists, the measured results for a CLEC should not be distinguishable from the measured results for the ILEC, once
random variability is taken into account.   Figure 1 illustrates this concept. On the right side of the figure are histograms of two samples. In this illustration, the ILEC sample contains 200 observations (data values) and the CLEC sample contains 50. Note that the two histograms are not exactly alike.   This is due to sampling variation. The assumption that parity exists implies that both samples were drawn from the same population of values. If it were possible to observe this population completely, the population histogram might appear as shown on the left of the Figure. If the samples were indeed taken from this population, histograms drawn for larger and larger samples would look more and more like the population histogram. Figure 1 shows that even when parity is being provided, there will be differences between the samples due to sampling variability.   Statistical tests quantify the differences between the two samples and make proper allowance for sampling variability. They assess the chance that the differences that are observed are due simply to sampling variability, if parity is being provided.
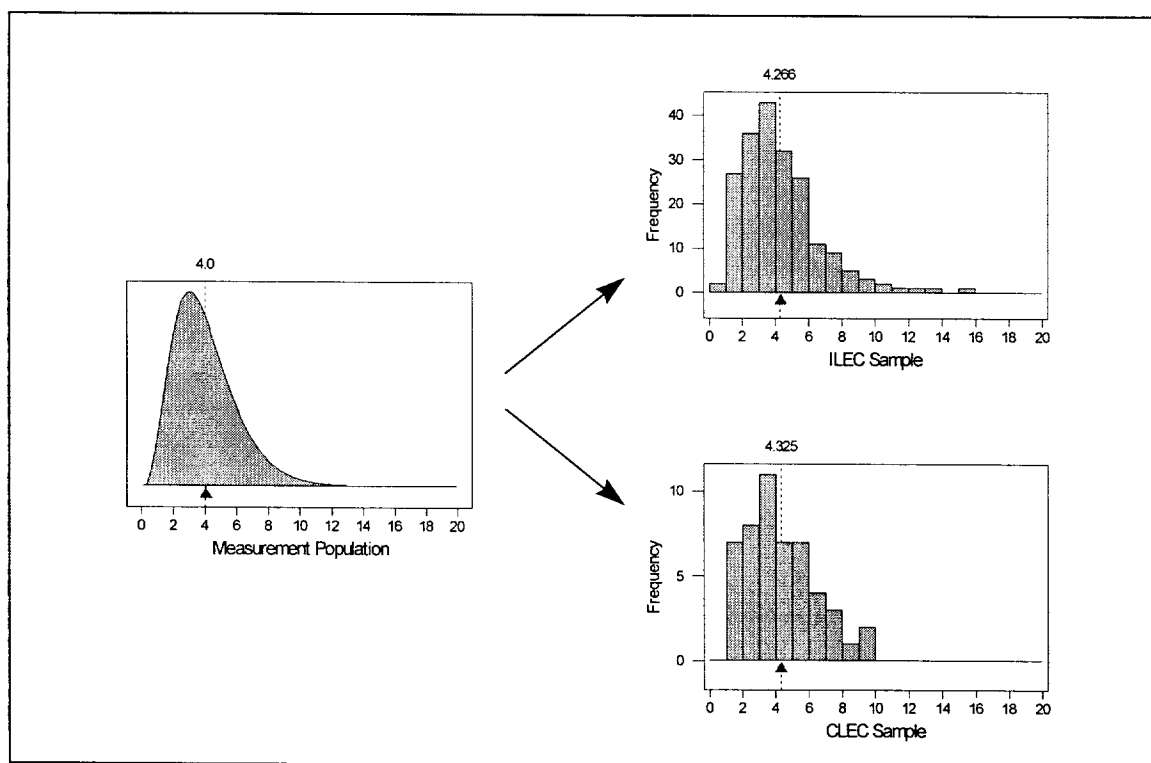

Figure 1.

Measures of Central Tendency and Spread

Often, distributions are summarized using "statistics." For the purpose of this paper, a "statistic" is simply a calculation performed on a sample set of data. Two common types of statistics are known as measures of "central tendency" and "spread."

A measure of central tendency is a summary calculation that describes the middle of the distribution in some way. The most common measure of central tendency is called the "mean" or "average" of the distribution. The mean of a sample is simply the sum of the data values divided by the sample size (number of observations). Algebraically, this calculation is expressed as

$$\bar{x} = \frac{\Sigma x}{n},$$

where x denotes a value in the sample and n denotes the sample size. The mean describes the center of the distribution in the following way: *If the histogram for a sample were a set of weights stacked on top of a flat board placed on top of a fulcrum (a "see-saw"), the mean would be the position along the board at which the board would balance.* (See Figure 1.) The mean in Figure 1 is indicated by the small triangle at approximately the value "4" on the horizontal axis.

A measure of spread is a summary calculation that describes the amount of variation in a sample. A common measure of spread is a called the "standard deviation" of the sample. The standard deviation is the typical size of a deviation of the observations in the sample from their mean value. The standard deviation is calculated by subtracting the mean value from each observation in the sample, squaring the resulting differences (so that negative and positive differences don't offset), summing the squared differences, dividing the sum by one less than the sample size, then taking the square root of the result. Algebraically, this calculation is expressed as

$$\sigma = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n - 1}}.$$

While the notion of mean and standard deviation exists for populations as well as samples, the mathematical definition for the mean and standard deviation for populations is beyond the scope of this paper. However, their interpretation is generally the same as for samples. In fact, for very large samples, the sample mean and sample standard deviation will be very close to the mean and standard deviation of the population from which the sample was taken.

Sampling Distribution of the Sample Mean

In Figure 1 we showed the positions of the means of the population and the two samples with triangular symbols beneath the distributions. If we sample over successive months, we will get new ILEC samples and new CLEC samples each and every month. These samples will not be exactly like the one for the first month; each will be influenced by sampling variability in a

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different way. In Figure 2, we show how sets of 100 successive ILEC means and 100 successive CLEC means might appear. The ILEC means can be thought of as being drawn from a population of sample means; this population is called the "sampling distribution" of these ILEC means. This sampling distribution is completely determined by the basic population of measurements that we start with, and the number of observations in each sample. The sampling distribution has the same mean as the population.

Figure 2 illustrates two important statistical concepts:

1. The histogram of successive sample means resembles a bell-shaped curve known as the Normal Distribution. This is true even though the individual observations came from a skewed distribution.

2. The standard deviation of the distribution of sample means is much smaller than the standard deviation of the observations themselves. In fact, statistical theory establishes the fact that the standard deviation on the population of means is smaller by a factor $\sqrt{n}$, where n is the sample size. This effect can be seen in our example: the distribution of the CLEC means is twice as broad as the distribution of the ILEC means, since the ILEC sample size (200) is four times as large as the CLEC sample size (50).

Figure 2.
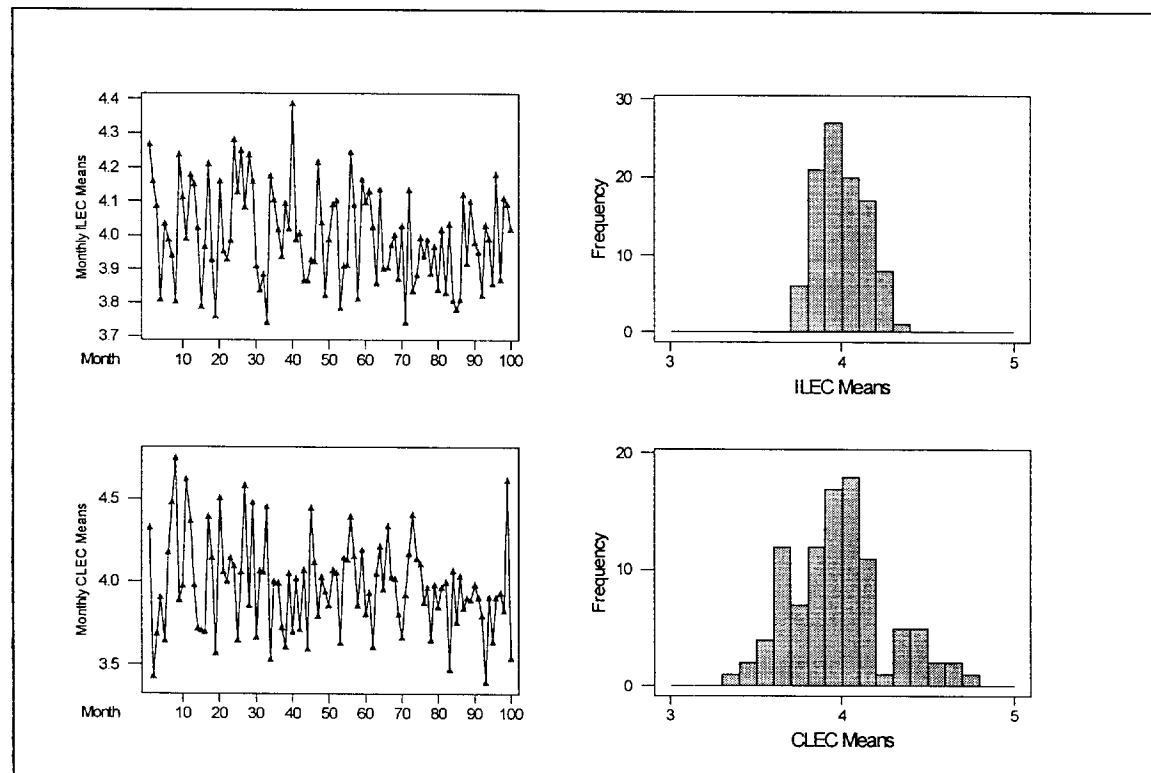
It is common to call the standard deviation of the sampling distribution of a statistic the "standard error" for the statistic. We shall adopt this convention to avoid confusion between the standard deviation of the individual observations and the standard deviation (standard error) of the statistic. The latter is generally much smaller than the former. In the case of sample means, the

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standard error of the mean is smaller than the standard deviation of the individual observations by a factor of $\sqrt{n}$.

The Z-test

Our objective is to compare the mean of a sample of ILEC measurements with the mean of a sample of CLEC measurements. Suppose both samples were drawn from the same population; then the difference between these two sample means (*i.e.*, $DIFF = \bar{x}_{CLEC} - \bar{x}_{ILEC}$) will have a sampling distribution which will

(i) have a mean of zero; and
(ii) have a standard error that depends on the population standard deviation and the sizes of the two samples.

Statisticians utilize an index for comparing measurement results for different samples. The index employed is a ratio of the difference in the two sample means (being compared) and the standard deviation estimated for the overall population. This ratio is known as a z-score. The z-score compares the two samples on a standard scale, making proper allowance for the sample sizes.

The computation of the difference in the two sample means is straightforward.

$$DIFF = \bar{x}_{CLEC} - \bar{x}_{ILEC}$$

The standard deviation is less intuitive. Nevertheless, statistical theory establishes the fact that

$$\sigma_{DIFF}^2 = \frac{\sigma^2}{n_{CLEC}} + \frac{\sigma^2}{n_{ILEC}},$$

where σ is the standard deviation of the population from which both samples are drawn. That is, the squared standard error of the difference is the sum of the squared standard errors of the two means being compared.[1]

We do not know the true value of the population σ, because the population cannot be fully observed. However, we can estimate σ given the standard deviation of the ILEC sample (σ_{ILEC}).[2] Hence, we may estimate the standard error of the difference with

$$\sigma_{DIFF} = \sqrt{\frac{\sigma_{ILEC}^2}{n_{CLEC}} + \frac{\sigma_{ILEC}^2}{n_{ILEC}}} = \sqrt{\sigma_{ILEC}^2 \left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}} \right]}$$

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[1] Winkler and Hays, *Probability, Inference, and Decision.* (Holt, Rinehart and Winston: New York), p. 370.

[2] Winkler and Hays, *Probability, Inference, and Decision.* (Holt, Rinehart and Winston: New York), p. 338.

If we then divide the difference between the two sample means by this estimate of the standard deviation of this difference, we get what is called a "z-score".

$$z = \frac{DIFF}{\sigma_{DIFF}}$$

Because we assumed that both samples were in fact drawn from the same population, this z-score has a sampling distribution that is very nearly Standard Normal, *i.e.*, having a mean of zero and a standard error of one. Thus, the z-score will lie between ± 1 in about 68% of cases, will lie between ± 2 in about 95% of cases, and will lie between ± 3 in about 99.7% of cases, always assuming that both samples come from the same population. Therefore, one possible procedure for checking whether both samples come from the same population is to compare the z-score with some cut-off value, perhaps +3. For comparisons where the values of z exceed the cutoff value, you reject the assumption of parity as not proven by the measured results. This is an example of a statistical test procedure. It is a formal rule of procedure, where we start with raw data (here two samples, ILEC measurements and CLEC measurements), and arrive at a decision, either "conformity" or" violation".

Type 1 Errors and Type 2 Errors

Each statistical test has two important properties. The first is the probability that the test will determine that a problem exists when in fact there is none. Such a mistaken conclusion is called a type one error. In the case of testing for parity, a type one error is the mistake of charging the ILEC with a parity violation when they may not be acting in a discriminatory manner. The second property is the probability that the test procedure will not identify a parity violation when one does exist. The mistake of not identifying parity violation when the ILEC is providing discriminatory service is called a type two error. A balanced test is, therefore, required.

From the ILEC perspective, the statistical test procedure will be unacceptable if it has a high probability of type one errors. From the CLEC perspective, the test procedure will be unacceptable if it has a high probability of type two errors.

Very many test procedures are available, all having the same probability of type one error. However the probability of a type two error depends on the particular kind of violation that occurs. For small departures from parity, the probability of detecting the violation will be small. However, different test procedures will have different type two error probabilities. Some test procedures will have small type two error when the CLEC mean is larger than the ILEC mean, even if the CLEC standard deviation is the same as the ILEC standard deviation, while other procedures will be sensitive to differences in standard deviation, even if the means are equal. Our proposals below are designed to have small type two error when the CLEC mean exceeds the ILEC mean, whether or not the two variances are equal.

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Tests of Proportions and Rates

When our measurements are proportions (*e.g.* percent orders completed on time) rather than measurements on a scale, there are some simplifications. We can think of the "population" as being analogous to an urn filled with balls, each labeled either 0(failure) or 1(success). In this population, the fraction of 1's is some "population proportion". Making an observation corresponds to drawing a single ball from this urn. Each month, the ILEC makes some number of observations, and reports the ratio of failures or successes to the total number of observations; the ILEC does the same does the same for the CLEC. The situation is very similar to that discussed above; however, rather than a wide range of possible result values, we simply have 0's (failures) and 1's (successes). The "sample mean" becomes the "observed proportion", and this will have a sampling distribution just as before. The novelty of the situation is that now the population standard deviation is a known function of the population proportion[3]; if the population proportion is p, the population standard deviation is $\sqrt{p(1-p)}$, with similar simplifications in all the other formulas.

There is a similar simplification when the observations are of rates, *e.g.*, number of troubles per 100 lines. The formulas appear below.

Proposed Test Procedures

Applying the Appropriate Test

Three z-tests will be described in this section: the "Test for Parity in Means", the "Test for Parity in Rates", and the "Test for Parity in Proportions". For each LCUG Service Quality Measurement (SQM), one or more of these parity tests will apply. The following chart is a guide that matches each SQM with the appropriate test.

Measurement (Corresponding LCUG Number)	Test
Preordering Response Interval (PO-1)	Mean
Avg. Order Completion Interval (OP-1)	Mean
% Orders Completed On Time (OP-2)	Proportion
% Order (Provisioning) Accuracy (OP-3)	Proportion
Order Reject Interval (OP-4)	Mean
Firm Order Confirmation Interval (OP-5)	Mean
Mean Jeopardy Interval (OP-6)	Mean
Completion Notice Interval (OP-7)	Mean
Percent Jeopardies Returned (OP-8)	Proportion
Held Order Interval (OP-9)	Mean
% Orders Held $\geq$ 90 Days (OP-10)	Proportion
% Orders Held $\geq$ 15 Days (OP-11)	Proportion

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[3] Winkler and Hays, *Probability, Inference, and Decision.* (Holt, Rinehart and Winston: New York), p. 212.

Time To Restore (MR-1)	**Mean**
Repeat Trouble Rate (MR-2)	**Proportion**
Frequency of Troubles (MR-3)	**Rate**
Estimated Time To Restore (MR-4)	**Proportion**
System Availability (GE-1)	**Proportion**
Center Speed of Answer (GE-2)	**Mean**
Call Abandonment Rate (GE-3)	**Proportion**
Mean Time to Deliver Usage Records (BI-1)	**Mean**
Mean Time to Deliver Invoices (BI-2)	**Mean**
Percent Invoice Accuracy (BI-3)	**Proportion**
Percent Usage Accuracy (BI-4)	**Proportion**
OS/DA Speed of Answer (OS/DA-1)	**Mean**
Network Performance (NP-1)	**Mean, Proportion**
Availability of Network Elements (IUE-1)	**Mean, Proportion**
Performance of Network Elements (IUE-2)	**Mean, Proportion**

Test for Parity in Means

Several of the measurements in the LCUG SQM document are averages (*i.e.*, means) of certain process results. The statistical procedure for testing for parity in ILEC and CLEC means is described below:

1. Calculate for each sample the number of measurements (n_{ILEC} and n_{CLEC}), the sample means ($\bar{x}_{ILEC}$ and $\bar{x}_{CLEC}$), and the sample standard deviations (σ_{ILEC} and σ_{CLEC}).

2. Calculate the difference between the two sample means; if *larger* CLEC mean indicates possible violation of parity, use $DIFF = \bar{x}_{CLEC} - \bar{x}_{ILEC}$, otherwise reverse the order of the CLEC mean and the ILEC mean.

3. To determine a suitable scale on which to measure this difference, we use an estimate of the population variance based on the ILEC sample, adjusted for the sized of the two samples: this gives the standard error of the difference between the means as

$$\sigma_{DIFF} = \sqrt{\sigma_{ILEC}^2 \left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}} \right]}$$

4. Compute the test statistic

$$z = \frac{DIFF}{\sigma_{DIFF}}$$

5. Determine a critical value c so that the type one error is suitably small.

6. Declare the means to be in violation of parity if $z > c$.

Example:

c:	3.58	Critical value for the test					

ILEC			CLEC			Test	
n	mean	variance	n	mean	variance	z	Violation
250	4.038	1.9547	50	5.154	23.2035	5.15	YES!

Test for Parity in Proportions

Several of the measurements in the LCUG SQM document are proportions derived from certain counts. The statistical procedure for testing for parity in ILEC and CLEC proportions is described below. It is the same as that for means, except that we do not need to estimate the ILEC variance separately.

1. Calculate for each sample sample sizes (n_{ILEC} and n_{CLEC}), and the sample proportions (p_{ILEC} and p_{CLEC}).

2. Calculate the difference between the two sample means; if *larger* CLEC proportion indicates worse performance, use $DIFF = p_{CLEC} - p_{ILEC}$, otherwise reverse the order of the ILEC and CLEC proportions.

3. Calculate an estimate of the *standard error for the difference* in the two proportions according to the formula

$$\sigma_{DIFF} = \sqrt{p_{ILEC}(1 - p_{ILEC})\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}$$

4. Hence compute the test statistic

$$z = \frac{DIFF}{\sigma_{DIFF}}$$

5. Determine a critical value c so that the type one error is suitably small.

6. Declare the means to be in violation of parity if $z > c$.

Example:

c:	3.58	Critical value for the test					

ILEC			CLEC			Test	
num	den	p	num	den	p	z	Violation
5	250	2.00%	7	40	17.50%	6.50	YES!

Test for Parity in Rates

A rate is a ratio of two counts, *num/denom*. An example of this is the trouble rate experience for POTS. The procedure for analyzing measurements results that are rates is very similar to that for proportions.

1. Calculate the numerator and the denominator counts for both ILEC and CLEC, and hence the two rates $r_{ILEC} = num_{ILEC}/denom_{ILEC}$ and $r_{CLEC} = num_{CLEC}/denom_{CLEC}$.

2. Calculate the difference between the two sample rates; if *larger* CLEC rate indicates worse performance, use $DIFF = r_{CLEC} - r_{ILEC}$, otherwise take the negative of this.

3. Calculate an estimate of the *standard error for the difference* in the two rates according to the formula

$$\sigma_{DIFF} = \sqrt{r_{ILEC}\left[\frac{1}{denom_{CLEC}} + \frac{1}{denom_{ILEC}}\right]}$$

4. Compute the test statistic

$$z = \frac{DIFF}{\sigma_{DIFF}}$$

5. Determine a critical value c so that the type one error is suitably small.

6. Declare the means to be in violation of parity if $z > c$.

Example:

c:	3.58	Critical value for the test					
ILEC			**CLEC**			**Test**	
num	den	rate	num	den	rate	z	Violation
250	610	0.409836	34	30	1.133333	6.04	YES!

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CERTIFICATE OF SERVICE

I, James P. Lamoureux, hereby certify that on this 13h day of March, 1998, a true and correct copy of the foregoing has been delivered via U. S. Mail, postage prepaid to the following counsel of record:

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