BellSouth Telecommunications, Inc. OSS Evaluation – Georgia

RSIMMS and ENCORE Systems Review

VERSION 1.0

Submitted by:

KPMG Consulting

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I. SUMMARY SYSTEMS REVIEW

1.0 Description

The objective of the RSIMMS and ENCORE Systems Review was to evaluate the Volume test environment developed by BellSouth – the Reengineered Services, Installation and Maintenance Management System (RSIMMS) – to determine if the hardware and software configurations mirrored those of BellSouth's production system (ENCORE), except where additional hardware or software had been created to support the specified test volume.

This review was conducted in parallel to the planning and execution of the volume tests associated with the BellSouth – Georgia OSS Evaluation described in the *Master Test Plan* (PRE-4, PRE-5, OP-3, and OP-4).

2.0 Method

2.1 Business process description

The ENCORE production order system (see Figure 1) consists of all the systems (hardware, software and communications) that facilitate a CLEC's ability to process the following transactions types on BellSouth's Operations Support Systems (OSS):

- Submit Local Service Requests (LSRs)
- Receive Functional Acknowledgements (FAs)
- Receive Firm Order Confirmations (FOCs)
- Receive Completion Notices (CNs)
- Receive Rejects, Clarifications (CLRs) and Service Jeopardies

Figure 1: BellSouth's ENCORE Production System

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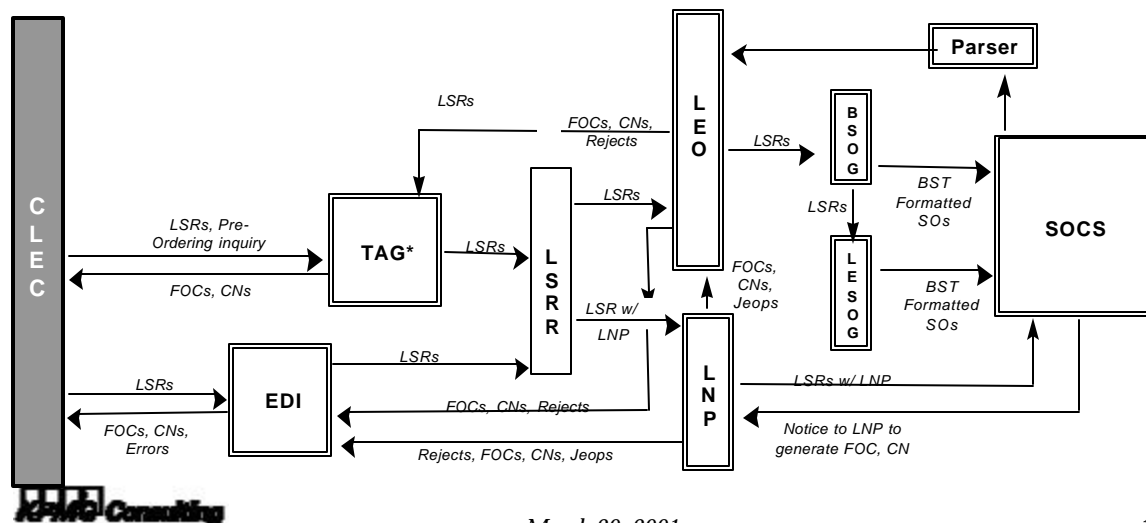
The RSIMMS environment (See Figure 2) was a test facility consisting of hardware, software, and communications equipment in an operational environment that emulated the ENCORE production environment in interoperability and end-to-end (flow-thru) testing in support of the above listed functionality. The RSIMMS environment also provided testing coordination resources for BellSouth initiatives.

Figure 2: BellSouth's RSIMMS Third Party Testing Environment
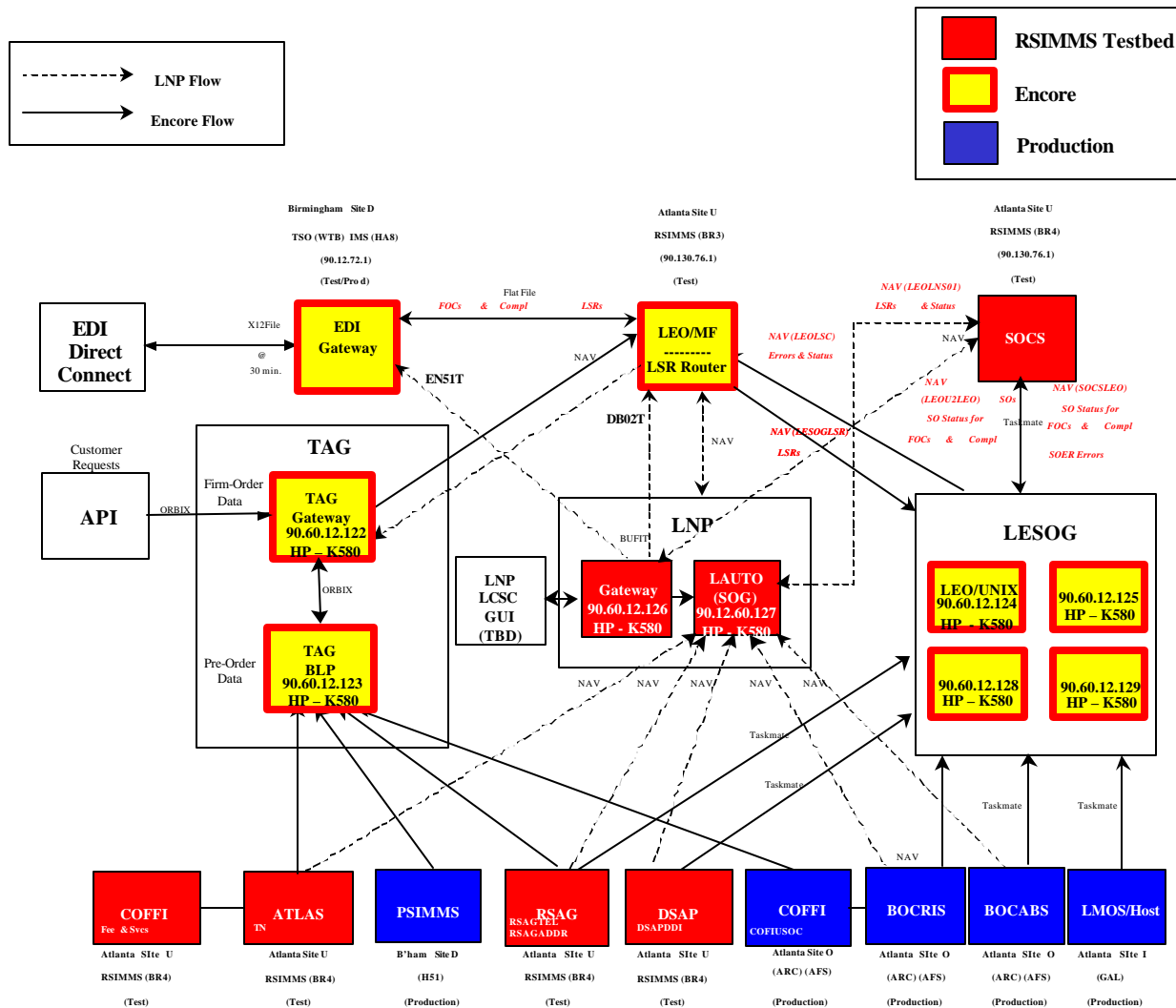
The applications and servers that were included as part of the Volume Tests, as described in RSIMMS and the ENCORE production system, are listed in Table 1 below.

Table 1: Application and Server List

Application	RSIMMS	ENCORE Production
TAG	HP 9000 model K580 (JRTAG-1T) HP 9000 model K580 (JRTAG-2T) HP 9000 model K580 (JRLNOP-2T)	HP 9000 model K570 (CRTAG1D) HP 9000 model K570 (CRTAG3D)
LESOG/ LEO-UNIX	HP 9000 model K580 (JRRSIM1T) HP 9000 model K580 (JRRSIM5T) HP 9000 model K580 (JRRSIM6T)	HP 9000 model K520 (BRLSOG1D) HP 9000 model K520 (BRLSOG2D)
LNP Gateway/ LAUTO SOG LCSC GUI	HP 9000 model K580 (JRRSIM3T) HP 9000 model K580 (JRRSIM5T) HP 9000 model K360 (JRLNOP-2T)	HP 9000 model K460 (CRLNOP1D) HP 9000 model K460 (CRLNOP4D) HP 9000 model K460 (BOLNOP1D)
P/SIMMS, EDI Gateway	Hitachi (HDS)-P8 (D2SY)	
LEO	Hitachi - Skyline 625 (U4SY)	Hitachi (HDS)-P9 (B2SY)
COFFI-Features, ATLAS, RSAG, DSAP, GA.SOCS	Hitachi - Skyline 625 (U4SY)	Hitachi - Skyline 727 (O1SY)
COFFI-USOC, GA.BOCRIS, GA.BOCABS	Hitachi - Skyline 727 (O1SY)	
GA.LMOS	Amdahl GS-765 (I3SY)	

2.2 Test approach

Operational analysis techniques were used to evaluate the RSIMMS environment and ENCORE production system. Interviews were conducted with program management staff, the systems development staff, and system operations and administration personnel responsible for the operation and maintenance of the RSIMMS environment and ENCORE production systems. These interviews were supplemented with an analysis of BellSouth systems performance and management data as well as data collected from the UNIX servers that comprise each of the environments.

The test was executed, according to the following steps:

1. Requested initial system data from BellSouth

2. Conducted interviews with program management staff, systems administration and support personnel as appropriate.

3. Reviewed procedural and other documentation related to systems change and capacity management.

4. Documented findings.

5. Resolved discrepancies

The following Information was requested from BellSouth

1. Software information

    -   Application architecture

    -   Operating system (OS) version on each server

    -   OS patch levels

    -   Applications on each server, by module

    -   Database information (if any deployed in this environment)

    -   Application load balancing information

2. Hardware information

    -   Network connectivity

    -   Hardware system information

    -   Processes running on each server

    -   Data storage information

    -   Detailed network information

3. System and network monitoring information

4. Application monitoring information

5. Problem and change management procedures and documentation

6. Capacity management procedures and documentation

7. System and network performance thresholds

8. Disaster recovery information

The data collected for this analysis were supplied by BellSouth or its contractors. No validation of the data was done except for a series of test commands that were executed against selected servers on May 19th, 2000 with the extracted data logged to an ASCII file.

3.0 Assumptions made in advance of the evaluation

1. BellSouth would provide the data about the RSIMMS and ENCORE production system environment s requested by KCI.

2. KCI would not validate the data provided by BellSouth.

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3. Systems deployed for the Volume Tests within the RSIMMS environment would remain the same throughout the tests, except where updates are communicated by BellSouth (a final list was provided to KCI by BellSouth on September 20th, 2000. See Appendix A).

4. Software versions of the applications deployed in the production and RSIMMS environments were the same, and were managed through a change control facility.

5. All hardware was configured using standard configurations developed by BellSouth and implemented by EDS using a build tool.

6. The servers run no other applications except the specific applications indicated in documents provided to KCI.

7. The configuration of the mainframe partitions/regions was identical in both the RSIMMS environment and ENCORE production system.

4.0 Systems review

Application components were the specific applications within the ENCORE production system, such as TAG, LESOG, etc., that were evaluated as part of the Volume Tests, and consisted of a single server, a group of servers, or a mainframe partitioned region. Additional information about these applications and their associated hardware is provided in Appendix A.

5.0 Summary

Based upon KCI's evaluation, it is our opinion that, except for specific, preauthorized changes that were made in RSIMMS to support the requirements of the volume test, the applications implemented in the RSIMMS environment mirrored those of BellSouth's ENCORE production system.

Specific changes were made to the RSIMMS environment to support the business volumes required to accomplish KCI's volume test. KCI is not aware of any reasons, and is satisfied, that these same changes could be made to the production environment such that it could support the same volumes as were tested in KCI's volume evaluation.

The network configuration supporting the RSIMMS environment was different from that of BellSouth's ENCORE production system in that the former was largely based on a local area network, and the latter was largely based upon a wide area network. This difference might result in a lesser system performance for the production environment than was observed for RSIMMS, even if production was an exact mirror image of RSIMMS in terms of applications and hardware.

5.1 Applications

5.1.1 Unix Server Applications

The three main applications groups evaluated as part of this system review are TAG, LESOG, and LNP.

The applications were evaluated from two perspectives: First, we validated that the servers that run the applications are setup and configured similar to the servers in the ENCORE production system, Second, we took a snap shot of the servers by running a series of commands (or a script) on the servers, logging the output to an ASCII file. The processes running on the server, the directory structure, IO scan, the file listing, and the OS versions are all captured and evaluated.

TAG - The servers that ran Tag had different configurations in ENCORE and RSIMMS. In the ENCORE production system two servers contained the \XST directory, and one contained the \POG directory. In the RSIMMS environment one server contained the \XST directory, and two servers contained the \POG directory.

The directory structure of the two servers running the TAG gateway software with the \XST directory were not the same. The servers were CRTAG-1D in production and server JR-TAG-1T in the RSIMMS environment.

LESOG - The servers that ran the LESOG application had different file and directory structures. Additionally, the application was running across three servers in the RSIMMS environment, and two servers in the ENCORE production system. During KCI's review we noted that BellSouth's internal performance thresholds were crossed under current production volume for production servers BRLSOG1D and BRLSOG2Dd.

LNP - The implementation of the LNP application group varied by environment. In the ENCORE production system there were two gateway servers, CRLNOP1D and CRLNOP2D, The was a single server, JRRSIM3T, in RSIMMS. The LAUTO and LNPTA applications were deployed on the same server CRLNOP4D in the ENCORE production system. In the RSIMMS environment the LAUTO was on a separate server JRRSIM4T, and the LNPTA application was deployed on the gateway server JRRSIM3T.

5.1.2 Mainframe Applications

The ENCORE production system mainframes that ran the applications P/SIMMS, EDI Gateway, LEO, COFFI-Features, ATLAS, RSAG, DSAP, GA.SOCS, COFFI USOC, GA.BOCRIS, GA.BOCABS, GA.LMOS were evaluated against the corresponding RSIMMS environment mainframes.

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Based on the data provided to KCI on the mainframe environment, it is our opinion that the mainframe system performance is not likely to adversely affect these applications.

Three of the mainframe systems, O1SY, D2SY, and I3SY, are part of both the RSIMMS environment and the ENCORE production system. The other mainframe in the ENCORE production system, B2SY, was more powerful than the equivalent system in the RSIMMS environment, U4SY.

5.2 Network

The ENCORE production system was distributed across three data centers at three different geographic locations connected by BellSouth's data network. The RSIMMS environment was located at the Jackson, MS data center with most of the servers connected to a common Fiber Distributed Data Interface (FDDI) ring. A performance difference could exist between the two environments due to inherent latency across a distributed BellSouth production network. Network information provided by BellSouth shows negligible latency across the FDDI rings that were connected to the core ATM networks.

5.3 Hardware[1]

The servers deployed by BellSouth within the RSIMMS environment for the Volume Tests were a newer generation of HP servers than those deployed in production. The RSIMMS applications and were deployed within a single data center in Jackson, MS. This was consistent with the objectives of the test environment, where compute power was added to compensate for the additional test volume.

5.3.1 TAG Servers

RSIMMS - The systems that ran the TAG application in RSIMMS were JRTAG-1T, JRTAG-2T and JRLNOP-2T. These servers were HP 9000 Enterprise servers, model K580 with four CPUs and 4GB of memory located in Jackson, MS connected to the FDDI network.

ENCORE - The servers in the production system that ran the TAG application were CRTAG-1D and CRTAG-3D. These were HP 9000 Enterprise model K570 with four CPUs and 2GB of memory located in Charlotte, NC connected to the FDDI network.

FINDINGS - Based on the reference document "K-Class Product Information" published on Hewlett Packard's Web site, the K580 servers in the RSIMMS environment "deliver a 20% faster compute performance" than the K570 servers deployed in the ENCORE production system.

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[1] Appendices A and B list the applications and servers that were included as part of this evaluation

5.3.2 LESOG Servers

RSIMMS - The systems in the RSIMMS environment that ran the LESOG and the LEO-UNIX application were three K580 servers with four CPUs and 4GB of memory each. The servers were connected to the network via FDDI connections and were located in Jackson, MS.

ENCORE - The two servers in the production system, BRLSOG1D and BRLSOG2D, were HP 9000 series model T520, with four CPUs and 2GB of memory, and were FDDI connected to the network.

FINDINGS - The compute performance of the servers in the RSIMMS environment was far greater than those in production, because there were three servers in the RSIMMS environment, each of which had a compute performance four to six times that of the compute performance of the two servers in the ENCORE production system.

5.3.3 LNP Servers

RSIMMS - The systems in the RSIMMS environment running the LNP gateway and LAUTO application consisted of two HP9000 model K580 servers with four CPUs and 4GB of memory, and one model K360 with two CPUs and 1GB of memory. One of the K580 servers, JRRSIM3T, ran the Gateway application, while the other K580 server, JRRSIM4T, ran the LAUTO application. The third server in the LNP group, JRLNOP1T, ran the LCSC application. All of the servers were located in Jackson and were FDDI connected to the network.

ENCORE -The servers deployed within the production system for the LNP application group were HP 9000 K460 servers. The server that ran the production gateway, CRLNOP1D, had four CPUs and 3GBGB of memory. The server that ran the production LAUTO application, CRLNOP4D, had two CPUs and 1GB of memory. These two servers were located in Charlotte, NC and were connected to the network via a 10 MB Ethernet connection. The third server, BOLNOP1D, located in Birmingham, AL had four CPUs with 2GB memory and was connected to the network via a 10 MB Ethernet connection.

FINDINGS - Comparing the servers running the Gateway and LAUTO applications, each of the HP K580 servers in the RSIMMS environment had a relative compute performance of approximately 48% more than each of the HP K460 servers that ran the same application in the ENCORE production system. The total relative compute performance of the two combined systems in the RSIMMS environment would be almost 100% greater than the combination of the two servers in the ENCORE production system. A comparison of the servers running the LCSC application, a K460 with four CPUs and 2GB memory in production, and a K360, with two CPUs and 1GB in the RSIMMS environment,

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showed that the production server has a much higher compute performance (72%) and would not negatively impact the ENCORE production system.

5.3.4 Mainframes

RSIMMS, EDI Gateway, LEO, COFFI, ATLAS, RSAG, DSAP, GA.SOCS, COFFI-USOC, GA.BOCRIS, GA.BOCABS, GA.LMOS

Three of the mainframe systems, O1SY, D2SY, and I3SY, were part of both the RSIMMS and ENCORE production environments. The other mainframe in the production environment, B2SY, was more powerful than the equivalent system in the RSIMMS environment, U4SY.

II. DETAILED SYSTEMS REVIEW

6.0 Applications Review - Details

The two environments, ENCORE production system and RSIMMS, were functionally similar because the applications that were deployed across the servers that constitute the two environments provided the same functionality. This was verified by processing sample transactions from the PRE-1, OP-1, and OP-2 functional tests in both the ENCORE production and the RSIMMS environment prior to the volume test. The applications that were included as part of the Operational Support System volume test, as described in the RSIMMS 3PT Volume Test environment, are shown in Appendix B.

6.1 TAG Application Group

TAG was developed for BellSouth by Telcordia Technologies. The applications within this group were evaluated using the following dimensions:

- Software Version
- OS Version and Patch Levels
- Configuration (multiple servers within an application group)
- Database
- Directory Structure
- File information
- Change Management
- Capacity Management

TAG used a multi-server configuration (see Table 2). One server, the Gateway, provided communication with the CLECs and balanced the workload across the servers that were running Business Logic Processors (BLPs) in that environment. TAG performance was primarily a function of BLP throughput.

The TAG servers in the Production environment were configured to run the various TAG versions used by BellSouth's wholesale customers. There are production customers using versions of TAG that are both older and newer than those used in testing RSIMMS. System resources are allocated based on which versions are being used.

Table 2: Name and IP address of Servers Running the TAG Application

Production Servers	IP Address	RSIMMS Servers	IP Address
CRTAG-1D	90.70.124.148	JRTAG-1T	90.60.12.122
CRTAG-3D	90.70.124.150	JRTAG-2T	90.60.12.123
		JRLNOP-2T	90.60.12.137

The TAG API on the client machine is compiled to a specific TAG version. Therefore, the user determines the version based on the version of the API in use. During installation of the TAG Client API, configuration parameters, provided by BellSouth, are set, which specify a host and a TAG Gateway server on that host that runs the TAG release used by the client. At startup, the TAG client invokes an ORBIX daemon on the client that establishes a connection to the client's pre-configured host and gateway server.

Each TAG host runs a TAG Gateway server for each TAG Release. At system startup, each TAG Gateway starts an ORBIX daemon that listens for connections to the TAG Gateway. Because the daemon processes are invoked at startup time on the TAG host, and the client and remain memory resident until shutdown, there is no performance impact due to TAG server invocation.

6.1.1 Software Version

The packages deployed in this application group at the time of our evaluation are shown in Table 3 below

Table 3: TAG Application Version by Server

Production	IP Address	Application Version	RSIMMS	IP Address	Application Version
CRTAG-1D	90.70.124.148	TAG 2.1.0.4	JRTAG-1T	90.60.12.122	TAG 2.2.0.5
CRTAG-3D	90.70.124.150	TAG 2.2.0.4	JRTAG-2T	90.60.12.123	TAG 2.2.0.7
		TAG 2.2.0.5	JRLNOP-2T	90.60.12.137	TAG 2.2.0.7B
		TAG 2.2.0.6			TAG 2.2.0.8
		TAG 2.2.0.7B			
		TAG 2.2.0.8			
		TAG 3.1.0.3			

Because the volume evaluations of KCI – the only CLEC using the RSIMMS environment – were based solely on TCIF 7, no RSIMMS application greater than release 2.2.0.8 was necessary.

BellSouth has contracted the development of the TAG application to Telcordia Technologies. Through this agreement, only binaries are delivered to a third

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party outsourced testing and configuration team via FTP for deployment to the TAG servers. These binaries are then deployed on the servers via BAIST, the application deployment tool for the TAG application. Discrepancies in the number of deployed TAG versions reported by BellSouth versus the number identified by KCI were due to the fact that some releases were removed manually without using the BAIST tool. The tool, therefore, does not show those versions that are not available.

6.1.2 Operating System

All of the servers within the RSIMMS environment and ENCORE production system ran HP UNIX version B.10.20. All servers had been updated to the same patch level with minor differences that would not impact the performance of the servers.

6.1.3 Databases

TAG BLP (Business Logic Processor) used an Oracle database to store RSIMMS information, which is updated in production via weekly updates. The RSIMMS data on the RSIMMS platform was static.

The BLP application that TAG uses exclusively contains local copies of RSIMMS data and NPA/NXX data in Oracle databases. This is essentially a data cloning of read-only data from other applications for performance reasons. TAG/BLP does not store customer order data.

6.1.4 Configuration

There were two servers in the ENCORE production environment – one TAG gateway (GW) server and one business logic processor (BLP) server. Three servers supported the RSIMMS environment – one TAG gateway (GW) server and two business logic processor (BLP) servers. The gateway server in the ENCORE production system was CRTAG-1D. In the RSIMMS environment the server was JRTAG-1T.

6.1.5 Specified Differences

TAG used a random distribution that is written into the proprietary TAG code provided by Telcordia. There were no functional differences for TAG in RSIMMS and the ENCORE production system except for selected changes made in the RSIMMS environment to accommodate the OSS volume test. KPMG Consulting was aware of these changes in advance, and does not believe that the changes had any material impact on the system's performance observed during the test.

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a. As in the Production environment, duplicate PONS were not allowed in RSIMMS. However, in the RSIMMS environment, because PONS were often re-used for testing purposes, a batch job was run manually to clean out the LEO database of existing orders. This was executed once prior to a test.

b. In the RSIMMS environment multiple orders on the same account were allowed. In production, LESOG failed orders that were submitted on the same account. This functionality was turned off in the RSIMMS environment to allow for volumes of data without requiring unique accounts. This was an environment flag that required no change in code.

c. CLEC ownership checks were turned off in LESOG. This meant that company code 7421, for example, could disconnect accounts owned by company code 7219 in RSIMMS, but could not do so in production.

d. Additional listings were not considered in RSIMMS.

e. Checks for frozen accounts were not performed in RSIMMS. An account with LSF FID on an ACT of V or W with a REQTYP of E, F, C, or M whose value includes EU or LP, fell out for manual handling in production. In RSIMMS, or on a production account with a company code of 8000 (test account), this check was not performed.

f. Embedded base errors on account ownership were bypassed. In RSIMMS, if the RESH field was not found on the BOCRIS record, the RESH was placed on the order. This is a result of not checking the CLEC ownership of the account. In production, this case would be caught via CLEC ownership check.

The above differences were turned on/off by an environment variables and not by code changes. The same code existed in both environments.

6.1.6 Directory Structure

Data was collected by running scripts on the TAG application servers, both in the production and in the RSIMMS environment (see Figure 3). The production server (CRTAG-1D) that ran the TAG gateway application had an application directory structure /XST. The second server (CRTAG-3D) also running the BLP application had a /POG directory structure.

In the RSIMMS environment, the gateway server (JRTAG-1T) had an /XST directory structure, and the two servers (JRTAG-2T and JRLNOP-2T) that ran the BLP application had /POG directory structures.

6.1.7 File Information

Data was collected from the TAG servers in Production and RSIMMS by running a script on each server (see Figure 3). A comparison of the data collected for servers that perform the same function revealed that there were differences in the files. BellSouth has stated that the differences noted would not impact the performance of the systems.[2]

Figure 3: Directory listing of files from server CRTAG-1D (ENCORE Production) and server JR_TAG-1T (RSIMMS)

Server CRTAG-1D running the TAG application in the Encore production environment

```
/bto/appl/tag/files:
total 36
-rwxr-xr-x       1 xst_adm   xst_grp      1467 Jun 25  1999 mail.msg
-rwxr-x---       1 xst_adm   xst_grp        87 Jun 30  1999 ordertran
-rwxr-xr-x       1 xst_adm   xst_grp      1397 Jun 25  1999 tag_cronfile
-rwxr-x---       1 xst_adm   xst_grp        33 Jun 30  1999 tagcc
-rwxrwxrwx       1 xst_adm   xst_grp        69 Nov  2  1999 tagcust
-rw-r-----       1 xst_adm   xst_grp      1247 Jan 15 13:24 tagobject
-rwxr-xr-x       1 xst_adm   xst_grp       823 May 10 16:06 tagobjects
-rw-r-----       1 xst_adm   xst_grp       243 Aug  6  1999 tagobjects.chuck
-rwxr-x---       1 xst_adm   xst_grp       381 Dec  8 13:45 tagobjects.save
-rwxrwxrwx       1 xst_adm   xst_grp      1066 May 10 16:29 tagobjectsnew
-rwxr-xr-x       1 xst_adm   xst_grp        33 Jun 30  1999 tagtran
-rw-r-----       1 xst_adm   xst_grp        40 Oct 28  1999 tagversions
-rw-r-----       1 xst_adm   xst_grp      1328 Dec  8 14:01 tmp
```

Server JR-TAG-1T - RSIMMS environment

```
/bto/appl/tag/files:
 total 40
-rwxrwxr-x       1 xst_adm   xst_grp     12277 Mar  5 02:00 cma_dump.log
-rw-rw-r--       1 xst_adm   xst_grp      1716 Apr 18 11:35 tagobjects
-rwxrwxr-x       1 xst_adm   xst_grp       658 Mar 20 09:52 tagobjects.3103
-rwxrwxr-x       1 xst_adm   xst_grp       563 Apr  3 09:21 tagobjects.403
-rw-rw-r--       1 xst_adm   xst_grp         9 Mar 10 15:42 tagobjects.tst
-rwxrwxr-x       1 xst_adm   xst_grp       858 Apr 18 11:33 tagobjects2
-rw-rw-r--       1 xst_adm   xst_grp       858 Apr 18 11:34 tagobjects3
-rwxrwxr-x       1 xst_adm   xst_grp       858 Apr  3 09:14 tagobjects_bkp
```

6.1.8 Change Management

There appears to be an exception to the standard distribution policy for the TAG application. KCI was informed by BellSouth that the TAG software does not work well with DDS, the BellSouth tool for application distribution within the

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[2] KCI was unable to verify the accuracy of this statement without conducting a detailed examination of each file and its purpose.

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UNIX environment. Thus, the application distribution tool, BAIST, is used to distribute the TAG software.

Based on the information supplied for the evaluation, the servers should normally have the same directory structure, file information, and software versions, but in comparing data collected from the servers we noted differences in the software versions in the two environments (see Table 4). BellSouth stated that the differences noted would not impact the performance of the systems .

Table 4: TAG server directory listing - versions by server

Production			RSIMMS		
Host Name	**IP Address**	**TAG Version**	**Host Name**	**IP Address**	**TAG Version**
CRTAG-1D	90.70.124.148	2.0.1.5	JRTAG-1T	90.60.12.122	2.2.0.6
\XST		2.1.0.4	/XST Directory		2.2.0.7
		2.1.0.8			2.2.0.7A
		2.2			2.2.0.8
		2.2.0.1			2.2
		2.2.0.4			3.1
		2.2.0.5	JRTAG-2T		2.3
		2.2.0.7B	/POG Directory		3.2.0.2
		3.1			2.3.0.2
		3.1.0.3	JRLNOP-2T		2.3.0.2
		3.1.0.7.	/POG Directory		
CRTAG-3D	90.170.124.150	3.2.0.3			
\POG		2.3.0.2			
		2.1.0.6			
		2.3.0.1			
		2.2.0.4			
		3.2.0.2			

6.1.9 Capacity Management

As part of its ongoing systems performance and capacity management regime BellSouth monitors CPU utilization and sends an alert when predefined thresholds of utilization are exceeded. These alerts signify the need to examine trends in both peak and average CPU utilization in order to predict when expansion of capacity is warranted. Our review of the performance data provided for evaluation of the servers in the TAG application group indicated that all of the servers in the ENCORE production system performed well within BellSouth's defined system performance thresholds, with the exception of the server JRTAG-2T (see Table 5). This server, during the month of February,

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[3] KCI was unable to verify the accuracy of this statement without conducting a detailed examination of each directory and its purpose.

experienced five instances of crossing the CPU utilization threshold in a ten-day period. In our opinion, this was not indicative of a performance or capacity problem at that time.

Table 5: February 2000 CPU utilization for TAG server JRTAG-2T

Collect	Node	Average Utilization	Max. CPU Utilization ≥ 70%
Date	Name	Avg.	Max.
20000102	m0012123	0.73	3.66
20000103	m0012123	0.83	9.65
20000104	m0012123	18.9	<u>81.71</u>
20000105	m0012123	7.36	<u>84.64</u>
20000106	m0012123	1.4	26.35
20000107	m0012123	3.16	<u>79.07</u>
20000109	m0012123	0.71	3.8
20000110	m0012123	7.79	<u>85.34</u>
20000111	m0012123	2.63	<u>74.92</u>

6.2 LESOG Application Group

LESOG is the Local Exchange Service Order Generator application.   The applications within this group were evaluated against the following dimensions:

- Version

- OS version and Patch Levels

- Configuration (multiple servers within an application group)

- Specified Differences

- Database

- Directory Structure

- File information

- Change Management

- Capacity Management

This application group included the LEO UNIX, LESOG (OSS7), and LESOG (OSS9) applications. The servers that ran the applications in this group were HP UNIX servers (see Table 6).

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Table 6: LESOG servers and IP addresses

Production Server	IP Address	RSIMMS Server	IP Address
BRLSOG1D	90.110.108.47	JRRSIM1T	90.60.12.124
BRLSOG2D	90.110.108.48	JRRSIM5T	90.60.12.128
		JRRSIM6T	90.60.12.129

6.2.1 Software Version

The software release versions of the applications deployed in this group are shown in Table7 below.

Table 7: LESOG application versions by Server

Application	Production		RSIMMS	
LEO UNIX	90.110.108.47	leoU.06.01C.01	90.60.12.124	leoU.06.01C.01
LEO UNIX	90.110.108.48	leoU.06.01C.01	90.60.12.129	leoU.06.01C.01
LESOG (OSS7)	90.110.108.47	lsog08.01C.09	90.60.12.124	lsog08.01C.09
LESOG (OSS7)	90.110.108.48	lsog08.01C.09	90.60.12.128	lsog08.01C.09
LESOG (OSS7)			90.60.12.129	lsog08.01C.09
LESOG (OSS9)	90.110.108.47	asop06.01C.06	90.60.12.124	asop06.01C.06
LESOG (OSS9)	90.110.108.48	asop06.01C.06	90.60.12.128	asop06.01C.06
LESOG (OSS9)			90.60.12.129	asop06.01C.06

6.2.2 Operating System

All of the servers within the RSIMMS environment and ENCORE production system ran HP UNIX version B.10.20. All servers had been updated to the same patch level with minor differences that would not impact the performance of the servers.

6.2.3 Databases

There were no databases deployed as part of the LESOG application in the UNIX server environment.

6.2.4 Configuration

The configuration of the application varied between the production and the RSIMMS environments. There were only two servers in the production group and three in the RSIMMS group.   There was a one-to-one applications deployment match between the two environments, with the exception of server JRRSIM6T, which also ran the LESOG (OSS7) and LESOG (OSS9) applications.

Each hardware server ran a series of BellSouth Navigator server processes, the number determined by the load balance between hardware servers.   The Navigator posts messages in the order in which they are received to the available LESOG server processes. When a LESOG process completes, a message in the process issues a new receive request to the Navigator. If no receive request is

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available to the Navigator, it buffers the message until one is available. Therefore, there is no direct interaction between LESOG hardware servers to manage the total workload.

6.2.5 Specified Differences

Selected changes were made in the RSIMMS and ENCORE production system environments to support the OSS volume test. These differences disabled the production exception processing that results in auto-clarification (manual processing to correct exception conditions) of an order before sending the order to SOCS. KPMG Consulting was aware of these changes in advance, and does not believe that they had a material adverse impact on the test.

a. Did not perform CLEC ownership checks.

b. Did not perform additional listing and abandoned station searches.

c. Did not perform edits on Local Service Freeze (LSF) fid. While RSIMMS recapped LSF, production orders fell out for manual handling.

d. Bypassed internal errors on ownership of accounts. Reseller Sharer (RESH) was recapped, when it existed, but several of the test accounts did not have RESH on them. Normally this would fall out because of the CLEC ownership checks. But since those checks were bypassed, the orders were submitted to SOCS and received SOER errors. As a fix, when RESH did not exist on the CSR of the account and it therefore could not be recapped, it was added to the order anyway.

e. The pending service order check was turned off. This prevented errors from duplicate orders received during testing.

f. Placed LEOTEST in the Remarks Section of the order. This was not an edit, just a difference.

Table 8 lists parameters that were expanded in the RSIMMS environment as compared to the ENCORE production system for the LESOG application.

Table 8: System parameter variations between Production and RSIMMS

Parameter type	Parameter	Production Value	RSIMMS Value
Kernel	msgseg	2048	4096
Kernel	semmap	256	258
LesogMonTM	TM_MAX_PROCESSES	25	30
LesogMonTM	PROC_SLEEP_SECS	30	10
LesogMonTM	EXEC_SLEEP_SECS	1	5
LesogNavServ	NUMBER_TO_START	70	40

Table 9 identifies scripts/commands which were executed in the ENCORE production system and not in the RSIMMS environment:

Table 9: Listing of scripts that were executed only in Production

lesogPurge.ksh	Removed temporary files created in the taskmate/dat dir.
htr.ksh	Compressed and moved the screen capture files into an archival file system.
intZip	Compressed and moved the TaskMate standard out files into an archival file system . Removed old compressed files.
other	Commands were run to find and compress SOCS and CSR files.

6.2.6 Directory Structure

The two main application directories within the LESOG group of servers were the LESOG and AESOP directories. A review of the information collected showed that there were differences in the directory structure, specifically with the data queues to the other systems within the ENCORE production system. There were a number of directories that did not exist in the RSIMMS environment. We were not able to determine the implications of these missing directories.

An example of the differences in the directory structure between servers BRLSOG1D and JRRSIM1T is shown Figure 5 below. These differences were also observed on server BRLSOG2D and JRRSIM5T / JRRSIM6T.

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Figure 5: Listing of directory structure – LESOG application

6.2.7 File Information

There were differences in the files on the servers within an application group. An example of the differences in files between two servers is shown in Figure 6 below.

Additionally, on the RSIMMS server, JRRSIM1T, there was sub-directory /bto/appl/lesog/spong, which was not present in the production ENCORE servers. BellSouth has stated that the differences noted would not have impacted the performance of the systems.

Figure 6: Selected file differences – LESOG application

6.2.8 Change Management

Based on the information supplied for the evaluation, the servers should normally have the same directory structure and file information. This could not be validated based on the data collected from the servers during the course of the evaluation.   BellSouth has stated that processes are in place for change management to maintain consistency across environments.

6.2.9 Capacity Management

As part of its ongoing systems performance and capacity management regime BellSouth monitors CPU utilization and sends an alert when predefined thresholds of utilization are exceeded. These alerts signify the need to examine trends in both peak and average CPU utilization in order to predict when expansion of capacity is warranted. Our review of the performance data provided for evaluation of the servers that are part of the LESOG application group (see Tables 10 and 11) found that the servers in the ENCORE production system consistently crossed the CPU utilization threshold set by BellSouth. The

data provided for the months of January through May showed that both BRLSOG1D and BRLSOG2D crossed the maximum CPU utilization threshold. In accordance with its M&Ps, BellSouth responded to this situation by making changes to improve the performance of the systems, so as to reduce CPU utilization.

Table 10: February 2000 CPU utilization for server BRLSOG1D

Collection Date	Node Name	Avg. CPU Utilization	Max. CPU Utilization
20000206	f0224034	11.39	28.79
20000207	f0224034	28.59	99.79
20000213	f0224034	3.22	28.85
20000214	f0224034	34.92	100
20000220	f0224034	17.83	40.65
20000221	f0224034	35.8	98.1
20000227	f0224034	4.5	14.02
20000228	f0224034	32.88	98.83

Table 11: February 2000 CPU utilization for server BRLSOG1D

Collection Date	Node Name	Avg. CPU Utilization	Max. CPU Utilization
20000201	f0224035	14.7	49.35
20000203	f0224035	32.04	99.78
20000204	f0224035	32.76	99.89
20000205	f0224035	11.71	48.25
20000206	f0224035	12.8	33.05
20000207	f0224035	3.55	10.91
20000208	f0224035	34.55	100
20000209	f0224035	26.12	92.6
20000210	f0224035	27.29	94.7
20000211	f0224035	26.32	77.8

6.3 LNP Application Group

LNP is the Local Number Portability application. The applications within this group were evaluated across the following dimensions:

- Version

- OS version and Patch Levels

- Configuration (multiple servers within an application group)

- Database

- Directory Structure

- File information

- Change Management

- Capacity Management

The four main software packages within this application group were the LNP Gateway, LNPTA, LAUTO, and the LCSC GUI application, which, in the ENCORE production system, was installed on a number of servers that are geographically dispersed. These servers did not have an impact on the overall performance of the servers in the ENCORE production system, since they provide only a GUI interface for, and are physically located close to, the customer service staff. The servers that ran the applications in this group were HP UNIX servers (see Table 12).

Table 12: Name and IP addresses of LNP application servers

Production Server	IP Address	RSIMMS Server	IP Address
CRLNOP1D	90.73.72.34	JRRSIM3T	90.60.12.126
CRLNOP2D	90.73.72.35	JRRSIM4T	90.60.12.127
CRLNOP4D	90.73.72.53	JRLNOP1T	90.60.12.136
BOLNOP1D	90.17.192.29		

In production, FAX LSRs are entered via the LCSC GUI. EDI and TAG LSRs are processed by the GW initially (first level validation). The LAUTO/SOG server then processes the EDI and TAG LSRs that meet these validation requirements. LSRs that do not meet second level validations require manual handling by LCSC personnel (using the LCSC GUI server). Therefore, based on the results of the second level validations, either a Firm Order Confirmation (FOC) is prepared for return to the CLEC, or the database is flagged for handling by the LCSC.

6.3.1 Software Version

The versions of the packages deployed in this application group are shown in Table 13.

Table 13: LNP application software version by server

Application	Production	IP Address	RSIMMS	IP Address
LNP Gateway 4.1	CRLNOP1D	90.73.72.34	JRRSIM3T	90.60.12.126
	CRLNOP2D	90.73.72.35		
LAUTO	CRLNOP4D	90.73.72.53	JRRSIM4T	90.60.12.127
LNPTA	CRLNOP4D	90.73.72.53	JRRSIM3T	90.60.12.126
LCSC GUI	BOLNOP1D	90.17.192.29	JRLNOP1T	90.60.12.136

6.3.2 Operating System

All of the servers within the RSIMMS environment and ENCORE production system ran HP UNIX version B.10.20. All servers had been updated to the same patch level with minor differences that would not have impacted the performance of the servers.

6.3.3 Databases

The database deployed within the LNP application was Informix.

6.3.4 Configuration

The configuration of the application varied between the ENCORE production and RSIMMS environments. Excluding the LCSC GUI servers, there were three servers in the ENCORE production group and two servers in the RSIMMS group. The deployment of the applications packages within this application group, as shown in the table above, varied by application. In the ENCORE production system there were two gateway servers (CRLNOP1D and CRLNOP2D), whereas there was only one in RSIMMS (JRRSIM3T).   The LAUTO and LNPTA applications were deployed on the same server (CRLNOP4D) in the ENCORE production system. In the RSIMMS environment, the LAUTO was located on a separate server (JRRSIM4T), and the LNPTA application was deployed on the gateway server (JRRSIM3T).

There was a variation in number of servers with the LCSC GUI. The number of users determined the number of GUI servers. Each user was assigned a specific server for login.   A shared database was connected to all servers in the environment and provided the only communication among servers. When the LAUTO/SOG server determined that an order required manual handling by the LCSC, a flag on the order was updated on the database. The user queried the database for his/her work.

6.3.5 Specified Differences

The following differences were created between the RSIMMS and the ENCORE production system environments in order to support OSS volume test. KPMG Consulting was aware of these changes in advance. We do not believe that these changes had a material adverse impact on the test.

a. No second validation occurred for the Pending Service Order validation in RSIMMS. This was to prevent errors from duplicate orders received during testing. The navigator contract was issued, but the results were ignored. A configuration parameter enabled/disabled this function.

b. No NPAC connectivity existed in RSIMMS. Therefore, SOA and LSMS processes were not started. This was controlled by command line arguments in the startup script.

c. There were differences in the tunable Kernel Parameters to improve performance of the BellSouth Navigator. These changes had previously been made in the LNP Certification Test Servers. These changes were scheduled to be applied to the production servers on May 21, 2000.

d. The changes were:

    1) Increase EQMEMSIZE parm to avoid warning messages in/var/adm/syslog/syslog.log

    2) Increase IPC resources for Navigator

    3) Standardize Tunable Kernel Parms for the LNP LCSC servers.

6.3.6 Directory Structure

There were differences in the directory structure between the gateway servers (CRLNOP1D and CRLNOP2D) in the ENCORE production system, and between the gateway server in the ENCORE production system (CRLNOP1D) and the gateway server (JRRSIM3T) in the RSIMMS environment. These differences are shown in Figures 7 and 8. Similarly configured servers dedicated to running the same application should have had similar directory structures.
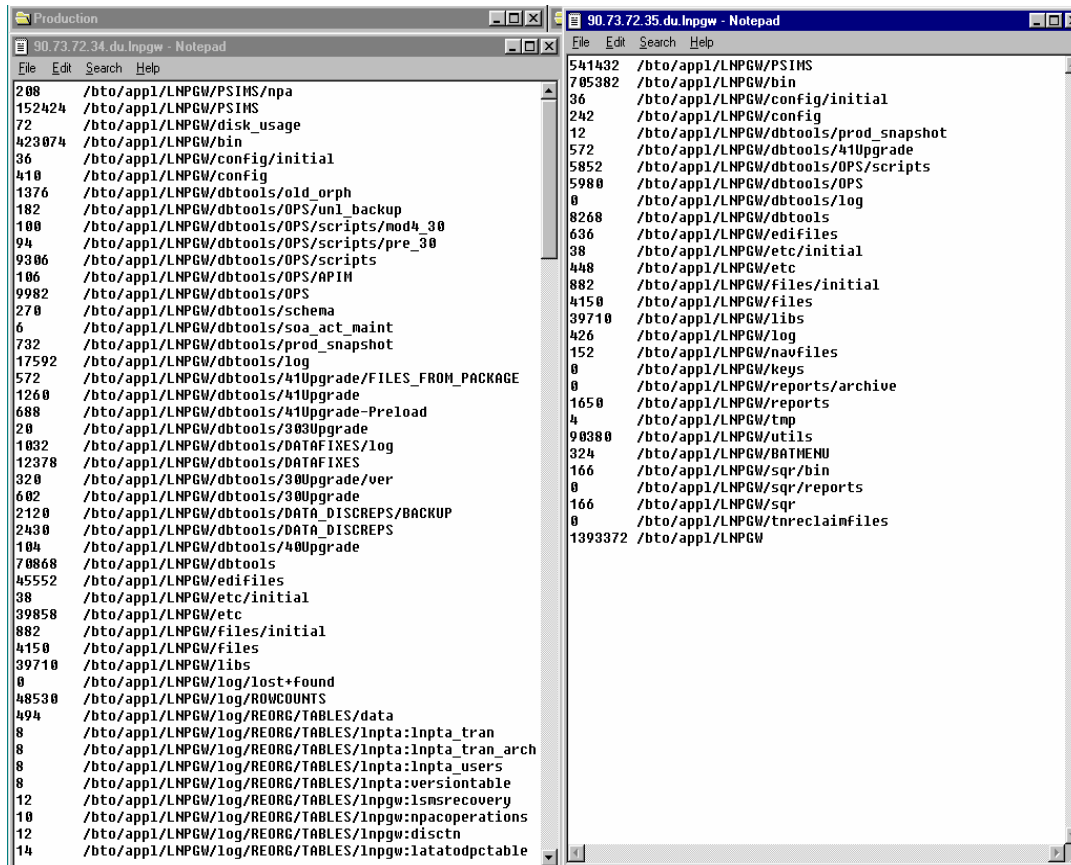
The directory structures of the servers running the LAUTO application were very similar, both on the production server (CRLNOP4D) and the server in the RSIMMS environment (JRRSIM4T).

The LNPTA application that ran on the production server CRLNOP4D had a different directory structure compared to the server JRRSIM3T, which ran the same application in the RSIMMS environment.

Figure 7: Directory structure differences between Gateway servers in the ENCORE Production System

Server CRLNOP1D (90.73.72.34)   **Server CRLNOP2D (90.73.72.35)**

Figure 8: Directory structure differences between Gateway servers in the ENCORE Production System and RSIMMS Environment

Server CRLNOP1D (90.73.72.34)   **Server JRRSIM3T (90.60.12.126)**

6.*3.7 File Information*

There were differences in the files on the servers that ran the same application. The files contained in the LNPGW/Bin were similar on the server CRLNOP1D in the ENCORE production system and the RSIMMS server JRRSIM3T, but there were differences in the /bto/appl/LNPGW/config directory and the /Dbtools directory, etc.

6.3.8 Change Management

Based on the information supplied for the evaluation, the servers should normally have had the same directory structure and file information. This could not be validated based on the data collected from the servers during the course of the evaluation.

6.3.9 Capacity Management

As part of its ongoing systems performance and capacity management regime BellSouth monitors CPU utilization and sends an alert when predefined thresholds of utilization are exceeded. These alerts signify the need to examine trends in both peak and average CPU utilization in order to predict when expansion of capacity is warranted. Our review of the performance data provided for evaluation of the servers that were part of the LNP application group, showed that all the servers in the ENCORE production system performed well within BellSouth's system performance thresholds, with the exception of the gateway server CRLNOP1D.   This server during the month of February had three instances of crossing the CPU utilization threshold (see Table 14). In our opinion, this was not indicative of a performance or capacity problem at that time.

Table 14: February 2000 CPU utilization for server CRLNOP1D

Collection Date	Node Name	Avg. CPU Utilization %	Max CPU Utilzation %
20000102	n3072034	14	32.96
20000103	n3072034	18.2	47.79
20000104	n3072034	30.2	62.8
20000105	n3072034	30.9	62.75
20000106	n3072034	25.8	58.02
20000107	n3072034	23.7	55.94
20000108	n3072034	14.5	55.39
20000109	n3072034	28.8	49.27
20000110	n3072034	48.7	83
20000111	n3072034	52.7	75.6
20000112	n3072034	33.3	61.32

Collection Date	Node Name	Avg. CPU Utilization %	Max CPU Utilzation %
20000113	n3072034	36.4	61.31
20000114	n3072034	38.7	71.6
20000116	n3072034	10.6	36.53

7.0 RSIMMS Environment and ENCORE Production Systems Hardware Review

The list of the hardware components that were included in BellSouth's RSIMMS and ENCORE production systems, including detailed information for each system, is shown in Appendix A.

7.1 TAG Systems

7.1.1 RSIMMS Environment

The systems that ran the TAG application in the RSIMMS were JRTAG-1T, with a backup, JYTAG-1T, and a third server, JRTAG-2T, which served a function listed as BLP. The servers were HP 9000 Enterprise servers, model K580 with 4 CPUs, with the exception of the backup server JRTAG-2T, which was a K570. The backup server had 2GB of memory and the two K580 servers had 4GB of memory. These servers were all located in Jackson, MS, and were FDDI connected to the network, except for the backup server which had an Ethernet connection.

7.1.2 ENCORE Production System

The servers in the ENCORE production system that ran the TAG application were CRTAG-1D, an HP 9000 Enterprise model K570 with four CPUs, as was the server CRTAG-3D with the BLP function. There was no equivalent backup server (not required). These servers, all of which were located in Charlotte, NC, had 2GB of memory and were FDDI connected to the network.

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Figure 9: Relative OLTP Performance[4] of HP K-Class Servers
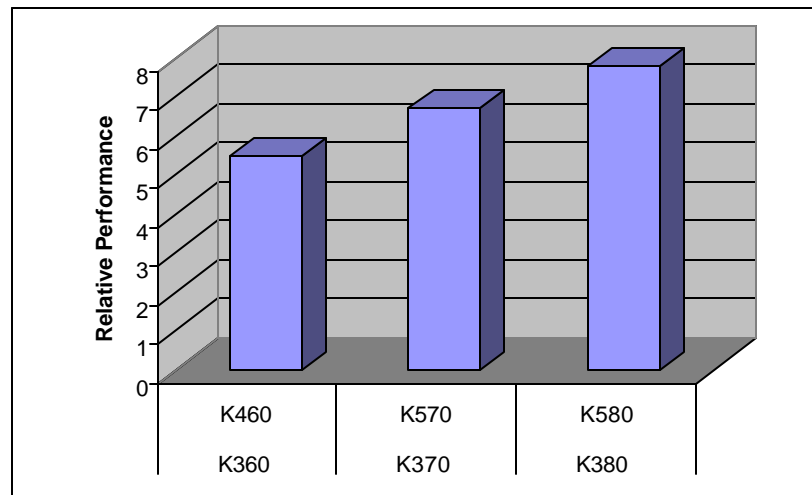
7.1.3 Differences

Based on the reference document[5] "K-Class Product Information" published on HP's Web site (see Figure 9), the K580 servers in the RSIMMS environment "deliver a 20% faster compute performance" than the K570 servers deployed in the ENCORE production system.

Excluding the backup system, a comparison of the two machines in the RSIMMS environment and ENCORE production system using published performance data from HP, shows that a 60% increase in relative compute performance existed in the RSIMMS environment. Additionally, the K580 systems in the test environment had 4GB of memory, whereas the systems in the ENCORE production environment had 2GB of memory. Depending on the nature of the application, the reduced memory could have had a negative impact on the performance of the systems in the ENCORE production system, especially if the applications were memory intensive. The backup servers were HP K570s, with the systems in the RSIMMS environment and ENCORE production system having two and four processors, respectively. Should the backup systems be deployed, there would be a 40% reduction in the relative compute performance of the backup server in the RSIMMS environment.

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[4] On Line Transaction Processing (OLTP). This graph compares the performance of HP's K series servers, various models of which are used in BellSouth's RSIMMS and production environments, relative to the performance of the HP 9000 2-way D350 Enterprise server (a baseline)
[5] "K-Class Product information" on HP's product information Web site:
http://www.unixservers.hp.com/midrange/KCIass/specifications/index.html

Figure 10: Relative Performance of HP T-Class Versus K-Class Servers
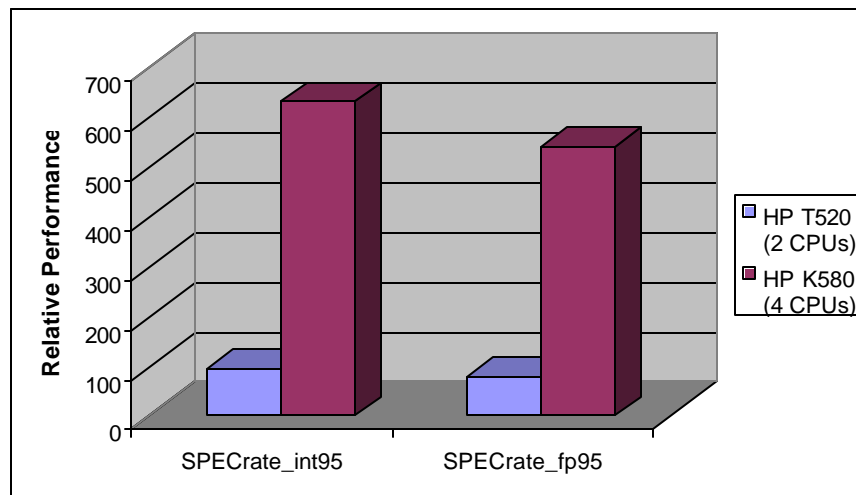
7.2 LESOG/LEO-UNIX

7.2.1 RSIMMS Environment

The systems in the RSIMMS environment that ran the LESOG and the LEO-UNIX application were a combination of six HP9000 T520 and K580 servers with four CPUs each. The four K580 servers, JRRSIM1T, JRRSIM2T, JRRSIM5T, and JRRSIM6T, each had 4GB of memory. The servers were connected to the network via FDDI connections and were located in Jackson, MS.

7.2.2 ENCORE Production System

The servers in the ENCORE production system consisted of two HP9000 server model T520s with four CPUs and 2GB of memory per server. These servers, BRLSOG1D and BRLSOG2D, were FDDI connected to the network and were located in Birmingham, AL.

7.2.3 Differences

The two servers in the ENCORE production system were HP 9000 series model T520, with four CPUs and 2GB of memory and the servers in the RSIMMS environment were HP9000 K580, with four CPUs and 4GB of memory. The four K580 servers were added to handle the added volume of order and pre-orders during volume testing. The usage of four HP9000 K580 servers did not mirror the ENCORE production system and it is possible that performance data obtained during the Volume Tests would not scale to the ENCORE production

system. The difference in compute performance between a T520 server and K580 server is shown in Figure 10 above.

7.3 LNP - Gateway – LAUTO (SOG)

7.3.2 RSIMMS Environment

The systems in the RSIMMS environment running the LNP gateway and LAUTO application consisted of two HP9000 model K580 servers with four CPUs and 4GB of memory, and one model K360 with two CPUs and 1GB of memory. One of the K580 servers, JRRSIM3T, ran the Gateway application, while the other K580 server, JRRSIM4T, ran the LAUTO application. The third server in the LNP group, JRLNOP1T, ran the LCSC application. All of the servers were located in Jackson, MS and were FDDI connected to the network.

7.3.3 ENCORE Production System

The servers deployed within the ENCORE production system for the LNP application group were HP 9000 K460 servers. The server that ran the production gateway, CRLNOP1D, had four CPUs and 3GB memory. The server that ran the production LAUTO application, CRLNOP4D, had two CPUs and 1GB memory. These two servers were located in Charlotte, NC and were connected to the network via a 10 MB Ethernet connection. The third server, BOLNOP1D, located in Birmingham, AL, had four CPUs with 2GB memory and was connected to the network via a 10 MB Ethernet connection.

7.3.4 Differences

Comparing the servers running the Gateway and LAUTO applications, each of the HP K580 servers in RSIMMS environment had a relative compute performance of approximately 48% more than each of the HP K460 servers that ran the same application in the ENCORE production system. This performance data was obtained from a product information document[6] on HP's Web site. The total relative compute performance of the two combined systems in the RSIMMS environment would be almost 100% greater than the combination of the two servers in the ENCORE production system. Additionally, the servers in the ENCORE production system had less memory than the servers in the RSIMMS environment, which could negatively impact the performance of the server in the ENCORE production system, especially if Gateway and LAUTO applications are memory intensive. There could be performance issues when the servers are connected to the network via 10MB Ethernet interfaces, when compared to similar servers connected to a FDDI network. However, if the data flow between server and network utilization is low, there would not be a significant impact to the performance of the system/application group.

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[6] "HP 9000 K-Class Enterprise Server and K-Class Technical server" available on HP's product information Web site: http://www.unixservers.hp.com/midrange/KCIass/ specifications/index.html

A comparison of the servers running the LCSC application - a K460, with four CPUs and 2GB memory in production, and a K360, with two CPUs and 1GB of memory in the RSIMMS environment, showed that the production server had a much higher compute performance (72%) and would not negatively impact the ENCORE production system.

8.0 Mainframe Hardware

P/SIMMS, EDI Gateway, LEO, COFFI-Features, ATLAS, RSAG, DSAP, GA.SOCS, COFFI-USOC, GA.BOCRIS, GA.BOCABS, GA.LMOS

Additional data was provided to KCI on the mainframe environment. Based on this information, mainframe system performance was not likely to adversely affect these applications.

In December 1999 the operating system running on both test and production was MVS 5.2.   In March 2000 the operating system running on both test and production was OS/390 2.5.   EDS upgraded the operating system software to OS/390 2.8 later during the year 2000. The hardware platform may be updated as necessary.

Table 15: Mainframe Application and Region Names used in the ENCORE Production and RSIMMS Environments

Application Name	SYS ID	Site	Control Region	CPU Model	MIPs[7]
SOCS	O1SY	O	ARC-IMS	Hitachi Skyline -727	878
SOCS RSIMMS	U4SY	U	BR4-IMS	Hitachi Skyline -625	620/24% Share
LEO	B2SY	D	IOA-IMS	Hitachi CMOS P9-89S	1078/35% Share
LEO RSIMMS	U4SY	U	BR3-IMS	Hitachi Skyline -625	620/24% Share
ATLAS	O1SY	O	ARC-IMS	Hitachi Skyline -727	878
ATLAS RSIMMS	U4SY	U	BR4-IMS	Hitachi Skyline -625	620/24% Share
RSAG	O1SY	O	ARC-IMS	Hitachi Skyline -727	878
RSAG RSIMMS	U4SY	U	BR4-IMS	Hitachi Skyline -625	620/24% Share
DSAP	O1SY	O	ARC-IMS	Hitachi Skyline -727	878
DSAP RSIMMS	U4SY	U	BR4-IMS	Hitachi Skyline -625	620/24% Share
BOCRIS	O1SY	O	ARC-IMS	Hitachi Skyline -727	878
COFFI	O1SY	O	ARC-IMS	Hitachi Skyline -727	878
P/SIMS	D2SY	D	H51-IMS	Hitachi CMOS P8-98S	846/60% Share

System U4SY was an RSIMMS image; O1SY, B2SY, D2SY were ENCORE production images.

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[7] Millions of instructions per second

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The BR4 and ARC control regions had different applications. The applications that existed on both regions were RSAG, CORTS, BOCRIS, SOCS, LCCSM, ORDMAN, TIPS, SONGS/DSAP, and RATEF. BR4 (test) had the following additional applications: LIST, SIMS, RELOG, WASSP, DSAP, and CABS. The ARC control region had 37 additional applications that did not exist on the BR4 control region. This was probably not significant since the ENCORE production system had been tailored to isolate applications.

The BOCRIS and COFFI applications were defined to the ARC control region and P/SIMS was defined to the H51 control region.

8.1 Platform and Application Monitoring

IMSAUTO and DB2AUTO were used to monitor both production and test subsystems and control regions. DB2AUTO monitored the DB2 platform and alerted on certain subsystem problems. IMSAUTO monitored the IMS platform, alerted on specific control region problems, and, in certain critical situations, initiated automated corrective actions. This monitoring, alerting, and automation was the same in all control regions.

IMSAUTO had also been customized to perform application level monitoring. These application-specific monitors were created with input from the Application groups and Database Administrators. Monitors for an application can be added, deleted, or refined at any time and are typically the same for every control region where that application runs. During the review, there were Financial and LEO application monitors in both production and test bed.

The primary functions of Solve: Operations for MVS were:

1. To provide remote operation of all MVS images from a Centralized Operations Center.

2. To suppress non-essential messages.

3. To provide delivery of essential messages to operations.

4. To manage status of MVS/VTAM resources (i.e., Started Tasks, Jobs, Cross Domains, Major Nodes, etc.).

5. To identify and respond to conditions that would result in system degradation or failure.

EDS does not run MVS systems without functioning automation since Solve is critical for normal mainframe operations.

8.2 Data Storage

The Data Access and Storage Device (DASD) pools were monitored by a BMC product called StorageGuard. Every 30 minutes, all of the DASD was scanned.

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If any pool exceeded the defined utilization threshold, StorageGuard issued a message and sent an E-mail to the primary and backup Site Storage Manager. DFSM's Hierarchical Storage Management (HSM) checked each pool on an hourly basis and attempted to reduce the utilization of any pool exceeding its threshold by releasing allocated and unused space, deleting data sets eligible for deletion, and migrating any eligible data set to compressed DASD or tape.

8.3 Differences

Three of the mainframe systems, O1SY, D2SY, and I3SY, were part of the RSIMMS environment and ENCORE production system. The other mainframe, B2SY, in the ENCORE production system, was more powerful than the equivalent system in the RSIMMS environment, U4SY. Performance differences within the mainframe environment would most likely be due to latency across BellSouth's network, since the RSIMMS mainframe environment was within a single data center, whereas the production systems mainframes were distributed across two data centers. Additional network information provided by BellSouth showed negligible latency across the FDDI rings that are connected to the core ATM networks.

9.0 Network Review

The topological layout of the network for the RSIMMS environment and the ENCORE production system are show in the logical network maps. BellSouth developed the topological diagrams based on a request from the Test team. These diagrams are shown in Appendix C.

9.1 ENCORE Production System

The servers within the ENCORE production system were distributed across the Birmingham, AL Data Center and the Charlotte, NC Data Center, although one server (BOLNOP1D) was located at an administrative building in Birmingham, AL.

9.1.1 ENCORE Production System – Connectivity

Due to the distribution of the ENCORE production system servers across many locations on the BellSouth network, it is important to note that the characteristics of the network need be taken in to consideration due to the inherent latency of data movement across a network. This is especially critical in the case of the server BOLNOP1D, which was located three hops from the closest connection to a FDDI ring and was networked via a 10MB Ethernet connection.

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Table 16: ENCORE Production Environment - server network information

Host Name	IP Address	LAN	Location	Type
TAG				
CRTAG-1D	90.70.124.148	FDDI	Charlotte	Production
CRTAG-3D	90.70.124.150	FDDI	Charlotte	BLP
LESOG / LEO-UNIX				
BRLSOG1D	90.110.108.47	FDDI	Birmingham	Production
BRLSOG2D	90.110.108.48	FDDI	Birmingham	Production
LNP - Gateway-LAUTO(SOG)				
CRLNOP1D	90.73.72.34	Ethernet	Charlotte	Production Gateway
CRLNOP2D	90.73.72.35	Ethernet	Charlotte	Production LAUTO
CRLNOP4D	90.73.72.53	Ethernet	Charlotte	Production LAUTO
BOLNOP1D	90.17.192.29	Ethernet	Bham-600 N 19th	Production LCSC
P/SIMMS, EDI Gateway				
D2SY Mainframe	90.12.72.1	Channel-FDDI	Birmingham	EDI Production
LEO				
B2SY Mainframe	90.12.12.1	Channel-FDDI	Birmingham	Production
COFFI-Features, ATLAS, RSAG, DSAP, GA. SOCS				
COFFI-USOC, GA. BOCRIS, GA. BOCABS				
O1SY Mainframe - Atlanta	90.12.24.1	Channel-FDDI	Birmingham	Production
O2SY Mainframe - GA Outstate	90.17.72.1	Channel-FDDI	Birmingham	Production
GA. LMOS				
I3SY Mainframe	90.70.136.1	Channel-FDDI	Charlotte	Production

9.2 RSIMMS – Connectivity (Logical)

A review of the RSIMMS network diagram showed that all of the HP servers
were located in Jackson, MS on a single FDDI ring. One mainframe was located
in the Atlanta, GA data center, one in Charlotte, NC, and two others are located
in Birmingham, AL. Table 17 lists systems in the RSIMMS environment. The
servers are listed with their IP address, which indicates their location on the
specific sub-networks.

Table 17: RSIMMS Test Environment - server network information

Host Name	IP Address	LAN	Location	Type
TAG				
JRTAG-1T	90.60.12.122	FDDI	Jackson	Test
JRTAG-2T	90.60.12.123	FDDI	Jackson	Test BLP
JYTAG-1T	90.63.40.42	ETHER	Jackson	Backup - Test
LESOG / LEO-UNIX				
JRRSIM1T (also LEO-UNIX)	90.60.12.124	FDDI	Jackson	Test
JRRSIM2T (also LEO-UNIX)	90.60.12.125	FDDI	Jackson	Test
JRRSIM5T	90.60.12.128	FDDI	Jackson	Test
JRRSIM6T	90.60.12.129	FDDI	Jackson	Test
LNP - Gateway-LAUTO(SOG)				
JRRSIM3T	90.60.12.126	FDDI	Jackson	Test Gateway
JRRSIM4T	90.60.12.127	FDDI	Jackson	Test LAUTO
JRLNOP1T (reused IOT box)	90.60.12.136	FDDI	Jackson	Test LCSC
JRLNOP2T (not installed)	90.60.12.137	FDDI	Jackson	Test
JRLNOP3T (not installed)	90.60.12.138	FDDI	Jackson	Test
EDI GATEWAY, P/SIMMS				
D2SY Mainframe	90.12.72.1	Channel-FDDI	Birmingham	EDI Prod.-Vol. Test
LEO				
COFFI-Features, ATLAS, RSAG, DSAP, GA. SOCS				
U4SY Mainframe	90.130.76.1	Channel-FDDI	Atlanta	RSIMMS Vol. Test
COFFI-USOC, GA. BOCRIS, BOCABS				
O1SY Mainframe - Atlanta	90.12.24.1	Channel-FDDI	Birmingham	Production-Vol. Test
GA. LMOS				
I3SY Mainframe	90.70.136.1	Channel-FDDI	Charlotte	Production-Vol. Test

APPENDIX A - RSIMMS AND PRODUCTION SYSTEMS

HOST NAME	IP ADDRESS	MODEL	CPU	RAM	DISK SPACE	LAN	OS	Region/ Partition	Location	TYPE
RSIMMS Test Environment										5/9/00
TAG										
JRTAG-1T	90.60.12.122	K580	4	4GB	82GB	FDDI	HP-UX 10.2		Jackson	Test - GW
JRTAG-2T	90.60.12.123	K580	4	4GB	82GB	FDDI	HP-UX 10.2		Jackson	Test BLP
JRLNOP-2T	90.60.12.137	K580	4	4GB	82GB	FDDI	HP-UX 10.2		Jackson	Test BLP
LESOG / LEO-UNIX										
JRRSIM1T (also LEO-UNIX)	90.60.12.124	K580	4	4GB	82GB	FDDI	HP-UX 10.2		Jackson	Test
JRRSIM5T	90.60.12.128	K580	4	4GB	82GB	FDDI	HP-UX 10.2		Jackson	Test
JRRSIM6T	90.60.12.129	K580	4	4GB	82GB	FDDI	HP-UX 10.2		Jackson	Test
LNP - Gateway-LAUTO(SOG)										
JRRSIM3T (Gateway)	90.60.12.126	K580	4	4GB	82GB	FDDI	HP-UX 10.2		Jackson	Test Gateway
JRRSIM4T (LAUTO)	90.60.12.127	K580	4	4GB	82GB	FDDI	HP-UX 10.2		Jackson	Test LAUTO
JRLNOP1T (GUI/reused IOT box)	90.60.12.136	K360	2	1GB	18GB	FDDI	HP-UX 10.2		Jackson	Test LCSC
EDI GATEWAY, P/SIMMS										
D2SY Mainframe	90.12.72.1	Hitachi (HDS) P8				Channel-FDD	TSO	WTB	Birmingham	EDI Prod.-Vol. Test

HOST NAME	IP ADDRESS	MODEL	CPU	RAM	DISK SPACE	LAN	OS	Region/ Partition	Location	TYPE
Production Environment 09/21/2000

HOST NAME	IP ADDRESS	MODEL	CPU	RAM	DISK SPACE	LAN	OS	Region/ Partition	Location	TYPE
TAG										
CRTAG-1D	90.70.124.148	K570	4	2GB	29GB	FDDI	HP-UX 10.2		Charlotte	Production
CRTAG-3D	90.70.124.150	K570	4	2GB	37GB	FDDI	HP-UX 10.2		Charlotte	BLP
LESOG / LEO-Unix										
BRLSOG1D	90.110.108.47	T520	10	2GB	100GB	FDDI	HP-UX 10.2		Birmingham	Production
BRLSOG2D	90.110.108.48	T520	10	2GB	100GB	FDDI	HP-UX 10.2		Birmingham	Production
LNP - Gateway-LAUTO(SOG)										
CRLNOP1D (Gateway)	90.73.72.34	K460	4	3GB	49GB	Ethernet	HP-UX 10.2		Charlotte	Production Gateway
***	90.73.72.35	***	***	***	***	***	***		Charlotte	Production Gateway
CRLNOP4D (LAUTO)	90.73.72.53	K460	2	1GB	2GB	Ethernet	HP-UX 10.2		Charlotte	Production LAUTO
BOLNOP1D (LCSC GUI)	90.17.192.29	K460	4	2GB	2GB	Ethernet	HP-UX 10.2		Bham-600 N 19th	Production LCSC
(LCSC GUI)	90.17.192.32	***	***	***	***	***	***		Bhm	Production LCSC
(LCSC GUI)	90.17.192.154	***	***	***	***	***	***		Bhm	Production LCSC
(LCSC GUI)	99.8.128.62	***	***	***	***	***	***		Bhm	Production LCSC
(LCSC GUI)	90.131.96.32	***	***	***	***	***	***		***	Production LCSC
(LCSC GUI)	90.131.80.55	***	***	***	***	***	***		***	Production LCSC
(LCSC GUI)		***	***	***	***	***	***		***	Production LCSC

APPENDIX B - RSIMMS APPLICATION ARCHITECTURE

RSIMMS 3PT Volume Test Environment

January 26, 2000

Legend:
- - - - → LNP Flow
────→ Encore Flow

Key:
- RSIMMS Testbed
- Encore
- Production

B'ham Site I
TSO (WTB) IMS (HA8
90.12.72.1
Test/Prod

Atlanta Site U
RSIMMS (BR3)
90.130.76.1
Test

Atlanta Site U
RSIMMS (BR4)
90.130.76.1
Test

EDI Direct Connect

X12File @ 30min

EDI Gateway

Flat File

FOC's & Comp

LSRs

LEO/MF ---- LSR Router

NAV (LEOLNS01
LSR & Status

SOCS

NAV (LEOLSC)
Errors & Status

NAV

NAV

EN51T

Customer Requests

API

Firm-Order Data

ORBIX

TAG

TAG Gateway
90.60.12.122
HP – K580

ORBIX

DB02T

NAV

NAV (LEOU2LEO)
SO Status for
FOC & Compl

NAV (SOCSLEO)
SO Status for
FOC & Compl

SOER Errors

Taskmate

SO

LNP

NAV (LESOGLSR
LSRs

LESOG

BUFIT

LNP LCSC GUI (TBD)

Gateway
90.60.12.126
HP - K580

LAUTO (SOG)
90.12.60.127
HP - K580

LEO/UNIX
90.60.12.124
HP - K580

90.60.12.125
HP – K580

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APPENDIX C - NETWORK TOPOLOGY MAPS

ENCORE PRODUCTION ENVIRONMENT
CHARLOTTE DATA CENTER

Jackson Data Center

ATM BACKBONE

Birmingham Data Center

Core Routers

CHRLUN08
BCN Router

CHRLUN09
BCN Router

All media is Fiber
unless noted otherwise.

Server Farm FDDI
Baynet FDDI

SS9000
90.73.72.1

CHRLUN21
BCN Router

NCFDDI02
MMAC8
90.70.124.2

Fiber

Repeater

AUI

Thick LAN

NCFDDI03
SS9000

NCFDDI04
SS9000

NCFDDI15
SS9000

CRTAG-1D
90.70.124.148

CRTAG-2D
90.70.124.149

NCFDDI16

AUI   AUI

BIRMINGHAM HEADQUARTERS
600 N. 19th Street

ENCORE PRODUCTION ENVIRONMENT
BIRMINGHAM DATA CENTER

Key

FDDI 'A'
FDDI 'B'

BRHHQ01
BCN Router

DS-3

State
SMDS

SS9000
90.17.196.3

Fiber

MR9TE

CAT5 UTP

Premise Ethernet
segment

BOLNOP1D
90.17.192.29

ATM BACKBONE

Charlotte Data Center

Jackson Data Center

Core Routers

BRHMDC09

BRHMDC10

NSG FDDI
Baynet FDDI

RSIMMS NETWORK ENVIRONMENT
JACKSON DATA CENTER

Key

———— FDDI 'A'

———— FDDI 'B'

ATLANTA DATA CENTER
675 W. Peachtree

ATM BACKBONE

Core Routers

ATLNCH80
NSC Router

JCSNDC06
BCN Router

JCSNDC07
BCN Router

U4SY
Mainframe
90.130.76.1

NSC Router
FDDI

NSG FDDI
Baynet FDDI

MSFDDI01
MMAC8