State of Minnesota

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ENTERPRISE ARCHITECTUE OFFICE

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Enterprise Architecture Guiding Principles

1 Global Architecture Principles

1.1 GA1: Statewide Focus

1.1.1 Principle

Architecture decisions will be made based on the over-all value and efficiency for the state, while considering the needs of individual agency programs.

1.1.2 Rationale

Planning and coordination at the state level, with input from the agency levels, will best deliver systems that support the state’s goals and activities. Decisions based on a state perspective will tend to have greater long-term value than those made at the agency level. However, delivering necessary functions to agency programs is more important than the technology that is used to do it.

1.1.3 Implications

Some systems will be sub-optimized from the point of view of individual agencies, but optimized for the state as a whole. The state needs to have a process in place to support architectural decision making at the state level. Agencies should plan their initiatives to mesh with the state’s architecture.

Management for systems and applications should be approached starting from the enterprise level and proceeding down to the local level, with management tasks performed at the highest level that makes sense. This approach leads to the fewest number of tools and automatically minimizes the amount of data and probes needed. It also enables SLA, dashboard and similar high-level tools while also allowing the per-system specialized local tools needed for administrators to operate the systems.

However, the state has always supported exceptions to its technical standards for legitimate business reasons. There may be some systems that are implemented that do not fit the architectural principles, but deliver considerable functionality to the state’s programs. Functionality and business processes take primacy over IT structure.

1.2 GA2: Standards

1.2.1 Principle

Standards will be selected to encourage sharing, interoperability, and efficiency. Open standards will be preferred and proprietary standards will be avoided if possible in choosing the right solution for the business requirements. Standards will be promulgated only when there is evidence that an informational, non-binding guideline would be ineffective.

1.2.2 Rationale

Use of standards provides ability to leverage the knowledge and efforts of others. Risk is reduced. Proven solutions are implemented. However, standards should not be used to prevent an agency from being the best it can be in carrying out its mission.

An open, vendor-neutral standards environment provides the flexibility and consistency that allows agencies to respond more quickly to changing business requirements.

This allows the state to choose from a variety of sources and select the most economical solution without impacting applications. It also supports implementation flexibility because technology components can be purchased from many vendors, insulating the state from unexpected changes in vendor strategies and capabilities.

1.2.3 Implications

Open standards do not exist for all parts of the architecture. Therefore, a combination of de facto industry standards, product standards, and open standards will be required in order to support a heterogeneous operating environment.

Open systems must be differentiated from proprietary systems throughout this architecture.

1.3 GA3: Incentives

1.3.1 Principle

Policies and standards will only be included in the enterprise architecture when there has been an examination of the incentives that will encourage or discourage agencies from adopting the new policy or standard. If that examination determines that many agencies are likely to disregard the new rule, then it will be approved only after explicit new incentives for adoption of the rule, or explicit new penalties for failure to adopt the rule, are put in place.

1.4 GA4: Ownership Value Driven

1.4.1 Principle

Decisions on information technology investments will balance the total cost of ownership (costs of development or purchase, support, disaster recover, and retirement) against added value, reduced risk, ease of use, reusability, interoperability, current investments and compliance with the architecture. Recognize that tradeoffs in quality, cost and delivery time are critical to realistically meeting business requirements. Standards should consider the full spectrum of cost considerations, including availability, quality and cost of supporting them, ability to repurpose content, licensing and legal restrictions and all other relevant considerations.

1.4.2 Rationale

When viewed over the whole state, choosing systems based on these criteria will lead to maximum value, and provide superior solutions over the lifecycle of the systems.

A new system with high availability and performance cannot be implemented if lowest cost is the single driving criteria. Tradeoffs in reliability or performance against cost must be made on a case-by-case basis, but always in the best interest of the business purpose. All investments must be tied to business outcomes.

1.4.3 Implications

Upfront costs for some items might be higher, but that will be balanced by reduced long-term costs. Products that can be reused and shared should be strongly considered because they can grow in value over time.

1.5 GA5: Information Protection

1.5.1 Principle

Information will be protected to the level required both internally and externally.

1.6 GA6: Interoperability

1.6.1 Principle

The architecture should support the sharing of information and applications among agencies and across jurisdictions. Systems will be constructed with methods that substantially improve interoperability and the reusability of components.

1.6.2 Rationale

It is difficult to foresee what systems will need to interoperate. Organizational changes, new mandates, and new emphases can require interoperability between systems that were originally seen as separate or standalone. Designing systems to interoperate based on reusable component services will reduce redundancy, save resources and allow systems to change quickly to meet changing government needs.

1.6.3 Implications

The enterprise architecture and systems that are built within it should support reusable, loosely coupled components (services). The architecture will need to support messaging between components. Application developers will need to alter their approach to application design. Support and enforcement of data standards will be essential to achieving interoperability.

1.7 GA7: Customer-Centric Service Delivery

1.7.1 Principle

The architecture should be focused on the delivery of government information and services to the citizens of Minnesota and other customers.

1.7.2 Rationale

In order for the state to be effective in the delivery of government information and services, it must be focused on meeting the needs of the State’s citizens.

1.7.3 Implications

The architecture should be developed to support the complete process that delivers government information and services, including availability regardless of location, time and method of access and group (*e.g.*, language, culture, age and ability). Make the presentation layer accessible and consistent. Consistency within and across application is desirable.

1.8 GA8: Follow Federal Architectural Direction

1.8.1 Principle

The architecture will incorporate standards, guidelines, software components, tools and protocols that comply with federal architectural and security recommendations and mandates.

1.8.2 Rationale

Following federal standards will lead to: better interoperability of systems of systems to meet issues with neighboring states, easier transfer of information to federal agencies and more effective government at all levels.

1.8.3 Implications

System developers and purchasers must be knowledgeable about federal technology standards, and they must build time into their plans to accommodate them. Developing systems based on standards can be more efficient because many decisions are already made, you can often reuse or modify existing components and they will more easily integrate with other systems based upon the same standards when or if it becomes necessary.

1.9 GA9: Proactive IT Risk Management

1.9.1 Principle

The mitigation or reduction of IT risks impacting the business through properly defined architectural requirements.

1.9.2 Rationale

Through the use of risk management practices EA will reduce the potential of adverse impact on the business of architecture requirements and improve business enablement. This will improve decisions for information technology investment and business enablement. It also becomes a means for continually improving the Enterprise Architecture program's standards and policies.

1.9.3 Implications

Defines processes for the evaluation of IT risks used throughout the various lifecycles in the Enterprise Architecture program and its standards and policies.

1.10 GA10: Design for Re-use

1.10.1 Principle

Identify opportunities for common components and implement them in such a way that there is an opportunity for reuse by another program, agency or unit of government.

1.10.2 Rationale

It is more cost-effective to build reusable components as reusable from the beginning. It will be cheaper to build custom products from standard reusable components than build all the components from scratch each time.

1.10.3 Implications

Designing for reuse does have the implication of requiring additional governance and more complex projects owing to more stakeholders.

2 Business Architecture Principles

2.1 BA1: Common Vision

2.1.1 Principle

An agency's business and IT staff must have a common vision of both its business functions and the role of technology in those business functions. They jointly have the responsibility for defining IT needs and ensuring that the systems delivered by the development teams provide the projected benefits.

2.1.2 Rationale

Executive leadership of an agency is responsible for its mission. Information technology staff provides automation of processes to aid in accomplishing that mission. Business and IT purposes must be synchronized to best accomplish the mission.

2.2 BA2: Business Processes Drive Architecture

2.2.1 Principle

The architecture of any individual system must be driven by the business processes of the enterprise.

2.2.2 Rationale

Deployments of technology are most valuable when they are customer focused, business-driven and focused on the mission and goals of the enterprise.

2.2.3 Implications

This minimizes the deployment of technology for technology's sake.

2.3 BA3: Examine Processes First

2.3.1 Principle

Business processes must be analyzed, simplified, or otherwise redesigned for optimization and efficiency before systems will be implemented.

2.3.2 Rationale

Process redesign challenges us to look at current processes differently and to discover the essential business requirements, avoiding automation of flawed processes. Process redesign also may point in the direction of more customer focused approaches. Work processes will be more streamlined, efficient, and cost effective.

2.4 BA4: Design for Re-use

2.4.1 Principle

Identify opportunities for common components and implement them in such a way that there is an opportunity for reuse by another program, agency or unit of government.

2.4.2 Rationale

It is more cost-effective to build reusable components as reusable from the beginning. It will be cheaper to build custom products from standard reusable components than build all the components from scratch each time.

2.4.3 Implications

Designing for reuse does have the implication of requiring additional governance and more complex projects owing to more stakeholders.

3 Information/Data Architecture Principles

3.1 IA1

3.1.1 Principle

Information is a state asset.

3.2 IA2

3.2.1 Principle

Information must be of an appropriate quality for its intended use.

3.3 IA3

3.3.1 Principle

Information must be managed in accordance with information management regulations.

3.4 IA4

3.4.1 Principle

Information must be defined and documented with metadata.

3.5 IA5

3.5.1 Principle

Information must be preserved.

4 Information Systems/Applications Architecture Principles

4.1 AA1: Follow Standard Processes

4.1.1 Principle

Use industry-recognized standard design methodologies in developing applications.

4.1.2 Rationale

Consistent processes aid in design, development, deployment, project management, business analysis, resource use, cost containment, quality and scheduling. Consistency and clarity are necessary not only during the development process to assist in determining structure and organization, but also for long-term support helping to ease maintenance.

4.1.3 Implications

Consider business process redesign prior to application design.

Foster collaboration between business users and technicians through industry standard design processes: *e.g.*, Joint Application Development, Rapid Application Development, Prototyping and Iterative Development.

Use modeling to provide a standardized view of business rules and technical requirements. Models complement the construction of distributed components.

Document the design of all applications. Models, diagrams and other design artifacts record the structure, behavior and interfaces of software solutions.

Use project management and software development methodologies that are established, well-documented methodology, which encompass all aspects of the systems development life cycle.

Manage your application development process using version control, configuration management and release management.

Adopt and document coding standards, in all languages and on all platforms.

Separate layers using the N-tier method: use the basic application reference model to place function components and services in the most appropriate layer.

4.2 AA2: Wherever Possible, Try to Solve Problems Architecturally

4.2.1 Principle

Do not reinvent the wheel: examine potential architectural solutions prior to coding.

4.2.2 Rationale

Architectural solutions are more likely to be reusable and may facilitate fewer complications by crossing functional or technological domains. They tend to provide greater value by addressing multiple issues and having a broader affect than a single application-based solution.

4.2.3 Implications

Architectural solutions usually require more consideration and investment.

4.3 AA3: Leverage the Internet as a Communications Medium

4.3.1 Principle

Use internet communications protocols, formats and web browsers as the delivery mechanism for the presentation layer whenever possible.

4.3.2 Rationale

The internet is ubiquitous, global, and standardized. It’s the communications medium of choice.

4.3.3 Implications

Solutions should conform to internet communications models and protocols (*e.g.*, TCP/IP).

Solutions should be designed to maximize the internet’s strengths and minimize the internet’s weaknesses.

While many browsers exist, the state of Minnesota cannot afford to support all known browsers. It is desirable to attempt to assure cross-browser compatibility. At the same point it is not cost effective to support all. Focus on the mainstream browsers in use by the most people.

Limit the use of proprietary browser features.

Cross-browser compatibility assures accessibility to users via a variety of browser products, and extends the life and usability of systems.

Cross-browser compatibility should be limited to the most popular browsers. It's unrealistic to be compatible with all versions of all browsers.

Limiting the use of proprietary browser features may also limit the application's functionality and diminish the user experience. The challenge is to find a reasonable balance between minimum proprietary browser features and maximum user experience.

4.4 AA4: Develop and Use Services or Service-Oriented Solutions When Possible

4.4.1 Principle

Components that provide services and can be reused are desirable over monolithic single tiered constructs.

4.4.2 Rationale

Designing code constructs or components that use a model separated as "Request for Service / Process / Response or Result" is most desirable than other approaches.

Smaller loosely coupled components can be referenced more than once and across multiple applications.

Services and service-oriented solutions enable many desirable characteristics, such as:

- abstraction
- autonomy
- composability
- discoverability
- formal contract
- loose coupling
- reusability
- statelessness

4.4.3 Implications

Design for reusability wherever possible.

Solutions can be developed by combining components and services.

Componentizing solutions reduces duplication.

Componentizing requires library management and by increasing abstractions may create longer term support issues.

Data validation can be a problem if not completed as close to the source as possible.

5 Technology Architecture Principles

5.1 TA1: Mainstream Technology Use

5.1.1 Principle

Architecture will be based on industry-proven, mainstream technologies except in those areas where advanced higher-risk solutions provide substantial benefit. As obsolete technologies also are high risk, solutions based upon obsolete technologies will be removed from the portfolio in a timely manner.

5.1.2 Rationale

Risk must be controlled. The state does not want to be on the leading edge for its core services because leading edge technology presents a high risk and expensive profile. Similarly, for the same reason, the state does not wish to be dependent upon obsolete technologies.

5.1.3 Implications

We will not usually be early adopters of new technology. However, we will retire obsolete technology promptly to reduce risk.

5.2 TA2: Interfaces

5.2.1 Principle

Standards should focus on interfaces between applications – ports, protocols, file structures and data formats – not on applications and application versions.

These interfaces should be publically-documented.

5.2.2 Rationale

The state has a huge installed base of applications. We will achieve interoperability and integration sooner by focusing on interchange standards than by replacing existing business applications.

Often, the state has a need to access data and information after the collecting application has become obsolete. A well defined publically documented interface to the data enables the state to fulfill its mission.

Standard interfaces will help move the state toward constructing services that will be more flexible than large complex applications.

5.2.3 Implications

Although moving to standard platforms is ideal for maintenance and administration of our systems, focusing on interchange standards will reduce this need. This may lead to less pressure to retire obsolete systems and to re-build systems running on non-standard platforms.

5.3 TA3: Resilience

5.3.1 Principle

The state prefers systems that are stable, robust, reliable, maintainable, flexible and extensible to meet business needs.

5.3.2 Rationale

The state and its partners and customers depend on the availability and functionality of its information systems. The needed performance can best be maintained by means of systems that are easy to manage, able to scale to greater capacity, reliable and flexible. Those systems will also be more cost effective because they will have extended life spans.

5.3.3 Implications

Appropriate availability and reliability should be designed into the architecture and systems that are developed within it. An assessment of recovery requirements is required when acquiring, developing, enhancing or outsourcing systems. The architecture must be frequently reviewed to be sure that it is following business needs, and the technology infrastructure must be open (not proprietary), easily modifiable and extensible.