



**Federal Student Aid (FSA)**  
**Financial Management System**  
**Lender Reporting System**  
**(FMS - LaRS)**

---

***Performance Test Plan***

August ~~7~~15, 2002



Change Record

Date	Author	Version	Change Reference
6/13/02	Roshani Bhatt	1.0	Begin document.
6/24/02	Todd Collins	2.0	Added LaRS and FMS Phase IV Requirements
6/25/02	Mike Tran	3.0	Updated LaRS and FMS Phase IV Requirements
6/26/02	Roshani Bhatt	4.0	Updated test goals, roles and responsibility based on 6/25 meeting
6/26/02	Chi-Yen Yang Cherr Wilks	4.1	Researched and added contact information.
7/23/02	Cherr Wilks Roshani Bhatt	5	Updated business processes and performance test dates.
8/01/02	Cherr Wilks	5.1	Corrected minor errors. Updated the test cycles
8/07/02	Roshani Bhatt Chi-Yen Yang	6.0	Incorporated NCS (IV&V) Feedback
<u>8/15/02</u>	<u>Cherr Wilks</u> <u>Roshani Bhatt</u>	<u>6.1</u>	<u>Incorporated NCS (IV&amp;V) Feedback</u>



TABLE OF CONTENTS

PERFORMANCE TEST PLAN ..... 1

**1 EXECUTIVE SUMMARY..... 5**

1.1 INTRODUCTION..... 5

1.2 BACKGROUND ..... 5

1.3 OBJECTIVES..... 5

1.4 EXPECTED RESULTS ..... 6

1.5 ASSUMPTIONS ..... 6

**2 OVERVIEW..... 7**

2.1 OVERVIEW..... 7

2.2 OVERALL GOAL ..... 7

**3 PERFORMANCE TEST PROCESS ..... 8**

3.1 PERFORMANCE TEST PROCESS..... 8

3.1.1 *Establish a list of performance test areas that will be monitored..... 8*

3.1.2 *Establish the data and parameters that need to be collected..... 8*

3.1.3 *Planning for the first LaRS Performance Test (Baseline)..... 8*

3.1.4 *LaRS test cycles monitored and data collected..... 8*

3.1.5 *Fixes and Changes made to the environment and application code..... 8*

3.1.6 *Specific Goals set for the next LaRS test run ..... 9*

**4 ROLES, RESPONSIBILITIES, AND DELIVERABLES..... 10**

4.1 PERFORMANCE TEST ROLES AND RESPONSIBILITIES..... 10

4.2 DELIVERABLES..... 11

4.2.1 *LoadRunner Test Cycle Results ..... 11*

4.2.2 *Final Recommendation ..... 11*

4.2.3 *Performance Test Summary Analysis..... 11*

**5 LARS BUSINESS PROCESSES ..... 12**

5.1 BUSINESS PROCESSES ..... 12

5.2 BUSINESS PROCESSES TABLE..... 12

**6 DETAILED GOALS PER CYCLE..... 13**

6.1 PERFORMANCE TEST CYCLES ..... 13

6.1.1 *Performance Test Cycle 1 – Scheduled 8/19/2002..... 13*

6.1.2 *Performance Test Cycle 2 – Scheduled 8/21/2002..... 13*

6.1.3 *Performance Test Cycle 3 – Scheduled 8/23/2002..... 14*

6.1.4 *Performance Test Cycle 4 – Scheduled 8/27/2002..... 14*

6.1.5 *Performance Test Cycle 5 – Scheduled 8/29/2002..... 15*

6.1.6 *Performance Test Cycle 6 – Scheduled 8/30/2002 (optional)..... 15*

**7 TECHNICAL INFRASTRUCTURE ..... 17**

7.1 LARS PERFORMANCE TEST ENVIRONMENT ..... 17

7.2 REQUIREMENTS ..... 17

7.3 LARS PRODUCTION ENVIRONMENT ..... 18



**8 PERFORMANCE MONITORING.....20**  
8.1 PERFORMANCE MONITORING TABLE.....20



## **1 Executive Summary**

### **1.1 Introduction**

The Federal Student Aid is identifying ways to reduce unit costs while delivering improved student financial aid capabilities to students, schools, and financial partners. In support of FSA's objective, the Financial Partners Channel has decided to improve its current Lender payment and reporting process, which today requires manual intervention that is both costly and labor intensive. This document describes the Performance Testing scope of Task Order 73, Lender Payment Process Redesign (Lender Redesign) project. This document outlines the LaRS Performance test objectives, roles and responsibilities, deliverables, the LaRS business processes, and performance test dates.

### **1.2 Background**

LaRS is being developed as part of the Financial Partners (FP) redesign efforts. The goal of the LaRS program is to develop a system that will streamline the business processes associated with exchanging financial information with Lenders and Servicers. This involves developing new business activities that integrate Lender and Servicer reporting with FMS. These business activities include: allowing Lenders and Servicers to electronically complete and submit their reports, developing digital approval and ad hoc query functionality, complying with current legislative mandates, providing timely notification of errors following submission, and integrating all activities with concurrent FSA enterprise-wide initiatives.

Before Lenders and Servicers can use LaRS to submit their quarterly reports, they must first apply to the program using the Web-enabled LAP system. Such a system increases program integrity and efficiencies while decreasing errors related to manual processes used previously. LAP provides an automated method for FSA FP to review and accept user data. Additionally, LAP is used as a way for current Lenders and Servicers to perform an online validation of their demographic data in preparation for their transition into the LaRS program.

### **1.3 Objectives**

The objectives of the performance test are to:

- Simulate production conditions in the performance testing environment, and then measure LaRS application performance.
- Support 476 concurrent users for at least an hour. The ITA team is conducting the Load Test on the LaRS application. The Load Test is defined as making sure that the application can support the required number of concurrent users. In this case the ITA team will load test the LaRS application with 476 concurrent users.



#### **1.4 Expected Results**

At the conclusion of each test cycle ~~a test result will be prepared with the results of the test cycle and confirmation that our objectives were met~~ the results of the test cycle should be compared to the expected results and a determination made as to whether or not the objectives were met. Each subsequent test cycle should get us closer to our overall goal of an optimized application and architecture performance.

#### **1.5 Assumptions**

476 user requirements came from the FMS team. FMS did the capacity planning for the LaRS application and came up with 476 users. According to the capacity planning done by FMS, 476 users are the upper limit for the LaRS application – in production LaRS will realistically experience about 300 users.

Teams/individuals specified in the roles and responsibilities matrix are in charge of monitoring the performance tests and documenting the results.

The ITA team collects the performance measurements from teams and creates the performance test report. This report will be distributed to the performance test teams. The report will outline defects that are captured by LoadRunner.

The performance test database is a clone of production. Relevant logs should be activated and running to simulate the production environment. The performance test environment is dedicated for the performance testing purposes only. There will not be other teams working on this instance of this environment.



## **2 Overview**

### **2.1 Overview**

This document provides the process and details the performance goals that will be used through the LaRS performance test effort.

Because of the new performance test environment, web infrastructure, and application, there is no “true” baseline history to set specific application performance goals. For the LaRS performance tests, there will be five performance test runs and one optional test run.

This document will be utilized to communicate test plans prior to each cycle execution with all key participants as outlined in Section 3.

Performance Test Runs will include:

- LaRS application
- LaRS application including FMS background noise
- LaRS application through FMS Phase IV including FMS background noise
- Load balance test

### **2.2 Overall Goal**

The Performance Test runs will be executed with the following goals in mind:

1. Run full set of scripts to performance test key functionality
2. Tune hardware/environment so both are at optimal performance at the conclusion of each test cycle.
  - eNetwork dispatcher is correctly balancing the load to the web servers
  - Review the performance of the Oracle connections and verify that the listener(s) can handle load.
3. Validate FMS background “noise” will not constrain LaRS application resources.
4. Support 476 concurrent users for at least an hour.



## **3 Performance Test Process**

### **3.1 Performance Test Process**

A process is required to achieve the overall goals, which include establishing a baseline for LaRS, and setting specific goals for tests. The items below explain the steps that will be taken through the performance test effort:

#### **3.1.1 Establish a list of performance test areas that will be monitored**

Performance test areas include a wide range of items such as user response times, throughput, and the various servers. These areas are established before the test so monitoring points can be derived, and teams have time to schedule the right people to monitor the tests. Specific monitoring points will be analyzed to identify issues such as bottlenecks and will also provide the necessary data for analysis and response times. Table 8.1 includes all the performance test areas that need to be monitored and the responsible party for each.

#### **3.1.2 Establish the data and parameters that need to be collected**

Data will need to be collected for analysis during and after each test cycle. Table 8.1 outlines the type of data that should be monitored and collected and the responsible party for each monitoring point. Section 4.2 outlines the data analysis deliverables that will be prepared at the conclusion of each test cycle.

#### **3.1.3 Planning for the first LaRS Performance Test (Baseline)**

The first LaRS performance test outlined in section 6.1.1 will become the baseline for set of tests that will be run. The goal of the first test is to take the necessary steps to ensure that a proper baseline is created, which will aid in setting more detailed goals for forthcoming tests. The current parameters/configuration settings on the hardware will be recorded before the first test is run. This will enable future tracking of the changes that will be made throughout the tests.

#### **3.1.4 LaRS test cycles monitored and data collected**

The ITA team will be running the pre-scheduled performance tests. The ITA team, CSC, LaRS, and the performance test team will be monitoring the test and collecting data. This data will be used to determine what modifications need to be made to the environment and application code.

#### **3.1.5 Fixes and Changes made to the environment and application code**

Based on the analysis and recommendations of the team, configuration changes may need to be made after each test run. These changes should provide higher performance results in the next test run.



### 3.1.6 Specific Goals set for the next LaRS test run

Specific goals for each test cycle are outlined in Section 6. After data has been collected, and the required fixes made, there will be the opportunity to modify specific goals for the next test run.



## 4 Roles, Responsibilities, and Deliverables

This section outlines the roles and responsibilities of all parties involved in the LaRS performance testing.

### 4.1 Performance Test Roles and Responsibilities

<b>Role</b>	<b>Assigned</b>	<b>Phone</b>	<b>Responsibility</b>
Application Performance Test Lead	Todd Collins Mike Tran (LaRS) Cara Jonas (FMS Phase IV)	202 962-0715 202-972-0373 202-972-0715	<p>Coordinate with all teams and resources to ensure that the capacity planning, performance test planning and performance test execution are completed on time.</p> <p>Work with the ITA team to define the detailed goals for each test cycle/test types.</p> <p>Analyze the application functionality to plan the right mix of tests (business processes).</p> <p>Define the expected concurrent users per server at optimized configuration.</p> <p>Work with ITA to plan the length of each run and starting/stopping points.</p> <p>Work with ITA team and IBM SME to assess scalability.</p> <p>Provide the Functional Test Scripts (Excel Format).</p> <p>Document Executive Summary of test cycle results.</p> <p>Set up a conference call for each test.</p>
ITA Performance Test Lead	Roshani Bhatt	202 962-0740	<p>Lead the LoadRunner test effort</p> <p>Verify all test scripts and perform calibration test.</p> <p>Work with CSC during Performance Test to measure the performance of each component (CPU, Mem, IO, Network).</p> <p>Analyze the application functionality to plan the right mix of tests (business processes).</p> <p>Provide each test cycle result.</p> <p>Run and Monitor test cycle.</p>
eNetwork Dispatcher Administrator	Roshani Bhatt / Bob Wehrle	202 962-0740 202 962-0760	<p>Load Balancer configuration changes and updates.</p> <p>Monitor key areas and deliver summary results.</p>



System Administrator	Dave Murdy	203 317-4818	Monitor hardware to ensure optimal configuration. Monitor CPU, Mem, IO, capacity levels. Record hardware capacity levels at different intervals throughout the test cycle.
Oracle Administrator	Rich Ryan	860 701-1209	Monitor Oracle Database to ensure the optimal configuration. Monitor the Oracle Database performance throughout the test cycle. Make recommendations on ways to improve Oracle performance.
Network Administrator	Dave Hugh	203 317-5006	Monitor Network to ensure optimal configuration. Monitor capacity levels at different intervals throughout the test cycle.
LaRS Developers	Anand Iyer/Brad Byron	202 962-0714	Investigate potential performance issues in the LaRS Portlet source code
Windows Administrator	Craig Gates	203 317-5174	Monitor and troubleshoot the load generator boxes during performance test

## 4.2 Deliverables

The following deliverables will be submitted to the FMS/LaRS team within the dates specified [for the scheduled performance test cycles, in section 6.1](#). Table 8.1 provides a guide as to the data that needs to be captured and presented to the team at the conclusion of each test cycle. Teams that provide the data should provide some analysis or “translation” of the data (as opposed to just raw data.)

### 4.2.1 LoadRunner Test Cycle Results

The ITA team will deliver a document that will summarize the test, problematic areas, and recommendations within two days after the performance test cycle.

### 4.2.2 Final Recommendation

The ITA team will deliver final deliverable with an analysis of each test cycle, a summary of the results, and a general recommendation on the performance of the FSA LaRS within five business days after the last performance test cycle.

### 4.2.3 Performance Test Summary Analysis

At the conclusion of the performance tests, CSC will provide a document containing general comments and summary of capacity issues within 2 days after the performance test cycle.



## 5 LaRS Business Processes

These are the business processes that we will be targeting in our performance testing. These business processes will drive the creation of our scripts for the performance testing cycles.

### 5.1 Business Processes

#### LaRS

1. Internal Reports – Internal report generation process.
2. LaRS Online Submission – Manually enter invoice data (ITA)
3. LaRS Profile Submission – Manually enter and update profile data (ITA)
4. File Transfer Process – Extract invoice data from FTP directory and load into LaRS schema (Mike Tran)

The Internal Reports business process was previously optional but is now required. This has extended the scope of the LaRS performance test.

#### FMS Phase IV

1. Summary Table Extract Batch – Launch batch that extracts data from LaRS summary table and populates FMS AR and AP (Mike Tran)
2. Accounts Receivable – Post receivable transitions (Mike Tran)
3. Accounts Payable - Post payable transitions (Mike Tran)
4. Notification Batch – Launch batch that generates lender payable and receivable notifications (Steve Kuhl)

### 5.2 Business Processes Table

The following table outlines the architecture components that make up LaRS. These components are web, application, and Database servers, and the Autonomy Search Engine. Each business process test scripts will test the outlined architecture components.

	Form Server	App Server	Oracle
<b>LaRS</b>			
Internal Reports	X	X	X
LaRS Online Submission	X	X	X
LaRS Profile Submission	X	X	X
File Transfer Process		X	
<b>FMS Phase IV</b>			
Summary Table Extract Batch		X	
Accounts Receivable	X	X	
Accounts Payable	X	X	X
Notification Batch		X	



## **6 Detailed Goals per Cycle**

This section will include goals for each test cycle. Initially the last two of the six test cycles were optional but now only the last test cycle is optional because of the scope increase and the performance test schedule change. This schedule is not static and may change depending on the daily testing status.

### **6.1 Performance Test Cycles**

#### **6.1.1 Performance Test Cycle 1 – Scheduled 8/19/2002**

Time: 9am-12pm

Goal(s): Run LaRS Online Submission and LaRS profile with 238 users while File Transfer is running in the background.

Entry Criteria:

Run LaRS Online Submission with minimum of 238 users

Run LaRS Profile with minimum of 238 users

File Transfer (Mike Tran will kick this off)

Exit Criteria:

Successfully ran 238 users for LaRS Online Submission for one hour

Successfully ran 238 users for LaRS Profile for one hour

Successfully executed File Transfer

#### **6.1.2 Performance Test Cycle 2 – Scheduled 8/21/2002**

Time: 9am-12pm

Goal(s): Run LaRS Online Submission and LaRS profile with 238 users while File Transfer and Batch are running in the background.

Entry Criteria:

Run LaRS Online Submission with minimum of 238 users

Run LaRS Profile with minimum of 238 users



File Transfer and Batch (background noise simulating the production environment) (Mike Tran and Steve Kuhl will kick these off)

Exit Criteria:

Successfully ran 238 users for LaRS Online Submission for one hour

Successfully ran 238 users for LaRS Profile for one hour

Successfully executed File Transfer and Batch

### 6.1.3 Performance Test Cycle 3 – Scheduled 8/23/2002

Time: 9am-12pm

Goal(s): Run LaRS Online Submission and LaRS profile with 238 users while File Transfer, Batch and ARAP are running in the background.

Entry Criteria:

Run LaRS Online Submission, LaRS Profile, and LaRS Internal Reports with minimum of 238 users

File Transfer, Batch, ARAP (Generated by FMS and LaRS team)

Exit Criteria:

Successfully ran 238 users for Online Submission, Profile and Internal Reports for one hour

Successfully executed File Transfer, Batch, and ARAP

### 6.1.4 Performance Test Cycle 4 – Scheduled 8/27/2002

Time: 9am-12pm

Goal(s): Run LaRS Online Submission and LaRS profile with 476 users using eNetwork Dispatcher while File Transfer, Batch, and ARAP are running in the background.

Entry Criteria:

Run LaRS Online Submission, LaRS Profile, and LaRS Internal Reports with 476 users



File Transfer, Batch, ARAP (Generated by FMS and LaRS team)

Load Balancing Test

Exit Criteria:

Successfully ran 476 users for Online Submission, Profile and Internal Reports for one hour under load balancing

Successfully executed File Transfer, Batch, and ARAP

#### 6.1.5 Performance Test Cycle 5 – Scheduled 8/29/2002

Time: 9am-12pm

Goal(s): Confirm that the LaRS Online Submission and LaRS profile can support 476 users using eNetwork Dispatcher while File Transfer, Batch, and ARAP are running in the background.

Entry Criteria:

Run LaRS Online Submission, LaRS Profile, and LaRS Internal Reports with 476 users

File Transfer, Batch, ARAP (Generated by FMS and LaRS team)

Load Balancing Test

Exit Criteria:

Successfully ran 476 users for Online Submission, Profile and Internal Reports for one hour under load balancing

Successfully executed File Transfer, Batch, and ARAP

#### 6.1.6 Performance Test Cycle 6 – Scheduled 8/30/2002 (optional)

Time: 9am-12pm

Goal(s): If the goal outlined in section 6.1.5. is not met then this test should be run. Confirm that the LaRS Online Submission and LaRS profile can support 476 users using eNetwork Dispatcher while File Transfer, Batch, and ARAP are running in the background.



Entry Criteria:

Run LaRS Online Submission, LaRS Profile, and LaRS Internal Reports with 476 users

File Transfer, Batch, ARAP (Generated by FMS and LaRS team)

Load Balancing Test

Exit Criteria:

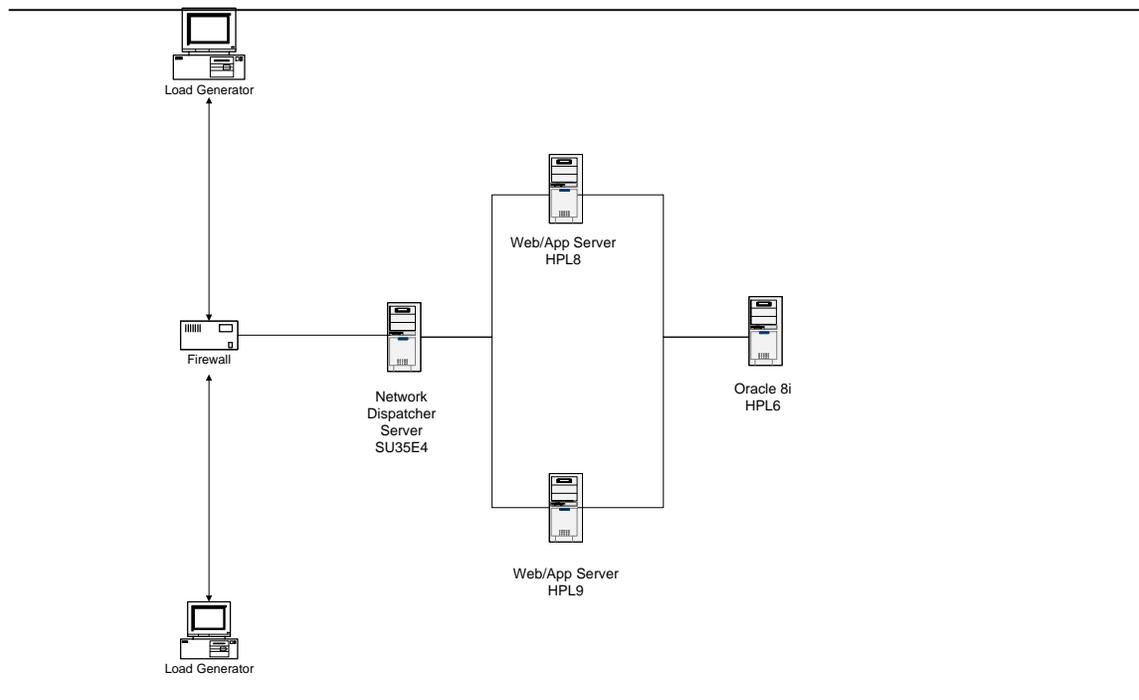
Successfully ran 476 users for Online Submission, Profile and Internal Reports for one hour under load balancing

Successfully executed File Transfer, Batch, and ARAP

## 7 Technical Infrastructure

### 7.1 LaRS Performance Test Environment

LaRS Performance Environment

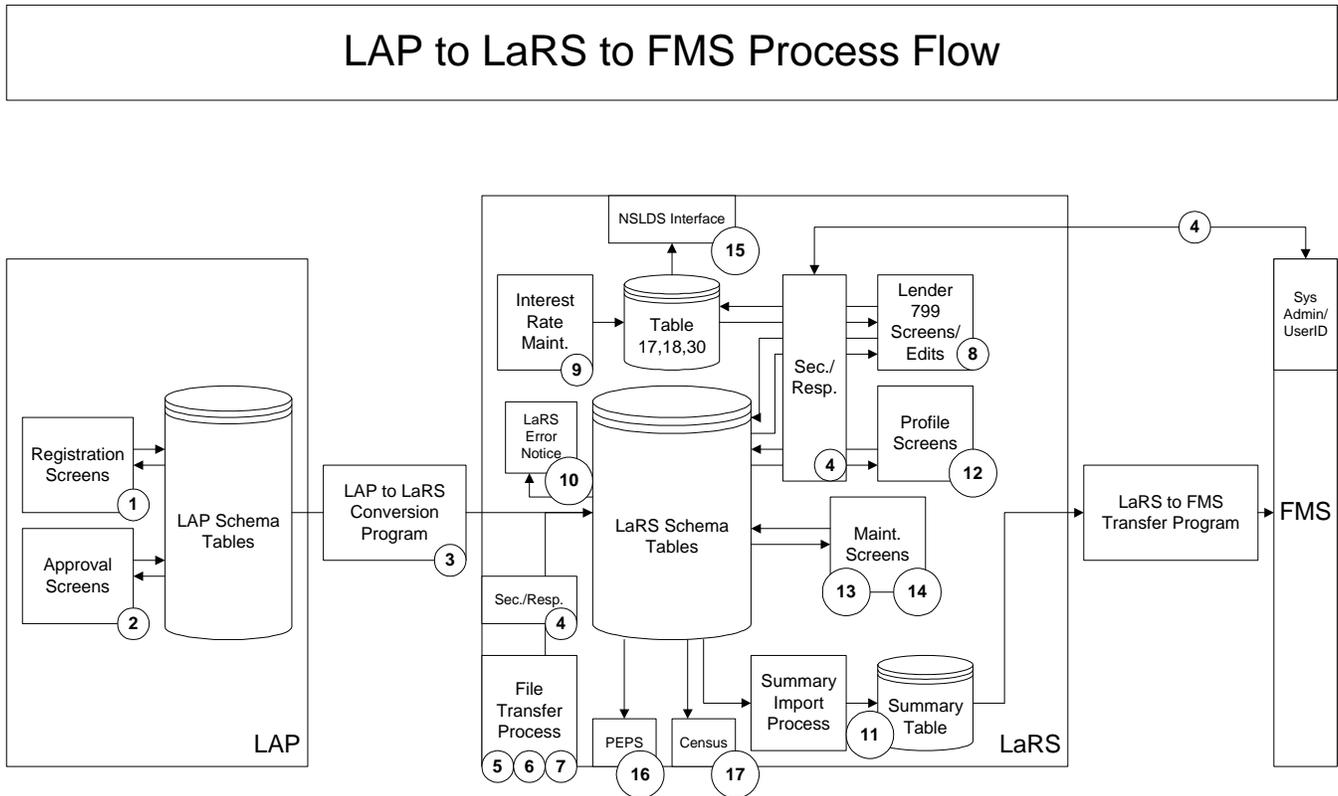


### 7.2 Requirements

- The LaRS Performance test environment should be delivered to the ITA team by August 12<sup>th</sup>. This environment mirrors as closely as possible the proposed production environment. All the data should be populated in the environment. Functional scripts and the data file should be provided to the ITA team by August 12<sup>th</sup>. Slippage on this date will impact the LaRS performance test schedule.
- The ITA team will configure the Network dispatcher in the performance test environment. Network Dispatcher will be used as a load balancer.
- Oracle Test Server should be configured to handle peak session usage.

### 7.3 LaRS Production Environment

#### LaRS Production Environment Diagram



#### LEGEND

1. LAP Registration Screens
2. LAP Approval Screens
3. LAP/LaRS Conversion Program
4. Security/Responsibility Form and Procedure
5. File Transfer Process – UNIX Script
6. File Transfer Process – Level 1 Validation
7. File Transfer Process – Level 2 Validation
8. LaRS Report, 799 Screens/Edits



9. Interest Rate Maintenance Screens
10. LaRS Error Notice
11. Summary Table Import Process
12. Profile Screens
13. Maintenance – Supplier LOV's
14. Maintenance – Supplier Hold/Deactivation
15. Interface – NSLDS
16. Interface – PEPS
17. Interface – Bureau of Census



## 8 Performance Monitoring

Performance monitoring detailed information

### 8.1 Performance Monitoring Table

The table lists each performance area, it's associated performance monitoring points, a general description of the performance area, and the group responsible for monitoring the area. This document will be supplied to those monitoring the test. This should ensure that all required areas will be monitored.

Performance Areas	Performance Monitoring Point	Description	Monitored By:
<b>Database connection pools</b>	<ul style="list-style-type: none"> <li>Average size of the connection pool (number of connections),</li> <li>Average number of threads waiting for a connection</li> <li>Average wait time in milliseconds for a connection to be granted</li> <li>Average time the connection was in use</li> </ul>	Application server - Reports usage information about connection pools for a database.	FMS
<b>Network Dispatcher</b>	<ul style="list-style-type: none"> <li>Completed number of connections per web server</li> <li>Number of connection errors per web server</li> <li>Active number of connections to the web servers</li> </ul>	eNetwork Dispatcher is an IBM load-balancing tool. It balances http requests between web servers.	ITA
<b>CPU utilization</b>	<ul style="list-style-type: none"> <li>Network Dispatcher Server (SU35E4)</li> <li>2 web server</li> <li>2 application server</li> <li>Database server (HPL6)</li> </ul>	Depicts the utilization of the CPU. High CPU utilization can be an indicator of a CPU bottleneck. CPU bottlenecks may occur when Global CPU utilization exceeds 75%. However, some workloads can operate with very high CPU utilization with the CPU becoming a bottleneck.	CSC/LaRS



<b>Memory utilization</b>	<ul style="list-style-type: none"> <li>• Network Dispatcher Server (SU35E4)</li> <li>• 2 web server</li> <li>• 2 application server</li> <li>• Database server (HPV1)</li> </ul>	<p>Indicates the utilization of memory. If memory utilization is below 95%, it is not a bottleneck. Memory can reach 100% utilization without necessarily being a bottleneck. The combination of high memory utilization and Virtual Memory reads &amp; writes indicates that memory is a bottleneck.</p>	CSC/Anand Iyer/Brad Byron
<b>Disk I/O</b>	<ul style="list-style-type: none"> <li>• Network Dispatcher Server (SU35E4)</li> <li>• 2 web server</li> <li>• 2 application server</li> <li>• Database server (HPV1)</li> </ul>	<p>Illustrates the percentage of time that a disk I/O is pending on a disk device. High disk utilization can be an indicator of a disk bottleneck. Disk utilization greater than 50% may indicate a disk bottleneck. The service times, not charted, will determine if the I/O subsystem is performing poorly.</p>	CSC/LaRS
<b>Network Utilization</b>	<ul style="list-style-type: none"> <li>• Connections from firewall to eNetwork Dispatcher</li> <li>• Network Dispatcher to Web Servers</li> <li>• Web servers to Application servers</li> <li>• App Servers to Oracle database servers</li> </ul>	<p>The bandwidth required to support an application. It can refer to the application traffic in and out of a data center, or between servers.</p>	CSC/LaRS
<b>Throughput</b>	<ul style="list-style-type: none"> <li>• Bytes per second</li> </ul>	<p>Volume processed in a specified period by the system or system component</p>	ITA/CSC
<b>Hits Per Second</b>	<ul style="list-style-type: none"> <li>• Hits per second</li> </ul>	<p>The number of hits per second on the application.</p>	ITA
<b>User Response Times</b>	<ul style="list-style-type: none"> <li>• Average, minimum, and maximum times</li> </ul>	<p>Elapsed time between two events measured at specific points</p>	ITA
<b>Database Optimization</b>	<ul style="list-style-type: none"> <li>• Database performance</li> <li>• Tables and Indexes</li> <li>• Database calls</li> </ul>	<p>The database performance should be monitored. Oracle database should be optimized.</p>	CSC/LaRS