

# INFORMATION ARCHITECTURE

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### ***DESCRIPTION OF INFORMATION ARCHITECTURE***

An information architecture is a planning tool which helps develop technically compatible systems by providing a consistent approach to information technology across an organization. It is an underlying foundation for dealing in a consistent and integrated manner with the technology, program and organizational issues in an enterprise. A well-designed information architecture can help create integrated technical solutions to program needs and can be used to manage complexity and changing technology.

An information architecture identifies the components of an organization's information technology environment and defines their relationship to the mission of that organization. An information architecture also details the principles, guidelines and standards which specify the strategy and style for the consistent implementation of information technology. In state government, the information architecture provides a framework for information sharing within agencies, between agencies, and, with the public.

Several key elements articulate an information architecture, namely: principles, standards, and models. Statements of principle describe an organization's philosophy regarding how it wants to use information technology. Standards are developed based on the principles and specify how the principles will be implemented. Models are graphic representations of principles and standards.

## **MAINE INFORMATION ARCHITECTURE ACCOMPLISHMENTS**

The Information Services Policy Board adopted Information Architecture Principles in December of 1990. The Board recognized that a consistent approach to information technology across Maine State Government was vital if the state was to meet the public demand for services and information in a cost-effective manner.

Subsequent to the passage of information architecture principles interagency standards committees were formed to draft standards in key information technology areas. These committees developed standards in database management systems, wide area networking, local area networking, departmental operating systems, and systems development life cycle which were adopted by the Information Services Policy Board in 1991 and 1992.

The information architecture has been highly successful in Maine State Government and has resulted in the building of many infrastructure components and systems which are common and shared among agencies. The wide area network forms the backbone of the state's data communication systems and has become the information highway for state agencies. The open system concepts embodied in the state's information architecture have been embraced by most agencies and have resulted in a steady movement from vertically oriented intraagency systems to horizontal interagency systems. Interagency efforts have become the norm rather than the exception.

## **THE FUTURE**

Perhaps most importantly the information architecture accomplishments have positioned the state to effectively capitalize on the national and international superhighway and conduct business in the global economy.

The information architecture principles support continuous quality improvement and business reengineering concepts. Implementation of the architecture expands the horizons in which state workers can improve quality and better serve the public.

The task force drafted the information architecture principles with full recognition that the principles and the information architecture process, by their nature, will be subject to review and refinement every two years.

## **INFORMATION ARCHITECTURE PRINCIPLES**

Principles are the most important element of an information architecture. They represent continuity and relative stability in an environment of change, and serve as a starting point for difficult evaluations and decisions.

In the document which follows, the state's revised information architecture principles are presented within four domains - infrastructure, data, application systems, and organization. These principles were reviewed by a ten-member interagency task force and articulate the state's basic philosophies of information management. The principles will guide the construction of data

processing and telecommunications standards in the areas of equipment and software acquisition, data management, application systems development, and organizational structure.

The attached statements of principles are supported with rationale for each, along with implications for state government associated with their adoption. Each principle is a statement of belief articulating a desired direction for the state; each supporting rationale is a reason why the principle has value for state government; each implication attempts to identify the impact that changes resulting from adopting these principles may have on current practice.

## **INFORMATION ARCHITECTURE PRINCIPLES TASK FORCE**

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## **INFORMATION ARCHITECTURE PRINCIPLES**

### **SUMMARY**

### **INFRASTRUCTURE PRINCIPLES**

- The infrastructure's ability to adapt to user needs is paramount.
- Interoperability is a goal of infrastructure, data management, and applications development.
- The State's infrastructure is based on open technology/architecture.
- The distribution and interconnection of information technology empowers users.

### **DATA PRINCIPLES**

1. Data owners are responsible for data integrity and distribution.
2. State government information is easily accessible.
3. State-level data is commonly defined and accessible across agencies.
4. Information systems are developed recognizing the future disposition of the data.
5. Agencies collect only necessary information, and managers seek to minimize the burden on those who must provide it.
6. Data is captured once and validated at the source.

7. State government information is a valuable resource which has been entrusted to public officials and must be managed and protected as such.

## **APPLICATION PRINCIPLES**

1. Application systems maximize the effectiveness of the user.
2. Application systems are developed using standard, common methodologies.
3. Agencies employ common user presentation methods within their applications, and coordinate presentation methods with other agencies on multi-agency systems.
4. Cross-functional application systems are highly encouraged.
5. Application systems are a joint responsibility of program management and I/S management.
6. Management anticipates and plans for the replacement of obsolete application systems.

## **ORGANIZATION PRINCIPLES**

1. The information architecture guidelines provide a framework for agency management resource decisions.
2. I/S management participates fully in program planning to maximize agency effectiveness.
3. Management plans for the impact that changes in information technology have on the organization, its employees, and the public.
4. Information technology planning recognizes and supports the way people work.
5. Standards are reviewed at least every two years with the participation of State agencies.
6. Successful information systems depend on well-trained staff.
7. Management cooperates and seeks out partnerships with other agencies in information technology areas.

## **INFRASTRUCTURE ARCHITECTURE PRINCIPLES**

### **Principle 1**

The infrastructure's ability to adapt to user needs is paramount.

#### **Rationale:**

1. Agency requirements are both unique and dynamic. The infrastructure should support an environment that allows applications to start small, quickly, and inexpensively.
2. An adaptable infrastructure provides the capability to add onto the current investment with minimum inconvenience to the user.
3. Applications should be able to expand or contract in concert with the demand for services.
4. The infrastructure should support applications that are flexible and portable.

#### **Implications:**

1. Adaptability and life expectancy are major criteria in setting infrastructure standards and selecting components.

2. Solutions which demonstrate a growth path and support portability are more likely to be maintained or supported in the future.

## INFRASTRUCTURE ARCHITECTURE PRINCIPLES

### **Principle 2**

Interoperability is a goal of infrastructure, data management, and applications development.

#### **Rationale:**

1. Interoperability enhances the ability to share data and other resources which is critical to the effective delivery of services by State government.

2. Interoperability fosters better interagency cooperation by eliminating many of the barriers which make interagency efforts difficult.

3. By promoting and providing interoperable components, scarce training and support resources can be directed in the most cost-effective manner.

4. A consistent user view of the infrastructure leads to productivity gains.

#### **Implications:**

1. An agency may incur higher initial costs to achieve statewide compatibility. This may delay upgrade for some agencies. However, this will position the agency to realize future cost savings.

2. Agencies may need budgeting and staffing support to migrate to an infrastructure that supports interoperability.

3. Agency management needs to be educated as to the benefits of a common infrastructure so they will support the strategic plan for such an infrastructure.

### **Principle 3**

The State's infrastructure is based on open technology/architecture.

#### **Rationale:**

1. Open technology/architecture enables the State to take advantage of industry trends and future technology.

2. An open systems approach provides for a better return on investment by prolonging the useful life of infrastructure components. It facilitates the portability of applications to smaller or larger platforms without extensive retooling and increases the likelihood that the replaced hardware can be effectively utilized elsewhere in the organization.

**Implications:**

1. State standards, based on open technology/architecture standards will be developed. Purchasing procedures will incorporate these standards.
2. The cost of excluding non-conforming solutions will require us to grandfather current non-conforming products for a period of time while a plan for their replacement is put in place.
3. The State needs to maximize use of existing open technology/architecture standards.

**INFRASTRUCTURE ARCHITECTURE PRINCIPLES**

**Principle 4**

The distribution and interconnection of information technology empowers users.

**Rationale:**

1. The use of intelligent workstations and personal computers in a networked environment, when situations and applications warrant, enhances productivity.
2. The availability of computing processing power and network connectivity to users is often a critical part of the appropriate solution of business system needs.
3. Increased productivity and improved job satisfaction can result from a work force which is able to take advantage of computing resources, while minimizing the need for using I/S specialists.

**Implications:**

1. Users must be trained to use computing power and network capabilities to attain optimal results.
2. Some users will proceed with their own development, independent of I/S involvement.
3. Computer resource location decisions will be based on effectiveness and not unilateral rules.
4. The effective management of networks and distributed computing resources will increase the I/S workload.

**DATA ARCHITECTURE PRINCIPLES**

THE FOUNDATION WHICH SUPPORTS THE  
INFORMATION ASSETS OF THE STATE.

**Principle 1**

Data owners are responsible for data integrity and distribution.

**Rationale:**

1. Data owners must be accountable for the effective and efficient management of data.
2. The accuracy, currency and security of data are management concerns best handled by data owners.

**Implications:**

1. State government needs to develop security procedures and standards which are consistent across the infrastructure.
2. State government needs to establish procedures for data sharing.
3. For distribution to the public, data owners need to establish fee schedules within freedom of information guidelines and Information Services Policy Board policy.

**Principle 2**

State government information is easily accessible.

**Rationale:**

1. The public has a right to expect more and better information.
2. The public has right of access to governmental information, except for that information which is confidential by statute.

**Implications:**

1. Agencies need to develop strategies and solutions to allow for easy and convenient public access.
2. Agencies need to provide information about the data which is accessible to assist public understanding and minimize misinterpretation.
3. Financial and human resource investments will be required if State government is to provide easy and convenient public access to its information.

### **Principle 3**

State-level data is commonly defined and accessible across agencies.

#### **Rationale:**

1. Standards for common categories of data collected by agencies facilitate information exchange and minimize duplicate information or information systems.
2. State-level data definition is important to all State agencies and as such needs to be available, accessible, consistent, and accurate.
3. Common definition reduces duplication, mismatching, misuse and misinterpretation of data, promotes inter-agency cooperation, and facilitates data sharing.
4. Standards for collecting and recording common data definitions can reduce acquisition costs and improve opportunities for maximum use of State information.

#### **Implications:**

1. Data which is classified as State-level must be made available by the data owners across the infrastructure taking into account appropriate security concerns.
2. In many cases State-level data is duplicated in several agencies. Efforts to coordinate data definitions will require close cooperation among agencies to develop appropriate standards.

### **Principle 4**

Information systems are developed recognizing the future disposition of data.

#### **Rationale:**

1. Data is recognized as a valuable asset in statutes for archiving and records management. These statutes apply to electronic as well as paper documents.
2. Identifying the useful life of data promotes more effective systems and efficient storage of data which should result in lower storage costs, while providing for future requirements.

#### **Implications:**

1. Archival and records management considerations have been incorporated into the systems development methodology and need to be applied as systems are developed.
2. Archived electronic records need to be as accessible as paper records. This presents some technical challenges regarding equipment/ media compatibility.



3. State personnel need to be trained in archival and records management policies and procedures and State archival and records management staff needs to be aware of technical considerations.

## DATA ARCHITECTURE PRINCIPLES

### **Principle 5**

Agencies collect only necessary information, and managers seek to minimize the burden of those who must provide it.

#### **Rationale:**

1. The value of the State's information lies in its application. Information should be collected or created only to the extent that it has use in fulfilling the agency's mission.
2. Data collection should be based on a defined need in order to achieve the most productive use of resources involved in the provider/collection stream.

#### **Implications:**

1. I/S developers and users will need to be trained to challenge assumptions requiring the capture of information, testing these against current and future needs.
2. Agencies must coordinate data collection with other agencies.

## DATA ARCHITECTURE PRINCIPLES

### **Principle 6**

Data is captured once and validated at the source.

#### **Rationale:**

1. Currently data may be captured and/or rekeyed multiple times.
2. To reduce redundancy, errors, and costs, data should be captured as close as possible to the originating source.
3. Interpretation questions are most effectively answered at the point of data capture.
4. Well-designed processes take into account source data collection.

#### **Implications:**

1. The State needs to continue to explore and recommend alternative technologies for data capture at the source.

2. Data collectors/validators need to understand what the data means and why it is important.
3. Solutions must account for control agency statutory responsibilities for data validity even though the data may be collected elsewhere.
4. An improved work flow and simplified work process will reduce the resources needed for data capture and increase the availability of data.
5. I/S developers need to develop work-flow analysis skills and incorporate them into the systems development life cycle.

### **Principle 7**

State government information is a valuable resource which has been entrusted to public officials and must be managed and protected as such.

#### **Rationale:**

1. Information has value to the State beyond the individual application. It is key to program planning and decision making.
2. Attention should be shifted from technology to the content, quality, use, and value of information.
3. Managers are responsible for assuring that information is protected and that controls are in place which assure that information is being collected and used properly.

#### **Implications:**

1. State Government must develop data and information management skills between users and owners including security, back up, and disaster recovery.
2. Confidential data needs to be identified and protected.
3. A policy is required to distinguish invalidated raw data, notes, working papers, etc. from official data and information.

### **APPLICATION ARCHITECTURE PRINCIPLES**

THE METHODOLOGIES AND TOOLS WHICH ARE

USED TO TRANSLATE THE STATE'S BUSINESS REQUIREMENTS

INTO APPLICATION SYSTEMS.

### **Principle 1**

Application systems maximize the effectiveness of the user.

**Rationale:**

1. Applications should be driven by the business requirements of an organization and supported by available technology.
2. Effective systems aid the delivery of services, maximize the use of high efficiency resources, and respond to user needs.
3. An effective user can better serve the customers.

**Implications:**

1. This requires both I/S developers and agency program staff to look beyond how things are being done and at what needs to be accomplished. Training support will be needed for both.

APPLICATION ARCHITECTURE PRINCIPLES

**Principle 2**

Application systems are developed using standard, common methodologies.

**Rationale:**

1. Standard development methodologies increase the likelihood of high quality results and promote reusable components.
2. Training and support economies of scale can be realized by using common methodologies and tools. Training is more apt to be offered and delivered in this environment.

**Implications:**

1. Systems Development Life Cycle standards must be adaptable to changes in proven industry methodologies and maximize the effectiveness of the development environment.
2. Training programs will be required to support standard, common methodologies.
3. The I/S staff will be more mobile within State government as the development approach will be similar across agencies.

APPLICATION ARCHITECTURE PRINCIPLES

**Principle 3**

Agencies employ common user presentation methods within their applications and coordinate presentation methods with other agencies on multi-agency systems.

**Rationale:**

1. Common user interfaces increase user productivity and promote interoperability.
2. Training economies of scale can be realized by common user interfaces. Training is more apt to be offered and delivered in this environment.

**Implications:**

1. Agency standards will be developed for user interfaces.
2. Training programs will be required to support the standards.
3. Agency staff will be able to learn to use new systems quicker as the interface will be familiar.
4. Agencies developing cross-functional systems will need to work together to accommodate differences in user presentation methods.

APPLICATION ARCHITECTURE PRINCIPLES

**Principle 4**

Cross-functional application systems are highly encouraged.

**Rationale:**

1. Today there are many common information system needs in State Government but few cross-functional systems are available. Those that have been developed have successfully demonstrated the value of this approach.
2. There are economies of scale to be realized in systems development and administration by incorporating cross-functional systems.
3. Cross-functional systems encourage cooperation between program and I/S staffs.
4. Multi-agency efforts should result in increased effectiveness and efficiency.

**Implications:**

1. Systems may cost more in the short-term and take longer to build as a result of obtaining multi-agency participation. However, more agencies will benefit from the investment which may reduce overall State costs.

2. The I/S community needs to stimulate the development of cross-functional systems.
3. BIS will need to provide staff resources to guide and support the development of cross-functional systems.

### **Principle 5**

Application systems are a joint responsibility of program management and I/S management.

#### **Rationale:**

1. It is important that both agency management and I/S staff recognize that they have a stake in the outcome of a development effort.
2. An application should maximize functional utility within I/S capabilities.
3. Application development is an investment which must be jointly managed to maximize the return to the agency.

#### **Implications:**

1. Both I/S and program managers will need to understand applications from the other's perspective. This will require development of supportive and dependent working relationships over the life of the application.
2. I/S professionals need to understand the mission and program goals of the agency.
3. Program managers need to understand the potential limitations and tradeoffs of technology.

## APPLICATION ARCHITECTURE PRINCIPLES

### **Principle 6**

Management anticipates and plans for the replacement of obsolete application systems.

#### **Rationale:**

1. Every application has a limited useful life span. Beyond this life span, the application becomes functionally deficient and costly to operate and maintain.
2. Planning for the replacement of applications will reduce crisis replacement and maintenance efforts.
3. Newer applications can be more responsive to changing requirements by incorporating proven technology in solving program problems.

**Implications:**

1. Systems need to be managed as an asset and linked to program and budget plans in order to obtain executive and legislative support.
2. Both agency and I/S management must work together in the search for the best possible replacement.
3. Agencies need to develop priorities for the replacement of obsolete systems.
4. Managers must be skilled in analyzing the value of investments in replacement systems.

**ORGANIZATION PRINCIPLES****THE PEOPLE AND STRUCTURES THAT MAKE GOVERNMENT WORK.****Principle 1**

The information architecture principles provide a framework for agency management resource decisions.

**Rationale:**

1. The mission and culture of each agency is best known from within.
2. This clarifies and balances the responsibilities between BIS and agencies.
3. Establishment of responsibility and authority fosters ownership and facilitates the decision-making process.

**Implications:**

1. Agencies will comply with Statewide policies and standards.
2. BIS needs to provide consulting resources to support agencies in making information architecture decisions.
3. Program and I/S management need to work closely together to insure that resource decisions meet agency goals.

**ORGANIZATION PRINCIPLES****Principle 2**

I/S management participates fully in program planning to maximize agency effectiveness.

**Rationale:**

1. Technology is becoming increasingly important to the successful operation of the State. It is also of strategic importance to the future well-being of the State.
2. Business decisions have technology consequences just as technology decisions have business consequences.
3. Joint involvement increases the likelihood of the I/S solution to the business problem being funded and reduces the likelihood of last minute, inadequate application support for the solution.

**Implications:**

1. The I/S head in each organization needs to be recognized as part of the agency management team.
2. Financial analysis and planning for I/S expenditures must be incorporated into the program planning process.
3. Both I/S and agency management must make a conscious effort to educate the other about their responsibilities and requirements.

**ORGANIZATION PRINCIPLES****Principle 3**

Management plans for the impact that changes in information technology have on the organization, its employees, and the public.

**Rationale:**

1. The processes and procedures that humans use to interact with information systems are vitally linked to successful utilization of the information resource.
2. Information systems technology has the impact of reducing the manual labor involved in information processing. Employees need to be retrained to work smarter, not harder.
3. Proper planning can aid in the understanding of I/T capabilities and make it easier to adapt to and implement change.
4. Planning for changes in business processes and new technology will help assure realization of expected outcomes.

**Implications:**

1. I/S management needs to help program management understand the changing nature and impacts of I/S technology.
2. Organizational change issues must be dealt within every systems development project.
3. Management must involve all levels of their organization when introducing new technology.

## ORGANIZATION PRINCIPLES

### **Principle 4**

Information technology planning recognizes and supports the way people work.

#### **Rationale:**

1. There is great creativity and energy that can be gained by recognizing and enhancing the work group. Information technology should not isolate the worker from peers, supervisors or subordinates.
2. Successful computer systems recognize the important role of people in the business processes which they perform.
3. The purpose of technology is to support business requirements.

#### **Implications:**

1. Human systems engineering training may be necessary for I/S and program staff.
2. End users need to participate in information technology planning.
3. Continuous quality improvement efforts will be key to realizing the synergy potential of information systems.

## ORGANIZATION PRINCIPLES

### **Principle 5**

Standards are reviewed at least every two years with the participation of State agencies.

#### **Rationale:**

1. Standards are best understood and followed when a sense of ownership is evident.
2. A collaborative definition of standards is more likely to result in standards which are followed.



3. Cooperative development will identify diverse needs as standards are developed and anticipate possible exceptions to the standards.

4. Technical standards should recognize individual agency capabilities, characteristics, and needs as well as the common good.

**Implications:**

1. This requires agencies to make resources available to participate in the standards process.

2. A participatory effort between BIS and agencies will result in better acceptance and application of standards.

3. Biennial reviews will result in timely revisions of standards where necessary.

**Principle 6**

Successful information systems depend on well-trained staff.

**Rationale:**

1. The effective use of methodologies, tools and techniques which can empower developers, and speed delivery and maintenance of the systems, requires timely training.

2. Optimal utilization of information systems requires that the users and user managers of such systems understand the processes and procedures necessary to utilize fully the system's capabilities.

3. Training is a fundamental ingredient of information systems and therefore, of doing business. Then, the costs of training, both direct and indirect, will be part of agency planning.

**Implications:**

1. Training investments may rise, but I/S staff, users, and agency management will be better able to take advantage of information systems and technology.

2. Well-trained staff needs to be readily available to system users.

3. A training plan, including funding, will be developed to support new systems.

4. I/S management must gain the support of agency management to achieve the training plan.

**Principle 7**

Management cooperates and seeks out partnerships with other agencies in information technology areas.

**Rationale:**

1. Research and development into new technologies is a costly investment. Sharing the cost among agencies may permit more technology exploration and further the exploitation of promising technologies.
2. Economies of scale can be realized by sharing new technology hardware/software platforms.

**Implications:**

1. The I/S community needs to work together to identify and develop action plans to explore new technologies.
2. Agencies that have implemented new technologies have an obligation to assist other agencies in applying the technology.
3. Agencies need to develop budgeting and accounting solutions for technology sharing.

**GLOSSARY OF TERMS**

**Agency:** A unit of State Government that meets one of the following conditions:

- (1) executive reports to the governor
- (2) executive is a constitutional officer
- (3) is a semi-autonomous body
- (4) the Judiciary
- (5) the Legislature

**Cross-functional** Application systems which cross organizational boundaries

**Systems:** and are designed to eliminate data and process redundancy.

**Data Owner:** The agency with the authority to collect data.

**End-User Data:** Data maintained by an individual primarily for use in the performance of job function.

**I/S:** Information Systems

**I/S Management:** The individual in an agency who has responsibility for the I/S function. This individual could be the person responsible for an agency I/S staff, or the individual with the sole responsibility for the I/S function in an organization.

**Interoperability:** The commonality which enables the user of one system to connect easily to other systems and process in a manner consistent with using one's own system.

**I/T:** Information Technology

**Open Architecture:** An infrastructure which supports, through standards, the interconnection and interoperability of multiple vendors' products and which presents a common interface to the user.

**State-Level Data:** Data which the owning agency defines cooperatively with other agencies to satisfy multi-agency needs.

**User:** Anyone who has authorized access to a system, data, information, or application.