

## Kaleidoscope Case Study

### 1. Software Design (Derived from Customer Requirements)

#### 1.1. System Overview

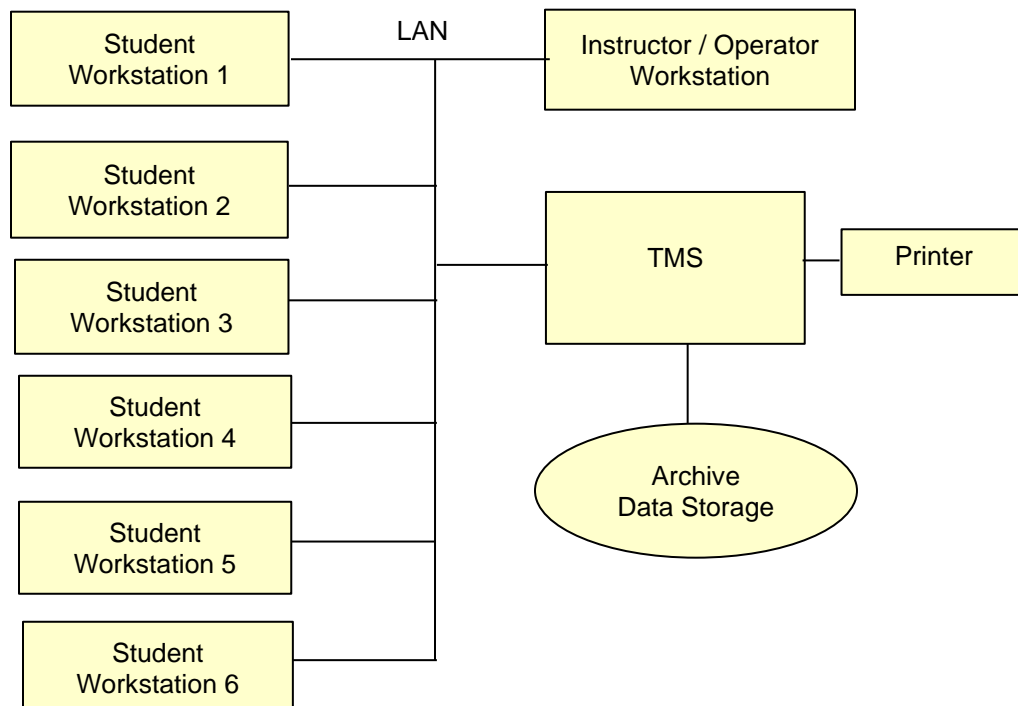
The Kaleidoscope Training System (KTS) can support simultaneous training of six students. Each student occupies a student workstation (Windows) and progresses through computer based training (CBT) material. The training course consists of five units, each requiring six to eight hours of student interaction with the workstation. Each group of six students (a class) is enrolled on Monday morning and graduates on Friday afternoon.

The system is administered by an instructor/operator who uses a dedicated workstation. The course is totally automated, therefore the instructor/operator is not required to provide guidance to the students but does assist when exceptions occur. After logging onto the system, student registration, presentation of each unit, test presentation, test grading, and remedial course presentation, and retest (if necessary) occur automatically.

The six student workstations and instructor/operator workstation are connected via local area network to a Training Management System (TMS) which is hosted on a Sun Workstation. The TMS is used to collect and archive student information (registration, test results, and time required to complete each unit). Software developed to run on the TMS produces reports and performs statistical analysis of student performance and results. Students must not have access to TMS hosted functionality or other student data.

The system is unclassified. Each build is to be developed at the contractor's facility, deinstalled, shipped, and re-installed at the operational site. The contractor has set aside \$100,000.00 of capital funds for the computer aided software development environment (CASE tools.)

#### 1.2. Hardware Architecture



### 1.3. Software Architecture

1.3.1. Programming Language: All applications software is written in the C++ programming language.

1.3.2. COTS Software Packages: The following COTS software packages are to be used:

Sun	PC
Unix	Windows XP
Sybase DBMS	Communications
Communications	
Print Driver	
Disk Controller	

1.3.3. Custom Developed Software (estimated executable lines of code)

Sun		PC	
Function	LOCs	Function	LOCs
Archive Management	4500	Unit 1 CBT	2000
Report Processing	6500	Unit 2 CBT	1500
Communications Management	1000	Unit 3 CBT	2200
Student Support	1800	Unit 4 CBT	1800
Inst/Operator Support	1200	Unit 5 CBT	1500
Statistical Analysis	3000	Registration	1000
System Startup / Shutdown	1000	System Startup / Shutdown	500
Error Handling	1000	Error Handling	500
		Communications Management	1000
Total:	20000	Total:	12000

## 2. Statement of Work

The contractor in support of development and delivery of the Kaleidoscope Training System shall provide the following products, work tasks, and services. This Statement of Work (SOW) is organized to define five major Work Breakdown Structure (WBS) elements:

- 2.1 Project Management
- 2.2 System Engineering
- 2.3 Software Engineering
- 2.4 Quality Assurance
- 2.5 Configuration Management

### 2.1. Project Management (Budget 10% of Software Engineering)

- 2.1.1. The contractor shall establish a project management office and identify a project manager responsible for all aspects (technical, cost, and schedule) of the Kaleidoscope Training System (KTS) development and installation effort.
- 2.1.2. The Project Manager shall produce and deliver a monthly Project Status report which summarizes cost, schedule, and technical issues.
- 2.1.3. The Project Manager shall conduct quarterly management reviews which address cost, schedule, risk issues, software management indicators, and very high level technical issues.
- 2.1.4. The quarterly review agenda shall be published one week before each review and minutes shall be published within two weeks of the conduct of each review.
- 2.1.5. The Project Manager shall conduct joint technical reviews following significant milestones throughout the project but not less than one every six months.
- 2.1.6. The joint technical review agenda shall be published one week before each review and minutes shall be published within two weeks of the conduct of each review.
- 2.1.7. The contractor shall provide office space and electronic access to all engineering products throughout development effort for use by the acquisition organization.

### 2.2. System Engineering (Budget 10% of Software Engineering)

- 2.2.1. System engineering shall be responsible for System Qualification Testing of each completed build at the contractor's facility. In addition, following the completion of the 3rd build, System Qualification Testing shall be conducted at the operational site.
- 2.2.2. System engineering shall be responsible for delivery of the KTS and installation at the operational site.
- 2.2.3. System engineering shall assess performance of the hardware and software system to ensure that computer components support performance requirements.
- 2.2.4. System engineering shall produce and deliver the following documents:
  - System Qualification Test Plan
  - System Qualification Test Procedures
  - System Qualification Test Reports (pre-installation and post-installation)
  - Installation Plan
  - Performance Analysis report

### 2.3. Software Engineering

- 2.3.1. The software engineering organization shall support the program manager in preparation for and conduct of quarterly management reviews and joint technical reviews (refer to SOW paragraphs 2.1.3 through 2.1.5).
- 2.3.2. The software engineering organization shall support the system engineering organization during the system requirements analysis and system design phases.
- 2.3.3. Software development shall be conducted using an evolutionary development model consisting of three incremental deliveries as follows:

Build	Student Console Functionality	Training Management System Functionality
0	<ul style="list-style-type: none"><li>• Unit 1 CBT</li><li>• Communications Management</li><li>• Registration</li><li>• System Startup / Shutdown</li></ul>	<ul style="list-style-type: none"><li>• Archive Management</li><li>• Communications Management</li><li>• System Startup / Shutdown</li></ul>
1	<ul style="list-style-type: none"><li>• Unit 2 CBT</li><li>• Unit 3 CBT</li></ul>	<ul style="list-style-type: none"><li>• Student Support</li><li>• Report processing</li><li>• Inst/Operator support</li></ul>
2	<ul style="list-style-type: none"><li>• Unit 4 CBT</li><li>• Unit 5 CBT</li><li>• Error Handling</li></ul>	<ul style="list-style-type: none"><li>• Statistical Analysis</li><li>• Error Handling</li></ul>

- 2.3.4. All software development shall utilize the C++ programming language. Object oriented analysis and design shall be the method used for requirements analysis and software design.
- 2.3.5. As a by-product of the software engineering process, the Software Engineering organization shall produce and deliver the following documents for build 0:
- Software Development Plan
  - Software Requirements Specification
  - Interface Requirements Specification
  - Software Design Document
  - Interface Design Document
  - Software Product Specification
  - CSCI Qualification Test Plan
  - CSCI Qualification Test Description
  - CSCI Qualification Test Report
  - Student User Manual
  - Instructor User Manual

The Software Development Plan shall be compliant with to ISO 12207 tailored as specified in this paragraph and elsewhere in this SOW. The contractor is not responsible for preparing for software transition and related parts of the SDP shall be tailored out. Software product evaluations and software quality assurance shall be the responsibility of the quality assurance organization and both topics shall be addressed within the software quality assurance paragraph of the SDP. The contractor is not required to develop a separate quality assurance plan.

- 2.3.6. The software engineering organization shall produce a Version Description Document (VDD) for each build.

- 2.3.7. The software engineering organization shall enhance appropriate Build 0 documentation (rather than originate new documents) for subsequent builds, thereby minimizing the total documentation set.

#### 2.4. Quality Assurance (Budget 5% of Software Engineering)

- 2.4.1. An independent Quality Assurance authority shall review documentation and other software products (software product evaluation) to ensure that a sound, comprehensive software development program is implemented.
- 2.4.2. The QA authority shall review processes and activities throughout the development of KTS to ensure compliance with plans and objectives (software quality assurance.)
- 2.4.3. The QA authority shall implement continuous process improvement initiatives within the budget constraints of the quality program. Capability Maturity Model Integration® (CMMI®) level 3 objectives shall be emphasized.

#### 2.5. Configuration Management (Budget 5% of Software Engineering)

- 2.5.1. Configuration management shall be employed to control the product baseline for all builds.
- 2.5.2. The CM organization shall establish and maintain a corrective action reporting system to track Problem/change reports from identification to closure. This system shall utilize Sybase to record and track items and generate appropriate reports.
- 2.5.3. The CM organization shall maintain a description of the configuration of each build including COTS software products and shall be able to recreate any build if required.