

Chapter 3 System Architecture and Requirements

The purpose of this chapter is to fully document the VES System Requirements for VES software components. This documentation will support development of some VES components, and identification, licensing, and integration of other components. This System Requirements documentation effort is important and necessary for two reasons:

- a) to assure that the VES systems which are required and specified in this chapter fully satisfy the enterprise requirements
- b) to enable prospective VES component suppliers to understand the VES architecture and its technology and system requirements

Contents: To these ends, this chapter is divided into the following seven major sections:

VES System Architecture - describes the unifying principles which distinguish VES and identifies the relationships between the VES Workspace, VES applications, third-party tools, other DOE applications, and enterprise databases. VES requires an open, standards based architecture characterized by a high level of integration.

VES System Description - identifies the components of VES to be built, developed, licensed and procured, explains the roles played by VES system users, and the objects with which they interact.

VES Workspace Requirements - outline the Workspace Requirements and provides a mapping of Enterprise Processes and Tasks to the VES Workspace and the User Interface.

VES System Requirements - contain the detailed requirements for all VES system components, which describe the functionality they provide to users and the interactions they have with other VES Components.

VES Database Requirements - contains the technical requirements for VES databases and a description of the VES Enterprise Data Model.

VES Hosting Environment Requirements - contain the functional and technical requirements for the hosting environment needed to deliver VES services to users.

VES E-Commerce Concession Requirements - contain the functional and technical requirements for the E-Commerce hosting, concession, and affinity program opportunities in VES.

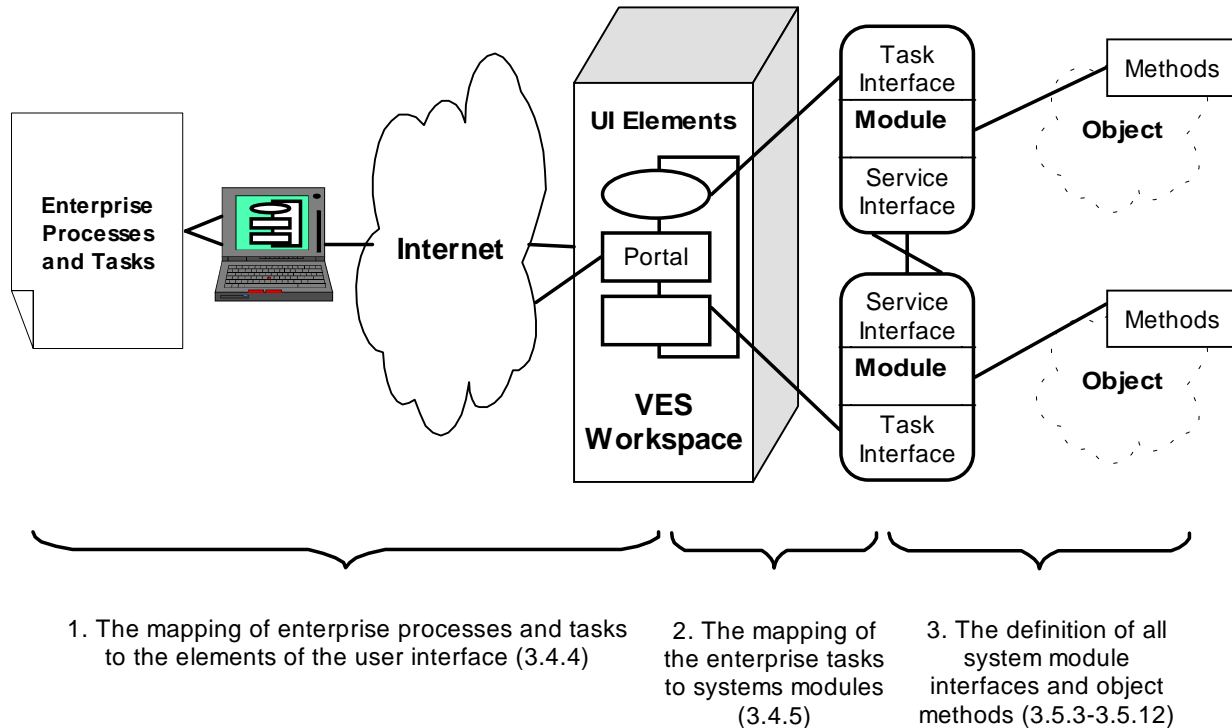
3.1 Overview and System Requirements Documentation Methodology



Roadmap to System Requirements: Vendors will want to read this chapter to understand the system requirements which have been documented from several points of view and at several levels of abstraction. The requirements documented in this chapter are complete and consistent, and are correlated to the enterprise requirements in Chapter 2. There is ample space for creative design and implementation by vendors, because of the requirements model used.

Whenever you see the Key symbol in this document, you will be at an important section of the requirements model.

Figure 3-1: VES Requirements Documentation Model



In the Requirements Documentation Model there are five key parts, which make up the system requirements:

- The mapping of enterprise processes and tasks, from Chapter 2, to the elements of the VES user interface (3.4.4)
- The mapping of the enterprise tasks to VES systems modules (3.4.5)
- The definition of all VES system module interfaces and object methods (3.5.3-3.5.12)
- The definition of entities and relationships in the enterprise data model (Appendix)
- The documentation of the data element dictionary which provides the greatest level and insight regarding the details of objects, interfaces, and Workspace elements (3.6.5)

Readers should follow these steps as a roadmap to understanding the Systems requirements:

Readers should begin by reading **Chapter 2 - Enterprise Description and Requirements**. The enterprise functions, processes, and tasks described there, are the reason for the VES Workspace interface and the other system requirements described in this chapter.

Read the **VES System Architecture 3.2**, to get a high level picture of VES and these requirements.

Read **VES System Description 3.3**, to understand the components of VES and their relationship to one another. This section will also introduce the idea of VES objects and their relationship to the VES architecture. Finally, this section will describe the user and organizational issues, discuss user roles, and access to objects.

Read **VES Workspace Requirements 3.4**, to understand the object oriented ideas of the Individual Workspace. The Workspace Elements are described and the User Interface requirements are spelled out. The most important part of this section is the mapping of Enterprise Functions and Processes to Icons, and the further mapping of Enterprise Tasks to VES System Modules and Methods. This mapping is the place that each of the enterprise requirements is satisfied by one or more systems modules.

Read **VES System Requirements 3.5**, to get the other matching pieces of the requirements puzzle. In this section, each of the VES subsystems and modules is described. For each module there is a mapping of the Objects, which interface with that module. This mapping is the place that each of the requirements for module interfaces and object methods is defined in detail.

Now, loop back to the **VES Common Application Service Element (CASE) Requirements 3.3.3**, for a cross subsystem view of a set of requirements common to all VES modules.

Study the **Enterprise Data Model** (Appendix) to explore the entity relationships in this model and to relate it to the VES objects.

For the finest level of detail, read the **VES Data Element Dictionary (3.6.5)**. It relates to the Data Model and to the module interfaces and object methods.

When you are getting a sense of these requirements, begin reading **Chapter 4 - Standards, Interfaces and Hardware Requirements**. It will provide information on the relevant and applicable standards, which must be supported by VES software and third party products. It will also provide an overview of the VES Integration Architecture (VESIA) Requirements. Finally, this chapter provides specifications for hardware required under this RFR and a set of assumptions which responders can use in their proposals.

3.2 VES System Architecture

This Section is included to introduce readers to the concepts and scope of the VES System Architecture. It provides information on the following topics:

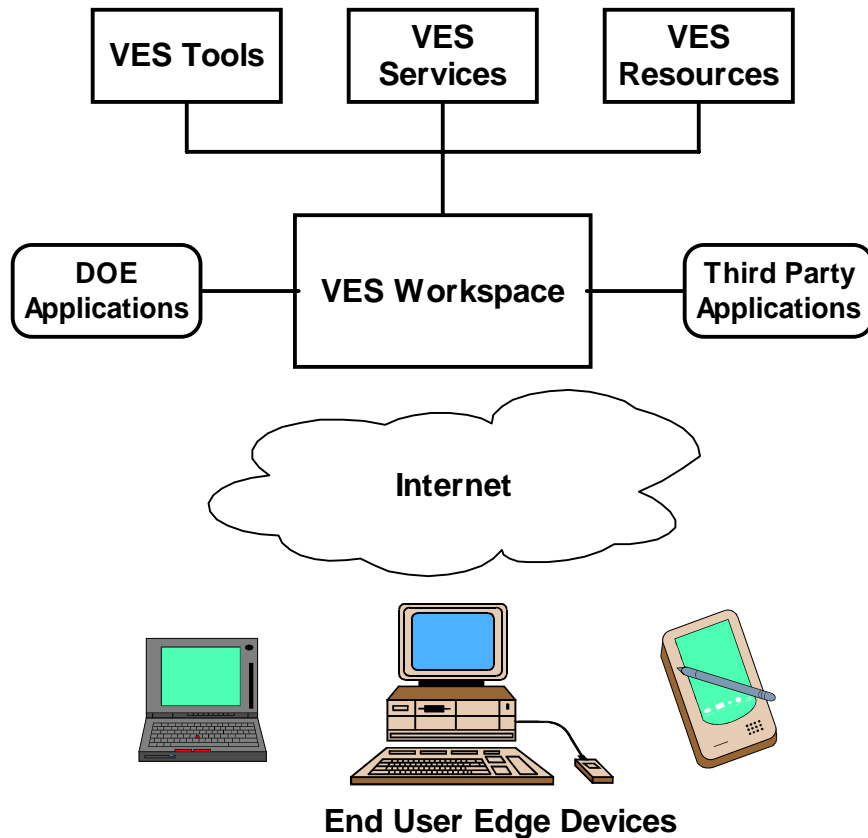
- VES System Architecture Overview
- Goals of the VES Architecture
- VES Workspace Concepts
- VES Integration Architecture - Rationale
- Relationship of VES to other DOE applications

Concepts contained in this Section are very important for an understanding of the VES System Requirements.

3.2.1 VES System Architecture Overview

Virtual Education Space (VES) is the Commonwealth's public set of on-line tools and implementation strategies customized for each educator, student, and parent to enable them to successfully use standards-based curriculum to increase student achievement.

Figure 3-2: VES System Architecture Model



The "on-line tools" in the VES definition will be a powerful set of customized, highly integrated, tools, services, and resources. Working together, these on-line VES tools will provide a virtual, web-based personal computer workspace, which will be available free to every teacher, administrator, and student in Massachusetts, 24 hours a day, 365 days a year. The VES Workspace is a way to bring a set of powerful educational tools to teachers and students in their classrooms, at the library, the community computer center, and at home.

The **tools** are the set of applications to be developed, licensed and integrated into VES. These include the Curriculum, Assessment, and Instructional applications, which will be developed. The tools may also include vendor licensed research, reference, resource, and desktop productivity products which will be integrated into the system.

The **services** are the set of applications, which provide users with important common support functions from anywhere within the VES environment. Examples of services include workspace services, communications and collaboration services, instructional delivery services, and technology support services specified in the various subsystems. The Common Application Service Elements (CASE), described in Section 3.3.3, are a collection of services.

The **resources** are the knowledge content, curriculum resources, instructional resources, and assessment resources shared, published, and accessed through the system.

In the VES procurement activity, we are seeking vendor proposals of the best available hardware and software components, which will enable us to deploy:

- personalized and customized VES user Workspaces
- a set of application modules and the interfaces between them
- interfaces to third-party and other DOE applications
- databases and repositories
- edge device hardware for schools and users
- and the VES hosting environment which serves the tools, services, and resources to users.

Because VES is all of these things, **AND** the relationships between them, it can properly be described as an **architecture**.

There are two other important reasons to view the VES requirements in the context of an architecture:

- First, VES is intended to be a standards based environment, incorporating, and adding value to, industry accepted standards, and
- Second, VES is designed to be an open, rather than a closed, system. Once implemented, it will be incrementally expanded by integration of new applications and tools and refinements to the workspace environment.

All of the VES System Requirements should be read, and interpreted, in the context of an open, standards based architecture.

3.2.2 Goals of the VES Architecture

The primary goal of VES is to give users a powerful set of customized, highly integrated, on-line tools, services, and resources, which will enable them to successfully implement standards-based curriculum in classrooms and schools, in order to increase student achievement. This is a daunting challenge!

The VES architecture is intended to make possible a universally available Workspace on the web, with its own storage space, tools, and resources. The VES architecture accomplishes this by employing a common set of principles for integration, usability, customization, personalization, openness, performance, scalability, collaboration, ease of implementation, and conformance with recognized standards.

The VES architecture adopts the Reference Model in the IEEE 1484.1 LTSC Architecture and Reference Model working documents. Vendors interested in understanding the architectural underpinnings of VES should become familiar with that document.

3.2.3 VES Workspace Concepts

VES is intended to provide users with a powerful set of customized on-line tools, services, and resources, together with all the things they need to use them. Efficient delivery of these things requires a virtual Workspace with eight coordinated capabilities:

- Authentication services to authenticate users and customize their Workspace for their roles
- Object oriented user interfaces which are transparent across platforms and are able to be personalized for each user
- Portals to the VES online tools, services, and resources
- Portals to online tools, services, and resources outside VES
- Portals to a secure, private, online space for each user to create and store their work
- Portals to public space for the publication of individual and group work
- Workspace support for heterogeneous computers, operating systems, and edge hardware devices
- Synchronization services for edge hardware devices

This set of **user interface** and **portal** capabilities, taken together, represents what we call the VES **Workspace**. The VES Workspace is designed to **simplify** the use of online tools, services, and resources for VES users by providing a unified interface, and by eliminating some of the following common online problems:

- Rather than a "one-size-fits-all" user interface, it presents an interface customized by user role, able to be individually personalized, and able to be localized by districts..
- Rather than a multiplicity of user interfaces to learn and use, it presents a single consistent user interface.
- Rather than require multiple logins, passwords, and authentication procedures, it provides a single login and authorization procedure.
- Rather than expose users to advertising pitches, inconsistent privacy policies, and varying types and levels of security, it provides a single private, secure, advertising-free environment.

The requirements for the VES Workspace are defined in Section 3.4.

3.2.4 VES Integration Architecture - Rationale

The key to understanding the VES Architecture is its integration:

- **Integration** of multiple applications and user interfaces into a single personalized user Workspace for teachers and students.
- **Integration** of educational, administrative, and support subsystems in a way that they add value to each other.
- **Integration** of the Workspace with a rich set of communications and collaboration tools that will enable students and teachers to use the Internet to work together in new ways.
- **Integration** of security and privacy systems with all aspects of VES to provide a safe and secure environment for teaching and learning.
- **Integration** of the suite of existing and planned DOE information applications with the VES applications.

The purposes of the VES Integration Architecture (VESIA) are:

- to enable seamless interoperability between VES components
- to enable the VES Workspace to complete user authentication for VES users

- with the Directory Administration Application
- to enable the VES Workspace to pass authentication tokens to other DOE applications
- to provide ways for third-party applications to integrate with VES at four levels of VESIA interoperability.
- to encapsulate VES functionality and give diverse and distributed functions a consistent user interface.

In order to provide the maximum in functionality, as well as integration, the VESIA will support four levels of application integration.

Level 0 Integration - Linked Integration

The most basic level of integration in VES is enabled by providing simple HTTP links from a user's Workspace to third party, or DOE, web sites. It requires no changes to the web application and no modifications to VES. It also provides none of the benefits of higher levels of integration.

Level 1 Integration - Access Integration

This level of integration is enabled by a third party vendor, or DOE, adoption of VESIA authentication protocols and role customization services. It requires creation of a separate VESIA interface to vendor web applications and must be supported in the VES Workspace Services module. Access Integration provides some, but not all of the benefits of the VESIA.

Level 2 Integration - Functional Integration

This preferred level of integration is enabled by full adoption by third party vendors, or DOE, of the VESIA, including authentication protocols, role customization services, service ports, and virtual cookies. It requires modifications to vendor or DOE applications to open service ports, and it must be supported in the VES Workspace Services module. Functional Integration provides the greatest benefits of seamless interoperability and personalization across application boundaries.

Level 3 Integration - Workspace Integration

The highest level of VESIA integration is reserved for future implementations where distributed object oriented software actually uses the object architecture of the VES workspace as the building blocks of new applications. Workspace Integration provides all the ultimate value of an object oriented architecture.

3.2.5 Relationship of VES to other DOE Applications

3.2.5.1 Overview and Objective

VES is intended to be the single consistent user interface to all on-line DOE applications.

Existing DOE on-line applications will initially be integrated with VESIA Linking Level (0) integration. Future DOE Applications, and DOE Applications currently in development, will be integrated with VESIA Access Level (1) or Functional Level (2) integration.

Table 3-3: Summary of DOE Application Interfaces

DOE Application	VESIA Integration Level	Timetable
Curriculum Library and Sharing Program (CLASP)	2	2000
Directory Administration Application	1 2	2000 2001
DOE SmartForms Information Applications (including IMS)	0 1	2000 2001
Teacher Training and Professional Development (TTPD) Application v 2.0	1 2	2000 2001
Accountability DataMart	0 1 2	2000 2001 2002
Virtual High School Applications	0 1	2000 2001
MassEd.Net Applications	0 1	2000 2001
ETIS Applications	0 1	2000 2001

In the following sections, we have described what their purpose is, their rollout schedule, and the ways in which they will be integrated with VES, are described.

3.2.5.2 Curriculum Library Alignment and Sharing Program (CLASP)

A relational database application was originally developed in 1995 by the North Andover Public Schools System for their own use in developing grade level expectations aligned to the state learning standards. Through a Department of Education Technology Literacy Challenge Grant, North Andover was able to systemically implement and further develop their curriculum development process using this relational database. Subsequently, partnering with Mass Networks Education Partnership (MNEP) in 1998, with the support from the DOE, the concept for a statewide standards based curriculum database, or library, was developed and is now being used by over 200 school districts to develop and manage their curriculum and to share instructional resources through mini conferences, professional development workshops, and the CLASP software application.

The core of the VES applications for Curriculum, Instruction, and Assessment owe their heritage to CLASP. VES will bring CLASP online to reach an even larger audience and bring depth to its use. All school districts currently using CLASP will have their data migrated to VES, when appropriate. The transition for CLASP school districts will be one which adds new features and capabilities to what they are currently experiencing and builds on the significant investment already made to local curriculum and instructional development.

3.2.5.3 Directory Administration Application

The goal of the **Directory Administration Application** is to make Directory information more timely, accurate, and accessible, and therefore, useful, while increasing efficiency of processing. It will do this by allowing the Districts and Municipalities themselves to manage Directory data via a web-based application.

The Directory Administration Application provides Internet functionality that will promote access and management of the directory. Districts and Municipalities will be able to view, print, add, update, and delete their own district specific directory information.

The Directory Administration Application will work with VES to create a single secure security portal for all web-accessed programs of the DOE. This means that all authorized users will only need one Log-on ID and password to access all VES and DOE applications. Users will be provided with a customized Workspace which contains links to all of the SmartForms they have privileges to view or edit.

VES will interface with the Directory Administration Application from the Workspace Services module and from the VES Directory Administration module.

3.2.5.4 DOE SmartForms Applications

The methodology that DOE has utilized to implement web based data collection is the SmartForm. SmartForms are interactive ASP pages or JSP pages, which post user data to a database. They allow users to edit, change, print, and review their input before posting it to DOE. DOE plans continuing implementation of new SmartForms, to replace existing paper processes.

Information Management System

For years, the Department of Education has been called upon to collect more and more data from schools. From grants to regulations to studies, each new state or federal program comes with its own set of forms to complete and data to submit. While school personnel legitimately complain about the amount of time spent filling out paperwork, others are equally dissatisfied with quality and quantity of data available to guide statewide educational decision-making.

In 1995 the Department began designing a comprehensive, state-of-the-art information management system. The first step, District IMS (DIMS), has been developed to replace over 250,000 pieces of paper submitted each year by districts with a web-based system of SmartForms. DIMS will enable districts to directly enter, edit, retrieve, and transfer data with the Department through any common web browser. The next step, Student IMS (SIMS), will provide the information infrastructure for the Education Reform Act by tracking individual student data for nearly one million public schools students.

VES will provide portals to the DOE IMS SmartForms applications through the Workspace and the Workspace Services module

Other SmartForms Applications are:

- District Technology Plan
- School Improvement Plan (future)
- Professional Development Plan (future)
- Grant RFR and Applications (future)

VES will provide portals to the DOE SmartForms applications through the Workspace and the Workspace Services module.

3.2.5.5 Teacher Training and Professional Development (TTPD) Application

The Teacher Training and Professional Development Application helps educators search for courses and enables providers to list their courses. TTPD will now incorporate subject areas, in addition to technology.

VES will provide portals to the TTPD 2.0 application through the Workspace and the Workspace Services module.

3.2.5.6 Accountability Datamart Application

The Accountability Datamart Application is designed to make all the online databases DOE has built accessible by district and school users, and members of the community for sophisticated data analysis. A query language, data mining capabilities, and summary and download of data will make this a very valuable addition to the DOE tool set.

DOE established the Accountability Datamart to pull together information previously kept in separate and relatively inaccessible legacy systems. The purpose is to make the information readily available in a consistent and relational format, with well-defined data elements. The Datamart is also intended to keep data historically in order to support longitudinal analysis. Still in its early stage, the DOE plans to include more types of data, as it becomes available and the development schedule and resources permit.

The Datamart, has ISR, YESIR and returned dropout data, other test data including SAT and Iowa reading scores, and will contain additional information as it develops over time, such as educator data (e.g., teachers in schools, financial, etc.)

The Datamart currently holds summary information at the school and district level as follows.

- Individual School Report (ISR) data related to enrollment by fiscal year since FY1993
- Year-End School Indicator Report (YESIR) data by fiscal year since FY1993
- Returned Dropout data by fiscal year since FY1993
- MCAS results for schools and districts since FY1998
- Iowa reading test results for FY1997, FY1998, FY1999
- SAT summary data for FY1995, FY1997, FY1998

MCAS data (without individual student identifiers) is included so that interested individuals can do demographic school district to school district, and school to school comparisons of the MCAS results, down to a fine level of detail.

VES will provide portals to the Enterprise Datamart Application through the Workspace and the Workspace Services module

3.2.5.7 Virtual High School (VHS) Applications

Eight consortiums consisting of a total of 45 high schools in Massachusetts are using the Distance Learning model developed by the national Virtual High School (VHS) Project. Forty-five teachers and forty-five site coordinators, one from each high school, work with the VHS National Office during online professional development and delivery of VHS NetCourses. In exchange for contributing a small amount of teaching time, a school can offer its students NetCourses ranging in content from academically advanced to technical and specialized courses. Schools donate computers, Internet connectivity, and staff time. The school's VHS site coordinator is responsible for project management and support of teachers and students at their local school.

VES will provide portals to the **Virtual High School (VHS) Applications** through the Workspace and the Workspace Services module.

VES will also provide portals to access Virtual High School courses through the Workspace, Workspace Services, Online Courseware and Instructional Administration modules.

3.2.5.8 MassEd.Net Applications

MassEd.Net is the Commonwealth's educational Internet Service Provider. Every K-12 educator in the state has unlimited, toll free Internet access with round-the-clock technical support from MassEd.Net. MassEd.Net has a registration and help desk application that will be available through VES Workspace.

VES will provide portals to the MassEd.Net applications through the Workspace, VES Directory Administration, and the Workspace Services module.

3.2.5.9 ETIS Applications

Educational Technology Integration Services (ETIS), launched in May of 1997, is an effective means for public schools, and now public libraries, to easily procure technology goods and services under the state procurement law, c.30b. ETIS offers a level of quality, simplicity, and savings that serve the precise needs of public education.

Municipalities have embraced ETIS. Approximately 12 new ETIS projects break ground each week and many teachers and administrators have contacted DOE to express their satisfaction with the program, as well as suggestions for improvements. This feedback resulted in the launching of ETIS II (April 1998) and ETIS III (October 1998).

ETIS II allows manufacturers of computing hardware to become approved ETIS vendors. Since manufacturers occupy a much different place in the market from resellers, this separate ETIS list was needed. All manufacturers approved under ETIS II have guaranteed that ETIS pricing is always the lowest available to any educational entity nationwide — regardless of configuration or quantity purchased. In other words, a small school district, requiring just one computer configured exactly to its specifications, automatically has the buying power of a major city.

ETIS III establishes a separate approved vendor list for providers of online instructional content. ETIS III will ultimately offer an impressive array of teaching tools beyond textbooks. Soon, teachers will be able download interactive, up-to-date content that can be presented on its own or integrated with lesson plans, tests, writing assignments, and field trips.

VES will provide portals to the ETIS web site through the Workspace and the Workspace Services module.

3.3 VES System Description

3.3.1 Overview and VES System Description Documentation

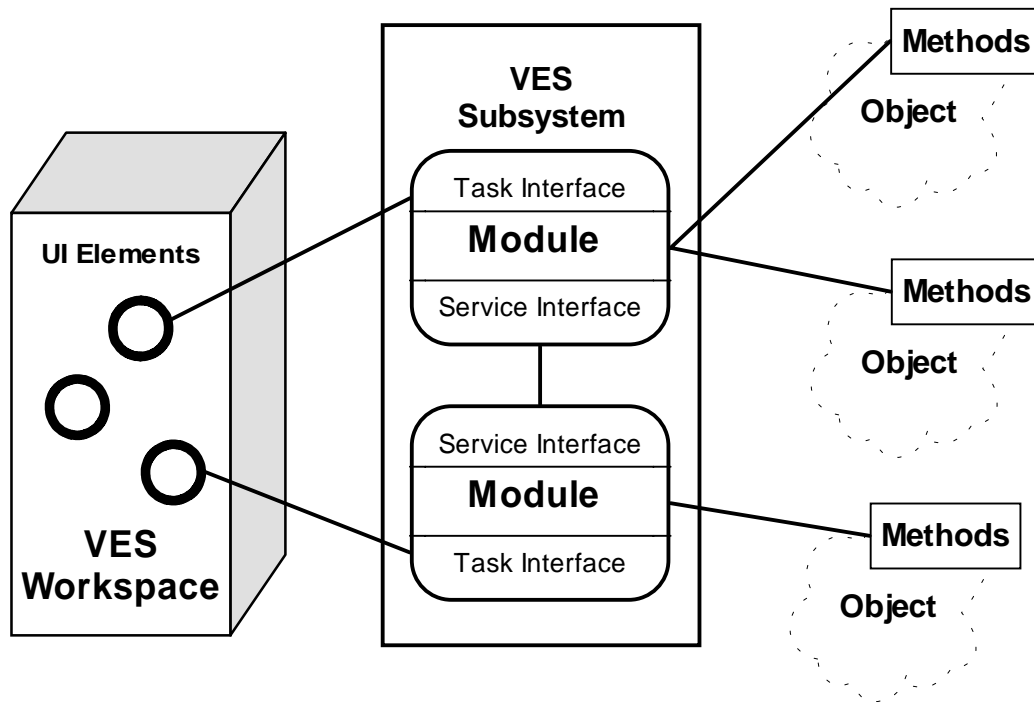
This section is provided to help readers understand the components of VES and their relationship to one another. This section will also introduce the idea of VES primary and system objects and their relationship to the VES architecture. This section identifies the components of VES to be built, developed, licensed and procured. Finally, this section will describe the user and organizational issues, discuss user roles, and access to objects.

3.3.2 VES System Components

3.3.2.1 VES Component Model

To understand VES you must understand its components. VES is comprised of a set of User Interface Elements in the Workspace, Subsystem and Module Components, Objects, and the interfaces and methods they share. Figure 3-3, depicts the VES component model, including subsystems and modules, and their interfaces.

Figure 3-4: VES Component Architecture



In Tables 3-5 through 3-7, we have listed the VES components: subsystems and modules, and their likely procurement methods.

Those components, which are highly particular to education in Massachusetts, and those related to VES administration and management, will probably need to be developed. The more generic productivity, communications, and collaboration tools will probably be able to be licensed and integrated into the VES architecture.

For each VES component we seek proposals on the most complete functionality, which meets or exceeds our system requirements, is capable of being integrated into VES with the VESIA, meets our database requirements, and is capable of being hosted in our ASP Hosting Environment.

Table 3-5: VES Educational Subsystems

Subsystem	Module	Procurement Method
Curriculum Management	State Curriculum Frameworks	Develop
	District Curriculum Guidelines	Develop
Instructional Design	Course	Develop
	Unit	Develop
	Lesson	Develop
	Activity	Develop
	Assessment	Develop
Instructional Management	Planner and Journal	Develop or License
	Class Registration	Develop or License
	Grading and Achievement Tracking	Develop or License
Student Tools	Assignment Book	Develop or License
	Student Work	Develop or License
	Portfolio	Develop or License

Table 3-6: VES Educational Support Subsystems

Subsystem	Module	Procurement Method
Productivity Support	Resource Tools	License and Integrate
	Research Tools	License and Integrate
	Reference Tools	License and Integrate
	Desktop Tools	License and Integrate
Technology Support	Classroom Troubleshooting	Develop
	Technology Competency	Develop
	Standards Based Education	Develop
	Network Troubleshooting	Develop or License
Instructional Support	Online Courseware	Develop or License
	Tutoring - Mentoring	License and Integrate
	Distance Learning	License and Integrate
Communication and Collaboration Services	Unified Messaging Services	License and Integrate
	IP Conferencing Services	License and Integrate
	Collaboration Services	License and Integrate
	Web Publishing Services	License and Integrate
	Calendar Services	License and Integrate
	Content Caching and Filtering	License and Integrate
	Media and Content Services	License and Integrate

Table 3-7: VES Educational Administration Subsystems

Subsystem	Module	Procurement Method
VES Administration	VES Administration	Develop
	VES Individual Workspace	Develop
	VES Workspace Services	Develop
	Instructional Administration	Develop
	VES Directory Administration	Develop

3.3.2.2 VES Subsystems

The VES System is organized into nine subsystems. Each subsystem corresponds to a comparable function in the Enterprise. Each subsystem contains one or more modules, which relate to a small collection of objects, or share closely related functionality.

Educational Subsystems:

- Curriculum Management Subsystem
- Instructional Design Subsystem
- Instructional Management Subsystem
- Student Tools Subsystem

Educational Support Subsystems:

- Productivity Support Subsystem
- Instructional Support Subsystem
- Technology Support Subsystem
- Communication and Collaboration Subsystem

Educational Administration Subsystem:

- VES Administration Subsystem

3.3.2.3 VES Modules

The VES Modules are the fundamental unit of development or licensing and contain either:

- A closely related set of functionality, or
- A close relationship to one, or a small group of objects

Each module contains standalone functionality, which is described in detail in the System Requirements section. Each module will also have VESIA interface requirements, which enable it to provide its services to other modules and to the Workspace Services Module.

The following list contains the names of VES Subsystems and Modules:

3.3.3 VES Common Application Service Elements (CASE)

VES Applications will share a number of features and capabilities made possible because of the Workspace environment and the requirement that all individual VES components have VESIA compliant service ports. Each of the following categories describes a set of common features that will be supported by appropriate Workspace interfaces. Features described should not be construed as being a complete list, but rather as a representative sampling.

3.3.3.1 CASE Concepts

These CASE provide a rich environment for users by delivering system services in a consistent way, wherever a user is. This polymorphism is made possible by mutual compliance with VESIA by cooperating modules and objects. In order for a common application service to be supported in VES, cooperating modules must meet the VESIA Level 2 interoperability specification. (Complete VESIA specifications will be provided to successful vendors after completion of Step 1 of the procurement process).

3.3.3.2 Document Management CASE

A good part of the work that VES users do involves the design, production, review, and approval of documents. Documents like the District Curriculum Guidelines and Teacher Lesson Plans represent the essence of the rationale to build VES. For each document created in VES Workspace, the following capabilities should exist.

Printable Forms

Online versions of Forms

Form Data and Formats stored and editable in database

Web Printable and PDF Versions of Forms

Local Workflow System Design and Naming

Document Version Control, Status, and State (History)

Document Collaboration

Document Transmission

3.3.3.3 Just-In-Time Application Training and Support CASE

There is a requirement that for every enterprise process, and task, and every VES tool, whether developed or licensed, that rich multimedia just-in-time tutorials and help be available to users from inside the tool or application. That user assistance should be available embedded at, or linked from, the place where they have a question or problem.

This requirement creates a parallel training and support requirement, which matches the required functionality a vendor delivers. Just as a vendor completes a system analysis to create a software design, which meets the functional requirements, they should create a training analysis to create an instructional design to meet the user training and support requirements.

It is required that this training and support be embedded for several reasons:

- To make it accessible where and when users need it
- To record, and track user problems to assure that they are resolved
- To keep track of the acquisition of competencies by users and the time spent in training or seeking support
- To improve the quality of the applications and to reduce the need for training and support.
- To be able to deploy future applications with embedded training and support without the requirement for significant implementation training.

The VES embedded training and support services, which are essential parts of the CASE will have the following features:

Universal integrated multimedia tutorials and demo Interface

Task Wizard and Expert Assistant Interface

Natural Language Troubleshooting Interface

Referral of uncompleted support requests to local support system

Real-time online help desk

3.3.3.4 Community Directory Services CASE

From wherever users are, they should be able to utilize the Community Directory Services of VES to create, maintain, manage, and delete VES communities. These communities might be the students in a class, or teachers on the Math curriculum committee, or teachers having a virtual meeting. VES users will need to have these capabilities.

Access to Existing Community Lists
Ability to Create and Manage Lists
Ability to indicate special capabilities like Audio and Video conferencing in the Directory, and to search for those capabilities.

3.3.3.5 Common Communications Services CASE

From wherever a user is in VES they should have the capability to access their unified messaging systems. For example, a teacher building a lesson plan comes across an activity they know their colleague will want to see. From the context of the Lesson Planning process, the teacher can send a copy of the Activity with a few clicks. The following requirements are ubiquitous. Users should also be able to act directly upon, communicate with, and collaborate about, the objects a user is working on.

Email, Fax, and Voicemail
Real-time Collaboration

3.3.3.6 Common Calendar Services CASE

Calendar Personalization
Event Publishing
Event Subscription

3.3.3.7 Information Channels CASE

Display of Information Elements
Information Subscriptions
Media Channels

3.3.3.8 Synchronization Services CASE

General Synchronization
Edge Device Synchronization
Database Synchronization

3.3.3.9 Security Services CASE

Password and Authentication Services
Secure Transaction Services
Security Audit and Logging Services

3.3.3.10 Upload and Download CASE

Upload of Files

Download of Objects

Download of Documents

System File and Object Transfers

Case Example

Teacher A, who is preparing a Lesson Plan, finds an interesting standards-based activity that, Teacher B would be interested in. Teacher A, without leaving the Lesson Planning task, emails the activity to Teacher B. Because the Lesson Plan calls for real time on-line collaboration between students, without leaving the Lesson Planning task, Teacher A can schedule a private chat room for the class. Teacher A needs some assistance in aligning the Lesson to the District Objectives, but forgets how exactly to do that. Without leaving the Lesson Planning task, Teacher A can view a multimedia help instruction that demonstrates the steps in aligning to objectives. Once the Lesson Plan is finished, Teacher A can post it to the Instructional Planner page of their shared calendar. The real-time interactive chat room is already scheduled and posted in Teacher A's calendar.

Although the specific requirements for these services are documented in Section 3.5, it is important to point out the shared nature of these Common Application Service Elements.

We seek proposals, which understand the need for, and build upon, the concept of polymorphism in the implementation of the Common Application Service Elements.

3.3.4 VES Objects

Within these requirements, we are using the abstraction of objects to represent important entities in the VES architecture. The use of objects and object oriented terminology was selected as the best way to present and document the requirements at a level of abstraction removed from implementation specifics. Although we believe that an open distributed object oriented design will be the best solution, the use of object based requirements permits other designs and implementations to be proposed by vendors.

To understand the terminology used in this document, one must understand the three types of objects which are used:

3.3.4.1 VES Object types

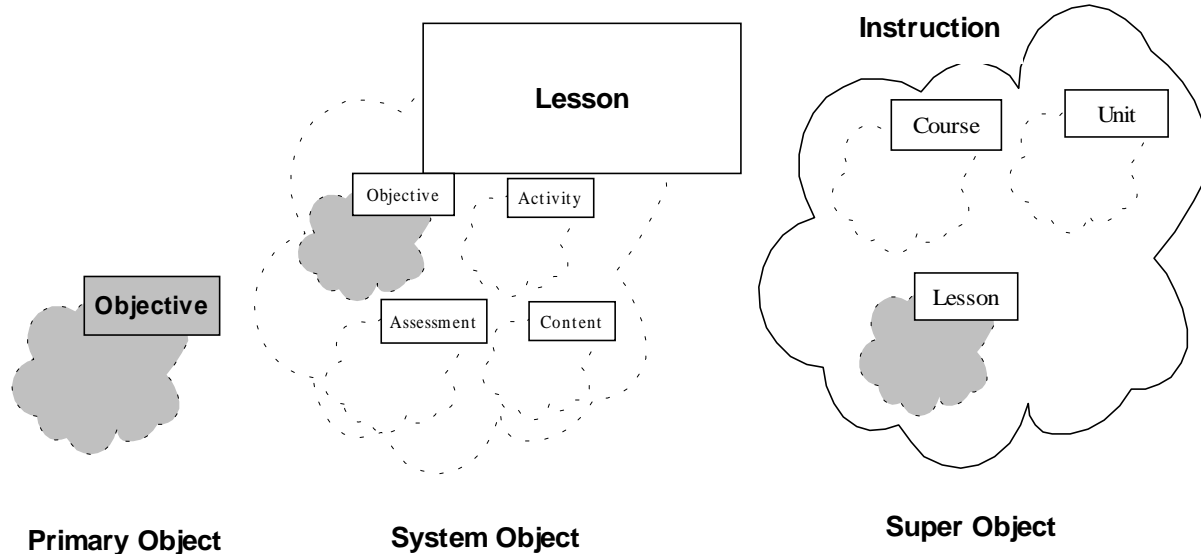
VES Object types are categorized into:

- **objects**, (alias: primary object) which are defined *ab initio* without reference to other object types, and
- **system objects**, which are specified, and partly defined, in terms of objects, and
- **super objects**, which are specified, and partly defined, in terms of system objects

The structural notion of an object type characterizes the object type as either:

- conceptually **atomic**, being intrinsically indivisible, (as in objects) or
- conceptually **aggregate**, which can be seen as an organization of specific component object types with specific functionality (as in system and super objects).

Figure 3-8: VES Object Model



3.3.4.2 Objects

Objects are the building blocks of the VES system. In these requirements, Object instances are the principal unit of work. They result from an enterprise process as implemented by VES. Most objects are created by users, through their interactions with VES. A few objects are created by modules for use by other modules. In the next section we will describe the System objects, which are made up of objects, and are the component parts of super objects.

3.3.4.3 System Objects

Within the system requirements, there is a class of objects we call system objects. They correspond to enterprise objects (documents) and are the products of users of the system components. These object classes represent mid-level abstractions. In the next section we will describe the super objects, which are compound objects, made up of system objects, and are the fundamental building blocks of VES.

3.3.4.4 Super Objects

Within the system requirements, there is a class of objects we call super objects. They correspond to a super class of the enterprise objects (documents) like curriculum, instruction, and assessment. These object classes represent the highest level of abstraction in the requirements.

3.3.4.5 Mapping Objects to Modules

The following chart is a key to understanding the System Requirements. It identifies the relationships between subsystems, modules, and objects. This is an important set of relationships. In addition to all the VES subsystems and modules, it identifies objects that interface with the Common Application Service Elements (CASE) and which are associated with many modules and subsystems.

Table 3-9: VES Educational Subsystems

VES Subsystem	VES Module	System and Super Objects	Objects
Curriculum Management	State Curriculum Frameworks	Frameworks, Reporting Categories	Guiding Principles Habits of Mind Core Concepts Strands Curriculum Content Learning Standards Student work examples Performance descriptors
	District Curriculum Guidelines	Guidelines Program of Studies	Objectives Performance descriptors Curriculum Content Instructional strategies Assessment strategies
Instructional Design	Course	Course Content Assessment	Unit Lesson Activity Instructional Content Assignment Assessment Resource Achievement Profile Competency Profile
	Unit	Unit Content Assessment	Lesson Activity Instructional Content Assignment Assessment Resource
	Lesson	Lesson Content Assessment	Assessment Activity Objective Instructional Content
	Activity	Activity	Procedure Objective Assignment Resource
	Assessment	MCAS Items, District ,Course, Classroom Assessment	Test Item Test Rubric Performance Descriptor Criteria Benchmark Exemplar Example
	Instructional Management	Planner and Journal	Calendar
Class Registration		Roster	Course Student

	Grading and Achievement Tracking	Grading Matrix Achievement Profile Competency Profile Progress Report	Assignment Assessment Benchmark Standard Objective
Student Learning	Assignment Book	Assignment Book	Assignment
	Student Work	Student Work	Student Work
	Portfolio	Portfolio	Student Work

Table 3-10: VES Support Subsystems

VES Subsystem	VES Module	System and Super Objects	Objects
Productivity Support	Resource Tools	Teaching and Learning Resources	Catalog Resource Library
	Research Tools	Search Engines Indexes Research Assistant Library Catalog	Search Query Results
	Reference Tools	Dictionary Thesaurus Encyclopedia Atlas Gazetteer Quotations	Reference Query
	Desktop Tools	Word Processing Spreadsheet Presentation Database Graphics	Document Spreadsheet Presentation Database Media
Instructional Support	Online Courseware	Courses Lessons JIT Training	Instruction
	Tutoring - Mentoring	Tutoring Mentoring Homework Help	Lesson Activity Tutor Mentor
	Distance Learning	High School Courses College Courses Non-credit Courses	Instruction
Technology Support	Classroom Troubleshooting	Troubleshooting Assistant	Problem Query Trouble Ticket
	Technology Competency	Technology Assistant	Query Task Self Assessment Prescription Instruction
	Standards Based Education	Standards Assistant	Query Task Instruction
	Network Troubleshooting	Network Troubleshooting Assistant	Network Topology Fault Notification Alert Profile

Communication and Collaboration Support	Unified Messaging Services	Email FAX Voicemail	Email message FAX message Voicemail message
	IP Conferencing Services	Conferences	Conference Call
	Collaboration Services	Collaborations	List Discussion Space
	Web Publishing and Hosting Services	Web Pages and Sites Web Publications Web Newspapers Web Yearbooks Web Exhibits	Page Site Publication Web Exhibit
	Calendar Services	Shared Calendar	Calendar Page Event Conference
	Content Cache and Filtering Services	Caching Filtering Proxy Services	Cache profile Filter profile
	Streaming Content Services	Web Media Event Web Radio Program Classroom Media Video Film Festival	Media Programming Media Document Media Exhibit

Table 3-11: VES Administration Subsystems

VES Subsystem	VES Module	System and Super Objects	Objects
VES Administration	VES Administration	Organization User Role Default Workflow	Organization Profile User Role Defaults User Role Exception Database Profile Object Workflow Localization Token
	VES Individual Workspace	Workspace	User Preferences Personalization Tokens Synchronization Tokens Localization Token Virtual Cookies Content Subscriptions Competency Profiles Achievement Profiles Portfolio
	VES Workspace Services	Module Interfaces Tokens Logs	Access Log Usage Log Authentication Tokens Customization Tokens
	Instructional Administration	Courses Rosters Profiles	Department Course Roster Achievement Profiles Competency Profiles
	VES Directory Administration	Directory	Organization Community User Capability Profile

Table 3-12: VES Common Application Service Elements

VES	CASE Function	System and Super Objects	Objects
Common Application Service Elements (CASE)	Document Management	TBD	TBD
	Just In Time JIT Embedded Training and Support	TBD	TBD
	Community Directory Services	TBD	TBD
	Common Communications Services	TBD	TBD
	Common Calendaring Services	TBD	TBD
	Information Channels	TBD	TBD
	Synchronization Services	TBD	TBD
	Security Services	TBD	TBD

3.3.4.6 VES Object Properties and Usage

Since VES Objects are documented as high level abstractions, it is important to know all of the methods and interfaces they support.

VES Object Properties

Properties are defined in two contexts:

- **Object properties:** generic features that apply to all object instances of the object type. Example: the object Lesson has the properties: contains Activities, contained in Units, aligned to Objectives; thus, all Lesson objects contain Activities, all Lesson objects are contained in Units, and all Lesson objects are aligned to Objectives.
- **Object instance properties:** an attribute associated with an object instance. Example: object instances each may have the property "discipline, grade", but each object instance would have its own copy of the property and, possibly, different values.

As we will see, two important properties of VES objects are whether they have system defined or default workflows (which correspond to local document draft, review, and approval processes), and whether prior versions of the object are maintained as part of an object or document history.

3.3.4.7 VES Task Primitives and Models

When we map the requirements represented by the Enterprise Process Scenarios, and their Task lists, across the VES modules, to the primary system objects, we find that there are a small set of Task Primitives or Methods. These Methods are used over and over, on different types and instances of objects, to perform user functions. These Methods are listed here and documented in the Appendices, because we think they will be useful building blocks to design and provide functionality.

List of Task Primitives:

- Align
- Sequence
- Others to be added...

Flow Charts of these Task Primitives are found in the Appendices.

3.3.5 VES System Users and Organizations

3.3.5.1 VES Organizations and VES Administration

VES will be deployed and supported for adoption by a majority of School Districts in Massachusetts. By 7/1/02, 40,000 educators will be actively using it, and by 7/1/03, 500,000 students will be using it. That means that the VES Workspace will be utilized on a daily basis by hundreds of thousands of people on over a hundred thousand computers. VES will be utilized at all organizations from the Department of Education and School Districts, to Schools, Classrooms, and in individual homes.

VES will be used by some with administrative roles, some with curricular roles, some with instructional roles, and it will be used by students, parents, and members of the community.

The VES Administrative Subsystem provides a set of tools for district VES administrators to establish user role mappings, to plan and document the district approval processes for various types of enterprise documents, which are represented in VES by object instances, and to localize terminology and workflows.

3.3.5.2 VES User Authentication Services

One most important function of VES is to authenticate users. No access to the VES Workspace will be provided except to authenticated users. The public will be provided access to the locked down public VES Workspace with anonymous "public" authentication. The DOE Directory Administration Application will provide authentication services to VES and the VES Workspace. There are two important roles that the Directory Administration Application plays in VES:

- Authentication Services Functions
- End User Administrative Functions

3.3.5.3 Directory Administration Authentication Services Functions

User Authentication at Log-in

When a web user attempts to enter VES, they will be presented with a Login screen. If they enter "Public" they will be connected to VES as an unauthenticated user and presented with the default unauthenticated Workspace. No further customization or personalization of the Workspace will be possible.

When users are members of authorized groups (teachers, administrators, students, etc.) they are issued VES Log-ins and passwords. If a valid Log-in ID and Password is entered at the Login screen, the authenticated user will be presented with their personalized VES Workspace, customized to their default role. (This assumes that the user has a single VES role defined with the Directory Administration Application.)

When an authorized user has multiple assigned roles the scenario is slightly different. If a valid Log-in ID and Password is provided, the user will be presented with a page in which they will be asked to select from the set of VES roles which they have been assigned by default, or by assignment in the VES Administration Module. Upon selection of the role(s) for the current VES session, the user will be presented with their personalized VES Workspace customized to their selected role(s).

User Authentication Token

When an authenticated user successfully logs in to VES, and for the duration of the current VES session, VES will maintain an Authentication Token which identifies that user as authenticated. If the user wishes to change the roles they have selected, the authentication token will be passed to the Directory Administration Application. Without reentering the login and password, the user will be presented with the role selection page, in which they will be asked to select from the set of VES roles, which they have been assigned by default, or by assignment in the VES Administration Module. Each time roles are changed, a new VES session is started.

Within their current role when a user selects an application to run, the User Authentication Token will be passed to that VES or DOE application. This will avoid the need for another Log-in and password.

Role Customization Tokens

When an authenticated user successfully logs in to VES, and for the duration of the current VES session, VES will maintain a Role Customization Token which identifies that user as having the selected role(s). Whenever the user is presented with icons, menus, options, and other objects in the Workspace user interface, the view of those user interface objects will be customized by the roles contained in the current instance of the role customization token. The user's Workspace will only present applications which the user's roles entitle them to use, and within those applications, only the application tasks which the user's roles entitle them to perform.

Personalization Tokens relate only to Workspace and Application presentation issues and NOT to functional issues. They are an important feature of the Workspace, but are not the responsibility of the Directory Administration Application. They are the responsibility of the VES Administration Module.

3.3.5.4 Directory Administrative Application - Administrative End User Functions

Authorized VES users will be able to:

- Add Directory Administration Information
- Update Directory Administration Information
- Launch Queries of Directory Administration Information
- Launch and Print Reports
- View Directory Administration Information

3.3.5.5 Users Roles, Rights and Permissions

In order to maximize flexibility in the use of VES, particularly for the development of curriculum and instructional plans, a comprehensive set of roles, rights, and permission requirements have been developed for use in implementing VES. Since the object is the principal unit of work in VES, the rules regarding who has what role, and what that role permits them to see and do, are all related to an instance of an object.

Default roles, rights and privileges for working on objects will be provided, but they will be highly modifiable to meet local district requirements.

3.3.5.6 Object State and Status

Rules for status and state: Associated with each discrete instance of an object is an object status. There are three possible statuses in which an instance of an object can exist:

- Private
- Shared
- Public

Each status contains one or more states. Each state within a status defines a stage in the life cycle of a document or object. The state of an object determines who can see it and work on it by defining the authorized group of collaborators and reviewers. An object can exist in only one status at a time, and can have only one state at a time in that status.

3.3.5.7 User Object Roles

Associated with each discrete instance of an object, its status AND its state, will be a set of roles which can be used to map default privileges to users based on user Function and Organization. The roles can also be used to override defaults and map privileges to specific individuals or groups.

Roles for instances of all Objects are:

- Manager
- Collaborator
- Reviewer
- Viewer

Manager - Privileged to change an instance of an object from its current state to another state and to change object status. The Manager will also make modifications to the default collaborators, reviewers, and viewers, associated with an instance of an object in its current state.

(change state and status, create, delete, view, edit, comment)

Collaborator - Privileged to create an instance of an object or contribute to an object in its current state

(create, view, edit, comment)

Reviewer - Privileged to provide comments on an instance of an object in its current state

(view, comment)

Viewer - Privileged to view object in its current state.

(view)

3.3.5.8 Object Workflow Concepts

A workflow is a construct which permits DOE, Districts, and Schools to document and incorporate the rules for their unique local approval and review processes for documents. The documents which are represented in VES as objects, (Guidelines, Lesson Plans, Assessments, Activities, and Resources) may be localized in a workflow profile to help with the management of the workflow of these documents.

A workflow profile is a list of the steps (states) a document takes to go from creation, through various draft states, to approval, and publishing for public viewing. VES will provide a default workflow profile for all objects. DOE and Districts can localize the default workflow in whole, or in part, to support their local requirements.

Examples of default workflow states:

- Private Status: Work-In-Progress, Completed
- Shared Status: Draft (unendorsed), Peer-Review Draft, Endorsed Draft
- Public Status: Endorsed, Unendorsed

Examples of customized District Workflow Context states:

- Private Status: Work-In-Progress, Completed
- Shared Status: Peer-Review Draft, District Draft, VES Draft, Endorsed Draft
- Public Status: Endorsed, Unendorsed

3.3.5.9 Object Version Control

Each time object state changes, the object is archived and given a version number, which is added to the object revision history. At any time, managers and collaborators can access the object revision history to visit prior versions of the object.

Version management is always a tradeoff between the goals for maximum data integrity, maximum data availability, and ease of use. It is relatively easy to specify a design that satisfies any two of these goals, but this is often at the expense of the third. For example, data availability and ease of use are easy to accomplish using authoring servers that compromise data integrity by following a last writer wins policy. In contrast, high data integrity and availability are possible using branch and merge systems, but at the cost of ease of use due to difficult merges.

The requirements for VES object versioning are based on compromises between these conflicting goals. VES object versioning specifies a set of mechanisms that can be exploited to support a variety of localized workflows, which users need to find a balance appropriate to their needs.

3.3.5.10 Object Versioning Requirements

These requirements have been adapted from the IETF WebDAV documentation:

A versioned object is an abstraction for an object, or a system object, which is subject to version control, an object having a set of revisions, relationships between those revisions, revision names, and named branches that track the evolution of the resource.

A revision is a particular version of a versioned object. An immutable revision is a revision that once created, can never be changed without creating a new revision. A mutable revision is a revision that can change without creating a new version.

3.3.5.11 Additional Object Attributes

In addition, each object will carry a number of important attributes, including:

- Owner/Author - Intellectual Property Rights ownership cluster of elements
- Object Revision History and Versions -
- Collaborators - by version
- Usage - by version
- Usage comments - by version
- Change notations - by version
- Time and Date stamps

3.4 VES Workspace and User Interface Requirements

3.4.1 Overview and Workspace Requirements Documentation

The requirements for the VES Workspace are documented in this section. These requirements describe how VES should look to users, how enterprise work processes and scenarios are represented in user workspaces, and how the issues of personalization, customization, and localization should be handled. This section maps Enterprise process and task requirements to System Requirements in the Workspace User Interface.

3.4.2 VES Workspace and Portal Concepts

VES is intended to provide users with a powerful set of customized on-line tools, services, and resources, together with all the things they need to use them. Efficient delivery of these things requires a context with five coordinated capabilities:

- User interfaces which are able to be customized and personalized for each user
- Portals to the VES online tools, services, and resources
- Portals to online tools, services, and resources outside VES
- Portals to a secure, private, online space for each user to create and store their work
- Portals to public space for the publication of individual and group work

This set of **user interface** and **portal** capabilities, taken together, represents what we call **Workspace**. It is important to understand that **Workspace** is each user's personal view of, and interface to, the VES landscape. **Workspace** will organize and make accessible to each user just the tools, services, and resources they need, in just the way they want. **Workspace** will provide every user with a virtual desktop designed to help them do their job better. **Workspace** is both the visual representation each user sees, **and** it is the collection of services that organize, customize, personalize, and enable it to interact with the user and interface with other VES components. VES **Workspace remembers** who you are, how you like to work, what you were doing last time, and where you put things.

VES **Workspace** acts as a **Portal** to provide connectivity to VES tools, services, and resources, enterprise data, and external tools, services, and resources.

By **Portal** we mean a pathway to, and connection with, tools, services, and resources. A VES **Portal** may provide a pathway as simple as an HTTP link, or as rich as a private, secure, intelligent, authenticated link. **Portal** functionality is defined in the VES Integration Architecture (VESIA) in Chapter 4.

The VES **Workspace** is designed to **simplify** the use of online tools, services, and resources for VES users and to eliminate some of the following common online problems:

- Rather than a "one-size-fits-all" user interface, it presents an interface customized by user role and able to be individually personalized.
- Rather than a multiplicity of user interfaces to learn and use, it presents a single consistent user interface.
- Rather than require multiple logins, passwords, and authentication procedures, it provides a single login and authorization procedure.
- Rather than expose users to advertising pitches, inconsistent privacy policies, and varying types and levels of security, it provides a single private, secure, advertising-free environment.

Because of the wide array of heterogeneous edge device hardware deployed to connect users to VES, it is important to think of Workspace as having a number of personalities. These personalities will be used to assure transparency between Netscape and Internet Explorer browsers, and to map the Workspace to PDAs, wireless handhelds, and various thin client Internet appliances. This format and display flexibility is not just related to the number of pixels on the screen. Workspace personality mapping could also be used to map the workspace to an interactive touch tone telephone device or intelligent cellular phone.

3.4.3 VES Personalization, Customization, and Localization of the User Workspace

We have used the terms Personalization, Customization, and Localization with regard to the VES Workspace. It is now the time to define them:

Customization of the VES Workspace is the organization and presentation of the user interface and portals for each user, based on their current or default role.

A customized Workspace presents only those interfaces and portals to tools, services, and resources for which a user is authorized, and which their current or default role requires.

Personalization of the VES Workspace is the organization and presentation of the user interface and portals for each user, based on their current or default preferences.

A personalized Workspace is a customized Workspace that is organized and presented in ways the user has chosen, and in colors, styles, and ways specified by users in their current or default preferences.

All Workspaces **will be** customized by current or default user roles. Workspaces also **may be** personalized by users.

Localization of the VES Workspace and its User Interface Elements is the use of local terminology and local document approval (workflow) processes in place of system defaults. To a degree, VES will support localization by district administrators to better match their local conventions.

A localized Workspace is a customized and personalized Workspace that may use local district preferences for naming conventions in place of system defaults.



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3.4.4 Workspace Elements, Enterprise Processes and the Task Interface

In this extensive section we document the elements of the user interface and the specific correspondence between enterprise requirements and the Workspace interface. In order to do this we will resort to using an abstraction of the actual user interface. No decisions will be made regarding the actual user interface until after vendor proposals have been received.

The abstraction is the use of User Interface Elements to represent the actual artifacts of a user interface without getting into the details. So, when we say Subsystem Icon, what we mean by that is that each subsystem will be represented in VES Workspace by a visual element. Maybe it will be an icon, maybe it will be a button, maybe it will be a set of hierarchical menus. The use of the word Icon in this section is as a generic user interface element representing some visible control on the Workspace display. So, when we say Process Icon, or Task Icon, we mean the same thing: a high level abstraction.

This section documents the primary connections between the Enterprise Requirements and the System Requirements. Each Enterprise Function maps to a System subsystem. Every Enterprise Process and Scenario are represented by a System User Interface Element Icon.

In the next section of the document we will map the Tasks in every Enterprise Process to the System Modules and Objects that represent them.

This chart shows the hierarchy of elements in the Workspace user interface. Although we have used the terminology, Icon, that term is being used in a general way to represent any element of the VES Workspace user interface:

Table 3-13 : Workspace Element Hierarchy

Subsystem Icon Enterprise Function	Process Icon Enterprise Process	Scenario Icon Enterprise Task Scenario
Curriculum Management		
	Curriculum Frameworks	Entry
	MCAS Tests	Entry
	District Curriculum Guidelines	Mapping Standards Based Performance Based Entry
	Develop Program of Studies	Course Listing Entry Program of Studies Entry
Instructional Design		
	Course	Standards Based Content Based Entry
	Unit	Standards Based Content Based Entry
	Lesson	Standards Based Performance Based Content Based Entry
	Activity	Standards Based Entry
	Assignment	Entry
	Assessment Instruments	Standards Based Performance Based Entry
Instructional Management		
	Instructional Planning	Entry
	Student Registration	Entry
	Assigning, Collecting, and Assessing Student Work	Entry
	Tracking Student Achievement	Entry
	Tracking Student Attendance	Entry
	Tracking Student and Parent Contacts	Entry
Student Tools		
	Assignment Book	Entry
	Student Work	Entry
	Portfolio	Entry
Productivity Support		
	Create, Catalog, Search and Retrieve Instructional Resources	TBD
	Conduct Research for teaching or learning	TBD
	Access Reference Documents, Materials, or Resources	TBD
	Utilize Word Processing, Spreadsheet, Database, and Presentation Tools for teaching or learning	TBD
Technology Support		
	Classroom Technology Troubleshooting Assistant	TBD
	Technology Competency Self-Assessment and Assistant	TBD
	Standards Based Education Assistant	TBD

	Network Technology Troubleshooting Assistant	TBD
Instructional Support		
	Online Courseware	TBD
	Tutoring and Mentoring	TBD
	Distance Learning	TBD
Communications and Collaboration Support		
	Email, FAX and Voicemail Services	TBD
	IP Conferencing Tools and Services	TBD
	Collaboration Tools	TBD
	Web Pages, Web Publications, and Web Sites	TBD
	Shared Calendar Services	TBD
	Web Filter and Caching Services	TBD
	Web Content and Media Services	TBD
VES Administration		
	VES Administration	TBD
	Individual Workspace	NA
	Workspace Services	NA
	Instructional Administration	TBD
	VES Directory Services	TBD



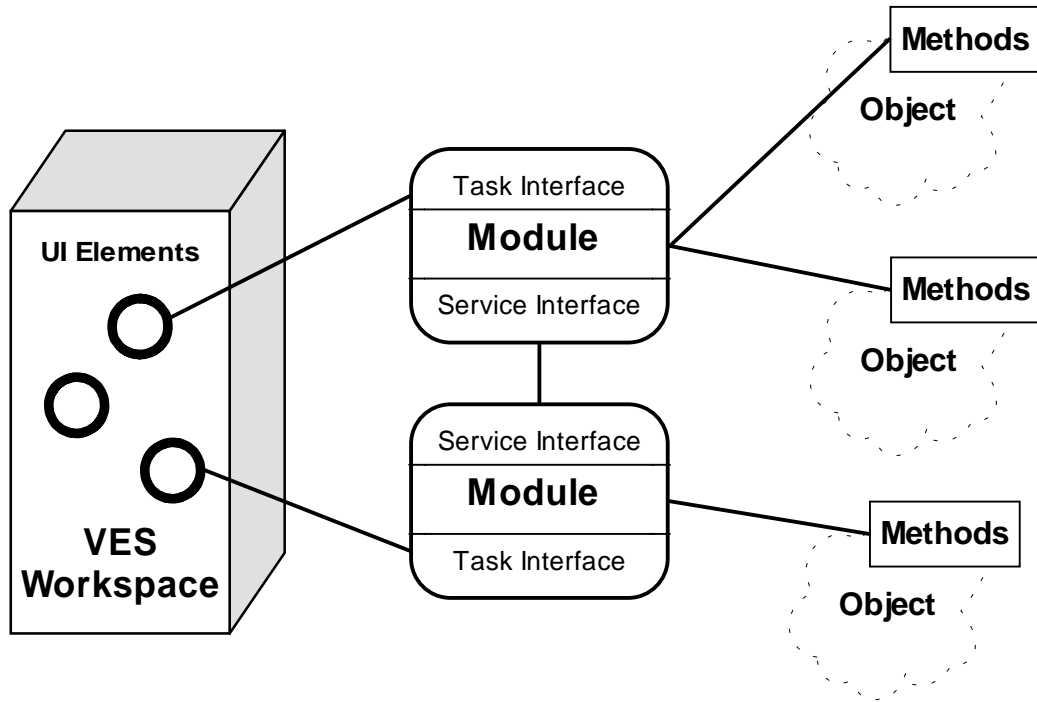
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3.4.5 Workspace Element Design Requirements

In this section we will document the Enterprise Tasks associated with a Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process. An understanding of Service Ports will be helpful here and the concept is described below:

VESIA Service Ports

Figure 3-14: VES Workspace, Modules and Objects



A basic concept represented in the VESIA is that VES components will be built with ports through which their services are provided. Task interfaces provide end user services and Service interfaces provide services to other modules. The Task interfaces and Service interfaces to an application are called the application's Service ports. The availability and use of features differentiate VES applications from standalone applications.

The Task interface provides end user functionality, typically through the user interface. An example of a Task Interface is an interactive web form for creation and editing of an email document. The Task Interface for email will be available from Email Application.

The Service Interface provides application functionality to other applications. An example of the use of a Service interface is the Curriculum Guidelines module automatically emailing notification that the 4th grade math guideline draft had been approved and is now available for viewing by the community. The Curriculum Guidelines module would accomplish this by invoking email services from the Service interface of the Email Application.

Specifications for the VESIA are contained in Chapter 4.

Another useful piece of information is the Task Vocabulary. In the Task Vocabulary VES verb refers to actions on Objects. VES verbs are precise and unambiguous and make up the set of Actions (Methods) users or modules can take on objects.

Table 3-15: VES Task Vocabulary

VES VERB	CONVENTIONAL VERBS
CREATE	Create, Add, Sequence, Copy, Enter, Write, Select, Type, Develop, Define, Save, Schedule
ALIGN	Align, Map
ADD	Add, Register
SEQUENCE	Sequence, Arrange, Order
EDIT	Edit, Add, Change, Update, Modify, Revise
REMOVE	Remove
DELETE	Delete, Erase
VIEW	View, Compare, Read, Use, Search, Copy, Align to, Display, Print
COMMENT	Comment, Feedback, Journal, Reflect, Review
PUBLISH	Publish, Share, Print, Approve, Review, Moderate, Change Status

In the following Sections, each Enterprise Process, and the tasks associated with it, are mapped to the modules and objects with which it interfaces. The type of interface, Service or Task, for each Task is identified.

Scenarios describe different sequences of the tasks associated with a process. Where there are multiple scenarios for a process, it means that there are more than one way to complete that process.

3.4.5.1 Curriculum Frameworks Process

In this section we will document the Enterprise Tasks associated with a State Standards Lesson Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-16: Curriculum Frameworks Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
State Standards	Create, edit, delete, and view Guiding Principles	Guiding Principles	State Curriculum Standards	Task
	Create, edit, delete, and view Habits of Mind	State Curriculum Standards	State Curriculum Standards	Task
	Create, edit, delete, and view Core Concepts	Core Concepts	State Curriculum Standards	Task
	Create, edit, delete, and view Strands	State Curriculum Standards	State Curriculum Standards	Task
	Create, edit, delete, and view Learning Standards	Learning Standards	State Curriculum Standards	Task
	Create, edit, delete, and view Curriculum Frameworks	Frameworks	State Curriculum Standards	Task
	Add National Standards	National Standards	State Curriculum Standards	Task
	Comment on Curriculum Frameworks	Comment	State Curriculum Standards	Task
	Publish Curriculum Frameworks	Frameworks	State Curriculum Standards	Task

There is only one scenario for this process, which is the entry process described in Chapter 2.

3.4.5.2 MCAS Process

In this section we will document the Enterprise Tasks associated with an MCAS Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-17: MCAS Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
MCAS	Create, edit, delete, and view MCAS Test items	Test Item	Assessment	Task
	Create, edit, delete, and view MCAS Reporting Categories	Reporting Category	Assessment	Task
	Create, edit, delete, and view Assessment Instruments	Assessment	Assessment	Task
	View National Standards	Standards	State Curriculum Frameworks	Service
	Add Learning Standards	Standards	State Curriculum Frameworks	Service
	Comment	Comment	Assessment	Task
	Publish MCAS Test	Assessment	Assessment	Task

There is only one scenario for this process, which is the entry process described in Chapter 2

3.4.5.3 District Curriculum Guidelines Process

In this section we will document the Enterprise Tasks associated with a District Guideline Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-18: District Curriculum Guidelines Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
District Guidelines	Create, edit, delete, and view Objectives	Objective	Guideline	Task
	Create, edit, delete, and view Curriculum Content	Content	Guideline	Task
	Create, edit, delete, and view Instructional strategies	Guideline	Guideline	Task
	Create, edit, delete, and view Assessment Methods	Guideline	Guideline	Task
	Create, edit, delete, and view District Curriculum Guidelines	Guideline	Guideline	Task
	Add or Remove Learning Standard	Standard	Guideline	System
	View other districts' curriculum guidelines.	Guideline	Guideline	Task
	Add or Remove course	Course	Guideline	System
	Add or Remove Assessment Instruments	Assessment	Guideline	System
	Comment on District Curriculum Guidelines	Comment	Guideline	Task
	Publish District Curriculum Guidelines	Guideline	Guideline	Task

There are four scenarios for this process, which are illustrated in the Appendices are:

- Mapping
- Standards Based
- Performance Based
- Entry

3.4.5.4 Program of Studies Process

In this section we will document the Enterprise Tasks associated with a Program of studies Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-19: Program of Studies Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Program of Studies	Create, edit, delete, and view Course Listing	Program of Studies	Program of Studies	Task
	Create, edit, delete, and view Course Requirements	Program of Studies	Program of Studies	Task
	View and Add Curriculum Objectives	Objective	Program of Studies	Service
	View other school districts' Program of Studies	Program of Studies	Program of Studies	Task
	Add and Remove Courses	Course	Program of Studies	Service
	Add and Remove Teachers	Teacher	Program of Studies	Service
	Comment on Program of Studies	Comment	Program of Studies	Task
	Publish Program of Studies	Program of Studies	Program of Studies	Task

There are two Scenarios for this Process:

- Course Listing Entry
- Program of Studies Entry

3.4.5.5 Course Process

In this section we will document the Enterprise Tasks associated with a Course Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-20: Course Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Course	Create, Edit, Delete, and View Course	Course	Course	Task
	View Program of Studies	Program of Studies	Course	Service
	Create, Edit, Delete, and View Instructional Content	Content	Course	Task
	Create, Edit, Delete, and View Course Methodology	Course	Course	Task
	Add Curriculum Objectives	Objective	Course	Service
	Add and Remove Units	Unit	Course	Service
	Sequence Units	Unit	Course	Task
	Create Unit	Unit	Unit	Service
	Add or Remove Assessment instrument	Assessment	Course	Service
	Create, Edit, Delete and View Roster	Roster	Register Students	Service
	Add Roster to Course	Roster	Course	Service
	Add teachers	Teacher	Course	Service
	Comment on Course	Comment	Course	Task
	Publish Course	Course	Course	Task

There are four Scenarios for this Process:

- Standards Based
- Performance Based
- Activity/Content Based
- Entry

3.4.5.6 Unit Process

In this section we will document the Enterprise Tasks associated with a Unit Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-21: Unit Process

Process Icon	Enterprise Tasks	Primary Object	Module Interface	Interface Type
Unit	Create, Edit, Delete, and View Unit	Unit	Unit	Task
	Add and Remove Curriculum Objectives	Objective	Unit	Service
	Create, edit, delete, and view topic or theme	Content	Unit	Service
	Add and Remove Instructional Content	Content	Unit	Service
	Add to a Course	Course	Unit	Service
	Add and Remove Lesson	Lesson	Unit	Service
	Sequence Lesson	Lesson	Unit	Task
	Create, Edit, Delete, or View Lesson	Lesson	Lesson	Service
	Add and Remove Assessment instruments	Assessment	Unit	Service
	Comment on a Unit	Comment	Unit	Task
	Publish Unit	Unit	Unit	Task

There are three Scenarios for this Process:

- Standards Based
- Activity/Content Based
- Entry

3.4.5.7 Lesson Plan Process

In this section we will document the Enterprise Tasks associated with a Lesson Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-22: Lesson Plan Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
LESSON PLANNING	Create, edit, and delete lesson plan	Lesson	Lesson	Task
	View State Learning Standards	Standard	Frameworks	Service
	Add or remove Curriculum Objectives	Objective	Guideline	Service
	Create, edit, delete, and view Lesson Goals	Lesson	Lesson	Task
	Create, edit, delete, and view Mode of Instruction	Lesson	Lesson	Task
	Add lesson plan to unit	Unit	Unit	Service
	Add and remove activities	Activity	Lesson	Task
	Sequence activities	Activity	Lesson	Task
	Create assessment instruments	Assessment	Assessment	Service
	Add and remove Assessments	Assessment	Lesson	Service
	Search for Activities	Activity	Resource	Service
	Create Activity	Activity	Activity	Service
	Search for Instructional Content	Content	Unit	Service
	Add and remove Instructional Content	Content	Lesson	Service
	Add student work	Exemplar	Assessment	Service
	Comment - Reflection on lesson plan	Comment	Lesson	Task
Publish lesson plan	Lesson	Lesson	Task	

There are four Scenarios for this Process:

- Standards based
- Performance based
- Activity/Content based
- Entry

3.4.5.8 Activity Process

In this section we will document the Enterprise Tasks associated with an activity Process Icon, and identify the required modules and objects necessary to completing the Activity Process.

Table 3-23: Activity Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Activity	Create, Edit, Delete and View Activity	Activity	Activity	Task
	View a Lesson	Lesson	Activity	Service
	Add to Lesson	Lesson	Activity	Service
	Create, Edit, Delete, and View Procedure	Procedure	Activity	Task
	Add to Instructional Planner	Calendar	Activity	Service
	Create Instructional Plan Entry	Entry	Calendar	Service
	Add and Remove Instructional Content	Content	Activity	Service
	Add and Remove Assignment	Assignment	Activity	Task
	Add and Remove Resources	Resource	Activity	Task
	Comment on Activity	Comment	Activity	Task
	Publish Activity	Activity	Activity	Task

There is only the Entry Scenario for this Process.

3.4.5.9 Assessment Process

In this section we will document the Enterprise Tasks associated with an Assessment Process Icon, and identify the required modules and objects necessary to completing the Assessment Process.

Table 3-24: Assessment Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Assessment	Create, edit, and delete, and view Assessment Type	Assessment	Assessment	Task
	Create, edit, and delete, and view Performance Descriptors	Performance Descriptor	Assessment	Task
	Create, edit, and delete, and view Assessment Criteria	Assessment	Assessment	Task
	Create, edit, and delete, and view Weighting Scale	Assessment	Assessment	Task
	Create, edit, and delete, and view Directions	Assessment	Assessment	Task
	Create, edit, and delete, and view Rubric item	Rubric	Assessment	Task
	Create, edit, and delete, and view Test item	Test Item	Assessment	Task
	Create, edit, and delete, and view Answer Sheet	Test	Assessment	Task
	Create, edit, and delete, and view Answer Key	Test	Assessment	Task
	Create, edit, and delete, and view Reporting Category	Test	Assessment	Task
	Add or remove Curriculum Objectives	Objective	Assessment	Service
	Add or remove Learning Standards	Standard	Assessment	Service
	View Curriculum Guidelines	Guidelines	Assessment	Service
	View Curriculum Frameworks	Frameworks	Assessment	Service
	View school district's MCAS results	MCAS Results	Assessment	Service
	Comment	Assessment	Assessment	Task
	Publish Assessment Instrument	Assessment	Assessment	Task

There are three Scenarios for this Process:

- Standards based
- Performance based
- Entry

3.4.5.10 Instructional Planner Process

In this section we will document the Enterprise Tasks associated with a Planner Process Icon, and identify the required modules and objects necessary to completing the Instructional Planner Process.

Table 3-25: Instructional Planner Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Planner	Edit and View Instructional Planner	Planner	Calendar	Task
	Add or Remove Course	Event	Calendar	Service
	Add or Remove Unit	Event	Calendar	Service

	Add or Remove Lesson	Event	Calendar	Service
	Add or Remove Activity	Event	Calendar	Service
	Create, edit, delete and view Event	Event	Calendar	Service
	Create, edit, delete and view Instructional Entry	Entry	Calendar	Task
	Create, edit, delete and view Journal Entry	Journal	Calendar	Task
	Create, edit, delete and view Note	Note	Calendar	Task
	Comment on Planner	Comment	Calendar	Task
	Publish Planner	Planner	Calendar	Task

There is only the Entry Scenario for this Process.

3.4.5.11 Registration of Students to Classes Process

In this section we will document the Enterprise Tasks associated with a Register Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-26: Registration of Students to Classes Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Register Students	Create, Edit, Delete and View Roster	Roster	Register Students	Task
	Add and Remove Student from Roster	Student Roster	Register Students	Service
	Add Roster to Course	Course Roster	Register Students	Service
	Publish Roster	Roster	Register Students	Task

There is only the Entry Scenario for this Process.

3.4.5.12 Assigning, Collecting, and Assessing Student Work Process

In this section we will document the Enterprise Tasks associated with a Track Student Work Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-27: Assigning, Collecting, and Assessing Student Work Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Track Student Work	Create, Edit, View, Delete Assignment	Assignment	Activity	Service
	Add and Remove Assignment from Calendar	Calendar Grading Matrix	Calendar	Service
	View Student Work	Student work	Student Work	Service
	Assess Student Work	Student Work Assessment	Student Work	Service
	Score Student Work	Grading Matrix	Student Work	Service
	Return student Work	Student work	Student Work	Service
	Save Example Student Work	Student work	Assessment	Service
	Save Exemplary Student work	Student Work	Assessment	Service

Each of the Scenarios for this Process will be referenced here, with reference pointers to the Appendices or Chapter 2.

3.4.5.13 Tracking Student Achievement Process

In this section we will document the Enterprise Tasks associated with a Track Student Achievement Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-28: Tracking Student Achievement Process

Process Icon	Enterprise Tasks		Module	Interface
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		Object	Interface	Type
Track Student Achievement	Create, Edit, Delete, View Achievement Profile	Achievement Profile	Student Achievement	Task
	Create, Edit, Delete, View Competency Profile	Competency Profile	Student Achievement	Task
	Add and Remove Standard	Standard	Student Achievement	Service
	Add and Remove Objective	Objective	Student Achievement	Service
	Add and Remove Performance Indicator	Performance Indicator	Student Achievement	Service
	Add and Remove Assessment	Assessment	Student Achievement	Service
	Create, Edit, Delete, View Grading Matrix	Grading Matrix	Student Achievement	Task
	Add and Remove Assignment	Assignment	Student Achievement	Service
	Add and Remove Benchmark	Benchmark	Student Achievement	Service
	Publish Achievement Profile	Achievement Profile	Student Achievement	Task
	Publish Competency Profile	Competency Profile	Student Achievement	Task
	Publish Progress Report	Grading Matrix	Student Achievement	Task
	Publish Grading Matrix	Grading Matrix	Student Achievement	Task

Each of the Scenarios for this Process will be referenced here, with reference pointers to the Appendices or Chapter 2.

3.4.5.14 Tracking Student Attendance Process

In this section we will document the Enterprise Tasks associated with a Track Student Attendance Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-29: Tracking Student Attendance Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Track Student Attendance	Add and Remove Absences and Tardies	Attendance	Calendar	Task
	Publish Attendance	Attendance	Calendar	Task

Each of the Scenarios for this Process will be referenced here, with reference pointers to the Appendices or Chapter 2.

3.4.5.15 Tracking Student and Parent Contacts Process

In this section we will document the Enterprise Tasks associated with a Contact Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-30: Tracking Student and Parent Contacts Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Track Contacts	Create, Edit, Delete View Appointment with Parent	Contact	Calendar	Task
	Create, Edit, Delete View Appointment with Student	Contact	Calendar	Task
	Journal and Log Meeting with Parent	Contact	Calendar	Task
	Journal and Log Meeting with Student	Contact	Calendar	Task
	Publish Contacts	Contact	Calendar	Task

Each of the Scenarios for this Process will be referenced here, with reference pointers to the Appendices or Chapter 2.

3.4.5.16 Student Assignment Book Process

In this section we will document the Enterprise Tasks associated with an Assignment Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-31: Student Assignment Book Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Assignment Book	Edit, Create, Delete and View Assignment book	Calendar	Calendar	Task
	Receive Assignments from Teacher	Assignment	Calendar	Service
	Add or Remove Resource	Resource	Calendar	Service
	View Lesson	Lesson	Lesson	Service
	View Activity	Activity	Lesson	Service
	View Assessment	Assessment	Lesson	Service
	Create Note	Note	Calendar	Task

Each of the Scenarios for this Process will be referenced here, with reference pointers to the Appendices or Chapter 2.

3.4.5.17 Student Work Process

In this section we will document the Enterprise Tasks associated with a Submit Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-32: Student Work Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Submit Student Work	Receive Assignment	Assignment	Student Work	Service
	Create, Delete, Edit, View Student Work	Student Work	Student Work	Task
	Publish Student Work	Student Work	Student Work	Task
	Submit Student Work to Teacher	Student Work Teacher	Student Work	Service
	Self-Assess Student Work	Assessment	Student Work	Task
	Receive Assessment from Teacher	Assessment	Student Work	Service
	Add Student Work to Portfolio	Portfolio	Student Work	Service
	Comment on Student Work	Comment	Student Work	Task

Each of the Scenarios for this Process will be referenced here, with reference pointers to the Appendices or Chapter 2.

3.4.5.18 Student Portfolio Process

In this section we will document the Enterprise Tasks associated with a Submit Process Icon, and identify the required modules and objects necessary to completing the Enterprise Process.

Table 3-33: Student Portfolio Process

Process Icon	Enterprise Tasks	Object	Module Interface	Interface Type
Student Portfolio	Create, Delete, Edit, View Student Portfolio	Portfolio	Portfolio	Task
	Create, Edit, Delete and View Portfolio Goals	Portfolio	Portfolio	Task
	Create, Edit, Delete and View Portfolio Guidelines	Portfolio	Portfolio	Task
	Create, Edit, Delete and View Portfolio Competency Profile	Competency Profile	Portfolio	Service
	Add and Remove Student Assessments	Assessment	Portfolio	Service
	Add and Remove Student Work	Student Work	Portfolio	Service
	Comment on Student Work	Comment	Portfolio	Task
	Publish Portfolio	Portfolio	Portfolio	Task

Each of the Scenarios for this Process will be referenced here, with reference pointers to the Appendices or Chapter 2.

3.4.5.19 Other Processes

For each of the following processes there could be a similar set of tasks, objects, modules, interfaces, and scenarios. Documentation of these processes and tasks is not complete and does not always have a corresponding function, process, or task in the existing enterprise. In place of these processes and tasks, the module definitions in the next section describe the functional requirements in detail.

- **Instructional Resources Process**
- **Research for teaching or learning Process**
- **Reference documents, catalogs, sources Process**
- **Word Processing, Spreadsheets, Presentation Tools Process**
- **Classroom Troubleshooting Assistant Process**
- **Technology Competency Assistant Process**
- **Standards Based Education Assistant Process**
- **Network Troubleshooting Assistant Process**
- **Email, Fax, and Voicemail Process**
- **IP Conference Process**
- **Collaboration Process**
- **Web Publishing Process**
- **Shared Calendar Process**
- **Caching and Filtering Process**
- **Media and Content Process**
- **Online Courseware Process**
- **Tutor and Mentor Process**
- **Distance Learning Process**
- **VES Administration Process**
- **VES Individual Workspace Process**

- **Instructional Administration Process**
- **VES Directory Administration Process**

3.5 VES System Requirements



3

This is the final section of the VES System Requirements for software and applications. In this section the final set of connections get made. Here we document the relationship of each module to the objects with which it interfaces, we describe those interfaces, and we identify the set of actions (methods) which exist with respect to the Objects.

3.5.1 Overview and System Requirements Documentation

The requirements for the VES system components are documented in this section. This is where we get to give specific technical and functional requirements for VES Subsystems and Modules. VES Subsystems exist to group software into groupings that correspond to the functions of the enterprise. This is important because prospective vendors will become qualified VES vendors by subsystem. They will then be able to be issued work orders to develop, license and integrate products within that subsystem.

VES Modules exist **ONLY** as an abstraction for procurement and requirements specification. The Modules provide documentation of the objects and methods needed to perform enterprise tasks. There is no requirement to build modules as software programs. Rather, we hope creative vendors will deliver proposals for open, standards based distributed object architectures. If they do, the Module construct will be useful as a tool in validating their proposals, and products.

VES Module Requirements - These requirements describe the subsystems and modules necessary to meet the Enterprise Requirements. In Chapter 2, the Enterprise Requirements are defined as functions, processes, tasks, and scenarios performed by users. In an earlier section of this Chapter, the enterprise functions (and their processes scenarios and tasks) were aligned to system modules and user interface elements. In this final section, the modules and objects, and their methods and interfaces are enumerated.

VES Module Interface Requirements - These requirements describe the services provided by VES modules to other modules, and how modules relate to one another. There are two parts to the Module Interface Requirements: VESIA service interface requirements and Module task interface requirements.

3.5.2 Scenario Flowcharts and Task Primitives

In the actual design of VES components there is one other abstraction which may be useful to responders. In Chapter 2 a series of Scenario flowcharts were introduced. The rest of these flowcharts are provided in the Appendices. They document the sequences of tasks commonly used by users to complete enterprise processes.

There are a number of commonly used "routines" in these flowcharts that provide common functionality. We have identified those reusable task steps as Task primitives.

3.5.3 VES Module Functional and Interface Requirements

All VES modules have functional **task** based requirements which are satisfied in the VES user interface. These requirements are enumerated in this section of the document.

All VES modules also have **service** interface requirements which are satisfied by implementation of VESIA integration. These requirements are also enumerated in this section. Complete VESIA specifications are provided in Chapter 4.

3.5.4 Curriculum Management Subsystem

3.5.4.1 State Curriculum Frameworks Module

This module will enable appropriate DOE users to create, update, and publish the state curriculum frameworks.

The Frameworks Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-34: State Curriculum Frameworks Module

Module	Object	Role	Method	Task Interface	Service Interface
Frameworks	Frameworks	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	
	Viewer	View	X		
	Guiding Principles	Collaborator	Add, Remove	X	
	Habits of Mind		Add, Remove	X	
	Core Concepts		Add, Remove	X	
	Strands		Add, Remove	X	
	Learning Standards		Add, Remove	X	
	National Standards		Add, Remove	X	
	Comment		Add, Remove	X	

3.5.4.2 District Curriculum Guidelines Module

This module will enable appropriate users to create, update, and publish the district curriculum guidelines mapped to state standards.

The module will enable users to view sharable (district draft or endorsed or [work in progress]) guideline data side by side from multiple districts.

The Guidelines Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-35: District Curriculum Guidelines Module

Module	Object	Role	Action	Task Interface	Service Interface
Guidelines	Guideline	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	
	Viewer	View	X		
	Objective	Collaborator	Add, Remove	X	
	Curriculum Content		Add, Remove	X	
	Standard		Add, Remove	X	
	Course		Add to	X	
	Assessment		Add, Remove	X	

3.5.5 Instructional Design Subsystem

3.5.5.1 Course Module

This module will enable appropriate users to create, update, align, and publish courses and course descriptions.

The Course Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-36: Course Module

Module	Object	Role	Method	Task Interface	Service Interface
COURSE	Course	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	
	Viewer	View	X		
	Program of Studies	Collaborator	View	X	X
	Instructional Content		Add, Remove	X	
	Objective		Add, Remove	X	X
	Assessment		Add, Remove	X	
	Unit		Add, Remove	X	X
			Sequence	X	
	Create		X	X	
	Roster	Add, Remove	X	X	
Teacher	Add, Remove	X	X		

3.5.5.2 Unit Module

This module will enable appropriate users to create, design, update, and publish units of study within courses, and map them to district learning objectives or, in the absence of district learning objectives, state standards

The Unit Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-37: Unit Module

Module	Object	Role	Method	Task Interface	Service Interface
UNIT	Unit	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	

		Reviewer	Comment	X	
		Viewer	View	X	
	Instructional Content	Collaborator	Add, Remove	X	X
	Objective		Add, Remove	X	X
	Assessment		Add, Remove	X	X
	Lesson		Add, Remove	X	X
			Sequence	X	
		Create	X	X	
Course	Add to	X			

3.5.5.3 Lesson Module

The Lesson Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-38: Lesson Module

Module	Object	Role	Method	Task Interface	Service Interface
LESSON	Lesson	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	X
	Viewer	View	X	X	
	Activity	Collaborator	Add, Remove	X	
			Sequence	X	
			Create	X	
	Standard		View	X	X
	Objective		Add, Remove	X	X
	Assessment		Add, Remove	X	X
	Instructional Content		Add, Remove	X	X
	Unit		Add to	X	X
Exemplar	Add, Remove		X	X	

3.5.5.4 Activity Module

The Activity Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-39: Activity Module

Module	Object	Role	Method	Task Interface	Service Interface
ACTIVITY	ACTIVITY	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	X
	Viewer	View	X	X	
	PROCEDURE	Collaborator	Create, Edit, Delete, View	X	
			Sequence	X	
	OBJECTIVE		Add, Remove	X	
	ASSIGNMENT		Add, Remove	X	
	RESOURCE		Add, Remove	X	
	Lesson		Add to	X	X
			View	X	X
	Instructional Planner		Add to	X	X

	Instructional Content		Add, Remove	X	X
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This module will also enable users to search for activities and lesson plans by learning objective, state standard, subject-grade span, and key words.

3.5.5.5 Assessment Module

This module enables appropriate users to create, edit, publish, or search for shared assessments, rubrics, and test items to build authentic assessments that are mapped to learning objectives.

The Assessment Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-40: Assessment Module

Module	Object	Role	Action	Task Interface	Service Interface
Assessment	Assessment	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	
	Viewer	View	X	X	
	Learning Standard	Collaborator	Add, Remove	X	X
			Add, Remove	X	X
			View	X	X
			View	X	X
			View	X	X
			Add, Remove	X	
			Add, Remove	X	
			Add, Remove	X	
			Add, Remove	X	
Add, Remove			X		

	Achievement Profile		Update	X	X
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The Assessment Module is linked to the idea of a continuum of Achievement and Competency. Individual Assessments measure specific student knowledge, skills and abilities. This Module supports the development and use of standards based assessments as part of Instruction.

This module also supports an ongoing Achievement and Competency Assessment model which depends on well-defined and unambiguous definitions of what students should know, value, and be able to do in Courses, Units, Lessons and Activities. It also depends on the creation of Competency and Achievement profiles for these units of study, which map and store indications of what registered students, know, value and are able to do, as a result of the series of assignments and assessments and benchmarks completed.

Competency and Achievement Profiles:

The use of the Assessment Module to provide ongoing assessment depends on a well-defined competency model and a taxonomy of competencies. These profiles will be available to serve as the basis for reporting student achievement and as metacognitive maps of student competency.

The purpose of implementing ongoing assessment through Competency and Achievement profiles is to support the creation, exchange and reuse of Competency and Achievement Profiles in Individualization of Instruction and Competency or Skill Gap Analysis

The profiles are needed to implement standards based education because there are currently many definitions of the terms "Learning Objective", "Competency" and "Skill", and very little agreement between how those definitions can be used to define reusable data models. As part of the VES project we will define a common data model that allows the building of various competency models, hierarchies and maps to support ongoing individualized assessment. The Competency and Achievement profiles will contain information on student work products and performance. The performance information will be able to be stated at any granularity, from fine granularity (performance on an exercise) to course granularity (high school performance).

3.5.6 Instructional Management Subsystem

3.5.6.1 Planner and Journal Module

This module will enable appropriate users to manage and maintain an instructional planner and instructional journal. It will enable appropriate users to schedule lesson plans and their associated activities and assignments for each instance of each course. In addition, the user can keep track of the actual schedule as distinguished from the planned one and add commentary on the success and failures of each lesson.

The Planner Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-41: Instructional Management Subsystem Planner and Journal Module

Module	Object	Role	Method	Task Interface	Service Interface
PLANNER	Planner	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	
	Viewer	View	X		
	Calendar Event	Collaborator	Create, Edit, Delete, View	X	
			Add, Remove	X	X
	Note		Add, Remove	X	
	Journal	Add, Remove	X		

3.5.6.2 Class Registration Module

This module will enable appropriate users to create and manage rosters of students assigned to individual instances of a course.

The Class Registration Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-42: Class Registration Module

Module	Object	Role	Method	Task Interface	Service Interface
CLASS REGISTER	Roster	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	
	Viewer	View	X		
	Course	Collaborator	Add to	X	X
	Student		Add, Remove	X	X

3.5.6.3 Grading and Achievement Tracking Module

This module will enable appropriate users to create, manage, and publish student assignments, student work, and individual student achievement of standards.

The Tracking Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-43: Grading and Achievement Tracking Module

Module	Object	Role	Method	Task Interface	Service Interface
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Tracking	Grading Matrix	Manager	Change Status	X	X
			Change State	X	X
	Delete		X	X	
	Progress Report	Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	
		Viewer	View	X	
	Achievement Profile	Collaborator	Create, Edit, View, Delete	X	
	Publish		X		
	Competency Profile		Create, Edit, View, Delete	X	
	Publish		X		
	Standard		Add, Remove	X	X
	Objective		Add, Remove	X	X
	Performance Indicator		Add, Remove	X	X
	Assessment		Add, Remove	X	X
Assignment	Add, Remove		X	X	
Benchmark	Add, Remove		X	X	

3.5.7 Student Tools Subsystem

The Student Tools subsystem provides support for students. It supports the use of the VES Shared Calendar as an assignment book. It enables students to submit student work to their teachers, and it enables students and teachers to place student work in a student portfolio.

In this section, student means any VES learner when they are playing the role of student. That includes teachers and administrators acting as learners in professional development activity.

3.5.7.1 Assignment Book Module

This module will enable students, and parents, to see assignments posted by their teachers, and to enter assignments, to-dos and notes on their assignments. The Assignment Book is a page view of the VES Shared Calendar in an individual's Workspace.

The Assignment Book Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-44: Assignment Book Module

Module	Object	Role	Method	Task Interface	Service Interface
ASSIGNMENT	Assignment Book	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	
	Viewer	View	X	X	
	Assignments	Collaborator	View	X	X
	Resource		Add, Remove	X	X
	Lesson		View	X	X
	Activity		View	X	X
	Assessment		View	X	X
	Note		Add, Remove	X	X

3.5.7.2 Student Work Module

This module will enable appropriate users to create, manage, and publish student assignments, student work, and individual student achievement of standards.

The Student Work Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-45: Student Work Module

Module	Object	Role	Method	Task Interface	Service Interface
Student Work	Student Work	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	
	Viewer	View	X	X	
	Assessment	Collaborator	Add	X	
			View	X	X
	Assignment		View	X	X
	Portfolio		Add to	X	X

3.5.7.3 Portfolio Module

This module will enable appropriate users to place student test scores, student assignments, student work, evaluation rubrics, and other evidence of individual student achievement of standards, in portfolios.

The Student Work Module enables users with these (or higher) roles to take these actions upon these objects through its task or service interfaces:

Table 3-46: Portfolio Module

Module	Object	Role	Method	Task Interface	Service Interface
Portfolio	Portfolio	Manager	Change Status	X	X
			Change State	X	X
			Delete	X	X
		Collaborator	Edit	X	
			Create	X	
		Reviewer	Comment	X	
	Viewer	View	X	X	
	Competency Profile	Collaborator	Add, Remove	X	X
	Assessment		Add, Remove	X	X
	Student Work		Add, Remove	X	X

3.5.8 Productivity Tools Subsystem

3.5.8.1 Resource Tools

This set of tools enables appropriate users to create, edit, catalog, publish, or search for instructional resources mapped to district learning objectives or state learning standards, within VES and from other sources.

When teachers connect to the Resource Tools, they will be able to access all of the VES curriculum and instructional resources as well as a rich set of Internet-based educational resources. By using the VES Resource Tools, rather than an Internet search engine, teachers will be able to locate the standards based resources they need more quickly and efficiently.

When educators use the Resource Tools they should be able to:

- **find** resources by reference to their District Curriculum Guidelines or the State Curriculum Frameworks.
- **browse** through lists organized by subject, keyword, or grade/education level,
- **search** by subject, keyword, title or the full-text of the resource's catalog record,
- go directly to VES or external resources from the Resource Tools.

In this category we seek vendors with well developed software for cataloging, searching, and managing large collections, willing to integrate their products to meet the specifications of the VESIA.

Table 3-47: Resource Tools

Tool Scenario	Tool Features
Catalog Resource	Enter Metadata for Cataloging Process - Identify Resource
Search Resource	Enter Query, Retrieve Resources, Print, Save, Publish
Browse Resources	Enter Query, Browse Catalog, Print, Save, Publish
Indexing Tool	Automated tools for indexing web sites, documents, and other materials for inclusion in Resource catalogs
Library Catalog	Library Catalog - Tools to place the School library catalog on VES for integration into the Resource Catalog and for standalone searching and interlibrary loans

3.5.8.2 Research Tools

This set of tools enables appropriate users to conduct research in support of instructional and learning objectives. Ideally, the vendor proposed solutions should include:

- On-line Research Tools- Tools which provide assistance locating educational resources on the Internet
- Research Agent Tool - Tools that are capable of running queries and searches against hundreds of databases, scanning pages, summarizing results, unattended and returning the results to user in various formats

In this category we seek vendors with well developed software for online and offline research, willing to integrate their products to meet the specifications of the VESIA.

Table 3-48: Research Tools

Tool Scenario	Tool Features
On-line Research Tools	Standards based Enter Query, Retrieve Resources, Print, Save, Publish capable of integrating with other VES components using VESIA
Off-line Research Agent Tool	Standards based Enter Query, Retrieve Resources, Print, Save, Publish Seek Web based Search Agent Technology that eliminates duplicates, uses a configurable set of search engines, and indexes retrieved page content.

3.5.8.3 Reference Tools

This set of tools provides appropriate users with access to powerful on line reference materials in support of instructional and learning objectives

In each of the following categories, we seek exiting products and services that could be licensed to be made available to VES users to enrich the VES environment. Multimedia and interactive web based products are of particular interest. Vendors with reference engines, willing to integrate them into the VES environment are also of interest. We seek vendors with reference tools, willing to integrate their products to meet the specifications of the VESIA.

Table 3-49: Reference Tools

Tool Scenario	Tool Features
Dictionary	On-line Query Interface for Integration with VES Components
Atlas	On-line Query Interface for Integration with VES Components
Encyclopedia	On-line Query Interface for Integration with VES Components
Thesaurus	On-line Query Interface for Integration with VES Components
Quotations	On-line Query Interface for Integration with VES Components
Foreign Language	On-line Query Interface for Integration with VES Components
Almanac	On-line Query Interface for Integration with VES Components
Spell Checker	On-line Interface for Integration with VES Components

3.5.8.4 Desktop Tools

This set of tools provides appropriate users with access to powerful on line productivity tools (word processing, spreadsheet, presentation) in support of administrative, instructional and learning objectives.

Our objective is to license a powerful set of tools, that can be made available at no cost to all VES users. Compatibility with existing desktop productivity suites, currently in use in schools, is a high priority.

We seek vendors with well developed desktop tools, willing to integrate their products to meet the specifications of the VESIA or to permit download of tools for standalone use.

Table 3-50: Desktop Tools

Tool Scenario	Tool Features
Word Processing	Standard Word Processing Features as in Microsoft Word and WordPerfect
Spreadsheet	Standard Spreadsheet Features as in Microsoft Excel and QuattroPro
Presentation	Standard Presentation Tool Features as in Microsoft Powerpoint and Presentations
Graphic Design	Standard Graphics Program Features as in Perfect Picture and Adobe Photoshop
Multimedia Design	Standard Multimedia Tool Features as in HyperStudio and Director
Database	Standard Database Features as in Microsoft Access and Paradox

3.5.9 Technology Support Subsystem

The principal function of the Technology Support Subsystem is to provide a suite of intelligent support assistants and embedded training to enable every teacher and student to become a successful and productive user of VES. The implementation of any new system is often frustrating to end users. The Technology Support System is the safety net that will assure widest possible adoption of VES tools, resources, and services.

3.5.9.1 Classroom Troubleshooting Module

The objective of the Classroom Troubleshooting Module is to support classroom teachers, and their students in the use of technology. The CTM will support three interfaces:

- Diagnostic Expert System Troubleshooting Assistant (It won't ...)
- Task Oriented Technology Assistant (How do I...?)
- Embedded Training Assistant (Teach me about...)

All three will use the same knowledge base and will present their interfaces seamlessly in VES components by utilizing VESIA Level 2 Integration.

It is also expected that this collection of assistants will use the IEEE 1484 Agent /Tool Protocols.

Table 3-51: Classroom Troubleshooting Module Requirements

Tool Scenario	Tool Features
Diagnostic Assistant	Provide walkthrough of diagnostic procedure to isolate problem when something goes wrong...video and audio prompts as necessary. Result should be resolution of problem. Example: The printer won't work!
Task Assistant	Whenever a user wants to know how to do something they can just ask in plain English. They will be presented with a set of task descriptions. By selecting one, they will be presented with a procedural view of the steps involved in doing what they need to do. Example: How do I find out my IP Address?
Embedded Training Assistant	When the need is not a problem, or a specific task, but a more general question of understanding, the Embedded Training Assistant will lead the learner through a well designed set of mini lessons until their questions are answered. Example: Teach me how to hook up a scanner.

There are three additional requirements for this Module:

- Interface with and updates to Technology Competency Profiles of users as users develop and use new skills.
- Maintenance of configuration and simplified inventory files so that it starts each incident or session with knowledge of classroom hardware configurations

- In Diagnostic Assistant, when the knowledge base of the system is exhausted and no solution is found, four things should happen:

The appropriate VES or local help desk escalation procedure should be invoked, and all current problem documentation forwarded to the appropriate default, or local help desk.

This should be a closed loop system, where new knowledge is added to the knowledge base each time an unexpected problem is resolved.

Statistics on each problem should be maintained, and

Classroom inventory files updated as a result of actions taken.

3.5.9.2 Technology Competency Module

The principal function of this module is to collect, document, and maintain profiles of technology competency on teachers and students. A baseline competency profile will be developed through a technology competency self-assessment. This module will interface with several other modules.

Table 3-52: Technology Competency Module Requirements

Tool Scenario	Tool Features
Self Assessment	. A baseline competency profile will be developed through a technology competency self-assessment.
Competency Prescriptions	Based on the self-assessment a set of technology activities and training may be prescribed to meet individual user technology competency goals. What do I want to do with technology In my classroom.
Portfolio Maintenance	As users acquire new competencies these update the Competency Profile and the user Portfolio.
Professional Development Planning	The Competency Profile, Self-Assessment, and Portfolio will all be available to assist with the creation of the annual Professional Development Plan by each user.
Automatic Competency Updates	As users complete diagnostic actions, or assessment activities in the Classroom Troubleshooting Module, the Network Troubleshooting module, or other VES modules, their Competency Profile will be automatically updated.

3.5.9.3 Standards Based Education Module

The objective of the **Standards Based Education Module** is to support classroom teachers, school and district administrators in the use of VES and standards based education. The SBEM will support three interfaces:

- Diagnostic Expert Problem Solving Assistant (It won't ...)
- Task Oriented Technology Assistant (How do I...?)
- Embedded Training Assistant (Teach me about...)

All three will use the same knowledge base and will present their interfaces seamlessly in VES components by utilizing VESIA Level 2 Integration.

Table 3-53: Standards Based Education Module Requirements

Tool Scenario	Tool Features
Curriculum Development	Explanation and Demonstration of Tools and Scenarios for Standards Based Curriculum Development.
Instructional Design	Explanation and Demonstration of Tools and Scenarios for Standards Based Instructional Design.
Instructional Management	Explanation and Demonstration of Tools and Scenarios for Standards Based Instructional Management.
Student Tools	Explanation and Demonstration of Tools and Scenarios for Standards Based Student Tools.

There are three additional requirements for this Module:

Interface with and updates to Technology Competency Profiles of technology coordinators as they develop and use new skills.

Maintenance of network configuration, network topology, and simplified inventory files so that it starts each incident or session with knowledge of network hardware configurations

In Diagnostic Assistant, when the knowledge base of the system is exhausted and no solution is found, four things should happen:

The appropriate VES or local help desk escalation procedure should be invoked, and all current problem documentation forwarded to the appropriate default, or local help desk.

This should be a closed loop system, where new knowledge is added to the knowledge base each time an unexpected problem is resolved.

Statistics on each problem should be maintained, and

Network inventory files updated as a result of actions taken.

3.5.9.4 Network Troubleshooting Module

The objective of the Network Troubleshooting Module is to support district and school technology coordinators, and their students in the use of networking technology. The NTM will support four interfaces:

- Diagnostic Expert System Troubleshooting Assistant (It won't ...)
- Task Oriented Technology Assistant (How do I ...?)
- Embedded Training Assistant (Teach me about ...)
- Automatic Fault Notification Service (...Just went down!)

All three will use the same knowledge base and will present their interfaces seamlessly in VES components by utilizing VESIA Level 2 Integration.

It is also expected that this collection of assistants will use the IEEE 1484 Agent /Tool Protocols.

Table 3-54: Network Troubleshooting Module Requirements

Tool Scenario	Tool Features
Diagnostic Assistant	Provide walkthrough of diagnostic procedure to isolate problem when something goes wrong...video and audio prompts as necessary. Result should be resolution of problem. Example: The printer won't work!
Task Assistant	Whenever a user wants to know how to do something they can just ask in plain English. They will be presented with a set of task descriptions. By selecting one, they will be presented with a procedural view of the steps involved in doing what they need to do. Example: How do I find out my IP Address?
Embedded Training Assistant	When the need is not a problem, or a specific task, but a more general question of understanding, the Embedded Training Assistant will lead the learner through a well designed set of mini lessons until their questions are answered. Example: Teach me how to hook up a scanner.
Fault Notification Assistant	Based upon a default network topology profile, and notification profile, the Automatic Fault Notification Assistant will continually check for the health of the network and its components. When one goes down it will follow the notification protocol to beep, email, fax, or telephone the appropriate technology person. This module should also keep records of system utilization, performance, and uptime and be able to make notifications when exceptional performance is recorded.

There are three additional requirements for this Module:

Interface with and updates to Technology Competency Profiles of technology coordinators as they develop and use new skills.

Maintenance of network configuration, network topology, and simplified inventory files so that it starts each incident or session with knowledge of network hardware configurations
In Diagnostic Assistant, when the knowledge base of the system is exhausted and no solution is found, four things should happen:

The appropriate VES or local help desk escalation procedure should be invoked, and all current problem documentation forwarded to the appropriate default, or local help desk.

This should be a closed loop system, where new knowledge is added to the knowledge base each time an unexpected problem is resolved.

Statistics on each problem should be maintained, and

Network inventory files updated as a result of actions taken.

3.5.10 Instructional Support Subsystem

The Instructional Support System is charged with providing on-line Instructional Content for users of VES. Although the focus of the system is supporting teaching and learning in the classroom, VES may use on-line Instructional Support for professional development, classroom enrichment, and administrative support.

All Instructional Content proposed within this subsystem, must be capable of at least VESIA Level 1 Integration. It is preferable to support Level 2 VESIA Integration. Administration of on-line Instructional Content will be handled by the Instructional Administration Module in the VES Administrative Subsystem..

3.5.10.1 Online Courseware Products

In this section, vendors should propose On-line Courseware products which will assist Teachers, Students, and Parents to raise student achievement. Three categories of on-line Courseware are sought:

- VES Hosted Courseware
- Vendor Hosted Courseware
- Courseware Portals and Design Tools

Table 3-55: Online Courseware Products Requirements

Tool Scenario	Tool Features
VES Hosted Courseware	Vendors should propose On-line Courseware products, which will assist Teachers, Students, and Parents to raise student achievement.
Vendor Hosted Courseware	Vendors should propose On-line Courseware products, which will assist Teachers, Students, and Parents to raise student achievement.
Courseware Portals and Design Tools	Vendors should propose On-line Courseware products, which will assist Teachers, Students, and Parents to raise student achievement.

All Courseware proposed within this subsystem, must be capable of at least VESIA Level 1 Integration. It is preferable to support Level 2 VESIA Integration. Administration of on-line Instructional Content will be handled by the Instructional Administration Module in the VES Administrative Subsystem.

3.5.10.2 Tutoring - Mentoring Tools

In this section, vendors should propose On-line Tutoring and Mentoring products and services which will assist Teachers, Students, and Parents to raise student achievement. Three categories of on-line Tutoring and Mentoring Tools are sought:

- VES Hosted Online Tutoring and Mentoring Support Software
- Vendor Hosted Online Tutoring and Mentoring Support Software
- Vendor Provided Online Tutoring and Mentoring Services

Table 3-56: Tutoring - Mentoring Tools Requirements

Tool Scenario	Tool Features
VES Hosted Online Tutoring and Mentoring Support Software	Vendors should propose On-line Tutoring and Mentoring products and services, which will assist Teachers, Students, and Parents to raise student achievement.
Vendor Hosted Online Tutoring and Mentoring Support Software	Vendors should propose On-line Tutoring and Mentoring products and services, which will assist Teachers, Students, and Parents to raise student achievement.
Vendor Provided Online Tutoring and Mentoring Services	Vendors should propose On-line Tutoring and Mentoring products and services, which will assist Teachers, Students, and Parents to raise student achievement.

All Tutoring and Mentoring software and services, proposed within this subsystem, must be capable of at least VESIA Level 1 Integration. It is preferable to support Level 2 VESIA Integration. Administration of on-line Tutoring and Mentoring will be handled by the Instructional Administration Module in the VES Administrative Subsystem.

3.5.10.3 Distance Learning Tools

In this section, vendors should propose On-line Distance Learning products which will assist Teachers, Students, and Parents to raise student achievement. Three categories of on-line Distance Learning courses are sought:

- VES Hosted Distance Learning
- Vendor Hosted Distance Learning
- Distance Learning Portals and Design Tools

All Distance Learning proposed under this section must be related to professional development issues, or be fully aligned to the Massachusetts Curriculum Frameworks if that is appropriate. These Distance Learning courses may be offered for remediation or enrichment, and may bear high school or college credit.

Table 3-57: Distance Learning Tools Requirements

Tool Scenario	Tool Features
VES Hosted Distance Learning	Vendors should propose On-line Distance Learning products, which will assist Teachers, Students, and Parents to raise student achievement. All Distance Learning proposed under this section must be related to professional development issues, or be fully aligned to the Massachusetts Curriculum Frameworks if that is appropriate.
Vendor Hosted Distance Learning	Vendors should propose On-line Distance Learning products, which will assist Teachers, Students, and Parents to raise student achievement. All Distance Learning proposed under this section must be related to professional development issues, or be fully aligned to the Massachusetts Curriculum Frameworks if that is appropriate.
Distance Learning Portals and Design Tools	Vendors should propose On-line Distance Learning products, which will assist Teachers, Students, and Parents to raise student achievement.

All Distance Learning courses and services, proposed within this subsystem, must be capable of at least VESIA Level 1 Integration. It is preferable to support Level 2 VESIA Integration. Administration of on-line Distance Learning, will be handled by the Instructional Administration Module, in the VES Administrative Subsystem.

3.5.11 Communications and Collaboration Support Subsystem

3.5.11.1 Unified Messaging - Email, FAX and Voicemail Services

Educators and students use email, fax, and voicemail in teaching and learning. Email between teachers and their students, and among students can add significant value to classroom learning activities. Use of mailing lists and email discussion groups create rich opportunities for student interaction. Voicemail and email also provide additional communications opportunities between educators and parents. The ability for educators to manage more efficiently their fax, email, and voicemail with a single unified messaging interface will be a benefit.

Table 3-58: Email, FAX and Voicemail Services - Unified Messaging Requirements

Tool Scenario	Tool Features
Standalone Email	Create, edit, send web based email Receive, read, reply, forward, delete, store, print web based email Manage multiple email accounts (web interface)
Standalone	Send, receive, forward, delete, store, print web based fax

FAX	Manage fax account (web interface)
Standalone Voicemail	Create, edit, send web based voicemail Receive, listen to, reply, forward, delete, store, web based voicemail Create voicemail answering messages and activate them Manage voicemail account (web interface)
Unified Messaging	Create, edit, send web based email and voicemail Receive, read, listen to, reply, forward, delete, store, web based email and voicemail Retrieve email and voicemail from a VoIP or conventional telephone Manage multiple email accounts, voicemail, and fax account in a unified interface (web interface) with a rule-based inbox metaphor Print logs of messages Set up pager or phone notification of priority email, fax, or voicemail messages Route VoIP, and priority messages to another IP address or conventional telephone number Schedule features of Unified Messaging by days of week, times of day, etc.

In the planning of a proposal responding to the VES unified messaging requirements, vendors should be aware of the following IETF Working Group:

[ACAP -- Application Configuration Access Protocol \(RFC 2244\)](#)

The work of this group provides a protocol specification for Email Personalization and Nomadic Email Account Maintenance. Vendors should consider this important document in proposing similar services to meet VES requirements.

ACAP Email Personality Class

In VES it will be common for Internet mail users to receive and compose mail in the capacity of different roles or identities (for example, personal and work), to receive and compose mail at different machines, and to use multiple programs which require mail composition configuration information. These different roles or identities have become known as email personalities. The Application Configuration Access Protocol [ACAP] provides an ideal mechanism for storage of email personality data. This specification defines a standard ACAP dataset class for email personalities, and a common option for indicating a default.

ACAP Email Account Dataset Class

In the VES environment, it will be common for VES mail users to have more than one account where mail is received, to access multiple accounts from the same machine, to access the same accounts from different machines, and to use multiple programs which require email account configuration information. The Application Configuration Access Protocol [ACAP] provides an ideal mechanism for storage of email account data. This specification defines a standard ACAP dataset class for email accounts, and a common option for indicating a default email account.

IP Conferences

This set of tools provides appropriate users with access to powerful on line IP conferencing services in support of administrative, instructional and learning objectives. These services will include: white-boarding, video and audio conferencing, voice over IP.

Conferencing Tools proposed in this section must meet VES requirements for relevant and applicable standards, and be capable of Integration with the VESIA. We seek VES hosted solutions.

Table 3-59: IP Conference Tools Requirements

Tool Scenario	Tool Features
Chat Conference	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Audio Conferencing	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2. Vendors may also propose end user hardware in this category.
Video Conferencing	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Whiteboard Conferencing	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2. Vendors may also propose end user hardware in this category.
VoIP Calls	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2. Vendors may also propose end user hardware in this category.
Video Calls	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2. Vendors may also propose end user hardware in this category.
Server Support for all of the above	Vendors should specify support in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2. Vendors may also propose server hardware in this category.

3.5.11.2 Collaboration Tools

This set of tools provides appropriate users with access to powerful on line collaboration and community building services in support of administrative, instructional and learning objectives. These collaboration services will include: mailing lists, threaded discussion forums, real time discussion spaces, and multidimensional training environments

Collaboration Tools proposed in this section must meet VES requirements for relevant and applicable standards, and be capable of Integration with the VESIA. We seek VES hosted solutions.

Table 3-60: Collaboration Tools Requirements

Tool Scenario	Tool Features
Mailing List	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Listserv	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
News Group	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Threaded Discussion Group	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Chat Room	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Voice Chat Room	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
MUD, MOO	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Real-Time Interactive Games Server	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2. Vendors may also propose server hardware in this category
3D Immersive Environment Server	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2. Vendors may also propose server hardware in this category

3.5.11.3 Web Publishing

This set of tools provides appropriate users with web hosting and publishing services in support of administrative, instructional and learning objectives. These services will include: turnkey web portals, domain registration, hosting of district, school, and classroom web sites, and tools to make it easy for users to maintain their sites.

Collaboration Tools proposed in this section must meet VES requirements for relevant and applicable standards, and be capable of Integration with the VESIA. We seek VES hosted solutions.

Table 3-61: Web Publishing Tools Requirements

Tool Scenario	Tool Features
Web Portal Turnkey Software	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Web Page Authoring	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Web Site Creation and Management	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
.us Domain Registration Tools	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Web Site Indexing	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Web Hosting and Support	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2. Vendors may also propose server hardware in this category
Broken Link Notification Service	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Web Traffic Statistics	Vendors should specify tools in this class available for hosting on VES Host Environment, with licensing and integration to VESIA Level 1 or 2.

3.5.11.4 Shared Calendar

The shared calendar requirements represent a core set of requirements. They support all VES users directly. They provide the teacher's Instructional Planner and Journal, and the Student Assignment Book, as well as every user's Workspace Calendar.

Each VES user will be provided with a multipurpose desk calendar and planner to assist them in completion of their work. The calendar will contain a number of layers, calendar formats, and several views, which will be configurable by the individual user and their organization.

Individuals will be able to plan and schedule events, activities, and instruction in the calendar with a drag-drop metaphor. Items entered will be flowed in or anchored to a date/time. If an item is not completed, or takes longer than expected it can be removed or expanded and the successive calendar entries will be adjusted.

Individuals will be able to record journal entries of actual events, activities, and instruction.

Organizations can identify events, which will be inherited by all of their member's calendars. In addition, individuals, or groups, can "subscribe" to events, which will be included in their calendars. Items like student assignments, which are entered by teachers, will be visible in student class member's calendars and parent's calendars.

When a user configures their calendar they select default views, formats, pages and map subscriptions and optional events to those pages.

Calendar Formats:

- Year
- Semester
- Month
- Week
- Day
- Calendar Views:
- Course View
- Calendar View
- Calendar Pages/Layers:

- Daily (Instructional) Planner
- Daily (Instructional) Journal
- Events
- Resource Scheduling
- Professional Development
- Personal
- etc.

Calendar Examples:

- Teacher Calendar (Instructional Planner/Journal)
- Student Calendar (Assignment Book)

Important Calendaring Terms:

Organizational Hierarchy: The organizations to which an individual belongs (e.g. Math Faculty, School, District)

Calendar Interchange Protocol: A well-defined set of messages for calendar maintenance and management and the rules for their exchange. The Calendar Interchange Protocol makes it possible for internal and external software systems to communicate with the VES calendar.

Calendar GUI: The user interface will contain a number of layers, calendar formats, and several views which will be configurable by the individual user and their organization.

Scheduling GUI: The user interface will provide tools for VES Calendar Sources to input events and entries for inclusion in VES calendars.

VES Calendar Sources: The VES, district, and school entities, which can generate events and entries for inclusion within VES calendars. Source entities will be provided with a Scheduling GUI and automated Calendar Interface. District VES customization will authorize Calendar Sources and define the Inheritance characteristics of the Organizational Hierarchy.

Calendar Subscription Sources: The third party entities, which can generate events and entries for inclusion within VES calendars. It is assumed that third party subscription sources will use the automated VES Calendar Interface and its protocols.

Calendar Inheritance: the property of calendars, which enables a calendar to contain events and entries from the Organizational hierarchy and other calendar sources and calendar subscriptions.

Automated Calendar Interface: This interface will permit the input, update, and deletion of entries and events by other VES software modules. It will be defined by a well-defined set of Calendar interchange protocols.

Calendar Engine: the software, which provides customized, dynamic calendaring services to all VES users. The calendar engine contains Calendar GUI, Scheduler GUI, Calendar transaction protocols.

Calendar Database: the repository for all calendaring information elements in VES. The Calendar Engine accesses this database to present Calendar and Scheduling GUI's and automated interfaces.

Calendar Requirements Examples:

The following examples illustrate VES user's basic calendaring and scheduling needs:

A district administrator wants to maintain her schedule on the VES Workspace, which she can access from anywhere.

Need: Read and manipulate one's own calendar.

A curriculum development team wishes to share agenda information by using a group scheduler in order to, eliminate conflicts, and more effectively schedule their time.

Need: Share calendar information with selected other VES users.

A teacher wants to plan next week's lessons in their Instructional Planner page of their VES calendar, and share it with their classroom paraprofessionals.

Need: Schedule calendar events and todos with other VES users.

A student, and their parent, looks at the Assignment Book page of their VES calendar, to determine what homework the student has.

Need: Schedule assignments with VES users (students).

A teacher wants his students to be able to book time slots during his homework help after-school hours.

Need: Schedule calendar events and to-dos with VES users.

The Department of Education wants to publish its schedule of Technology Workshops and Seminars so that district technology coordinators can easily access it and register for events.

Need: Share calendar information with VES users by publishing it to their calendars.

A district wants to publish the school year calendar to all VES users in that district. In addition, they want to be able to modify it easily to reflect snow days and the change they make to the end of the school year.

Need: Share calendar information with VES users by publishing it to their calendars.

A teacher wants to be sure to tell their students when MCET and Discovery Channel programs, relevant to their classwork, will be on TV. The teacher subscribes to free MCET and Discovery Channel schedule and calendar subscription services. Those programs appear each day in the teacher's Media page of their calendar and when programs on specific topics are scheduled, the teacher is automatically notified in advance by email.

Need: Share calendar information with VES users by publishing it to their calendars.

A teacher's association wants to plan and schedule a meeting, share an agenda and collect RSVPs.

Need: Share calendar and agenda information with VES users by publishing it to their calendars and asking for RSVP.

Table 3-62: Shared Calendar Requirements

Tool Scenario	Tool Features
Personalize Calendar	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Email, Fax, and Voicemail Integration	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Subscribe to Event Schedules	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Calendar Event Inheritance	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Calendar Event Filtering	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Instructional Planning and Journaling	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Assignment Book	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Attendance Book	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Contact Log and Schedule Book	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Calendar Sharing	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Handheld Edge Device Synchronization	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Event Invitation and RSVP	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
To do list and Project Plan	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.
Resource and Room Scheduling	Vendors should specify calendar features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 or 2.

The Internet Engineering Task Force (IETF) has a Working Group building specifications on the important application of the Web based calendar. Since the VES requirements extend beyond the capabilities of any existing calendar software or service we look to the IETF specification as a basis for the extended functionality required in the VES shared calendar. We plan to implement open standards based calendar requirements and will be challenging our vendors and partners to implement it, too.

The IETF group will create standards that make calendaring and scheduling software significantly more useful, and to enable a new class of solutions to be built that are only viable if open standards exist. The Calendaring and Scheduling Working Group is chartered to focus on Internet standards for three basic problems facing group scheduling and calendaring users today. These include the following:

A standard content type for capturing calendar event and to-do information. The content type should be suitable as a MIME message entity that can be transferred over MIME based email systems or HTTP World Wide Web. The basic objects along with their representation using MIME will be specified in the document entitled "Core Object Specification".

A standard peer-to-peer protocol for common calendaring and group scheduling transactions. For example, these may include exchanging over the Internet, event-requests, reply to event-requests, cancellation notices for event-requests, requesting free/busy time and replying to free/busy time requests between different calendaring products. The working group will undertake this work in two phases, with the first phase focusing on meeting requests and the second phase on free-busy time. To the extent that the peer-to-peer protocol has requirements related to security, the working group will attempt to apply existing Internet standards for authentication, and to assure privacy and integrity of sensitive calendaring information. The protocol for the interoperable transactions will be specified in a document called "Calendar Interoperability Protocol" in the milestone list.

A standard access protocol to allow for the management of calendars, events and to-dos over the Internet. This protocol will be specified in the document called "Calendar Access Protocol" in the milestone list.

Current IETF Calendar Standard documents include:

[CAP Requirements](#)

[iCalendar Real-time Interoperability Protocol \(IRIP\)](#)

[iCalendar v2.0 Formal Public Identifier](#)

[Internet Calendaring and Scheduling Core Object Specification \(iCalendar\)](#)

[Calendar Access Protocol \(CAP\)](#)

[Implementors' Guide to Internet Calendaring](#)

Pending IETF Calendar Standard documents include:

[Calendar attributes for vCard and LDAP \(RFC 2739\)](#)

[Internet Calendaring and Scheduling Core Object Specification \(iCalendar\) \(RFC 2445\)](#)

[iCalendar Transport-Independent Interoperability Protocol \(iTIP\) Scheduling Events, BusyTime, To-dos and Journal Entries \(RFC 2446\)](#)

[iCalendar Message-based Interoperability Protocol \(iMIP\) \(RFC 2447\)](#)

Vendors should be familiar with these documents and be prepared to work with them if selected to participate in the VES project.

Explanation of Calendar Protocol Requirements

A number of the needs, stated at the beginning of this section, can be satisfied through proprietary calendar solutions, but several of the needs cannot. From these needs we can establish that protocols are required for accessing information in a calendar store, and for scheduling events and to-dos. In addition, these protocols require a data format for representing calendar information. These roles are filled by the following protocol requirements.

[ICAL] is the data format [ICAL] provides data format for representing calendar information, which the other protocols can use. [ICAL] can also be used in other contexts such as a drag and drop format or an export/import format. All the other protocols depend on [ICAL], so all elements of a standards-based calendaring and scheduling systems will have to interpret [ICAL].

[ITIP] is the scheduling protocol [ITIP] describes the messages used to schedule calendar events. These messages are represented in [ICAL], and have semantics that include such things as being an invitation to a meeting, an acceptance of an invitation or the assignation of a task. [ITIP] messages are used in the scheduling work flow, where users exchange messages in order to organize things such as events and to-dos. CUAs generate and interpret [ITIP] messages at the direction of the calendar user. [ITIP] is transport-independent, but has two specified transport bindings, [IMIP] is a binding to email and [IRIP] is a real-time binding. In addition [CAP] will provide a second real-time binding of [ITIP], allowing CUAs to perform calendar management as well as scheduling over a single connection. Both CUAs and calendar services may have [ITIP] interpreters.

[CAP] is the calendar management protocol [CAP] describes the messages used to manage calendars. These messages are represented in [ICAL], and have semantics such as being a search for data, being data in response to a search or the being the creation of a meeting. [CAP] also provides a real-time binding for the calendar management messages. Although other bindings, such as an email binding, could be defined, this is not done because it is inappropriate for this protocol. The following diagram describes the implementation dependencies between the protocols. A calendar system using these standards will implement at least one of the leaves of the tree. The calendar management message and transport protocol parts of CAP are separated in the diagram to highlight its relationship to ITIP.

Calendar Standards Examples:

Returning to the examples at the beginning of this section, they can be solved using the protocols in the following ways:

The district administrator, who wishes to access her agenda from anywhere on the VES Workspace, can use a [CAP] enabled VES calendar service accessible through the internet. She can then use whichever [CAP] clients are available to access the data.

A proprietary system could also be employed which provides access through a web-based interface, but the use of [CAP] would be superior in that it would allow the use of third party tools, such as PDA synchronization tools.

The curriculum development team can use a VES calendar service which supports [CAP] and then each member can use a [CAP]-enabled CUA of their choice. Alternatively, each member could use an [IMIP]-enabled VES CUA, and they could book meetings over email.

This solution has the drawback that it is difficult to examine the other agendas, making organizing meetings more difficult. Proprietary solutions are also available, but they require that all people use clients by the same vendor, and disallow the use of third party applications.

The teacher can set up a calendar service, and have students book time through any of the [ITIP] bindings. [CAP] or [IRIP] provide real-time access, but could require additional configuration. [IMIP] would be the easiest to configure, but may require more email processing. If [CAP] access is provided then determining the state of the teacher's schedule is straightforward. If not, this can be determined through [ITIP] free-busy requests. Non-standard methods could also be employed, such as serving up ICAL, HTML, XML through HTTP.

A proprietary system could also be used, but would require that all students be able to use software from a specific vendor.

For publishing DOE's technology schedule [CAP] provides the most advanced access and search capabilities. It also allows easy integration with VES user's calendar systems.

Non-standard methods such as serving data over HTTP could also be employed, but would be harder to integrate with user's systems. Using a completely proprietary solutions would be very difficult since it would require every user to install and use proprietary software.

The teacher's association could distribute meeting information in the form of [ITIP] messages. This could be done over email using [IMIP], or [IRIP] depending on the recipient. Meeting invitations, as well as a full published agenda could be distributed.

Alternatively, the teacher's association could provide access to a [CAP] enabled calendar service, however this solution would be more expensive since it requires the maintenance of a server.

3.5.11.5 Caching and Filtering Module

Many VES user organizations have implemented caching and filtering appliances on their networks, or software on their firewall servers. Many others have not made the investment at this time. DOE requires all school districts to have a filtering and Internet protection plan in place. These VES requirements will provide locally configurable filtering and caching services, as an option, to all VES organizations. Vendors should propose turnkey solutions, which are scalable to meet VES requirements.

Table 3-63: Caching and Filtering Module

Tool Scenario	Tool Features
Filter Localization and Control	Vendors should specify caching and filtering features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 - 2.
Distributed Cache Configuration And Control	Vendors should specify caching and filtering features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 - 2.
Dynamic Cache	Vendors should specify caching and filtering features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 - 2.
Pre-Caching by Request	Vendors should specify caching and filtering features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 - 2.
Distributed Cache Protocol Support	Vendors should specify caching and filtering features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 - 2.
Cache Performance Audit Report	Vendors should specify caching and filtering features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 - 2.
Filter Audit Report	Vendors should specify caching and filtering features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 - 2.
Other Proxy Services	Vendors should specify caching and filtering features, which are available for hosting on the VES Host Environment, with licensing and integration to VESIA Level 1 - 2.

3.5.11.6 Media and Content

There are six sets of requirements in this section:

VES seeks vendors and partners who have collections of Media and Content that would add value to the VES environment. Vendors should be willing to index and categorize media and content according to the VES Knowledge Content Schema. This Schema will be provided to vendors who qualify and are selected.

We also seek hardware and software vendors to provide equipment and support to build a streaming multimedia content facility, or alternatively to provide those services to VES. This facility will be to support VES Technology Support embedded multimedia training services, school web radio and TV stations, and school special events.

We seek vendors who can provide multicasting hardware and software for use on the Internet, and on MPEG2 DVB satellite links.

We seek a media hosting capability to support an instructional media database containing large numbers of multimedia assets, to support exhibition of Student Work, for the publication of Web documents.

Internet resources for students, parents, educators, including news resources.

Media Cataloging and Content Indexing tools and support.

Table 3-64: Media and Content Requirements

Tool Scenario	Tool Features
Third Party Media and Content Resources	Multimedia, Text, Audio, and Video collections are sought. Online textbooks aligned to the Massachusetts Curriculum Frameworks. Vendors should specify media content features and describe the hosting requirements for proposed media and content.

Streaming Media Content Facility	A broadband multimedia Internet delivery facility is sought. Vendors should specify media content features and describe the hosting requirements for proposed media and content.
Multicasting Hardware and Software (Satellite & Internet)	Broadband multicasting Internet delivery facility is sought. Vendors should specify media content features and describe the hosting requirements for proposed media and content.
Media Hosting Environment	A broadband multimedia Internet hosting facility is sought. Vendors should specify media content features and describe the hosting requirements for proposed media and content.
Media Cataloging and Content Indexing Tools	A set of real time media cataloging tools is sought. Vendors should specify media content features and describe the hosting requirements for proposed media and content.
Web based Education Resources	Any Internet Education resources, which will support the mission of VES are sought. Vendors should specify media content features and describe the hosting requirements for proposed media and content.

3.5.12 VES Administration Subsystem

3.5.12.1 Administration Module

This module interfaces with the DOE Directory Administration application, Universal Educator Registration application, and other authentication applications to enable responsible administrators to modify VES defaults, to change the role of an individual user, and to customize local workflow processes and terminology. This functionality will be provided to school and district administrators. This module will be the gatekeeper to VES functionality and will manage access, security, roles, and permissions in VES.

Table 3-65: Administration Module

Tool Scenario	Tool Features
Administer DOE Directory	To be provided
Administer District Directory	To be provided
Administer School Directory	To be provided
Administer VES Roles and Default User Roles	To be provided
Administer DOE and District Document Workflow and Approval Processes	To be provided
Administer other Localization Processes	To be provided

3.5.12.2 Workspace Services Module

This module will provide authenticated access from the VES workspace to other DOE applications including: IMS Applications, School and District Planning, Professional Development, Educator Certification and Job Placement, MCAS DataMart, and others.

This Module will also provide protocol binding for the Common Application Service Elements to all VESIA Level 2 compliant modules. This is the session connecting point, audit, and management point for all VES Sessions.

The Workspace Services Module manages the Authentication, Customization, Personalization, and Localization Tokens, and the VES Virtual Cookies. The Workspace Services Module also handles uploads and downloads of VES objects to user hardware.

In the planning of a proposal responding to the VES Workspace Services Module requirements, vendors should be aware of the following IETF Working Group:

[ACAP -- Application Configuration Access Protocol \(RFC 2244\)](#)

The work of this group provides a protocol specification for management of distributed bookmarks and Messages of the Day. Vendors should consider this important document in proposing similar services to meet VES requirements.

ACAP Bookmarks Dataset Class

The ACAP Bookmarks dataset class defines a set of attributes for each bookmark, and provides for bookmark inheritance and hierarchy. VES will use this class to provide Workspace bookmark capabilities and Web tour capabilities.

ACAP Message of the Day Dataset Class

Multi-user systems offer a small "Message of the Day" (MOTD) greeting to all users that sign onto the system, informing them of any changes made to the system, scheduled outages, etc. As systems become more distributed, the ability to make announcements to all users becomes substantially harder. VES will utilize this kind of facility.

One way to look at the VES Customization and Personalization capabilities is to consider VES as a distributed system which falls under the management of multiple administrative domains, and each domain may wish to notify its users of upcoming events. The requirements for the VES Workspace include the requirement to provide a capability for each organizational layer to include its Message of the day in the VES Workspace. This will include DOE, district, and school.

The ACAP MOTD dataset class specifies a way to store small messages in ACAP. The MOTD dataset structure also leverages ACAP's inheritance capabilities to allow users to "subscribe" to MOTD providers. MOTD clients will allow users to view any existing MOTDs, mark MOTDs as read, and notify users when new MOTD entries are posted.

Advanced MOTD clients will also allow users to subscribe or unsubscribe from MOTD providers, as well as prune any old message information. Administrative clients will create MOTDs.

MOTD clients will be implemented in the Workspace Services Module as virtual clients with HTTP user interfaces. Calendar Clients, (CUA), will be implemented, on behalf of the user, by the Workspace Services Module in the same way.

Table 3-66: Workspace Services Module

Tool Scenario	Tool Features
Authentication Services	To be provided
Token Management	To be provided
Virtual Cookie Management	To be provided
CASE Functionality	To be provided
VES Audit, Usage, and Logging Functions	To be provided
Bookmark, MOTD Client and CUA Implementation	To be provided

3.5.12.3 Individual Workspace Module

This module provides a personalized web based workspace for all authenticated VES users. Based on individual user roles and responsibilities, the workspace will be customized to provide access to appropriate tools and modules. Workspaces will be further customizable for individual preferences and district localization.

The Workspace Module implements the object oriented VES user interface.

Table 3-67: Individual Workspace Module

Tool Scenario	Tool Features
Workspace User Interface	To be provided

3.5.12.4 Instructional Administration Module

Table 3-68: Instructional Administration Module

Tool Scenario	Tool Features
Registration and Tracking of Students in Online Courses	To be provided
Competency and Achievement Profile Maintenance	To be provided
Reporting, Transcript and Portfolio Management	To be provided
Course Reservations and Scheduling	To be provided
TTPD Interface	To be provided
Professional Development Plan Interface	To be provided

3.5.12.5 VES Directory Administration Module

Table 3-69: VES Directory Administration Module

Tool Scenario	Tool Features
Manage VES Communities	To be provided
Manage VES Capability Listings	To be provided
Search, Browse, and Print Directory	To be provided

3.6 VES Database Requirements

Vendors of VES software components will be building, integrating, or delivering systems, which will interface with the DOE Oracle Database Servers.

The details of these servers and the current licenses are contained in Section 3.6.1. Vendors will be expected to propose hardware and software compatible with this database configuration. When vendors calculate that their proposed systems, when combined with other VES systems, will exceed the capacity of the DOE licenses and servers described in Section 3.6.1, they should propose an upgrade path in their proposals.

The following types of data are all part of the VES data requirements and should all be supported in vendor proposed configurations:

- Enterprise Data Requirements
- VES Data Requirements
- Secure, private, online space for each user to create and store their work, portfolios, and projects. (In the year 2003, this requirement will exist for 540,000 users.)
- Public space for the publication of individual and group work (Web space in the k12.ma.us domain)

3.6.1 DOE Database Environment and Requirements

This section will provide info on the target DOE database environment, licensing issues, etc... and requirements for VES vendors to meet. To be updated...

3.6.2 VES Enterprise Data Model

The VES Enterprise Data Model describes in formal conventions the data entities created maintained, and used in the enterprise, and the explicit relationships between them. The enterprise model is a rigorous exposition of the enterprise information assets to be included in VES.

3.6.2.1 Overview

The major components of the Enterprise Data Model include of the following:

Data Entities, which represent the “things” that are of interest to VES, such as courses, units, lesson plans, activities, district curriculum objectives, persons, and organizations.

Data Elements, which represent the specific characteristics of an entity. For example, a person has a first and last name, and an activity includes a duration, a description of what to do, and a list of materials.

Data Entity Relationships, which represent the “rules” for how entities relate to one another. An example is that a Framework Strand must be part of one and only one Framework Discipline, while a Framework Discipline may be subdivided into one or more Framework Strands.

This Section describes the Enterprise Data Model from several perspectives.

- How the enterprise and system requirements map to the model components.
- Modeling notation, including how to interpret the diagram
- The graphical depiction of the Enterprise Data Model
- Data Entity Descriptions
- Report showing each entity with its elements and their definitions Report showing each entity with a summary list of its attributes and relationships

3.6.2.2 Mapping of Enterprise and System Requirements to the Model

The information requirements for VES have so far been defined as Objects representing the enterprise rules. The Enterprise Data Model is a high level interpretation of these enterprise and system requirements as they relate to data and the enterprise rules about that data. The model takes these requirements a step further by beginning to define the enterprise data in a specific, rigorous manner consistent with relational database design.

Objects are documented in the model as entities and their elements. In the diagram, entities show up as boxes, and elements show up as a list of items within an entity box.

Each Object becomes one or more Data Entities, as follows:

Objects and data entities both represent the “things” that are of interest to VES. Straightforward examples include courses, units, lesson plans, activities, district curriculum objectives, persons, organizations, MCAS items, and student work. In this case, the model contains entities that more or less match the objects one for one.

Sometimes the *linkages* between objects become themselves additional, independent “things” that VES manages. One example is the alignment of the lesson plan to district curriculum objectives. Any given lesson plan will likely align to more than one objective, and an objective will certainly be used by many lesson plans. This is called a many-to-many (M:M) relationship between entities. In this case, a new entity gets defined that represents the combination, or join, of the two entities. The lesson plan entity still describes just the lesson itself, and the objective entity defines the objective. The new entity tracks lesson plan usage of objectives.

Some objects get represented as more than one entity simply because they are complex when it comes to specifying the information about them. An example is the assessment, which may be composed of a set of pieces that might or might not be reusable. A well designed rubric for a district objective could be incorporated into several different tests, performance evaluations, and the like.

Code and reference entities are added to the model both as lookup tables and to restrict data elements to a set of valid values. Some typical examples include the official list of disciplines for the state curriculum frameworks, a table of the state names and their two-character postal abbreviations, MCAS reporting categories, and a standard set of codes for grade levels and grade spans. Code entities allow the VES system to enforce consistency in the database and user interfaces.

Each **Data Entity** contains one or more **Data Elements**, which represent the specific characteristics of an entity, e.g., a person has a first and last name, or an activity includes a description of what to do and list of materials. Elements are also called attributes, and eventually end up as fields in a database table. Each element is a specific type, such as a number, text, a date, and so on.

The **Rules** listed under each **Function** in the Section on Enterprise Requirements (Chapter 2) help to define the **Data Entity Relationships**. These represent how entities relate to each other. In the diagram, relationships show up as the lines between the boxes. An example is that a Framework Strand must be part of one and only one Framework Discipline, while a Framework Discipline may be subdivided into one or more Framework Strands. Likewise, a Framework Standard must be a subcategory of one and only one Framework Strand, while a Framework Strand may be divided into one or more Framework Standards. Note that the relationships interact, or add up, over the whole model. In the example above, the two rules taken together imply that to add a Framework Standard requires that both the discipline and strand already exist.

The **Rules** listed under each **Function** in the Section on Enterprise Requirements (Chapter 2) also help to fill out the **elements** of the entities. An example is the rule “Disciplines contain Guiding Principles”. Guiding principle becomes an element of the Framework Discipline entity.

3.6.2.3 Interpreting the Data Model Diagram Notation

The VES Enterprise Data Model is represented graphically by an Entity Relationship Diagram (ERD), which is a standard means for presenting relational data structures.

The Enterprise Data Model is documented using an automated application, Oracle Designer 2000, which provides an integrated set of tools for maintaining data diagrams, definitions, relationships, and so on. Designer also supports the evolution of the enterprise data model into a physical database design, and can be used to generate the code required to create the database. Implications for this document are, one, the diagrams and reports included are those directly generated by Designer, and two, the modeling conventions and diagram notation are those defined by Oracle.

Table 3-70: Data Model Diagram Notation

Graphic Symbol	Represents	Comments
Box	Entity	
Box containing other boxes	Supertype Entity	The most general level of a set of entities that share most of their attributes and relationships. Example: Instruction.
Box within a box	Subtype Entity	A type of the more general entity, the subtype inherits all attributes and relationships that go with the supertype, and also has some distinguishing characteristics of its own. Example: Course, Unit, Lesson, and Activity within Instruction.
Line	Relationship	A rule that relates two entities. Read it clockwise.

Also show and define: solid lines, dotted lines, crow’s feet; how relationships make a sentence; attributes mandatory, optional, part of PK; what a PK is; FK and inheritance; FK as part of PK;

In the diagram, entities show up as boxes. Further explanation, plus a listing of all entities with definitions follow below.

In the diagram, relationships show up as the lines between the boxes. The enterprise rules in Section 2 are formally represented by specific definitions. Further explanation, plus a listing of all entities and their relationships follow below.

Elements may be inherited from one entity to another.

In the diagram, elements show up as a list of items in the entity boxes. They further define the entity. Further explanation, plus a listing of all entities and their attributes follow below with definitions.

3.6.2.4 The VES Enterprise Data Model Diagram

See Appendix E.

3.6.3 VES Entity Descriptions

--To be provided in Appendix

3.6.4 Detailed VES Entity Definition Report

The Entity Definition report contains specific information about each entity, including its names, description, attributes and relationships. It is a standard report produced by Oracle Designer. The contents of the report come from the same repository that is used to generate the entity relationship diagrams and descriptions in previous sections, and will therefore be consistent with these and with all other Designer reports. The report will be available to qualified vendors at a later time.

For each entity, the following information is shown.

- Entity name – a name that should be apparent to general users
- Short name – an abbreviation used to prefix attribute names belonging to this same entity
- Plural name – initially a plural of the name that is used by Designer to construct the relationship “sentences”; later in the design process, the plural name is used to define the physical table name
- Sub-type of – indicates that this entity is a particular variation of another entity; in most cases, this field is irrelevant and does not appear at all
- Description – a short definition of the entity
- Attributes – a list of the elements in the entity and their characteristics
- Relationships – a constructed “sentence” showing how this entity relates to any other entities
- Unique Identifiers – the elements that singly or as a group uniquely determine an instance of this entity
- Notes – any comments about the entity

3.6.5 VES Element Dictionary

The VES Element Dictionary presents each entity in alphabetical order together with a list of its attributes and their descriptions and characteristics. It is a standard report produced by Oracle Designer. The contents of the report come from the same repository that is used to generate the entity relationship diagrams and descriptions in previous sections, and will therefore be consistent with these and with all other Designer reports. The report will be available to qualified vendors at a later time.

For each attribute, the following information is shown.

- Attribute name – as it will appear in the database
- Sequence – its order in the entity as defined by the database designer
- Optionality – N if the attribute must have a value, or Y if it is optional
- Format – the data type of the element, e.g., character, number, or date
- Length – the maximum size of the element, if specified
- Decimal places – the number of places to the right of the decimal point if the element is a number; blank means zero, or an integer
- Attribute description – a brief definition of the element
- Attribute notes – any notes or comments about the element

3.7 VES Hosting Environment Requirements

In order for VES to support 40,000 educators and 500,000 students it must run in a robust environment with secure web, application, and database servers, supported by a 24x7 help desk and support services. We seek proposals from vendors to provide a turnkey Application Service Provider (ASP) Hosting Environment for VES and the MCN Communications and Collaboration Tools.

This section outlines the goals and specifications for ASP Hosting Services.

3.7.1 Goals of ASP Requirements

The following goals will be satisfied by third party ASP Hosting Services:

- Access to VES from any computer (PC or Mac) with access to the Internet and capable of running a state of the art web browser.
- Individualized access for all VES users to powerful custom curriculum and productivity applications without the need to procure, install, support and maintain them and the server and database environments they require.
- Application and Database Support Services including transparent application updates and database backup.
- No need for districts to procure hardware servers to support VES.
- Management of VES services at no cost to users providing redundancy, disaster recovery, and graceful degradation of service through standby servers, automated backup, UPS and generators, backup environmental conditioning and redundant Internet connections and server sites.

3.7.2 ASP Hosting Service Requirements

In order to meet the goals listed in the prior section, proposers will demonstrate how they will satisfy the following requirements for ASP Hosting Services:

3.7.3 ASP Host Environment - Operations 24x7

Vendor will propose how they will meet the requirement for an ASP Host Environment to support the VES project with a 24x7 operations center. Vendors should propose the hardware and software, server, firewall, caching environment, and levels of redundancy of these components.

3.7.4 ASP Requirements - 24x7 Help and Support desk

Vendor will propose how they will meet the requirement for an ASP Help and Support Desk Environment to support the VES project with a 24x7 staffing. Vendors should propose the hardware and software, help desk capabilities, features, and strategies, and discuss problem escalation levels and procedures. The security and redundancy of the Help and Support desk should also be discussed.

3.7.5 ASP Requirements - UPS and Backup Power Systems

Vendor will propose how they will meet the requirement for a nonstop ASP Host Environment to support the VES project with a 24x7 operations center. Vendors should propose the specific hardware and software, UPS, backup power systems, off-site contingency support, hot, warm, and cold standby equipment, and the levels of redundancy of these components.

3.7.6 ASP Requirements - Redundant Broadband Internet connectivity

Vendor will propose how they will meet the data communications requirements for an ASP Host Environment to support the VES project and all the school districts in Massachusetts with a 24x7 operations center. Vendors should propose the specific communications services, hardware and software, server, firewall, caching environment, and levels of redundancy of these communications services and components. Vendors should take into account the full suite of VES capabilities including streaming multimedia content, and collaboration and conferencing services.

3.7.7 ASP Requirements - Application Backup, Support, and Security

This section to be provided

3.7.8 ASP Requirements - Database Backup, Support, and Security

This section to be provided.

3.7.9 ASP Requirements - Communications and Collaboration Support, Backup, and Security

Vendor will propose how they will meet the requirement for the VES Communications and Collaboration Services with 24x7 operations. Vendors should propose the hardware and software, server, firewall, caching environment, and levels of redundancy of these components. Vendors should take into account the full suite of VES capabilities including streaming multimedia content, multicast multimedia, and concurrent multimedia collaboration and conferencing services.

3.7.10 ASP Requirements - Physical Site Security, Disaster Recovery, and Site Backup

Vendor will propose how they will meet the security requirements for an ASP Host Environment to support the VES project with 24x7 operations. Vendors should propose Physical Site Security, Disaster Recovery Plans, and Site Backup options, and levels of redundancy of these components.

3.8 VES E-Commerce Concession Requirements

The VES environment will support 40,000 educators, 500,000 k-12 students, large numbers of parents and the public. Because of the nature of the site, authenticated users and visitors will spend an average of 20-30 minutes on the site at each session, and many will spend more than an hour per day.

The primary motivation of the users of VES is to raise student achievement of students in Massachusetts. Vendors of commercial product lines that support that objective, are invited to submit proposals in response to this RFR to provide e-commerce concessions at the VES web site.

We seek proposals from vendors to provide turnkey click-through Affinity programs, standalone concessions we would host, electronic ordering and payment systems, unbranded storefronts, and other e-commerce concession services.

The following goals should be met by the selection of vendors to provide this service:

1. Generation of revenue to support VES programs, operations, and development.
2. Convenient access to educational toys, tools, and resources, books, computers, and services.
3. High quality products, services, customer service and return policies, and a privacy policy compatible with VES privacy policies.
4. No access to inappropriate products or services, or those which are incompatible with the VES mission.