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Governor's
Office of Information
Technology

C²P: The Colorado Consolidation Plan

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**State of Colorado
Information Technology
Enterprise Architecture,
Governance and Consolidation
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Section I Introduction

2 Introduction and Scope

In 2007 Governor Bill Ritter Jr. announced a multi-year information technology consolidation plan that folds state government's decentralized operations into the Governor's Office of Information Technology (GOIT). The plan calls for centralized information technology management, purchasing, spending and planning. The plan will also create a statewide enterprise structure compared with today's department-by-department model. The successful consolidation efforts of other states were studied as part of the plan development process.

In May 2007 Governor Ritter issued an Executive Order which elevated the position of the State of Colorado Chief Information Officer (CIO) to a cabinet level position and addressed a number of administrative changes to Information Technology management processes. An "IT Consolidation Bill" will be introduced in the 2008 legislative session by sponsors Representatives Andy Kerr and Bernie Buescher and Senators Bill Cadman and John Morse to enact the reforms. In addition, an Enterprise Architect was appointed.

In June of 2007, the State of Colorado engaged CIBER to assist in developing an Enterprise Architecture program which is foundational to consolidation and associated governance consistent with the State of Colorado's drive toward consolidation of Information Technology functions. The development of an Enterprise Architecture discipline will address key technology and business issues enabling a consolidated Information Technology discipline throughout the State of Colorado.

Early in 2007 an initial assessment was performed by North Highland Company. Some of the findings of the study concluded:

- △ A large number of State of Colorado personnel were involved in technology decisions but under no central authority resulting in a fragmented approach to Information Technology management
- △ There is no consolidated view of the enterprise
- △ There are large numbers of redundant infrastructures (hardware and software) across multiple departments providing essentially the same functions
- △ The state has experienced a number of challenged and failed projects
- △ Tracking of IT spend across the State of Colorado is problematic
- △ There is a lack of technology standardization across the enterprise

The conclusion of the study was that the State of Colorado is unlikely to realize either the Colorado Promise or an Enterprise Technology Strategy the way Information Technology is currently organized in the State of Colorado.

Enterprise architecture describes how an organization performs its work using business processes, information, people, technology and facilities. Once documented, this can serve as a reference point to manage the coordination of common business processes, information flows and supporting technology investments across all state departments. The State needs to leverage technology to boost the effectiveness and efficiency of service delivery (i.e., doing the right things) and to maximize the coordination of these technology investments (i.e., doing them the right way). Colorado will standardize state-wide enterprise architecture as a means of connecting individual agency goals to a shared information technology strategy so the State can realize the return on its IT investment. The overarching goal is to manage technology investments from a statewide approach which allows it to proactively capture economy-of-scale opportunities. The key results will be a reduction of the total cost of ownership for the State's existing



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technology. This enables an opportunity to reinvest savings, continue to drive greater cost reductions and provide better service to citizens.

Enterprise Architecture is a key governance discipline leveraged within enterprise focused organizations providing oversight of information technology investments, standards, processes, alignment of business and Information Technology objectives, responsible for planning and implementing the various architectures required to support business objectives.

Enterprise Architecture to date has not been staffed or supported as a formal discipline in the State of Colorado. There are a limited number of personnel who act as architects and there are very few individuals dedicated to the discipline. The State of Colorado has however, recognized that when attempting to move from a series of vertically oriented organizations to an enterprise organization, there needs to be a discipline that is chartered with providing enterprise-wide oversight. Such oversight addresses not only evaluation of new technologies and initiatives but also the more proactive aspects of the discipline such as technology standards, platform and reference architectures, enterprise integration, and support for defining enterprise processes.

As such, this effort was designed to address the development of the Enterprise Architecture discipline for the State of Colorado Information Technology organization. Enterprise Architecture for the purposes of this engagement is defined within the State of Colorado Information Technology Strategic Plan and is presented immediately below.

The Enterprise Architecture Design Team (EADT) has addressed the core responsibilities of this engagement (Enterprise Architecture and Enterprise Architecture Governance) but also undertook a number of additional activities which were designed to assist the State of Colorado in achieving its consolidation-oriented goals. The Enterprise Architecture Design Team assisted the State of Colorado in not only performing the research for undertaking consolidation inclusive of internal discussion activities, external discussions, and research, but also worked with the State of Colorado to develop a four phase consolidation framework and the initial activities within Phase I of the framework. The framework and Phase I activities were developed in concert between the State of Colorado Chief Information Officer, the State of Colorado Deputy Chief Information Officer, State of Colorado Departmental Chief Information Officers, the State of Colorado Enterprise Architect, and two senior consultants from CIBER.

The EADT has also provided a Communications Plan to address consolidation mechanisms and structures, basic information on Information Technology governance extending beyond Enterprise Architecture governance, a review of existing initiatives designed to determine how these initiatives fit within the goal of consolidation, and a limited amount of information on organizational benchmarks.

This engagement has not addressed the more encompassing concepts of the Project Management Lifecycle, the Software Development Lifecycle, and Program Management (some aspects of which have been addressed by another entity) but has provided a framework under which these processes can be further refined and standardized.

In addition, although this engagement's primary focus areas were Enterprise Architecture, governance and consolidation, the subsequent disciplines of Data Architecture and Business Architecture governance and compliance have been addressed at only a superficial level in early phases but are identified as core deliverables of later phases. In addition, the definition of the Enterprise Architecture discipline does not provide prescriptive standards, policies, procedures and processes but rather identifies those as needs which will need to be addressed when the Enterprise Architecture discipline is created. Elements of Enterprise Architecture transcend almost all aspects of the project life cycle as shown below in figure 2.1



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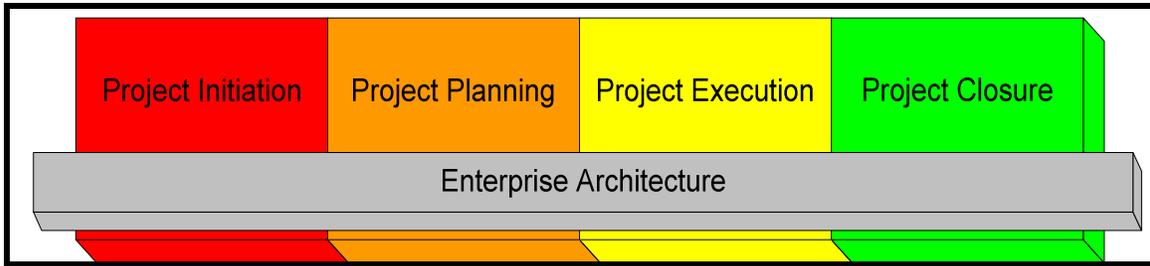


Figure 2.1 – Enterprise Architecture Scope

By way of organizational scope, although this engagement has primarily focused on Executive Level departments, the goal of this is to ensure that the enlisted approach and resultant services are extensible to all State of Colorado departments including the Legislature, Department of Higher Education and its constituent institutions, the Secretary of State, and Judicial branch departments as well.

Proceeding forward within this document, the EADT is the Enterprise Architecture Design Team and is referenced as EADT underscoring the collaborative nature of this engagement. The EADT is comprised of Mr. Ron Huston, the State of Colorado Enterprise Architect, and two senior consulting resources, Mr. Manish Sharma, and Mr. Gregg Powers.



3 Executive Summary

The initial scope of this activity involved engaging the EADT to provide guidance with respect to Enterprise Architecture governance for the State of Colorado in light of its consolidation activities. The EADT has provided this guidance within this document but has also provided consolidation guidance, a communications plan, as well as addressing a wide variety of issues related to consolidation. A summary of the findings and recommendations of these activities are listed below.

- △ Consolidation activities should be undertaken in a logical order starting with organizational preparation, followed chronologically by infrastructure, service, and business (or program) function consolidation. The latter consolidation activities (service and business) should be carefully evaluated for investment value before embarking on such a consolidation. If sufficient value is not present for an out-of-cycle consolidation, then consolidation should be revisited when the existing service or function requires an upgrade or replacement.
- △ As new functions or services (e.g. content management) are procured for departments, each of these functions or services should be carefully scrutinized to determine whether there is enterprise applicability for the service or function to be acquired. If it is determined that it is an enterprise level service or function, an enterprise wide set of requirements should be collected and products supporting enterprise wide requirements should be selected and implemented as an enterprise service. This approach will involve Enterprise Architecture in identifying solutions but will result in not having to re-procure the same solutions over and over.
- △ Careful evaluation should be undertaken with respect to which information technology functions should be physically consolidated and which should be logically consolidated (e.g. placed under the control of a centralized authority but executed in distributed locations). In general, the EADT would counsel that the State of Colorado physically consolidates functions which require minimal interaction with departmental programs and thoughtfully consider whether or not to consolidate those functions which interact heavily with departmental programs and personnel. Of specific note, the EADT would counsel careful consideration before physically consolidating (but logical consolidation should still be undertaken) the following functions:
 - Program specific application development
 - Quality assurance
 - Business analysis
 - Desktop support
 - Departmental coordination and planning
- △ Consolidation should initially be undertaken using a broadly-based and collaborative approach using State of Colorado information technology expertise to assist in effecting the change. Although this approach may take slightly longer, the overall strain on the organization will be less than a purely top down approach and should enjoy the benefits of reducing risk since the very individuals who have traditionally managed Information Technology functions can be engaged to identify and address risk as well as participate in the consolidation. The EADT acknowledges and believes it is critical that the State of Colorado Chief Information Officer has both the mandate and the authority to act in the event that progress towards consolidation does not move forward in a reasonable manner.
- △ The EADT believes that there are flaws in the existing structure and the support of the centralized IT organization. Although the existing Division of Information Technology will be able to be re-



organized in a manner that will support successful service delivery, the amount of work required to effect the changes will be significant and will take considerable time. Failure to dramatically upgrade the capabilities of a consolidated information technology organization prior to consolidation will introduce additional risk to the consolidation effort. Areas that must be addressed include personnel issues, funding and investment issues, service provisioning functions, institutionalization of enterprise processes, and enhancing organizational capabilities through the introduction of new services. Finally, provisioning of utility infrastructure management functions is not from the EADT's perspective, a core competency of a state government. As such, the EADT would recommend the State of Colorado consider whether management of utility information technology services is a core competency of the state before determining the service provisioning strategy.

- △ The EADT would recommend that the State of Colorado begin the process of institutionalizing departmental processes through formal documentation of the various processes. This will not only provide a mechanism to protect the departments from a continuity perspective, but will also facilitate quicker consolidation of departmental functions in the future.
- △ The EADT recommends the use of a multi-tiered Enterprise Architecture discipline and associated governance with oversight provided by an Enterprise Architecture Board which is chaired by the Chief Architect or Chief Technology Officer. The EADT would recommend the use of several existing departmental CIOs to sit on this board as well as the Chief Information Officer, Deputy Chief Information Officer, Service Delivery Officer, and Chief Information Security Officer. Since Enterprise Architecture is not a robustly staffed discipline anywhere in the State of Colorado at this time, the EADT would recommend that the State of Colorado start the process of identifying and hiring Enterprise Architects to begin building the Enterprise Architecture discipline responsible for building the reference architectures, defining State of Colorado platform and technology standards, defining technology review, adoption, and compliance processes, and developing technology policies.
- △ Communication will be one of the most important, yet troublesome areas of consolidation if not properly addressed. As such, the EADT strongly recommends acquiring dedicated communications resources whose primary mission is to ensure consistent and accurate communications to a variety of audiences as well as providing education to key decision makers throughout State of Colorado government. Communications focus has been strongly accentuated by other state CIOs that have been consulted throughout this engagement and who have persevered through their own challenges encountered from their consolidation efforts.
- △ The critical path of the pre-consolidation activities is based around determining what organization (internal or external) will provide managed services, which in turn drives the organizational change approach. As such, any short circuit evaluations which can be undertaken to expedite the decision related to the service provisioning organization will reduce the overall organizational preparation time required. In the event that the State of Colorado were able to determine whether or not to use an external managed service provider, the State of Colorado may be able to leverage potential managed service provider resources and processes to address many of the activities described in this document as a prelude to both consolidation and the move to a managed service provider. The EADT does acknowledge there are aspects of state procurement code which must be complied with nevertheless anything that can be done to shorten this process will be of benefit.
- △ A very basic analysis of compensation levels within the State of Colorado would suggest that the State of Colorado will need to analyze and potentially upgrade compensation for certain positions, especially if service provisioning will be internally staffed. This will be an important consideration in delivering consistent enterprise service. Above average employee turnover, extended position



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vacancy periods, and the inability to attract experienced candidates will all contribute to service degradation which will in turn compromise consolidation efforts. The State of Colorado should wait until decisions are made on the location of functions before undertaking this step.



4 Strategic Issues

As a part of this activity The EADT has identified a number of different issues that the EADT would recommend the State of Colorado carefully consider prior to adopting and executing a final consolidation strategy. Some of these issues are core to the service provisioning strategies that the State of Colorado will adopt and the others are related to more cultural and political issues which the State of Colorado will have to deal with, especially if it decides that service provisioning is a core competency of the State of Colorado.

Is Information Technology service provisioning (in part or in whole) a core competency of the State of Colorado?

Although this is a question best answered by the State of Colorado, the EADT will observe that the more utilitarian nature of the Information Technology function, the fewer tendencies there are to consider them core competencies. Certain information technology functions can be executed effectively by a wide variety of organizations without extensive program or domain knowledge. The State of Colorado government exists to protect and serve its citizens and while Information Technology management is an enabler of programs and services, the execution of the more utilitarian (operations, infrastructure) Information Technology functions are not considered a core competency of a state government. Many states have outsourced their infrastructure and operations to 3rd party managed services providers. This approach to providing service should not be considered a panacea however. Although this approach solves many issues, it introduces other issues which the State of Colorado will have to manage.

Does the State of Colorado have the political will to fund Information Technology services to the level required to make it effective?

Again this is a question best answered by the State of Colorado. The EADT will observe that traditionally, funding of Information Technology personnel, infrastructure, and projects in the State of Colorado has in some cases, been insufficient and has directly contributed to some failures and challenges in State of Colorado Information Technology projects. This is a core educational issue that must be addressed with the State of Colorado legislature and other State of Colorado executives ensuring that the correlation between adequate funding and success is clearly defined. Furthermore, if the State of Colorado determines that it will own service provisioning for State of Colorado departments, there could be some short term increases in costs but the result will be a more robust and more effective information technology infrastructure.

Since the goal is to move to a consolidated Information Technology discipline would departmental or centralized competency centers be developed?

Although the exact distribution of various competency centers should be determined by the nature and users of the individual competency centers, the location of such centers should be determined using proximity values of the centers. As such, if there is significant value in maintaining the competency centers or parts of the competency centers near their users, the competency centers should be logically centralized, but physically distributed. If there is no compelling value to distributing the personnel, the competency centers can be both logically and physically consolidated.

Is physical consolidation of human resources also a goal of the envisioned consolidation?



There will likely be some physical consolidation of human resources, the degree to which will be determined by the final nature of the consolidation. The initial consolidation phase calls for infrastructure consolidation most of which should be able to be provisioned from a centralized location. There are certain Information Technology functions which do not easily lend themselves to physical consolidation and these should probably be left in a more decentralized structure even if logical control is used to manage the distributed function. Example of these types of services are those that are distributed over the expansive geography of the State of Colorado and which have been positioned there because of the need to have them local. In any event, careful consideration should be given as to whether physical consolidation should be undertaken because there may be considerable impact on individuals who may have to travel to different facilities.

Will the State of Colorado be able to sustain attracting and retaining the level of Information Technology personnel required to provide support for the goals of its departments, especially in more robust economic times?

This is a question that can best be answered by looking at existing compensation structures and behavioral patterns of employees which transcend various generations of potential employees. The general statement that State of Colorado Information Technology personnel compensation (in this case total compensation) must at least mirror marketplace compensation is true. The State of Colorado must also recognize that there are some types of marketplace compensation (e.g. stock options) which it can not easily compete with. Furthermore, there are different employee demographics and generations and as such, it may be possible to develop targeted offerings to each of these demographics and generations. As such, it is important to define compensation offerings and value propositions which position the State of Colorado to offer different types of compensation to remain competitive. If a managed service provider is selected, the managed service provider will likely be required to maintain compensation levels consistent with market compensation levels.

Different generations of potential employees may well have different motivations. For example many existing employees of the State of Colorado considered stability as a motivator in choosing a career with the State of Colorado. The current generation may be more interested being compensated for their drive and innovation. These types of employees often place less priority on stability and more emphasis on compensation. This was revealed through a survey of employee ages of existing employees within state governments. Although economic times can have a profound effect on the motivations of individuals, the nature of the various generations needs to be considered.

This is an important consideration especially as it relates to Information Technology introduced efficiencies and innovation. Private companies can more easily attract and retrain more driven individuals and can harness these talents to optimize the service provisioning process resulting in lower costs to provide equivalent levels of service.

Will the State of Colorado continue to allow departments to control spend for Information Technology assets and services, but now consistent with enterprise standards?

This is a fundamental issue that must be addressed by the State of Colorado. Other states have taken varied approaches to consolidation and as such, some have transferred all funds to a centralized organization and others have left responsibility for spend within the various departments using a "fee for service" model under a tightly controlled set of policies, processes, and standards. There are advantages and disadvantages to each model, but this will need to be resolved and if the existing model (e.g. departmental responsibility for spend) is radically changed, this will require additional education and cooperation with departmental representatives.



Section II Consolidation

5 Consolidation Objectives

Although there are a number of possible objectives for Information Technology consolidation, setting these objectives up front will allow the State of Colorado to determine when consolidation has been successful. In general, it would be more valuable to define the magnitude of the scalar quantities presented below, but even defining the objectives in a subjective manner would allow the State of Colorado to measure progress against the objectives and to determine if additional consolidation activities need to be undertaken.

Listed below are the perceived objectives of the consolidation activities. These have been garnered from the State of Colorado Promise, the State of Colorado Information Technology Strategic Plan, informal discussions, and input from other states.

Objective 1

Achieve Information Technology Strategic Plan Objectives and the Colorado Promise

A number of specific objectives have been identified within the State of Colorado Promise and the State of Colorado Information Technology Strategic Plan. Not only are objectives identified within these documents laudable, they represent fundamental commitments to the State of Colorado constituents, businesses, and employees. As such, consolidation is an enabler of many of the stated objectives and should be aggressively pursued. Examples of the objectives from the Colorado Promise include:

- △ Instituting state government performance and financial reviews that have generated savings of as much as 6% in other states
- △ Improving purchasing and coordination of state information technology
- △ Establishing Colorado as a 21st century leader in applications of information technology
- △ Converting state government telecommunications to Voice over Internet Protocol (VoIP)
- △ Taking advantage of improvements in technology, purchasing, and business processes

Examples of objectives from the State of Colorado Information Technology Strategic Plan include:

- △ Securing and protecting IT assets
- △ Optimizing spending for IT decisions, projects, and technology
- △ Managing effective IT projects
- △ Improving service delivery
- △ Improving collaboration and innovation

Anticipated Results: Achieving objectives stated in both the State of Colorado Promise and the State of Colorado Information Technology Plan.

Objective 2

Standardize Technology Usage, Procurement, and Contracting

In order to optimize spend within the State of Colorado for information technology, it is necessary to both standardize technology and the processes used to acquire technology. This does not mean that a single vendor needs to be selected in each solution space, but reduced numbers of vendors allow the state to take advantage of greater volume discounts using more aggressive negotiating postures, requiring less differentiated skills to support, and reducing the overall cost to procure and support information technology.



Anticipated Results: Technology and technology acquisition standardization will result in lower cost acquisition of technologies and reduced support costs requiring less differentiated skills and eventually less personnel to support the technologies supporting State of Colorado programs.

Objective 3
Standardize Processes and Policies

Differentiated standards and policies create artificial barriers between organizations inhibiting both the sharing of resources and experience as well as resulting in disparities between individuals in different departments.

Anticipated Result: Information Technology staff utilizing a common set of policies and processes would enable the capability for the organization to move resources, as state requirements demand, between various departments or parts of the enterprise. In addition, certain disciplines with which the State of Colorado has traditionally struggled (e.g. project management) can be handled in a more enterprising fashion enabling the development of superior practices, risk identification and mitigation techniques, and accountability.

Objective 4
Unify the Infrastructure Supporting Program Operations

The existing infrastructure supporting programs and services is both distributed and diversified across a large number of facilities, platforms, and communications mechanisms. While it is neither necessary nor desirable to consolidate to a single facility, usage of a smaller number of facilities will concentrate experience and knowledge and reduce the overall costs to provide service. Furthermore, once infrastructure is consolidated, there are natural savings opportunities (e.g. reduce physical security constructs, server virtualization, common management tools) which can be exploited to the benefit of the state.

Anticipated Result: Usage of a reduced set of infrastructure will result in reduced operational costs as well as opening up additional opportunities to save additional resources.

Objective 5
Enterprise Level Planning

Historically the State of Colorado has identified and acquired technology solutions in support of programs by identifying departmental requirements and then provisioning the solution. By planning for and identifying solutions that can meet the needs of multiple (or all) departments, the overall cost of acquisition is reduced and a single solution can be applied to multiple business needs. Furthermore, as Enterprise Integration is addressed, a smaller number of solutions enables the State of Colorado to focus the integration on the richness (or depth) of the services as opposed to the breadth of the services. Traditionally there has been a large amount of redundancy in information (e.g. constituent information) which has been implemented through multiple solutions throughout the State of Colorado which can now be addressed from an enterprise perspective as opposed to a departmental perspective.

Anticipated Result: Enterprise level planning will result in a smaller subset of solutions as well as less replicated data (which is problematic to keep synchronized) reducing the overall costs of providing program services to the State of Colorado constituents.

Objective 6
Effective Use of Information Technology Resources



The State of Colorado has a large array of information technology resources distributed across more than 20 different organizations. At this time, there is considerable diversity in both the technologies used and skills required to support state programs and services and in a FTE constrained environment, this leads to a requirement to have broad skills as opposed to deep skills. Furthermore, in many cases, key technologies are underutilized.

Anticipated Result: Optimizing the use of information technology resources by reducing both the number of differentiated skills required and differentiated technologies used by the state enabling State of Colorado resources to develop deeper skills across a smaller number of technologies. In addition, consolidation will facilitate combining various applications and data onto a less number of underutilized devices reducing the managed asset base.

Objective 7

Reduce Exposures Associated with Information Technology Investments

The State of Colorado has historically presided over a number of both challenged and failed projects along with many more successful projects. Although the successes should not be lost in the shuffle, the goal is to achieve 100% success in projects. The reasons for execution miscues can not be laid at the door of any one organization or individual but many dollars have been invested without returning appropriate business value to the constituents funding them.

Anticipated Result: By managing these investments from an enterprise perspective using a mixture of best practices, education, and expectation management, the State of Colorado will be able to proactively manage information technology investments in a manner that will greatly reduce the number of challenged and failed projects.

Associated with the overarching objectives identified above, the following performance objectives can be used to track organizational performance at an enterprise level. It should be noted that the State of Colorado does not have an established baseline for some of these objectives. The State of Colorado can quickly establish some of these baselines whereas others may not merit the investment in developing the baseline but can use measurement of the objectives to determine organizational performance moving forward. The specific objectives are depicted below in tables 5.1 – 5.8.

Data Center Objectives	Enterprise Objective
Reduce the number of raised floor data centers housing State of Colorado information technology equipment	Reduce the overall cost of facilities required to support Information Technology infrastructure
Provide a standardized disaster recovery data center equipped with appropriate connectivity	Ensure that all State of Colorado systems are identified, categorized, and prioritized with respect to recovery

Table 5.1 – Data Center Objectives

Shared Application Objectives	Enterprise Objective
Reduce the number of groupware systems providing productivity applications throughout the State of Colorado	Reduce the cost of providing groupware and productivity services to State of Colorado agencies
Reduce the number of systems providing administrative functions throughout the State of Colorado	Reduce the cost of overall administrative functions throughout the State of Colorado
Develop enterprise services which can be standardized and provided to the State of Colorado	Standardize selective services transitioning them to enterprise services which can be administered



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departments	consistently across the enterprise
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Table 5.2 – Application Objectives

Investment Objectives	Enterprise Objective
Adopt project management best practices including advanced risk management techniques	Reduce the number of challenged or failed IT investments driving project success towards 100%
Develop processes for evaluating information technology investments	Ensure that funds invested in information technology provided are compliant with enterprise standards and deliver business value

Table 5.3 – Investment Objectives

Network Objectives	Enterprise Objective
Reduce the number of network links used throughout the State of Colorado	Reduce the overall cost of network services supporting delivery of State of Colorado programs and services
Integrate voice, data, audio, and video over a common network infrastructure	Reduce the overall cost of network services supporting delivery of State of Colorado programs and services and simplifying network management

Table 5.4 – Network Objectives

Enterprise Architecture Objectives	Enterprise Objective
Utilize enterprise wide planning supporting the implementation of new programs and services	Reduce the number of types of similar services leveraging instead a series of enterprise level services and focusing on reuse
Define enterprise standards for hardware, software, and service types throughout the State of Colorado	Enable the procurement organization to leverage aggregate buying power reducing the overall cost of information technology goods and services
Develop various enterprise architectures	Ensure an enterprise approach to design, development, and implementation of systems
Develop agency architectures	Ensure that each agency has a service delivery architecture based on a common architectural base reducing design efforts and improving reuse
Develop enterprise solutions	Consolidate the number of departmental solutions into a lesser number of enterprise solutions meeting the needs of many departments

Table 5.5 – Enterprise Architecture Objectives

Security Objectives	Enterprise Objective
Define and implement an integrated Information Security plan	Secure State of Colorado resources and data

Table 5.6 – Security Objectives

Procurement Objectives	Enterprise Objective
Procure a lesser number of types of goods and services	Reduce the overall cost of procurement of goods and services throughout the State of Colorado reducing the per unit price and the number of differentiated skills required to manage IT infrastructure

Table 5.7 – Procurement Objectives



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Financial Objectives	Enterprise Objective
Account for all funds expended on information technology resources	Provide the capability to definitively understand how and where funds are being expended for information technology resources

Table 5.8 – Financial Objectives



6 Consolidation Approaches

One of the identified goals of the State of Colorado is to consolidate Information Technology disciplines resulting in a more economical, standardized, and institutionalized discipline which is able to more effectively serve the citizens and businesses of Colorado.

Virtually every state has attempted some type of consolidation effort in order to more effectively utilize taxpayer resources to provide governments services. There are a number of approaches to consolidation, but the most common approach to consolidation is a physical consolidation followed in some cases, by applications consolidation. Other approaches include consolidation by department or consolidation by function. The EADT would define physical consolidation as physically consolidating Information Technology disciplines into a single location or set of locations under a common management structure and logical consolidation as standardizing execution of Information Technology disciplines across a distributed set of physical locations. To date, more states have focused on the low hanging fruit (e.g. infrastructure consolidation) whereas less have focused on applications consolidation.

Even if both types of consolidation are undertaken within the State of Colorado, the degree of complexity suggests that an infrastructure consolidation be attempted before an applications consolidation. This is largely because of the complexity in trying to identify the normalized business processes required to consolidate applications. Furthermore, having a robust and well managed infrastructure available to house the consolidated applications eliminates one potential source of performance and availability problems for the consolidated applications. Once the physical consolidation has been successfully undertaken, it is then possible to focus on applications consolidation. Within these two categories of consolidation (physical, logical) there is a further breakdown of consolidation efforts that will streamline the process.

There are a number of approaches to Information Technology consolidation that have been undertaken within state governments. In some cases, single state governments have used multiple approaches. A quick survey of these approaches is described below.

Consolidation by stepwise progression

Consolidation by stepwise progression involves identifying a series of steps to move through consolidation in an evolutionary manner. The goal of such an approach is to ready the organization for consolidation and then start focusing on the highest value and lowest risk targets for consolidation first and then over time move to lower value and more risky consolidation targets. The advantage of such a strategy is that consolidation efforts may be halted at any point or suspended for a period of time and the more significant benefits will still have accrued to the organization. Such an approach usually involves focusing on infrastructure first, followed by more functional consolidations later.

Consolidation by business function

Consolidation by business function focuses on identifying common business functions and then centralizing those services. This approach will work and is a variant of a stepwise approach, but there are challenges in implementing such a strategy if the underlying governance, processes, and infrastructure are not in place to support the standardized business functions. As such there is the potential that such an approach can either be derailed or progress significantly impeded if business processes are not standardized. In addition, if a responsive service organization is not prepared to operate the consolidated systems supporting the applications and the individuals using the systems, this can cause service disruptions which would also threaten further consolidation efforts.

Consolidation by department



Consolidation by department focuses on consolidating entire departments into a centralized Information Technology organization. Such an approach can also work, but this approach can have considerable challenges to it if not clearly thought through. A simple example is the challenge in uniting disparate software development life cycles and tools. The time and effort to consolidate these may be overwhelming and yet without undertaking this standardization, few savings will occur from a consolidation involving for example, application development disciplines. If this strategy is chosen, it is imperative that slow and methodical assimilation of departments occurs. It can be problematic for any but the most experienced state CIO's to quickly assimilate the domain knowledge and issues faced by twenty (20) different governmental departments all delivering unique programs and services.

6.1 Recommended Approach

Given the input from the State of Colorado CIO's, lessons and approaches learned from other states, and adopting a risk profile that facilitates thoughtful execution, the EADT recommends that the State of Colorado proceed towards consolidation through a multi-phased approach which can best be described as crawl, walk, run resulting in a stepwise progression which builds on successes from a prior phase to launch new consolidation activities in the current phase. As such, the approach creates sustainability for the current and subsequent phases.

This consolidation approach utilizes as a fundamental axiom that it is important to get robust standards, processes, management services, and infrastructure in place before starting to embark upon consolidation of the more important infrastructure services and eventually, business services. If we approach consolidation targeting infrastructure and business services first without having the processes and operational services to support them, we risk failed consolidations. This is the case because throughout the consolidation process, certain processes will have to transition from departmental only processes to departmental/service provider processes. Although not impossible to address business and infrastructure consolidation concurrently, the real opportunity is to consolidate infrastructure first, acquiring the most aggressive pricing possible, and reducing the total assets under management to provide IT services. Furthermore, a solid infrastructure, complete with responsive service is a requirement for service and business function consolidation. If these foundations are not in place, service and business functions consolidations can fail affecting the enterprise.

When proceeding into infrastructure consolidation in Phase II and beyond, the EADT would recommend utilizing a formal framework to guide the consolidation. This framework would ensure that individual requirements of the various departments are addressed and that subtle nuances in service requirements are addressed. The EADT has defined a framework below although the framework could easily be modified once phase I activities are complete.

6.2 Framework

In order to pursue consolidation activities, the EADT has worked with the State of Colorado to define a consolidation framework which will generally guide consolidation activities. The framework is not designed to be absolute in nature but is designed to describe a general approach to consolidation which is logical and which is evolutionary in nature (e.g. organization → infrastructure → services → business functions). This is a logical approach since business functions supporting programs rely on services and they both rely on infrastructure. All aspects of IT service further rely upon the organization.

The framework depicted below in figure 6.1 is broken down into four (4) phases – a preparatory phase and a series of consolidation phases. The preparatory phase is designed to ready the organization to support consolidated information technology services and the subsequent phases are designed to address actual consolidation activities.



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Infrastructure consolidation activities are centered on consolidating the physical infrastructure but introducing either no change or a very minimal amount of change to the business functional environment. As such, the planned organizational change will be focused largely on infrastructure support and design personnel. Once the base infrastructure consolidation is completed, the service provisioning organization will start to explore ways to achieve further consolidation to save funds (e.g. server virtualization, combining of network links, standardizing platforms). In addition, phase II activities also focus on establishing common platform architectures and technology standards guiding technology procurement going forward so the amount of investment in legacy platforms is minimized.

Once consolidation of the infrastructure is complete, it will be time to start undertaking service consolidation. Service consolidation will be done through the collection and normalization of service based processes and will also require organizational change. In general, it is the EADT's counsel that investment value be determined for all service consolidation activities since in many cases, large outlays of capital and manpower will be required to establish common software bases. There will be personnel based services (e.g. applications development, help desk) and technology services (e.g. email) that will be candidates for consolidation. Consolidation of services will require in some cases, both business process re-engineering and normalization across the enterprise. Furthermore, since services are beginning to be consolidated at the logical level, some programming may be required if underlying services are consolidated and normalized (e.g. migrating to Exchange or Groupwise may require some programmatic interfaces to be changed). Such an opportunity will enable the State of Colorado to build an enterprise service to abstract the underlying technology from the program using the service.

Finally, similar to service consolidation, business functions supporting State of Colorado services and programs will be undertaken. The same comments that apply to service consolidation also apply to business function consolidation except that in most cases, business process re-engineering and normalization across the enterprise will be required. Business function consolidation will be by far the most complex consolidation activities undertaken not only because of the various business process re-engineering and business process normalization efforts, but also because a modicum of organizational change will be required as a part of the business process changes. Similar to the organizational change that usually accompanies new ERP (Enterprise Resource Planning) system deployments a similar set of activities will have to be undertaken even if the State of Colorado both physically and logically consolidates enterprise business functions.

The discussion of business function consolidation gets even more complex when we consider domain function consolidation. For example although there are some elements of licensing that are the same across all licensing functions, there are others that are unique to the programs and services needing licensing functionality. As such, a careful and thorough requirements development activity will be required followed by a functional decomposition of enterprise licensing and domain licensing services. These types of consolidation can be undertaken and will provide benefit, but will require considerable work.

It is the expectation of this framework that the initial two phases (e.g. organizational preparation and infrastructure consolidation) may be undertaken without a great deal of evaluation as to the benefits that will result from these types of consolidation activities. Experiences from other states have clearly demonstrated the value of such consolidations. At this time, there is no reason to believe that the State of Colorado is any more or less standardized than other states which have undergone similar consolidation efforts.

The framework developed provides a roadmap consistent with the approach described above. The EADT has leveraged the use of the existing State of Colorado project life cycle and depicted each phase, governed by this life cycle, along with sample activities included within the framework.



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The framework is depicted below in figure 6.1.

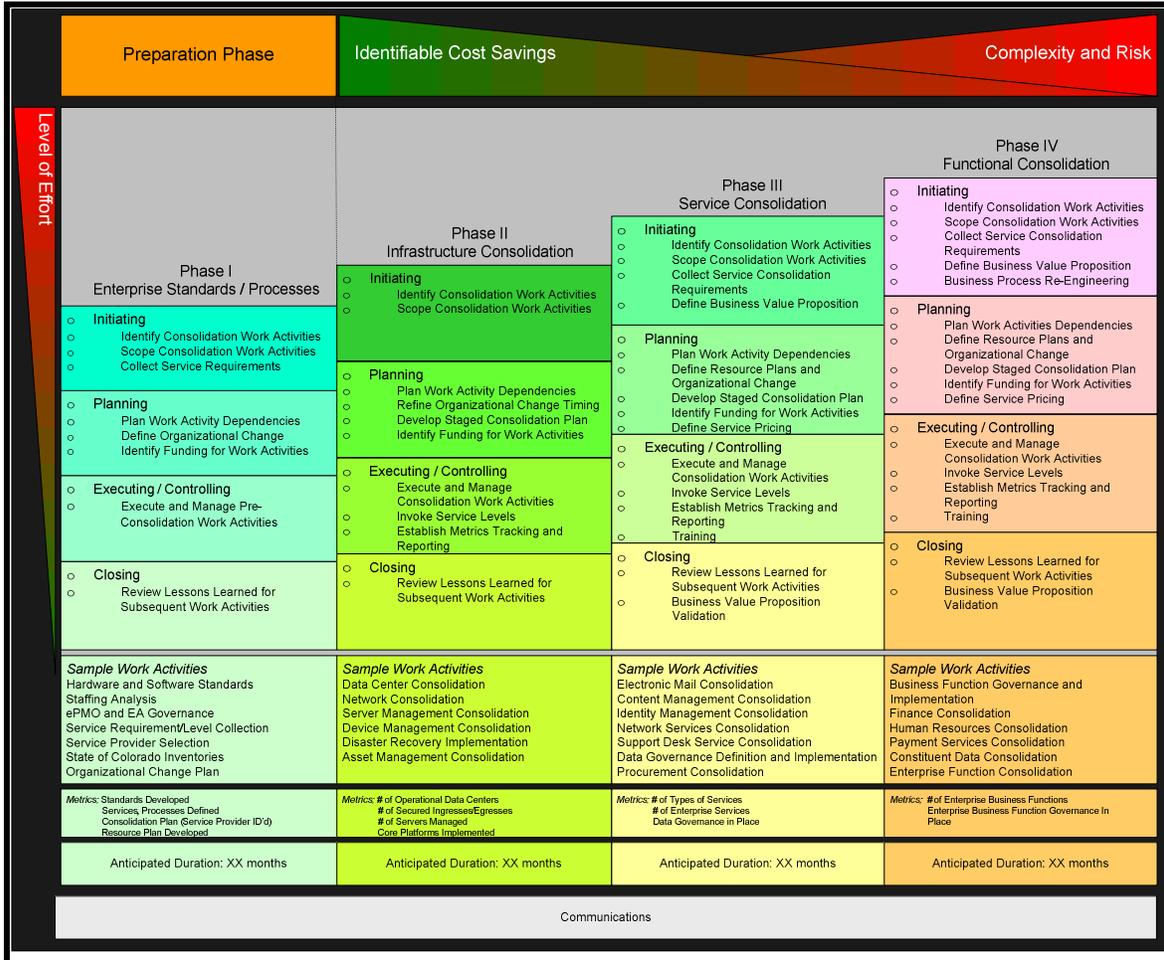


Figure 6.1 – Consolidation Framework

6.3 Phase I Framework Narrative

The proposed approach to consolidation for Phase I is straightforward. It is designed around defining business requirements for service, defining existing State of Colorado Information Technology resources, determining the type of organization required to support those requirements, and then determining how the organization must be upgraded to support enterprise wide management. There are other activities that will be undertaken within Phase I as well, but these activities are not in the critical path and have more to do with governance. A high level, graphical depiction of the process is shown below in figure 6.2 followed by short narratives of each of the steps. More detail, in the form of specific activities supporting the steps is documented in a later section.

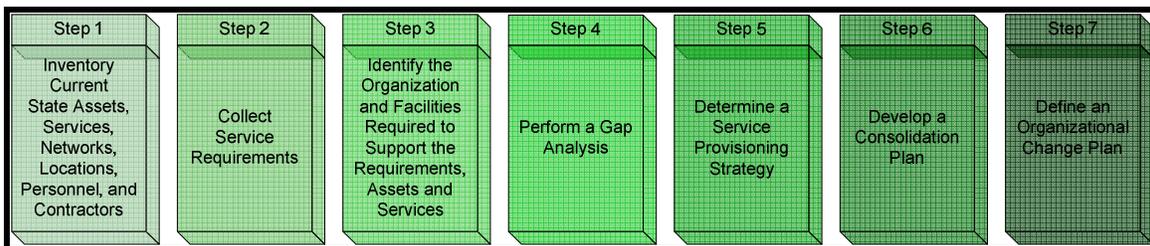


Figure 6.2 – Phase I Stepwise Progression



Step 1

Start by inventory and identifying the personnel, contractors, contracted services, assets, networks, and services currently in place within the State of Colorado departments. In addition, identify the Information Technology services required by each of the State of Colorado departments and use this as a service baseline. The goal of this set of activities is to define the baseline of what the State of Colorado currently has in place with respect to the various items that need to be managed and the resources available to manage them.

Step 2

Collect the business requirements for various types of services needed to support business operations and the service levels required for each of those services. This is a critical step as it sets forth the business requirements for the services needed and the service levels for delivering those services. Such requirements must include the applications and their service levels for those applications.

Step 3

Identify the type of organization required to support the assets and services defined above in steps 1 and 2. The identification of such an organization would include # of individuals, skills requirements, location requirements, etc. This step would result in a staffing plan for an enterprise information technology services organization.

Step 4

Perform a gap analysis of what steps would be required to upgrade the centralized service organization to meet the defined business requirements, service levels, and support the defined assets and services. This includes such items as developing bridge processes to enable the defined distribution of information technology functions.

Step 5

Contact external managed service providers to determine their capability to meet State of Colorado needs and the costs to provide the defined service provide. A subtlety of this gap analysis is that it must be conducted at both a departmental level and an enterprise level. This is so that individual migration plans may be developed on an agency basis and that the necessary level of services are available at departmental cutover.

Step 6

Define a detailed consolidation plan to support the consolidation of all in-scope functions targeted for consolidation in Phase II. The consolidation will depend on the service provisioning strategy selected and will address what will be consolidated and in what order functions and departments will be consolidated.

Step 7

Define the necessary organizational change plan to enable the transition from the existing organization(s) to the new organizations. This would include transition of departmental personnel as required, potential usage of a managed service provider, any required training, etc.

The steps above are chronologically ordered, but are not an exhaustive list of activities that have to be undertaken to effect consolidation. As such, there are a number of activities not directly within the critical path defined above which also need to be addressed. These activities are identified below and generally affect items such as funding and governance.



There are also a number of other activities which are not directly in the path of the consolidation planning process which have been included in the detail activities. These represent organizational preparation activities and include such items as setting up the appropriate governance, defining funding strategies, defining technology standards, aligning procurement with those standards, defining various processes, and so forth. These are not directly consolidation planning activities but do support some aspects of organizational change required to manage information technology from an enterprise perspective.

Within each of the various phases of the consolidation framework, there are additional levels of breakdown. For example in Phase II when network consolidation is undertaken, it is not advisable to undertake network consolidation across the breadth of State of Colorado departments. As such each of the individual activities in the consolidation phases (Phase II – Phase IV) will also be broken down into a logical series of migration activities that will affect either one or a small number of departments at a time.

It should be noted that in some cases, consolidation activities will need to be linked to ensure that orderly migrations are undertaken. For example, if servers are moved, in some cases, it may be necessary to move communication links at the same time. Such activities will be planned at the end of Phase I activities. The development of this plan will require considerable effort but has NOT been depicted on the Phase I activities.

6.4 Approach Rationale

The rationale for using the defined approach and framework is based on the commonly agreed upon principles of obtaining maximum value for minimum investment and minimum risk (80/20 rule). Having studied other states experience as well as using the experience of various Information Technology executives, the choice to focus on infrastructure consolidation first is based on this rule. The specifics of focusing on infrastructure first are driven by the following factors:

- △ The cost to consolidate infrastructure will be less than combining business functions
- △ The consolidation of infrastructure is less complex than business function or service consolidation
- △ State of Colorado program services, although they rely on infrastructure services, have no requirements dictating who provides the infrastructure services
- △ Since applications and program services rely on infrastructure it makes sense to ensure that infrastructure and infrastructure services are robustly implemented before starting to address service or business function consolidation
- △ The greatest value will be obtained from infrastructure consolidation and standardization
- △ Infrastructure consolidation value will be easiest to define and capture

In Phase II the following disciplines are expected to be consolidated in a phased manner:

- △ Network design, administration, operation, and management (including support of remote network access points and devices)
- △ Systems (mainframe and servers) implementation design, storage design and management, administration, operation, and management
- △ Enterprise facilities management including facility security
- △ Enterprise asset management
- △ Physical and logical security of networks and systems
- △ Facility security
- △ Enterprise approach to disaster recovery of infrastructure
- △ Enterprise architecting
- △ Procurement and contracting
- △ Portfolio and investment management



△ Program Management Office oversight

In Phase II the following disciplines are expected to continue to be located in the departments but reporting to the consolidated information technology organization:

- △ Application development and support processes (QA, Business Analysis)
- △ Help desk
- △ Desktop support
- △ Applications administration (but not server administration)
- △ Customer liaison

Because of the split of some of these functions, certain interim processes will have to be developed (or updated) as a part of the actual Phase II activities. This is because as of today, these processes (regardless of whether institutionalized or not) are executed within the bounds of a single department whereas during the consolidation process, these processes will be split over the departments and the consolidated organization. Longer term these processes may reside completely within the consolidated service organization or maintain a distributed execution profile.

During the consolidation transition period, there will need to be changes to selective processes as facets of the organization are divested from departments and instantiated in the consolidated service organization. Some of the processes that will need to be adjusted (or defined as necessary) are listed below. The list below in table 6.3 is not designed to be comprehensive but features some of the more common processes that will need to be addressed and should spur thinking as to other processes that will have to be addressed.

Process	Current Process	Transitional Process
Move to Production	Departmentally Coordinated	Coordinated between Department and Consolidated Organization
Configuration Management	Departmentally Coordinated	Coordinated between Department and Consolidated Organization
Help Desk (infrastructure)	Departmentally Coordinated	Coordinated between Department and Consolidated Organization
Operational Change Control	Departmentally Coordinated	Coordinated between Department and Consolidated Organization

Table 6.3 – Sample Processes Requiring Re-Factoring

6.5 Activities and Roadmap

Listed below in figure 6.4 are the various activities which must be undertaken to complete Phase I activities. In some cases, aspects of these activities have already been addressed, either partially or fully by activities already initiated. These initiatives will be undertaken and data collected and placed in a common repository. Once the data has been collected, various analysis activities and decisions will be made based on the data collected. Once the various decisions have been made, then formal plans to begin the consolidation will be developed.

Most of the initial data collection activities will be conducted through both structured inquiries, document inquiries, and in some cases, individual consultation. Individual issues which may arise will be addressed through collaborative and consensus building mechanisms. The EADT has developed and vetted these activities but acknowledge that there are many circumstances under which execution of these activities may be modified. Furthermore, the State of Colorado will leverage all existing information sources which can be used to reduce the defined work efforts.



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A temporal depiction of the 31 activities, complete with predecessor / successor relationships is shown below in figure 6.4.

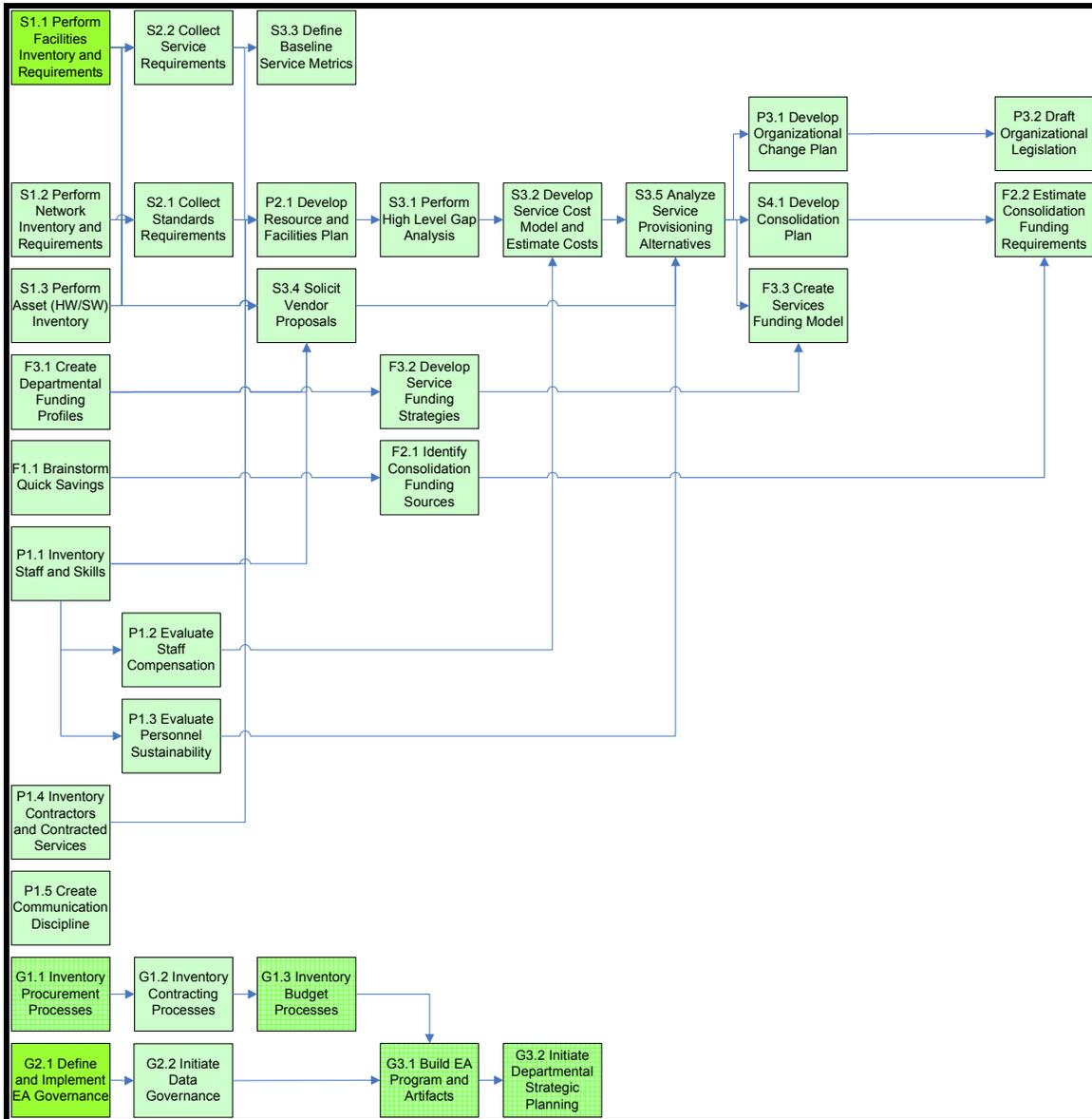


Figure 6.4 – Phase I Activities

Caveats: There is the potential as selective activities are undertaken that the overall order of progress may change. This may happen due to new information uncovered, interim decisions which are made and potentially new activities or information which was not envisioned at the time this plan was created. In addition, conservative estimates have been provided for the activities but there is a chance depending on a variety of factors, that additional time or resources may be required. Furthermore, these activities and associated timelines assume that sufficient resources are available to staff the activities. Large scale changes are not expected but there may be some changes that will be required moving forward.

A high-level, grouped timeline has been provided for the activities listed above. A more detailed plan can not be developed until such time as detailed planning meetings are completed for each of the activities and



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resources are identified. Once these two things have been done, more accurate estimates can be provided. The initial estimates for the durations of these activities are believed to be conservative in nature, but until the scope and resources are finalized, a more definitive schedule is not possible. As such, the schedule provided below in figure 6.5 is high-level and is subject to variances. Initiation of these activities can proceed as soon as the legislation is passed.

Once again, it must be stressed that this timeline is a preliminary timeline only and assumes that sufficient resources are available to staff and execute multiple activities in parallel.

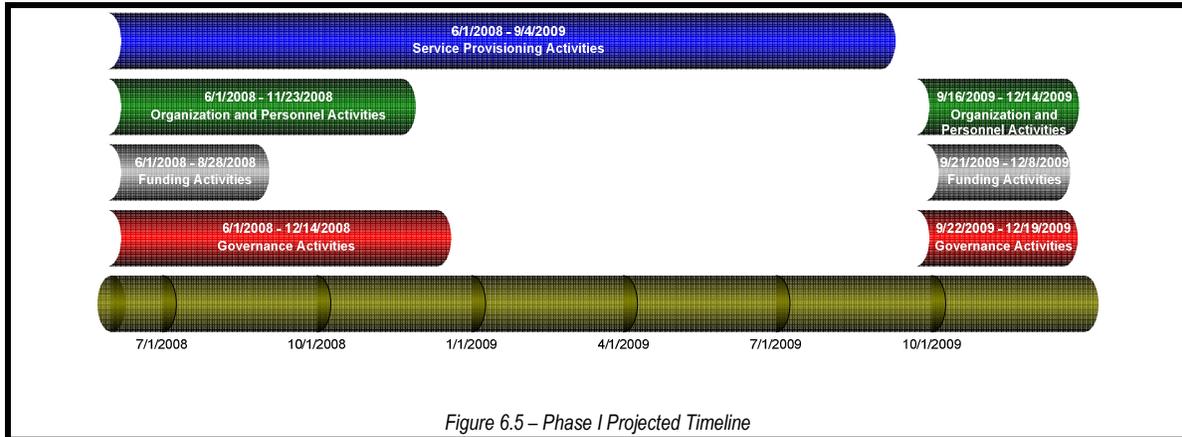


Figure 6.5 – Phase I Projected Timeline

