

History of Changes

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Application / Web Development Technical Domain

Purpose

The purpose of this document is to set expectations of the agencies, bidders, vendors and consultants on life cycle and support for technical standards and products to be used by the agencies in acquiring, developing and deploying application and systems. This document defines the strategic standards and products for the Enterprise Architecture Standards Process (EASP) and provides technology road-maps or time frames for these standards and products. It does not address (at this time) patterns or implementation principles.

Overview

The Enterprise Architecture Standards Project (EASP) covers two broad categories:

- Applied domains that identify specific technology in support of each Architecture Domain
- Integration or cross-over domains that combine and interface two or more technical domains

The Application Development Technical Architecture identifies criteria and techniques associated with the design of applications for the State's distributed computing environment that can be easily modified to respond quickly to the State's changing business needs, as well as to the rapidly evolving information technologies available to support those needs.

The State of Connecticut, like most large public and private enterprises, relies heavily on computer applications to support its business operations. Because the State's business processes change dynamically in response to both legislation and new demands from citizens, it is important that the State's computer applications also be able to change rapidly. Historically, the State's applications have been designed as 2-tier or 3-tier client/server applications. Systems were designed and implemented independently of each other, with little or no re-use of code or components.

The contemporary approach calls for considerably more modular, web-enabled applications with reusable components and sharing of information and processing resources. More importantly, application design is driven by business requirements, business activities and business processes. Applications and systems need to be designed for flexibility, scalability and agility, plus a lower total cost of ownership (TCO). Such systems generally conform to most or all of the principles of Service-Oriented Architecture (SOA), and the related Web-Oriented Architecture (WOA) and Event-Driven Architecture (EDA).

The W3C (Worldwide Web Consortium) is the primary organization for the development of interoperable technologies (specifications, guidelines, software, and tools) for Web-based architecture designs. (The Web is itself an application that rides on top of the internet and its associated technologies and standards.) Additional standard for WOA (and for SOA) are the province of the Organization for the Advancement of Structured Information Standards (OASIS).

The Web / E-Government Technical Architecture defines the policies, guidelines, best practices, technologies, and standards needed for adaptive deployment of electronic commerce and internet/intranet websites. This will allow for seamless platform-independent and secure anytime, anywhere access to state information.

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This domain is closely aligned with other domains including Collaboration/Directory Services, Database, and Middleware, sharing as it does technical standards, products and best practices.

Technology categories in this domain

Application Development

Application Development identifies criteria and techniques associated with the design of applications for the State's distributed computing environment that can be easily modified to respond quickly to the State's changing business needs, as well as to the rapidly evolving information technologies available to support those needs.

For database standards please refer to the [Data Management Domain](#) document.

Technical Standards

XHTML, HTML, ASP

Web Browser

The primary interface for applications is a "standard" web browser, in keeping with web based architecture design. The choice of web browser is based on the target audience of the application. The technology in this category is defined in conjunction with the Platform Domain team.

The standards contained within this section are the "Code To" standards. Please refer to the Web / eGovernment section for the current desktop standards.

HTML/XML Editing

HTML or XML creation and editing is normally handled by the application development toolset; it can also be handled through the portal product or a stand-alone tool. (See Web Oriented Architecture below).

Application Development Languages

An application development language is a very-high-level programming language that generates coding in a conventional programming language or provides the user of a database management system with a programming language that is easier to implement than conventional programming languages. High-level languages permit a programmer to ignore many low-level details of the computer's hardware solving the problems of portability. Further, it is recognized that the closer the syntax, rules, and mnemonics of the programming language are to "natural language," the less likely the programmer is to introduce errors ("bugs") into the program.

C, along with its extensions, C++ and C#, has perhaps become the most widely used general-purpose language among professional programmers because of its ability to deal with the rigors of programming object-oriented programming. Object-oriented programming is a modular approach to computer program (software) design. Each module, or object, combines data and procedures (sequences of instructions) that act on the data. Java is an object-oriented

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language similar to C++ but simplified to eliminate features that are prone to programming errors. Java was developed specifically as a network-oriented language, for writing programs that can be safely downloaded through the Internet and immediately run without fear of computer viruses.

- ASP – including ASP Classic and ASP .Net is a framework for developing web applications and dynamically generated web pages.
- C++ - Object-oriented version of C that is popular because it combines object-oriented capability with traditional C programming syntax.
- C# - A Microsoft .NET language based on C++ with elements from Visual Basic and Java.
- COBOL - Developed in the 1960s. Widely used for mini and mainframe programming.
- Java - The programming language developed by Sun and repositioned for Web use. It is widely used on the server side, although client applications are increasingly used.
- JScript – Microsoft’s name for the scripting language used in web pages embedded into the HTML page. (Same as Sun’s JavaScript)
- JavaScript - A scripting language widely used on the Web. JavaScript is embedded into many HTML pages.
- VBScript - Subset of Visual Basic used on the Web similar to JavaScript.
- Visual Basic – A widely used Microsoft .NET language.
- Web Languages - Languages such as JavaScript, Jscript, Perl and CGI are used to automate Web pages as well as link them to other applications running in servers.

Application Development Toolsets (IDEs)

An integrated development environment (IDE) also known as *integrated design environment* or *integrated debugging environment* is a software suite of products that provide comprehensive facilities to develop software computer programmers for software development to simplify the construction of GUI and object-oriented solutions. An IDE normally consists of:

- a source code editor
- a compiler and/or an interpreter
- build automation tools
- a debugger
- version control
- integrated tools
- test tools
- a class browser
- an object inspector
- a class hierarchy

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IDEs are designed to maximize programmer productivity by providing tightly-knit components with similar user interfaces. IDEs typically present a single developer workspace in which all development occurs. This developer workspace typically provides many features for authoring, modifying, compiling, deploying and debugging software. IDEs are complex environments, however, once the learning curve is mastered, the programmer has much less mode switching to do than when using discrete development programs.

IBM Rational Eclipse (incl. Java, C#, C++, and WSDL) and Microsoft Visual Studio (incl. Visual Basic, Visual C#, Visual C++, Java, and F#) are multiple-language IDEs.

JBoss Enterprise Application Platform is the market-leading platform for innovative and scalable Java applications. Integrated, simplified, and delivered by the leader in enterprise open source software, it includes leading open source technologies for building, deploying, and hosting enterprise Java applications and services.

Standalone Testing Tools

Testing tools may be standard parts of the IDEs. You may have separate testing tools as well, for example, you may utilize tools for stress or load testing.

Source Code Management

Source control management (SCM) is software that provides coordination and services between members of a software development team. At the most basic level, it provides file management and version control so that team members do not write over each other's changes, and only the newest versions of files are identified for use in the workspace. More enhanced SCMs also give developers the ability to work concurrently on files (in branches that may or may not converge), to merge changes with other developers' changes, to track and audit changes that were requested and made, and to track bug-fix status and to perform releases. In some cases, SCMs may include other components to assist in managing a software process throughout the entire lifecycle. SCM tools help development teams in many ways:

- **Collaboration:** SCM tools prevent one user from accidentally overwriting the changes of another, allowing many developers to work on the same code without stepping on each other's toes.
- **History:** SCM tools track the complete development history of the software, including the exact changes which have occurred between releases and who made those changes.
- **Release notes generation:** Given the tracking of each change, the SCM can be used to generate notes for their software releases that accurately capture all of the changes included in the new release.
- **Documentation and test management:** SCM tools can be used to manage not just software source code, but also test suites and documentation for their software.
- **Change notifications:** To keep interested members of the team informed when changes occur to the source code.

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Business Process Management

Business process modeling (BPM) addresses the process aspects of business architecture and is part of the business process management (BPM) discipline. The graphical representation of business process information is of value to business stakeholders, business analysts and system developers. Effective BPM is at the heart of Service Oriented Architecture design (see below).

Modeling

Business Process Modeling Notation (BPMN) — defines a standard graphical notation for specifying business processes in a business process diagram.

Unified Modeling Language (UML) — an open method used to specify, visualize, construct and document objects, components and services during system design and analysis.

Workflow

A workflow application is a software application, which automates, at least to some degree, a process or processes. The processes are usually business-related, but it may be any process that requires a series of steps that can be automated via software. Some steps of the process may require human intervention, such as an approval or the development of custom text, but functions that can be automated should be handled by the application. Advanced applications allow users to introduce new components into the operation. Automated workflow tools use a programming language in conjunction with libraries and interfaces that capture abstractions for task coordination such as Microsoft Windows Workflow Foundation.

It is also possible to use languages designed for business process modeling (e.g. the Business Process Modeling Notation) to specify workflows. However, to fit the purpose of workflow specification, such notations need to be enhanced with additional constructs to capture data passing, data transformations and routing conditions and to bind tasks to their implementation. Indeed, business process modeling is about capturing business processes at a higher level of abstraction in order to enable their analysis through methods such as simulation. Meanwhile, workflow specification is about capturing processes at a level of detail that is sufficient to enable their execution.

Messaging and Middleware

Middleware is software that supports communications between the functional tiers of an application, between two or more different applications, and between applications and shared services. The role of middleware is to insulate application developers from having to understand the complexities of the networking and computing environments and to minimize the use of directly interfacing to platform, network and data layers. Middleware also provides an environment in which to implement business rules (logic) and workflow rules (orchestration and choreography in SOA environments).

For the full list of standards for messaging and middleware, please refer to the [Middleware Domain document](#).

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Application Middleware and Messaging Products

Message Oriented Middleware (MOM) is inter-application communication software that generally relies on asynchronous message passing, generally on some sort of message queuing system. An Enterprise Service Bus (ESB) performs a similar function within a Service Oriented Architecture solution. Message queuing software is considered to be a point to point model (sender and receiver know each other). The other general model is publish and subscribe in which neither the sender nor receiver know each other (a good metaphor is anonymous bulletin board).

Technical Standards

Business Process Execution Language (BPEL) — BPEL is a standard executable language for specifying interactions with services or Web Services in WOA and SOA applications.

URI/URL

XML, XSLT, XPath, WS-BPEL

Message Queuing

Message queuing software is considered a point-to-point model (sender and receiver know each other). Message queues provide an asynchronous communications protocol, meaning that the sender and receiver of the message do not need to interact with the message queue at the same time. Messages placed onto the queue are stored until the recipient retrieves them. Most message queues have set limits on the size of data that can be transmitted in a single message. Many implementations of message queues function internally: within an operating system or within an application. Such queues exist for the purposes of that system only. Other implementations allow the passing of messages between different computer systems, potentially connecting multiple applications and multiple operating systems. These message queuing systems typically provide enhanced resilience functionality to ensure that messages do not get "lost" in the event of a system failure.

Reporting

The reporting category covers two primary types of tools: (1) tools intended for end-users for simple reporting and analysis and (2) tools designed to enable developers to easily deliver reports that are either fundamental to a system or more complex than the end-user can reasonably be expected to produce.

Tools intended for end-users are covered in the [Collaboration and Directory Services Domain](#) document under desktop standards.

Report Creation

Reporting software allows report designers to create highly formatted reports, connected to virtually any data source. Features to look for in a good reporting tool include:

- Interactivity empowering business users to manipulate data
- Ad Hoc report creation
- Security

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- Ability to securely share, schedule and deliver reports in a variety of formats including e-mail and over the Web
- Customization
- Export capabilities to other formats such as Excel, PDF, CSV, XML, TIFF (and other image formats), MS Word, and HTML Web Archive.
- Support page styling including fields, images, graphs, tables.
- Support field definitions including extended attributes of fields populated with formulas, dynamic data, or Database derived data.
- Accept Parameters either furnished by the user or passed in from another application; and database connections and queries for pulling data into the report.

Report Servers

A report server is the central component of a Reporting Services installation, consisting of a pair of core processors plus a collection of special-purpose extensions to handle authentication, data processing, rendering, and delivery operations. Processors are the hub of the report server. The processors support the integrity of the reporting system and cannot be modified or extended. Extensions are also processors, but they perform very specific functions. Reporting Services includes one or more default extensions for every type of extension that is supported. You can add custom extensions to a report server to support features such as support for single sign-on technologies, report output in application formats not handled by the default rendering extensions, and report delivery to a printer or application.

A single report server instance is defined by the complete collection of processors and extensions that provide end-to-end processing, from the handling of the initial request to the presentation of a finished report. Through its subcomponents, the report server processes report requests and makes reports available for on-demand access or scheduled distribution.

Online Analytical Processing (OLAP) tools

In situations where the drill down and sorting features of Enterprise Reporting products are insufficient to meet user needs for custom reporting, Query / Analysis tools may be used to satisfy the needs of the “advanced” user. OLAP tools are required when high-end scalability and advanced ad hoc analytical queries, and multi-dimensional and cross-dimensional operations are required.

Miscellaneous Applications

Technology standards in this category include Project Management tools, Help File/Facilities tools, Optical Character Recognition (OCR) tools, and Document Management tools. Other technology standards, that do not fall under the other Application Development categories, may be added to this section.

Help File/Facilities

Help authoring tools (HAT) automate and speed up the generation/creation of help files. HAT tools vary in the formats supported for import, including such formats as ASCII, HTML and Microsoft Word, and compiled Help formats such as Microsoft WinHelp and Microsoft Compressed HTML Help. The output from a HAT can be either a compiled Help

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file in a format such as WinHelp (*.HLP) or Microsoft Compiled HTML (*.CHM), or non-compiled file formats such as Adobe PDF, XML, or HTML.

Base the selection of the format you use for your help files on an evaluation of how your system will be distributed and how people will use it. Do they need a context help file in the application or will they print out the entire help file and keep the manual on their desk? How often will you update the help file? Is it relatively easy to distribute together with your program files or is it better to store it on the website? Answering these questions will help you decide which format is best. Often a combination of approaches is best, for example:

- Keep the HTML manual on your website for reference and it may attract people from search engines
- Distribute the CHM file with the application for context sensitive help
- Upload the printable version of the help file in PDF or RTF\DOC format on the public website for those who may want to print out the entire document as a reference
- Maintain a permanent version in your Document Management database

Other

Optical Character Recognition (OCR) is the mechanical or electronic translation of scanned images of handwritten, typewritten or printed text into machine-encoded text that can be easily edited, searched, electronically stored, displayed, and printed free of scanning artifacts. OCR greatly reduces the storage space as required by hard copy materials and enables the use of such techniques as machine translation, text-to-speech and text mining. It is widely used to convert books and documents into electronic files, to computerize a record-keeping system in an office, or to publish the text on a website.

OCR technology requires both hardware and software. Sophisticated OCR systems may require an additional circuit board in the computer itself to complete the process. An optical scanner scans the text on a page and breaks the fonts down into a bitmap, and translates the bitmap into computer text. Currently, OCR technology supports most common fonts; however, improvements still need to be made in handwriting recognition or fonts that look similar to handwriting.

OCR is a field of research in pattern recognition, artificial intelligence and computer vision.

Document Management controls the life cycle of documents in your organization from how they are created, reviewed, published, and consumed to how they are ultimately disposed of or retained. Although the term "management" implies top-down control of information, an effective document management system should reflect the culture of the organization using it. The tools you use for document management should be flexible, allowing you to tightly control documents' life cycles or loosely structure the system if that better suits your enterprise. A well-designed document management system should support ease of finding and sharing information; organize content in a logical way; make it easy to standardize content creation and presentation across an enterprise; promote knowledge management and information mining; and help your organization meet its legal responsibilities. Document

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management systems commonly provide storage, versioning, metadata, security, as well as indexing and retrieval capabilities.

For additional information on the State's standards of Document Management please refer to the [Collaboration and Directory Services Domain](#) Document.

Geographic Information Systems (GIS)

GIS software allows users to effectively capture, store, manipulate, analyze and display all forms of geographically referenced information. Such information includes any data that can be identified with a specific location on a map, whether it is tied to a specific address or aggregate information about a particular area of land such as a town, county or state.

Geographic data is logically and effectively organized so that users can take such data and turn it into information that can be communicated in an intuitive manner that enhances understanding and decision-making. GIS software allows users to present such information in a map format, or information can be generated using tools included in the software and then presented in other formats as needed.

Technical Standards

ArcGIS Desktop by ESRI is available in several licensing levels that include more or less features and cost commensurately more or less to license:

- ArcView (Basic)
- ArcEditor (Intermediate)
- ArcInfo (Advanced)

There are also many extensions to the software to perform specialized functions and analysis that may be purchased separately, including:

- ArcGIS 3D Analyst
- ArcGIS Geostatistical Analyst
- ArcGIS Network Analyst
- ArcGIS Schematics
- ArcGIS Spatial Analyst
- ArcGIS Survey Analyst
- ArcGIS Tracking Analyst

Enterprise GIS

ArcGIS Server by ESRI, , for which there are several editions that include more or less features and cost commensurately more or less to license:

- Basic
- Standard
- Advanced

Each edition can then be licensed at two different levels of capacity, including:

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- Workgroup (limited to running on a single machine, 4 GB of storage on a multi-user database, up to 10 simultaneous connections to a single multi-user database, and uses only SQL Server Express as the database engine.
- Enterprise (runs on multiple machines, user's choice of multi-user database, with unlimited storage and number of simultaneous connections to multi-user geodatabases.

Web Oriented Architecture (WOA)

Web-Oriented Architecture (WOA) is an architecture approach that leverages characteristics and technology of the web (e.g., XML, HTTP), and that uses Asynchronous Java and XML (AJAX) for communications. Some WOA applications are in fact a flavor of SOA design. The term WOA is not synonymous with Web 2.0, which is a developmental approach to web based designs that emphasizes flexibility and user interaction.

For the full list of standards for WOA, please refer to the [Middleware Domain](#) document.

Technical Standards

WSDL, SOAP, XML, XForms, XHTML, HTML

Web Browser

The primary interface for applications is a “standard” web browser, in keeping with web based architecture design. The choice of web browser that is the target environment is based on the target audience of the application. The technology in this category is defined in conjunction with the platform domain team.

HTML/XML Editing

HTML or XML creation and editing is normally handled by the application development toolset; it can also be handled through the portal product or a stand-alone tool.

Web publishing and Content Management

Web publishing consists of those topics involved with the presented images, the process for creation of websites, maintenance of the sites, and content management.

Technical Standards

Many interdependent standards and specifications, some of which govern aspects of the Internet, not just the Web, directly or indirectly affect the development and administration of websites and web services. Considerations include the interoperability, accessibility and usability of web pages and websites.

Web Browsers

Within this domain, Web Browser standards are set for development, testing, and production. These are the minimum web browser requirements that websites and web applications being created for state business should function within. Web browsers are primarily intended to

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access the [Internet](#). They can also be used to access information provided by Web servers in private networks or files in file systems.

Portals

A Portal is a term, often used interchangeably with gateway, as the entry point for users connecting to Internet, Extranet or Intranet enterprise sites. Portals generally provide a single access point to enterprise services and a variety of standard and customizable features. A Portal does not provide web content management, enterprise content management, or identity content management.

Web Page Creation and Editing

This category includes software used to develop and manage a website outside a Web Content Management System.

Web Content Management System (WCMS)

A WCMS is a web application used to create, manage and control a large, dynamic collection of Web materials (HTML documents and their associated images). A WCMS facilitates content creation, content control, editing, and essential Web maintenance functions.

Link Checker

Software tools to aid web content managers to locate orphans or broken links within a site.

Forums

Software tools to aid web content managers to design and host moderated forums.

Graphic/Photo Editors

Software with which a user may manipulate, enhance, and transform images.

Interactive Content Development

Multimedia includes a combination of text, audio, still images, animation, video, and interactivity content forms.

On-Line Publication

Software animation, storyboard, 2D and 3D tools to aid web content managers in designing web content, must include a comparable text page for section 508 compliance.

Video Editors

Software which handles the editing of video sequences on a computer. Digital editors are typically based on a timeline interface paradigm where sections of moving image video recordings, known as clips, are laid out in sequence and played back. They offer a range of tools for trimming, splicing, cutting and arranging clips across the timeline.

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Video Captioning Tools

This category includes tools to assist in making a transcript and adding closed captioning to video to meet accessibility requirements.

Search Engines

A web search engine is designed to search for information on the WWW. The search results are usually presented in a list and are commonly called *hits*. The information may consist of web pages, images, information and other types of files.

Definitions above provided by Wikipedia at <http://en.wikipedia.org>

eCommerce

The two major forms of eCommerce are Business-to-Consumer (B2C) and Business-to-Business (B2B). The terms “e-business” and “e-tailing” are often used synonymously with eCommerce. The terms “e-tailing” or “virtual storefronts” refer to websites with online catalogs. Security includes authenticating business transactors, controlling access to resources such as Web pages for registered or selected users, encrypting communications and, in general, ensuring the privacy and effectiveness of transactions.

Technical Standards

- Electronic Data Interchange (EDI) is used for the business-to-business exchange of data. EDI may be replaced by one or more standard Extensible Markup Language (XML) formats, such as electronic business Extensible Markup Language (ebXML).
- Among the most widely-used security technologies is the Secure Socket Layer (SSL) which is built into Web browsers. (Refer to [Security Domain Document](#))

Online Payment Processing

- DoIT has developed a web service called “DoIT Payment Service” to be used by State agencies when developing websites and/or applications that need to process Credit Card transactions. This payment service uses PayPal Payflow Pro API to communicate with PayPal, the secure commercial Credit Card processing tool.

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Summary of principles

General Architecture Principles

1. Product choices and solution architectures should minimize overall total cost of ownership. This can be accomplished by consistency and uniformity in making choices about standards and products.
2. Product choices and solution architectures must provide for and enhance the overall security and integrity of systems and information assets.
3. Products choice decisions must consider the availability of training and technical support.
4. Product choices and solutions should minimize short term and long term risks, this can be partially accomplished by utilizing widely supported products or those with long-term support commitments by vendors (see principle 6).
5. Solution architectures should maximize information sharing among agencies and applications.
6. Product standards will consist of vendor supported versions only; this includes open source products.
7. New products and version/release upgrades for existing products will not become standard until a minimum 6 months has passed after the manufacturer's General Availability date.

Application / Web Development Specific Principles

1. Use the State's SDM for all applicable projects involving development, enhancement, procurement, deployment of applications and systems.
2. Implement IT systems in adherence with all security, confidentiality, and privacy policies and applicable statutes. Act appropriately to protect information confidentiality, integrity and availability.
3. Applications, systems, and infrastructure that support the anytime/anywhere access to information and services will be given priority over alternate solutions where practical.
4. The boundaries between application component functionality should reflect the way work is accomplished in the business unit. Interfaces between components should reflect business interfaces so there is linkage between the business and IT solutions.
5. Document the design of all application. Object models, service, WSDL, interaction diagrams and other design artifacts record the structure, behavior and interfaces of application solutions. These are important deliverables of the development process that can benefit future efforts.
6. Leverage data warehouses to facilitate the sharing of existing information to accelerate and improve decision-making at all levels.
7. Design, acquire, develop, or enhance systems allowing data and processes to be shared and integrated across the enterprise and with our partners.
8. The enterprise architecture must reduce integration complexity to the greatest extent possible.
9. Look to reuse existing applications, systems and infrastructure before investing in new solutions. Build only those applications or systems that will provide a clear business advantage and demonstrate cost savings.
10. Analyze, simplify and otherwise redesign business processes as appropriate first, then implement new information systems.

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11. Applications, systems and infrastructure will employ reusable components across the enterprise, using an *n-tier* model.
12. The logical design of application systems and databases should be highly partitioned. These partitions must have *logical boundaries* established and must not be violated.
13. The interfaces between separate applications requiring real-time synchronization should be message-based for both internal and external systems.
14. Deploy application systems driven by business events.
15. Applications and systems should be evolving toward an object-oriented approach.
16. Employ consistent software engineering practices and methods based on accepted industry standards.
17. Websites and Web-based systems such as eGovernment, eCommerce and Web Content Management:
 - a) Should be driven by business principles and events.
 - b) Must always be in compliance with applicable Federal and State laws and regulations.
 - c) Must be developed and implemented using the appropriate application standards and security models based on data classification (Refer to Security Domain Document)
 - d) Should always be published with and adhere to a strict and valid privacy policy (Refer to CT.gov Privacy Policy for model).

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Product/Technology Life Cycle Matrix

Life Cycle Definitions

The Life Cycle Matrix is based a sliding window of 12 quarters (3 Fiscal years). The date range of a fiscal year is July 1 through June 30.

Key	Definition
S	Standard - These are the products and standards selected by the state for NEW development or acquisition, and for the replacement of <i>obsolete</i> or <i>transitional</i> standards or products. They are supported by DOIT and have mainstream support from one or more vendors or standards bodies.
T	Transitional - Products are currently supported by DOIT, the agencies, or a vendor; however they have been replaced by new standard products or standards. Transitional products may have limited support from a vendor or have a defined End of Life (EOL). Neither the State nor the agencies should use these standards or products for NEW development. Existing implementations may be upgraded to a newer version to fix security or functional issues. Agencies should develop plans to migrate from transitional to new standard products either by replacing the technologies or replacing the solution prior to the End-of Life of the product.
O	Obsolete & Divest – Products or standards that are in use by the agencies. These products are generally End of Life and have very limited or no support from vendors, the community or DOIT. Neither the agencies nor the State should undertake new investments or development using these products (this includes version upgrades). Plans should be developed by to migrate from obsolete to standard products either by replacing the technologies or replacing the solution as rapidly as possible.

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Application/ Web Development Domain Products and Standards

Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Application Development														
Technical Standards														
ASP.NET 4	.NET				S	S	S	S	S	S	S	S	S	S
ASP.NET 3	Microsoft .NET or JAVA		S	S	T	T	T	T	T	T	T	T	T	T
ASP.NET 2	Microsoft .NET		T	T	O	O	O	O	O	O	O	O	O	O
ASP.NET 1.1	Microsoft .NET	Legacy support only	O	O	O	O	O	O	O	O	O	O	O	O
HTML/XML Editing Tools														
MS XML Notepad		Entry Level XML Editor	S	S	S	S	S	S	S	S	S	S	S	S
Altova XML Spy			S	S	S	S	S	S	S	S	S	S	S	S
Application Development Languages														
Visual Basic	.Net		S	S	S	S	S	S	S	S	S	S	S	S
Visual C#	.Net		S	S	S	S	S	S	S	S	S	S	S	S
Visual Basic v6.0			O	O	O	O	O	O	O	O	O	O	O	O
ASP.NET	.NET		S	S	S	S	S	S	S	S	S	S	S	S
Java	Microsoft .NET or JAVA		S	S	S	S	S	S	S	S	S	S	S	S

Application / Web Development Technical Domain

Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Jscript		limited client side edits, dynamics	S	S	S	S	S	S	S	S	S	S	S	S
COBOL LE			T	T	T	T	T	T	T	T	O	O	O	O
MicroFocus Cobol			T	T	T	T	T	T	T	T	O	O	O	O
Application Development Toolsets														
Visual Studio 2010					S	S	S	S	S	S	S	S	S	S
Visual Studio 2008			S	S	T	T	T	T	T	T	T	T	T	T
Visual Studio 2005			T	T	O	O	O	O	O	O	O	O	O	O
Borland JBuilder Enterprise 2006	JAVA		T	T	T	T	T	T	T	T	O	O	O	O
Eclipse		JAVA Open Source IDE	S	S	S	S	S	S	S	S	S	S	S	S
IBM Rational Suite		High end diagramming tools used to document complex systems or business processes or other complex models.	S	S	S	S	S	S	S	S	S	S	S	S
Oracle JDeveloper			T	T	T	T	T	T	T	T	O	O	O	O
JBoss Development Studio	JAVA	Java Application Server	S	S	S	S	S	S	S	S	S	S	S	S

Application / Web Development Technical Domain

Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Standalone Testing Tools		Contact Enterprise Architecture for Information												
Source Code Management														
HCM	Mainframe		S	S	S	S	S	S	S	S	S	S	S	S
Team Foundation Server	MS .NET				S	S	S	S	S	S	S	S	S	S
Visual SourceSafe 6.0c	MS .NET		S	S	T	T	T	T	T	T	T	T	T	T
Perforce	JAVA/.NET	Software Version / Change Management	S	S	S	S	S	S	S	S	S	S	S	S
Business Process Management														
Modeling														
MS Visio 2010					S	S	S	S	S	S	S	S	S	S
MS Visio 2007			S	S	T	T	T	T	T	T	T	T	T	T
Workflow														
MS Windows Workflow Foundation	MS .NET		S	S	S	S	S	S	S	S	S	S	S	S

Application / Web Development Technical Domain

Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
FileNet P8 Workflow.	Mainframe		S	S	S	S	S	S	S	S	S	S	S	S
Laser Fiche			T	T	T	T	T	T	T	T	O	O	O	O
Messaging and Middleware														
Technical Standards														
XML 1.0 / 1.1		Refer to Middleware Domain												
XSD 1.1		XML Documentation	S	S	S	S	S	S	S	S	S	S	S	S
XSLT 2.0		XML Validations	S	S	S	S	S	S	S	S	S	S	S	S
XSLT 1.1	XML Validations	XML Validations	T	T	T	T	T	T	T	T	O	O	O	O
XPath 1.0		Refer to Middleware Domain												
WS-BPEL 2.0	Oracle		S	S	S	S	S	S	S	S	S	S	S	S
Message Queuing														
IBM WebSphere MQ 7.0.1	All	Middleware Messaging			S	S	S	S	S	S	S	S	S	S
IBM WebSphere MQ 6.0	All	Middleware Messaging	S	S	T	T	T	T	O	O	O	O	O	O
ActiveMQ	All	Middleware	T	T	T	T	T	T	T	T	O	O	O	O

Application / Web Development Technical Domain

Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		Messaging												
JBoss Messaging 1.4	Java	JBOSS implementation of JMS	S	S	S	S	S	S	S	S	S	S	S	S
Windows Communication Foundation (.NET 4.x)	All	Part of .NET 4.x framework Uses MS Message Queuing			S	S	S	S	S	S	S	S	S	S
Windows Communication Foundation (.NET 3.x)	All	Part of .NET 3.x framework. Uses MS Message Queuing	S	S	T	T	T	T	T	T	T	T	T	T
Reporting														
MS SSRS 2008		SQL Server	S	S	S	S	S	S	S	S	S	S	S	S
MS SSRS 2005		SQL Server	T	T	T	T	T	T	T	T	O	O	O	O
Visual Studio 2010					S	S	S	S	S	S	S	S	S	S
Visual Studio 2008			S	S	T	T	T	T	T	T	O	O	O	O
Crystal Reports		Oracle / SQL Server	S	S	S	S	S	S	S	S	S	S	S	S
Report Servers														
MS SQL Server		Refer to Database Management Domain												
Crystal Reports Server		Refer to Database												

Application / Web Development Technical Domain

Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		Management Domain												
OLAP tools														
		Refer to Database Management Domain												
Miscellaneous Applications														
Help File/Facilities														
Adobe RoboHelp (versions 5,6,7,8 –v 8 released in 2009)		Help file creation (formerly Blue Sky and Macromedia)	S	S	S	S	S	S	S	S	S	S	S	S
Snag-It		Refer to Collaboration and Directory Services Domain												
Other														
OCR - Pegasus	.NET	Document Scanning and Optical Character Recognition (OCR)	S	S	S	S	S	S	S	S	S	S	S	S
Asprise (Doc management)	Java/.NET	Document	S	S	S	S	S	S	S	S	S	S	S	S

Application / Web Development Technical Domain

Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		Scanning												
GIS														
Technical Standards														
ESRI ArcGIS Desktop 9.x							S	S	S	S	S	S	S	S
ESRI ArcGIS Desktop 8.x			S	S	S	S	S	T	T	T	T	T	T	T
MapInfo			T	T	T	T	T	T	T	T	O	O	O	O
Enterprise GIS														
ESRI ArcGIS Server 8.x			S	S	S	S	S	S	S	S	S	S	S	S
Web Oriented Architecture														
Technical Standards														
WSDL		Refer to Middleware Domain												
SOAP 1.2		Refer to Middleware Domain												

Application / Web Development Technical Domain

Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Service Oriented Architecture														
Technical Standards		Refer to Middleware Domain												
Web publishing and Content Management														
Technical Standards														
HTML 4.01 Transitional*		Markup Language	S	S	S	S	S	S	S	S	S	S	S	S
XHTML 1.1		Hypertext with the full benefits of XML architecture	S	S	S	S	S	S	S	S	S	S	S	S
CSS 2.1		Style Sheet Standard	S	S	S	S	S	S	S	S	S	S	S	S
XML 1.0		Markup Language	S	S	S	S	S	S	S	S	S	S	S	S
WMV		Streaming Video Standard	S	S	S	S	S	S	S	S	S	S	S	S
SWF		Non-streaming (short duration)	S	S	S	S	S	S	S	S	S	S	S	S
* HTML is based on 3 document type declarations (Strict, Transitional, and Frameset)														
Web Browsers		Browsers listed below are for development compliance. See Platform domain for Enterprise Desktop Standards.												

Application / Web Development Technical Domain

Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Microsoft Internet Explorer 8.0		Required Standard	S	S	S	S	S	S	S	S	S	S	S	S
Microsoft Internet Explorer 7.0		Required Standard	S	S	S	S	S	S	S	S	S	S	S	S
Internet Explorer 6		Baseline for Web development only	O	O	O	O	O	O	O	O	O	O	O	O
Mozilla Firefox 3.6		Required Standard	S	S	S	S	S	S	S	S	S	S	S	S
Google Chrome 4.1		Optional	S	S	S	S	S	S	S	S	S	S	S	S
Portals														
Microsoft SharePoint 2010		Internet, Extranet, and Intranet Enterprise Portals			S	S	S	S	S	S	S	S	S	S
Web Page Creation and Editing (HTML Editors)														
MS FrontPage 2003		Website creation and support	T	T	T	T	O	O	O	O	O	O	O	O
MS Expression Web 3		Website creation and support. Better integration with Microsoft technology.	S	S	S	S	S	S	S	S	S	S	S	S
Adobe Dreamweaver CS4		Website creation and support	S	S	T	T	T	T	T	T	O	O	O	O
Adobe Dreamweaver CS5		Website creation and support. Better integration with Adobe products.			S	S	S	S	S	S	S	S	S	S

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Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Web Content Management Systems														
Classic DSF 2.0 (Cimbrian)			S	S	S	S	T	T	T	T	O	O	O	O
Link Checker														
InSpyder (OrFind, InSite)		OrFind for orphan reporting, InSite for link checking.			S	S	S	S	S	S	S	S	S	S
Forums														
ASPPlayground.Net		Moderated Forums			S	S	S	S	S	S	S	S	S	S
Graphic/Photo Editors														
Adobe Photoshop CS4		For complex photo and graphic manipulation	S	S	T	T	T	T	T	T	O	O	O	O
Adobe Photoshop CS5		For complex photo and graphic manipulation			S	S	S	S	S	S	S	S	S	S
Corel Paint Shop Photo Pro X3		For standard photo and graphic manipulation	S	S	S	S	S	S	S	S	S	S	S	S
Paint.Net		For basic photo and graphic manipulation	S	S	S	S	S	S	S	S	S	S	S	S
Interactive Content Development		For animated introductions and video only. Not for												

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Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		site development use.												
Adobe Flash CS4 Professional		For animated introductions and video only	S	S	T	T	T	T	T	T	O	O	O	O
Adobe Flash CS5 Professional		For animated introductions and video only			S	S	S	S	S	S	S	S	S	S
On-Line Publication														
DigiCel Flipbook		Animation, Storyboard, 2D, 3D, and Stop Motion Must be followed-up with comparable text page.			S	S	S	S	S	S	S	S	S	S
Video Editors														
Adobe Premier Pro CS4		High Performance, feature-rich video editing software.	S	S	T	T	T	T	T	T	O	O	O	O
Adobe Premier Pro CS5		High Performance, feature-rich video editing software.			S	S	S	S	S	S	S	S	S	S
Avid Pinnacle Studio Ultimate Collection 14		User friendly - entry level video editing software	S	S	S	S	S	S	S	S	S	S	S	S
Video Captioning Tools														
NCAM MAGpie 2.0.5		Free tool to add captions to video	S	S	S	S	S	S	S	S	S	S	S	S

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Tool/Technology	Platform	Usage/Type	FY 2011				FY 2012				FY 2013			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
DicTran WAVpedal 7		Transcription Tool	S	S	S	S	S	S	S	S	S	S	S	S
Search Engines														
USASearch		External Sites Only - Free service from federal government	S	S	S	S	S	S	S	S	S	S	S	S
Ultraseek		Search engine used for internal websites (Intranets)	T	T	T	T	O	O	O	O	O	O	O	O
E-Commerce														
Technical Standards														
EDI		Electronic Data Interchange	S	S	S	S	S	S	S	S	S	S	S	S
XML/ebXML		Extensible Markup Language/ Electronic Business XML	S	S	S	S	S	S	S	S	S	S	S	S
SSL		Secure Socket Layer	S	S	S	S	S	S	S	S	S	S	S	S
Online Payment Processing														
DoIT Payment Service		DoIT Developed Service utilizing PayPal	S	S	S	S	S	S	S	S	S	S	S	S

Application / Web Development Technical Domain

Best Practices

- Best Practice 1.** Adopt a total cost of ownership model for applications and technologies that balances the costs of development, support, training, disaster recovery and retirement against the costs of flexibility, scalability, ease of use, and reduction of integration complexity.
- Best Practice 2.** Implement business rules as discrete components ensuring the correct enactment of policies governing the accuracy of related data and the execution of the actions to be performed. Discrete components support the ease of change to business rules and policies and verification that the information or process complies with the applicable rules.
- Best Practice 3.** Access data through business rules.
- Best Practice 4.** Make business rule components platform-neutral supporting SOA architecture.
- Best Practice 5.** Assign responsibility for defining and maintaining the integrity of business rules to business units.
- Best Practice 6.** Adopt coding standards for all languages on all platforms.
- Best Practice 7.** Design applications for future usage and added functionality. Most applications evolve to support new business requirements. Extensibility provides functional scalability.
- Best Practice 8.** Use integrated tool sets to support the use of the State's SDM.
- Best Practice 9.** Document object models, interaction diagrams, design artifacts, and record the structure, behavior and interfaces of application solutions. Document business processes, business rules, source code and user interface.
- Best Practice 10.** Design applications that are platform independent.
- Best Practice 11.** Design the code providing input and output to the user interface to support as wide a range of interfaces as needed, including other applications and other types of user interfaces such as internal user, mobile user, Internet, and Extranet.
- Best Practice 12.** Once the detailed application design is complete, concentrate on achieving a working system utilizing reusable components whenever possible, allowing the system to be tested first and optimized later.
- Best Practice 13.** Design applications so they can be managed using the enterprise's system management practices and tools.
- Best Practice 14.** Design for ease of testing; design application components so they can be tested and debugged easily.
- Best Practice 15.** Design web-facing applications to support the current minimum "code to" standards for web browsers. Recommended baseline "code to" standards optionally include Microsoft IE 6.0 and above, Mozilla Firefox 3.x and above, Google Chrome 4.x and above, Apple Safari 3.x and above, and Opera 10.x and above.
- Best Practice 16.** Implement Commercial Off-The-Shelf (COTS) solutions with little or no customizations and well defined governance procedures. Business needs requiring specific customizations should lean towards Modifiable Off-The-Shelf (MOTS) solutions or Government Off-The-Shelf (GOTS) solutions.
- Best Practice 17.** Establish and maintain shared reuse libraries.

Application / Web Development Technical Domain

- Best Practice 18.** Develop solutions using industry standard coding practices including conventions, styles, standards, and security guidelines.
- Best Practice 19.** “DoIT Payment Service” must be used by State agencies when developing websites and/or applications that need to process Credit Card transactions. This payment service uses PayPal Payflow Pro API to communicate with PayPal, the secure commercial Credit Card processing tool.
- Best Practice 20.** The use of Adobe Flash is limited to only creating animated introductions and features on existing websites and for video. Flash cannot be used to develop interactive websites or applications. Special consideration should be given to ensure accessibility of any Flash content.
- Best Practice 21.** Within this domain, Web Browser standards are set for development, testing, and production. These are the minimum web browser requirements that websites and web applications being created for state business should function within.
- Best Practice 22.** It is the policy of the State of Connecticut to ensure that people with hearing, visual and other disabilities have equal access to public information that is available on the Internet and the Web to ensure access.
- a. Federal Rehabilitation Act Section 508 standards must be incorporated on state funded websites;
 - b. It is the direct responsibility of the agency and its web page developers to become familiar with the guidelines for achieving universal accessibility and to apply these principles in designing and creating any official State of Connecticut Website;
 - c. Testing tools should be used to validate a site’s adherence to Section 508. Recommended tools are available at <http://www.access.state.ct.us/tools.html>.
- Best Practice 23.** CT.gov “branding standards for new websites or applications is available.
- a. Agencies should review the [CT.gov Website Guidelines](#) for more details on home page content standards.
- Best Practice 24.** Data validation must be written into all online forms
- Best Practice 25.** A security assessment should be performed on all new websites and applications that collect information or were developed in a programming language. (Refer to [Security Domain Document](#))
- Best Practice 26.** All websites and applications should have a valid privacy policy that meets the requirements of the application or website where it resides. CT.gov policy can be used or modified as needed to ensure policy compliance.
- Best Practice 27.** All applicable policies should be reviewed prior to creating any new websites and applications (including social networking websites) (Refer to the [State of Connecticut Policies Relevant to this Domain](#))
- Best Practice 28.** Content on websites and applications should reviewed, at a minimum, on an annual basis. Outdated content should be removed or modified.
- Best Practice 29.** Content no longer needed should be deleted from web servers. Web servers should not be used for archive purposes. All content that needs to be saved and stored for record retention should be housed locally at the agency.
- Best Practice 30.** Websites that are no longer being used must be taken offline and the domain name should be redirected to an active website.

State of Connecticut IT Policies Relevant to this Domain

[Policy for the Management of State Information Technology Projects](#)

[Domain Name Registration and Usage](#)

[Implementation and Deployment of State Agency Internet Sites and Extranet Sites](#)

[Acceptable Use Policy of State Systems \(Internet and E-Mail\)](#)

[Accessibility Policy for Connecticut State Government Websites](#)

[Management of State Information Technology Projects](#)

[Network Security and Procedures](#)