C.   Test Results: Billing Systems Capacity Management Evaluation (BLG-3)

1.0   Description

The Billing Systems Capacity Management Evaluation entailed a comprehensive review of the methods and procedures in place to plan for and manage projected growth in the use of CRIS (Customer Records Information System), CABS (Carrier Access Billing System), ADUF (Access Daily Usage File), and ODUF (Optional Daily Usage File) applications for bill generation and invoicing.

The objective of this evaluation was to determine the extent to which procedures to accommodate increases in CRIS/CABS/ADUF/ODUF billing transaction volumes and users were being actively managed.

2.0   Methodology

This section summarizes the test methodology.

2.1   Business Process Description

See Section VI, "Billing Overview" for a complete description of the billing systems.

CRIS/CABS/ADUF/ODUF billing systems operate in a mainframe environment. BellSouth has outsourced mainframe operations, application and database support. The Mainframe Operations Group manages the mainframe hardware, which includes Central Processing Unit (CPU), core memory, Direct Access Storage Device (DASD), and tape library systems. The Application Support Group manages the production software applications. The Database Administration Group manages the databases and assists the Application Support Group with system resource impact analysis. The BellSouth Transport Organization manages day-to-day operations for the network and collects data on network performance. The BellSouth Architecture & Standards (A&S) Group is responsible for network capacity planning.

2.2   Scenarios

Scenarios were not applicable to this test.

2.3   Test Targets & Measures

The test target was the billing systems capacity management process. Sub-processes, functions, and evaluation criteria are summarized in the following table. The last column "Test Cross-Reference" indicates where the particular measures are addressed in section 3.1 "Results & Analysis."

Table VI–3.1: Test Target Cross-Reference

Sub-Process	Function	Evaluation Criteria	Test Cross- Reference
Billing Systems Capacity Management	Data collection and reporting of business volumes, resource utilization, and performance monitoring	Adequacy and completeness of data collection and reporting	BLG-3-1-1, BLG-3-1-2, BLG-3-1-3, BLG-3-1-4, BLG-3-1-5, BLG-3-1-6
	Data verification and analysis of business volumes, resource utilization, and performance monitoring	Adequacy and completeness of data verification and analysis	BLG-3-1-7, BLG-3-1-8, BLG-3-1-9, BLG-3-1-10, BLG-3-1-11
	Systems and capacity planning	Adequacy and completeness of systems and capacity planning	BLG-3-1-12, BLG-3-1-13, BLG-3-1-14, BLG-3-1-15

2.4   Data Sources

The data collected for the test are summarized in the table below.

Table VI-3.2: Data Sources for Billing Systems Capacity Management Evaluation

Document	File Name	Location in Work Papers	Source
Section VI – Billing Process	Billing.ppt	BLG-3-A-1	BLS
EDS Memorandum (Correspondence #R10740G-MMK-11/09/99-01)	Corr-Joe Bains.doc	BLG-3-A-2	BLS
Mainframe Software Support Procedure Manual	ipsa5001.doc	BLG-3-A-3	BLS
BellSouth Mainframe CPU Configuration RAO's	hardware.txt RAO.ppt	BLG-3-A- 4	BLS
CABS Service Order Validation	No electronic copy	BLG-3-A-5	BLS
CABS Daily Job Flow	No electronic copy	BLG-3-A-6	BLS
Daily CRIS Cycle	No electronic copy	BLG-3-A-7	BLS
BIBS and UNE Cycle Flow	BIBSflow.ppt	BLG-3-A-8	BLS
Framework and column descriptions for Mainframe Performance Reporting	PT.xls	BLG-3-A-9	BLS

Document	File Name	Location in Work Papers	Source
Scratch Tape Statistics By Site, 10/01/99	SCRATCH TAPE STATISTICS BY SITE.doc	BLG-3-A-10	BLS
Active Tape Count By Site, 07/01/99-10/01/99	ACTT1099.doc	BLG-3-A-11	BLS
Strobe Performance Profile, 11/04/98	stbrtp.doc	BLG-3-A-12	BLS
StorageGUARD Pool Utilization	Stguard.doc	BLG-3-A-13	BLS
Concurrent Tape Drive Usage Report Card, September, 1999	CONC0999.XLS.xls	BLG-3-A-14	BLS
StorageGUARD Pool Summary History	History.doc	BLG-3-A-15	BLS
InTune Report	Snap.txt	BLG-3-A-16	BLS
CPU Measurement Reports	CPU.xls	BLG-3-A-17	BLS
Interview Summary – Mainframe Operations	Interview_summary2_111699.doc	BLG-3-A-18	KCI
Interview Summary – Billing test team	Interview_summary1_111699.doc	BLG-3-A-19	KCI
Interview Summary – Database administration	Interview Summary2_112999.doc	BLG-3-A-20	KCI
Interview Summary – Mainframe Performance & Tuning	Interview Summary1_112999.doc	BLG-3-A-21	KCI
Interview Summary – Mainframe Storage Management	Interview_summary3_112999.doc	BLG-3-A-22	KCI
Mainframe Resource Utilization--Top 10 (CPU, DASD, and Tape) Consumers	Top 10 Consumers Sept.xls	BLG-3-A-23	BLS
Billing Mailing Volume Report	No Electronic Copy	BLG-3-A-24	BLS
Billing Usage Volume Report	No Electronic Copy	BLG-3-A-25	BLS
Billing Service Order Volume and Error Report	No Electronic Copy	BLG-3-A-26	BLS
MIP Projections	MVS MIPS Projections.xls	BLG-3-A-27	BLS
Projected DASD Retirements for 2000	2000-DASD-Retirements.xls	BLG-3-A-28	BLS
B2SY-S2ST-G2SY Application Hours	Trend CPU_Corp.xls	BLG-3-A-29	BLS
A6SY Application Hours	Trend CPU-RAO.xls	BLG-3-A-30	BLS
Letter on Mainframe Asset Planning inputs	MF-capacity planning letter.doc	BLG-3-A-31	BLS
EDS Mainframe Requirements	EDS Mainframe	BLG-3-A-32	BLS

Document	File Name	Location in Work Papers	Source
	reqs.doc		
System Production Readiness Requirements	Readiness checklist.doc	BLG-3-A-33	BLS
Critical Application Availability (Andersen & EDS)	KCIdata.xls	BLG-3-A-34	BLS
Application Availability	GA2000SLAs.xls	BLG-3-A-35	BLS
Interview Summary – Wholesale Billing Manager	Interview_summary_04192000.doc	BLG-3-A-36	KCI
BellSouth Telecommunications Information Technology – Capacity Planning Methodology, Practices and Requirements – July, 1999	Cap_methodology.doc	PRE-6-A-1	BLS
Interview Summary – 12/15/1999	Interview_summary_121599.doc	PRE-6-A-2	BLS
BOSIP Network Diagrams	Atlntadc.ppt Bosipcor.ppt Brmghmdc.ppt Chrltdc.ppt Jcksondc.ppt Miamidc.ppt Nsvlledc.ppt	PRE-6-A-3	BLS
Birmingham BayNet Protocol Distribution	Bay1.gif	PRE-6-A-4	BLS
Monthly Average Utilization – Birmingham	FDDI1.gif	PRE-6-A-5	BLS
LAN Interface With In Utilization over 20%	LAN~1.htm	PRE-6-A-6	BLS
Average Latency Between RDC's Originating from Birmingham	Monthl~1.gif	PRE-6-A-7	BLS
Monthly Maximum IP Routes Known to Core	Monthl~2.gif	PRE-6-A-8	BLS
WAN Interface With In Utilization over 30%	SMDS1.gif	PRE-6-A-9	BLS
Daily Interface Performance Statistics for PNSCGS04 to JCVLBA19	Pnscgs04.gif	PRE-6-A-10	BLS
Total Traffic Across Core	WAN~1.htm	PRE-6-A-11	BLS
Server Utilization Report	Viewar~1.csv	PRE-6-A-12	BLS
Interview Summary – Transport Solutions	Interview_summary1_121099.doc	PRE-6-A-13	KCI

Document	File Name	Location in Work Papers	Source
Interview Summary – Asset Planing	Interview_summary1_01202000.doc	PRE-6-A-14	KCI
BSCN – DS3 Equivalent Capacity	Bscncap.ppt	PRE-6-A-15	BLS
BellSouth Official Communications Special Services Facility Forecast for 2000 – 2002 and Update to the 1999 Forecast (Cover Letter)	Ss99ltr.doc	PRE-6-A-16	BLS
BellSouth Telecommunications Official Communications Service Requirements And Special Service Forecast	Bscn1999.doc	PRE-6-A-17	BLS
Capacity Planning Metrics for BST Assets Managed by BCS	Capaci~1.doc	PRE-6-A-18	BLS
BellSouth Telecommunications Official Communications Service Requirements Mechanized Input Form	Bscnele.xls	PRE-6-A-19	BLS
Trunk Utilization Report	Rpdn_0110.doc	PRE-6-A-20	BLS
BellSouth Integrated Broadband Network Diagram	Ibtcp911.ppt	PRE-6-A-22	BLS
Transport Asset Planning – Infrastructures	Infraex.ppt	PRE-6-A-23	BLS
Interview Summary – Network Asset Planner	Interview_summary2_01202000.doc	PRE-6-A-24	KCI
Questionnaire designed to aid Capacity Planner and/or Technical Architect in characterizing an application workload	Config.xls	PRE-6-A-25	BLS
BOSIP Support Web Site Printouts – Homepage	No Electronic Copy	PRE-6-A-39	BLS
BOSIP Support Web Site Printouts – Shared BOSIP Network	No Electronic Copy	PRE-6-A-40	BLS
BOSIP Support Web Site Printouts – BCS Support	No Electronic Copy	PRE-6-A-41	BLS
BOSIP LAN and WAN Network Topology Overview	No Electronic Copy	PRE-6-A-42	BLS
TRENDview HTML Reports	No Electronic Copy	PRE-6-A-45	BLS
TRENDview HTML Reports – Overutilized/Underutilized WAN Interfaces	No Electronic Copy	PRE-6-A-46	BLS
TRENDview HTML Reports –	No Electronic Copy	PRE-6-A-47	BLS

Document	File Name	Location in Work Papers	Source
WAN interface utilization graphed over time			
Capacity Planning & Management Playbook (What we do & How we do it) Working Draft – Not Approved	No Electronic Copy	O&P-6-C-1	BLS
Capacity Management Analysis	Analysis of recent docs for Cap mgmt.doc	PRE-6-A-71	BLS
Attachment 4: Application Specific Forecast Processes	CapMgt.doc	PRE-6-A-72	BLS
Billing Tower Interim Procedures	Critic~11.doc	PRE-6-A-73	BLS
Capacity Planning and Management Standard Operating Procedures	F-1-5 Capacity Plan.doc	PRE-6-A-74	BLS

2.4.1 Data Generation/Volumes

This test relied on documentation reviews and interviews with BellSouth personnel.

2.5   Evaluation Methods

The Billing Systems Capacity Management Evaluation began with a review of systems documentation and process flows for billing. Interviews were conducted with key business process owners and system administration personnel responsible for the operation of CRIS/CABS/ADUF/ODUF billing systems. These interviews were supplemented with an analysis of BellSouth capacity management procedures as well as with collection of evidence of related activities such as periodic capacity management reviews, system reconfiguration/load balancing, load increase induced upgrades, resource utilization reporting, and performance management reporting.

2.6   Analysis Methods

The Billing Systems Capacity Management Evaluation included a checklist of evaluation criteria developed by KCI during the initial phase of the BLS - Georgia OSS Evaluation. These evaluation criteria provide the framework of norms, standards and guidelines for the test.

The data collected from inspections and interviews were analyzed employing the evaluation criteria referenced above.

3.0   Results Summary

This section identifies the evaluation criteria and test results.

3.1   Results & Analysis

The results of this test are presented in the table below.   Definitions of evaluation criteria, possible results, and exceptions are provided in Section II.

Table VI-3.3: BLG-3 Evaluation Criteria and Results

Test Cross-Reference	Evaluation Criteria	Result	Comments
BLG-3-1-1	There is an established process for capturing business and transaction volumes	Satisfied	Billing volumes are tracked and reported monthly. KCI was provided copies of sample reports for Bill Mailing Volumes, Billing Usage Volumes, and Billing Service Order and Error Volumes.
BLG-3-1-2	There is an established process for capturing resource utilization	Satisfied	The billing systems run on mainframe computers. The mainframe tower management group follows a simple monthly process for each mainframe box: 1) Collect monthly Central Processing Unit (CPU) utilization data and application hours divided into two categories, billable to BLS and non-billable overhead; and 2) Track total application hours consumed against known maximum thresholds for each mainframe. Network resource utilization data is reported on the BellSouth Open System Interconnect Protocol (BOSIP) home page. This Web site is available to and accessed by the resources responsible for monitoring network performance. The processes for capturing resource utilization were described during interviews with members of the groups responsible for these activities. In addition, KCI reviewed the Midrange Performance Monitoring Web site. Sample resource utilization reports collected during the review are referenced in section 2.4, Data Sources.
BLG-3-1-3	Resource utilization is	Satisfied	The Performance and Tuning Group

Test Cross-Reference	Evaluation Criteria	Result	Comments
	monitored for system components and elements		monitors Multiple Virtual Storage (MVS) mainframe components such as storage utilization (central storage), memory paging rates, batch jobs, Time Sharing Option (TSO) sessions, Direct Access Storage Device (DASD) response times, tape drives allocated, CPU percentage busy, etc. Sample mainframe resource utilization reports were collected during the test. Resource utilization data are collected for the CPU, buffer and memory utilization for the routers, circuits utilization of the routers, Wide Area Network (WAN), Local Area Network (LAN) interfaces on routers, hubs, and the Fiber Distributed Data Interface (FDDI) rings. For the circuits and LAN interfaces, reports are generated for the devices with the highest utilization. The resource utilization data collection processes were described during interviews. KCI reviewed the BOSIP home page and collected sample reports.
BLG-3-1-4	Instrumentation and other tools are used to collect resource utilization data	Satisfied	InTune and Strobe are mainframe MVS tools used to provide information on where applications are spending CPU cycles, wait times, DASD volumes, tracks accessed, etc. These application-profiling tools operate on Information Management System (IMS) and DB2 databases. Storage Guard is an on-line system that takes a snapshot of DASD storage (each Volume Table of Contents [VTOC]) every 30 minutes. Through the on-line facility it is possible to view the capacity and utilization of each storage pool. Data Facility Storage Management Subsystem (DFSMS) is a hierarchical storage manager that checks for previous messages. Targets are set for

Test Cross-Reference	Evaluation Criteria	Result	Comments
			storage utilization. If a device is over the utilization target, then the utility searches for old data (past period set for retention for all data types) that can be moved to a lower priority stage. These tools were described during interviews with the Mainframe Operation Group and sample reports were provided to KCI. Tools running to collect network resource utilization data include TRENDsnmp (from DeskTalk), Spectrum Enterprise Manager, OpenView, Nerve Center for BOSIP (the router network), and Starkeeper (for the Datakit networks). These tools were described during interviews with the BOSIP Support manager and sample reports were provided to KCI.
BLG-3-1-5	Performance is monitored at all applicable levels (e.g. network, database server, application server, client, etc.)	Satisfied	The Performance and Tuning Group monitors system resources for mainframe computers (i.e., MVS mainframe components such as storage utilization [central storage], memory paging rates, batch jobs, TSO sessions, DASD response times, tape drives allocated, CPU percentage busy, etc.) The site manager ensures that DFSMS is running, checks for previous messages, and checks tape drive status. The BLS Transport Team is responsible for day-to-day operations of the networks (comprised of components such as routers, ATM switches, and hubs.). The team is comprised of three groups: Protocol Analysis and Communication Support (PACS), which provides support and problem resolution for escalated network performance issues; Proactive Performance Analysis, which looks at the networks to prevent problems; and the Tools Group, which collects the data on network performance.

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Test Cross-Reference	Evaluation Criteria	Result	Comments
			Homegrown scripts have been written to collect data such as latency and packet loss across the BOSIP core. These activities were described during interviews with the Mainframe Operation Group and Network Support Team. Sample performance reports were collected and reviewed.
BLG-3-1-6	Instrumentation and other tools are used to monitor performance	Satisfied	The CMF tool looks at system logs to collect mainframe performance data. MainView (a graphical user interface for CMF) presents the performance data collected by CMF in a graphical format so that trending can be performed. TRENDsnmp (from DeskTalk), Spectrum Enterprise Manager, OpenView, Nerve Center for BOSIP (the router network), and Starkeeper (for the Datakit networks) are tools used to monitor network performance. Performance monitoring activities were described during interviews and sample reports were provided to KCI.
BLG-3-1-7	There is an established process for forecasting business volumes and transactions	Satisfied	During initial testing, no established, ongoing process for forecasting business and transaction volumes was observed for BLS's billing interfaces. See Exception 25 for additional information on this issue. BLS documented the business volume and transaction forecasting process for the mainframe billing systems in the Standard Operating Procedure (SOP) section of BLS's *Capacity Planning & Management Playbook.* The amended SOP documents the established process of using the LSR forecast to develop projections for mainframe impact. Applications targeted are CRIS and CABS. The SOP outlines the process steps that the Capacity Planner is to

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Test Cross-Reference	Evaluation Criteria	Result	Comments
			complete in order to develop the mainframe forecast that is delivered to mainframe operations for use in the quarterly capacity planning meetings. In addition, BLS developed an appendix to the Playbook, which describes the transaction forecasting process for the mainframe billing systems. The new process has been completed once and a forecast was provided to the mainframe planners in November 2000. Exception 25 is closed.
BLG-3-1-8	The business volume tracking and forecasting data is at an appropriate level of detail to use for capacity management	Satisfied	During initial testing, no established, ongoing process for forecasting business and transaction volumes was observed for BLS's (mainframe) billing interfaces. See Exception 25 for additional information on this issue.
			Additional interviews and documentation reviews associated with retest activities for the exception confirmed that business volume tracking and forecasting data will be utilized in the mainframe capacity management process. The mainframe forecast worksheet tracks actual LSRs and forecast data through 12/2001 and transforms the LSR forecast into calculated CRIS region MIPS requirements. The calculated MIPS requirements are compared to MIPS installed and a percentage of Installed MIPS to LSR Impact is reported. The dedicated CRIS control region contains the CRIS, CABS, and pre-order mainframe applications.
			In addition, CPU utilization data is trended and future CPU utilization projections are compared to CPU capacity. If the trend line exceeds capacity, then load balancing is done or system capacity is added to remove the capacity constraint. Normal growth is planned for and additional

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Test Cross-Reference	Evaluation Criteria	Result	Comments
			capacity can be added within days for emergency situations.
			The CRIS Database Administration Group supports the application teams in projecting requirements for the next quarter. The database administrators work with the application teams to estimate the impact of each work request or new process on CPU, DASD, or Tape. Any potential impact is reported to the appropriate parties via e-mails, TRIAD/Quarterly meetings, etc.
			For BLS's network, capacity planning is done annually as part of the budgeting process and also for each application release. Application development, system administration, and production support resources participate in the capacity planning process. The planning process takes as input the Network Carrier Services (NCS) Marketing Group forecast, current volumes, trend data, and anticipated volume changes that may result from new system functionality. This information is used to project future hardware and software needs. If additional capacity is needed, the request is brought to BLS (Delivery and Customer Service Managers) for approval, equipment purchase, and installation.
			Exception 25 is closed
BLG-3-1-9	There is an established process for reviewing the performance of the business and transaction volume forecasting process	Satisfied	During initial testing, no established, ongoing process for reviewing the performance of the mainframe or network business and transaction volume forecasting process was observed. See Exception 25 for additional information on this issue.
			BLS developed an appendix to the *Capacity Planning & Management Playbook* specifying that BTSI will track and compare actual LSR flow-through against forecast volumes. In

Test Cross-Reference	Evaluation Criteria	Result	Comments
			addition, a copy of a recent comparison of actual to forecast LSRs was provided. Exception 25 is closed
BLG-3-1-10	There is an established process for verification and validation of performance data	Satisfied	Mainframe hardware performance is monitored daily. Detected anomalies are reported, investigated, and resolved. The performance monitoring, database administration, and application support groups participate in this process of verification and validation of performance data. Data from the system hardware resources is downloaded for personal computer access. This information is formatted into PC reports and is analyzed and/or reviewed periodically by the team members responsible for mainframe performance and tuning analysis. This data is retained for a minimum of one year. Network performance data are verified and validated by the Transport Group. Performance reports are reviewed regularly on the BOSIP home page and through on-line tools. The reports and tools define thresholds for utilization of network resources. Any values exceeding the established threshold are highlighted in the reports, investigated, and resolved. Performance monitoring activities were described during interviews. KCI reviewed and collected sample performance and resource utilization reports.
BLG-3-1-11	Performance monitoring results are compared to service level agreements and other metrics	Satisfied	Interviews with mainframe operations indicated that BLS and the vendor managing the systems operations have contracts in place governing system performance. These contracts define targets for BOCRIS and CABS system

Test Cross-Reference	Evaluation Criteria	Result	Comments
			availability. KCI was provided with the targets for system availability and copies of reports on vendor performance, by system.
			Service Quality Measurements are defined for intervals for billing invoices (B-2. Mean Time to Deliver Invoices), for accuracy of data delivery (B-3. Usage Data Delivery Accuracy), for completeness of data delivery (B-4. Usage Data Delivery completeness), timeliness of data delivery (B-5. Usage Data Delivery Timeliness) and for time to deliver data (B-6. Mean Time to Deliver Usage). (See *BellSouth Service Quality Measurement Plan* document dated 07/2000.) Performance results for these metrics are reported through the Performance Monitoring and Analysis Platform (PMAP).
			BLS monitors its own network performance results. Network availability (i.e., trunk and node availability) results are tracked against established performance targets/objectives. The Transport Group works with the BLS Architecture & Standards (A&S) Group to address any network performance issues. Network performance activities were described during interviews with the BOSIP Support Manager.
BLG-3-1-12	Capacity Management process is defined and documented	Satisfied	The processes that are executed for performance monitoring and capacity planning activities are defined and documented. The document, *BLS Telecommunications Information Technology Capacity Planning Methodology, Practices, and Requirements July 1999,* outlines a capacity planning process for the mainframe, midrange, and network environments. BLS's capacity planning process is part of the IT

Test Cross-Reference	Evaluation Criteria	Result	Comments
			Engagement Process (ITEP). Process flows for the capacity planning process have been developed and are posted on the BLS IT Web site. These flows are also contained in a document entitled *Capacity Planning & Management Playbook.* The capacity planning process has been communicated within the Engineering & Design Group. The links within the Asset Management Group and the interfaces to other organizations are defined in the process documentation. BLS is refining the definition of process links between the remaining functional groups. Documentation depicting the current mainframe performance monitoring process was provided to KCI. Midrange and network performance monitoring is addressed in the capacity planning and management documentation.
BLG-3-1-13	Resource usage and capacity is considered in the planning process for capacity management	Satisfied	On a monthly basis, the Mainframe Operations Management Group uses data collected for each mainframe box to 1) Fit a trend line through the monthly utilization data points; 2) Estimate, based on trends and rates of growth, when upgrades or new purchases must occur; and 3) Purchase additional capacity, as needed. If anomalies in CPU utilization, DASD, etc. occur, the Operations Group will contact the appropriate application support group to determine the root cause of the anomaly. In addition, TRIAD meetings are held every three months. TRIAD meetings include representatives from Hardware Procurement, mainframe performance monitoring, and customer representatives for the applications running in the

Test Cross-Reference	Evaluation Criteria	Result	Comments
			mainframe environment with the largest DASD usage. Customer representatives provide input on changes to applications and how they may impact various components of system capacity. Resource utilization reports are examined on an ongoing basis and as part of the quarterly capacity planning process. LAN/WAN interface and FDDI utilization reports are examined on an ongoing basis as part of the network capacity planning processes. These capacity planning activities were described during interviews.

Test Cross-Reference	Evaluation Criteria	Result	Comments
BLG-3-1-14	Performance monitoring results are considered in the planning process for capacity management	Satisfied	Mainframe performance monitoring reports are examined on an ongoing basis and as part of the quarterly capacity planning process. The BLS Architecture & Standards (A&S) Group is responsible for network capacity planning. The BLS Transport Team analyzes network performance data and resolves capacity issues. If unable to resolve capacity issues, the Transport Team alerts the A&S Group, which purchases equipment or makes architecture changes in order to increase or adjust system capacity. These capacity planning activities were described during interviews.
BLG-3-1-15	Capacity Management procedures define performance metrics to trigger the addition of capacity, load re-balancing or system tuning	Satisfied	Mainframe application hours are tracked monthly. Historical growth trends of these hours are tracked against known thresholds and used to estimate future growth and determine when upgrades or new purchases must occur. Scratch tape counts and scratch tape thresholds are tracked monthly, by site. These counts and thresholds are used to assist in determining when additional tapes should be ordered. Active tape counts and corresponding Average Growth per Month are also tracked monthly. Thresholds have been set for resource utilization and performance measures in the mainframe environment. Values that exceed the established thresholds are flagged and investigated. In the network environment, WAN interface utilization is tracked to identify opportunities for load balancing. Procedures for performance monitoring were described during interviews. In addition, KCI viewed and collected sample reports.