ADOA-ASET

Project Investment Justification

Version 01.01

A Statewide Standard Document for Information Technology Projects

Project Title:

DES Data Center Relocation - Compute Implementation

Agency Name:	**Department of Economic Security (DES)**
Date:	**March 2015**
Agency Contact Name:	**Kim Hartleroad**
Agency Contact Phone:	
Agency Contact Email:	

I. Management Summary*

The Arizona Department of Economic Security (AZDES) is seeking approval to procure hardware and professional services needed to implement the computing resources within the new co-located multi-tenant data center.

The DES compute solution is required to support the computing, processing and storage capacity that will be implemented in the I/O Data Center and used to transition from the 1720 AZDES Data Center to the CenturyLink I/O facility site Data Center, hereafter referred to as the I/O Data Center.

Network connectivity will be extended to both data centers on a single and pre-existing subnet. The IP addressing of servers will not be changed between data centers before or during the migration.

The IBM mainframe will be physically relocated to the I/O Data Center. To reduce risk and keep the mainframe under warranty, it's required for IBM to perform the relocation of the mainframe components to the I/O Data Center.

There are 66 physical servers at the DES. Many of these are scheduled to be virtualized before the data center move, so physical relocation may not be required.

For the virtualized distributed systems, a new virtual environment will be created using a Cisco FlexPod solution. This solution provides an ideal solution to do a virtual migration of the current distributed environment which helps reduce risk and potential down time.

NetApp provides the ability to keep storage synchronized between storage arrays in the two data centers. Utilizing VMware, a single virtual data center will be created between the current UCS environment and the new UCS environment.

After the new Cisco Unified Computing System (UCS) and storage hardware has been racked, stacked and configured, applications will be migrated in a series of waves. All of the migrations except for Exchange, Mainframe and potentially a few physical servers will be migrated virtually with either the VMotion or Site Recovery Manager applications.

The project is complete when all applications and services are hosted and running from the I/O Data Center and the 1720 AZDES Data Center can be decommissioned.

II. Project Investment Justification (PIJ) Type*

☐ **Yes** ☒ **No** Is this document being provided for a Pre-PIJ / Assessment phase?

If Yes,

Identify any cost to be incurred during the Assessment phase.	$
Based on research done to date, provide a high-level estimate or range of development costs anticipated for the full PIJ.	$

Explain:
Click here to enter text.

☐ **Yes** ☒ **No** Will a Request for Proposal (RFP) be issued as part of the Pre-PIJ or PIJ?

III. Business Case

*A. Business Problem**

The AZDES Data Center continues to rapidly deteriorate. The AZDES Data Center has experienced three significant facility outages (requiring emergency services & evacuation) over the last 18 months. These facility issues have included: fire, flood, power outages, leaks, asbestos abatement, generator issues and halon deployments.

The cost to repair this facility would require millions of dollars and the repairs cannot take place while equipment is in the AZDES Data Center. Without immediate intervention, a catastrophic failure is inevitable. The only viable solution is to relocate the AZDES Data Center to the new co-located, multi-tenant site within the CenturyLink / IO facility site. The AZDES Data Center is essential to the daily functionality of the Arizona Department of Economic Security enterprise and multiple other business units within the state that are dependent on our system interfaces. It is imperative to continue the necessary project activities to prepare for the actual relocation of the current AZDES Data Center. The AZDES requires additional funds to relocate computer equipment, procure new servers and storage equipment and engage implementation services for the migration to the new co-location facility. The new UCS and storage equipment are a continuation of the Data Center Relocation (DCR) activities approved in the previous Networking PIJ (DE15003).

*B. Proposed Business Solution**

The DES is requesting approval to proceed with the current data center relocation project by acquisition of additional computing hardware and professional services to address the following project needs:

- Replacement of existing end of life distributed system servers
- Replacement of existing end of life enterprise storage
- Additional data center facility requirements (Non-recurring Charge items)
- Professional services to install and configure server and storage
- Professional services to relocate the IBM Mainframe equipment
- Professional services to facilitate the application migration process

The installation of the hardware, configuration, and training of the DES Division of Technology Services (DTS) staff on the new environment will be performed by contract personnel (professional services).

The approach to migrate to the new data center is to utilize applications “waves”. The waves were proposed based on the risk to services based on assessing the technology, system integration, organizational support capability, business impact and priority. Each application was scored based on these criteria. The score of each application was

accumulated to determine the overall impact of a failure for any particular wave. The order of the waves introduces risk slowly and increases risk as confidence grows in the capability of the new data center and the team performing the migrations.

The project plan has four weeks allocated to each wave. This is to allow time for the development, test, and production environment to be moved and tested independently. The plan is to have each environment be a small wave with testing and validation before initiating the next set of moves. Each wave will have test plans, test staff and signoff requirements. The allocated time is intended to provide time to both testing and time to mitigate any issues that may surface. In the event a signoff cannot be provided, the issues will be documented and the wave will be rolled back.

As each wave is planned further, it is important to provide preparation guidance to the end-user community. These users need to be aware of the planned outages, expected durations and testing and validation plans. It is expected that end-users will be engaged to validate the applications after the move.

The project will build backup plans and prepare materials in the event that a system outage lasts longer than the planned duration. The planning needs to consider how the business can continue to service clients without a system for short periods of time. This may include the use of desktop software and manual methods.

Last, a communication plan that include DES clients will be executed to provide notifications of system outages if/when they occur. The DES will need to plan for increased phone support during these outages.

The project assumes no changes to the current business continuity plans. However, the project plans to have manual business processes in place in the event that systems are down longer than anticipated. Manual business process may have to be deployed for short amounts of time. The purpose is to document transactions that would later be manually added to the system once everything is brought back up. This would only be employed if there was a high level of confidence that the system was going to be successfully brought up in a reasonable amount of time.

The DES IBM Mainframe will go through a number of disaster recovery failover exercises to the Arizona Department of Administration (ADOA) in preparation of the physical relocation. The first of these tests was successfully completed on February 21th, 2015. To assure that the critical services on the mainframe can be supported for an extended period at ADOA the project includes transition to virtual tape from the current physical tape environment. The New Virtual Tape Libraries will be deployed at both DES and ADOA. This will allow DES to failover to ADOA during the move, reducing risk and potential downtime.

In the event that a system testing is unsuccessful after the move to the co-located data center, the following steps would be executed in order:

- Fail back to the existing data center image
- Restore system from snapshot
- Restore system from tape
- Restore system by redeployment of software and restore database

System backups and snapshots must be maintained and retained during the data center move until such time it is clear that the applications have been successfully transitioned.

The project will be considered complete when all applications and services are hosted and running from the I/O Data Center and the 1720 AZDES Data Center can be decommissioned.

*C. Quantified Benefits**

	Service enhancement
	Increased revenue
	Cost reduction
x	Problem avoidance
x	Risk avoidance

Explain:

Problem Avoidance – Problems associated with the current data center environment.
Risk Avoidance – The risk associated with potential system/service failures induced by the current data center conditions.

IV. Technology Approach

*A. Proposed Technology Solution**

The networking solution approved in the previous PIJ is underway utilizing services from CenturyLink. When CenturyLink completes their work, all network connectivity will be established from a Wide Area Network/Local Area Network (WAN/LAN) perspective.

All router and switching configurations will be completed by CenturyLink with a hand off ready for the mainframe and UCS environment. These systems will only need to connect to the switching provided by CenturyLink.

IBM, cStor, VMware and B&D Technologies (referred to simply as B&D throughout this document) will be the primary contractors for the implementation of the Cisco USC, NetApp and VMware configuration.

IBM professional services will relocate the DES IBM mainframe. Included in scope is the relocation services required to relocate equipment for the ADOA and the Department of Public Safety (DPS) that currently resides in the AZDES Data Center.

Professional services will facilitate the application migration phase. The application migration will utilize a wave approach moving groups of inter-related applications over approximately six months to reduce risk that could potentially impact client services. VMware and B&D will provide the professional services for the distributed application migrations.

The following goals are expected at the completion of the project:

- Remove all dependency on the old AZDES Data Center
- Relocate the IBM mainframe and associated computer equipment
- Relocate all non DES equipment
- Replace end-of-life servers and storage

As required by State law, this project is required to contract with an independent third party for review of and guidance on the technology approach, scope, estimated cost, timeline for completion and overall feasibility of the project.

The research firm Gartner Inc. whose technology expertise is often used by DES, has been engaged in this capacity for the project. The Gartner review documents, comments and observations are available to support this approach and planning presented in this PIJ.

B. Technology Environment

IBM Mainframe

- Relocation services provided by IBM:
  - All activities associated with moving and shipping of Mainframe equipment
  - Physical loss or damage to the equipment during disassembly, transportation, and reassembly
  - Replacement Value Coverage included for equipment
  - Invisible Transit Damage (ITD) included
  - Maintenance Service Qualified status maintained

Cisco UCS

- (2) 6296 Fabric Interconnects each with 48 ports licensed
- (8) 5108 UCS chassis
- (28) B200 M4 blades evenly distributed across the 8 chassis
  - (17) have:
    - 2@ 14-core CPU
    - 768GB Memory
    - VIC1340
  - (11) have:
    - 2@ 14-core CPU
    - 512GB Memory
    - VIC1340

- AD-DHCP (Windows Server Hosts)
  - Cisco UCS
  - (9) B200 M4 blades
  - 2 x E5-2609v3 (1.90 GHz / 6-core / 85w)
  - 2x200GB SSDs disk drives
  - 128GB Memory
  - VIC1340

VMware Licensing

- (1 Instance) vCenter Standard
- (56 CPUs) vCloud Suite Enterprise
- Production SnS 24x7 – 3 Years

NetApp Storage

- Cluster 1
  - All Flash Tier
    - FAS8060 HA Pair with 1x24x800 SSD & 1x12x800GB SSD; **16TB usable**
    - 2 cDOT Cluster Switches and 1 Cabinet
  - SAS Flash Tier
    - FAS8060 HA Pair with 18x24x900GB SAS & 1x24x800GB SSD (Flash Pools); **309TB usable**
    - 2 Cabinets
  - SATA Flash Tier
    - FAS8060 HA Pair with 10x24x4TB SATA & 1x24x800GB SSD (Flash Pools); **704TB usable**
    - 1 Cabinet
- Cluster 2
  - Microsoft DPM Backup Target
    - FAS8020 Single Node 3x24x4TB SATA; **187TB usable**
    - 1 Cabinet

NetApp Software

Deduplication - With NetApp deduplication, the DES can store just one copy of each unique data object, substantially reducing capacity requirements. Deduplication automatically removes duplicate data blocks on a 4KB level across an entire volume, reclaiming wasted storage to achieve significant space savings.

Data compression - Data compression reduces physical space usage by replacing repeating patterns within chunks of data. It can be run whether or not deduplication is enabled and can provide additional space savings whether run alone or together with compression.

FlexClone volume - With NetApp FlexClone technology, the DES administrators can create instant writable Snapshot copies to support application testing. Unlike full copies from mirrored production data, FlexClone copies can be created almost instantly, take very little space, and have negligible performance impact. You can affordably create as many clones as needed to speed product development.

Snapshot copies - NetApp Snapshot technology enables DES's IT administrators to create point-in-time copies of virtual machines or entire data stores. By using NetApp SnapRestore technology, you can then restore from these backup copies at any level of granularity—single files, directories, or entire volumes—simply and quickly when you need to. Many copies can be made at any time increment in less than one second, with no performance impact, no matter how many Snapshot copies are taken.

MetroCluster™ software - NetApp MetroCluster is an integrated high-availability/disaster recovery solution for campus and metro-area deployments.

SnapMirror technology - With NetApp SnapMirror, DES's data is available and up to date at all times. By maintaining two copies of data online, SnapMirror protects data against all types of hardware outages, including site failure. When used with the NetApp clustered failover high-availability solution, SnapMirror enables DES to achieve a level of data availability that was previously attainable only with mainframe architectures.

SnapVault software - NetApp SnapVault is a disk-to-disk backup product that is a core feature of Data ONTAP. It includes application-aware backup solutions tailored for application-specific protection provided by the suite of NetApp SnapManager® products.

Flash Pool - Flash Pool is a persistent aggregate-level read and write cache. It lets you add RAID groups consisting of SSDs to an aggregate containing HDDs, with the goal of delivering performance comparable to that of an SSD-only aggregate; it also keeps costs closer to those of an HDD-only aggregate. A relatively small number of SSDs in an aggregate are used as a persistent cache to accelerate both random reads and writes.

Infinite Volume - NetApp Infinite Volume addresses the scalability needs of enterprise content repositories with a single logical file container that can scale to 20PB.

SnapRestore - SnapRestore rapidly restores single files, directories, or entire LUNs and volumes from any Snapshot copy backup. Instantaneously recovers your files, databases, and complete volumes from your backup.

IBM TS7720 VTS system, add de-duplication for 203TB usable capacity

- AZ DES Site-A PROD - DLm2100 with DD2500
- AZ DES Site B: D/R - DLm2100 with DD2500

C. Selection Process

Selection of the new co-located site was done under an RFP issued by the Arizona Department of Administration (ADOA). DES intends to leverage the recently established state contract with CenturyLink Technology Solutions, in strategic partnership with the IO Data Centers, LLC.

The DES will procure the required products in compliance with current state contracts and purchasing policies. Hardware products will be procured that are compatible with both the current DES infrastructure and ADOA-ASET established standards.

The DES is procuring new Cisco UCS and NetApp equipment that is essentially a match for the current environment. This direction was selected to lessen the risk associated with a physical relocation of the current UCS environment and to replace all of the end-of-life equipment currently being utilized.

Selection of IBM to relocate the Mainframe is needed to assure continuation of the warranty and the knowledge and depth IBM has with these types of relocation efforts.

V. Project Approach

*A. Project Schedule**

Project Start Date: 9/15/2014 **Project End Date**: 4/1/2016

B. Project Milestones

Major Milestones	Start Date	Finish Date
Acquire, Install, Initial configuration of UCS servers	06/12/2015	07/07/2015
Acquire, Install, Initial configuration of NetApp storage	06/12/2015	07/07/2015
Configure and validate virtual server environment (VMware)	07/07/2015	07/27/2015
Test & Validate network, UCS and VMware environments	07/27/2015	08/07/2015
Distributed Replication enabled	08/08/2015	N/A
Exchange physical relocation	09/11/2015	09/11/2105
IBM Mainframe failover testing	Various	12/05/2015
New I/O space ready for Mainframe move	08/08/2015	12/04/2015
IBM Contract and Services	01/18/2016	01/18/2016
Uninstall, Relocate, Install, Validate IBM Mainframe and peripherals	03/19/2015	03/19/2016
Distributed Application Wave Migrations	08/10/2015	03/19/2016
Project closure and decommission	03/21/2016	04/01/2016
IV&V Oversight	10/29/2014	04/01/2016

VI. Roles and Responsibilities

A. Project Roles and Responsibilities

Sponsor	Executive	Initiate project, obtain funding	Mike Dellner - DTS AD
Sponsor	Executive	champion project, team staffing	Dennis Myers - DTS
Project Architecture	DTS Enterprise Architecture	Manage and review overall project architecture	Albert A. Barbieri – DTS Todd B. Templeton – DTS
Project Manager	DTS Project Manager	Manage project schedule and tasks to include test and acceptance	Dwayne Carter - DTS

Program Manager	DTS Program Manager	Works with project managers in support of each work stream	John Peckardt – B&D
Manager, Division of Technology Services	Project Finance and Budgeting	Manage project budgeting and expenditures	Robert Navarro – DTS
Manager, Division of Technology Services	Hardware Coordinator	Project Manager, works with Hardware Vendor Project Manager and DCSO to install and setup compute and storage hardware	Clay Sikes - DTS
Virtualization Engineer	Configuration and deployment; testing and evaluation of virtualization environment	Provide staff to install, configure, deploy, and coordinate setup and verification of VMware environment	Vendor Staff - VMware
Storage & Server Engineer	Configuration and deployment; testing and evaluation	Provide staff to install, configure, deploy, and coordinate setup and verification of storage and server hardware	Vendor Staff - cStor
Mainframe Engineer	Relocation of all mainframe computing assets	Provide staff to move all mainframe equipment from current data center to new co-location facility	Vendor Staff - IBM

B. Project Manager Certification

- [x] Project Management Professional (PMP) Certified
- [ ] State of Arizona Certified
- [ ] Project Management Certification not required

C. Full-Time Employee (FTE) Project Hours

Total Full-Time Employee Hours	4160
Total Full-Time Employee Cost	$208,000

VII. Risk Matrix, Areas of Impact, Itemized List, PIJ Financials

VIII. Project Approvals

*A. Agency CIO Review**

Key Management Information	Yes	No
1. Is this project for a mission-critical application system?	**Y**	
2. Is this project referenced in your agency's Strategic IT Plan?	**Y**	
3. Is this project in compliance with all agency and State standards and policies for network, security, platform, software/application, and/or data/information as defined in http://aset.azdoa.gov/security/policies-standards-and-procedures, and applicable to this project? If **NO**, explain in detail in the "XI. Additional Information" section below.	**Y**	
4. Will this project transmit, store, or process sensitive, confidential or Personally Identifiable Information (PII) data? If **YES,** in the "XI. Additional Information" section below, describe what security controls are being put in place to protect the data.	**Y**	
5. Is this project in compliance with the Arizona Revised Statutes (A.R.S.) and GRRC rules?	**Y**	
6. Is this project in compliance with the statewide policy regarding the accessibility to equipment and information technology for citizens with disabilities?	**Y**	

*B. Project Values**

The following table should be populated with summary information from other sections of the PIJ.

Description	Section	Number or Cost
Assessment Cost (if applicable for Pre-PIJ)	II. PIJ Type - Pre-PIJ Assessment Cost	**$0**
Total Development Cost	VII. PIJ Financials tab	**$5,112,137.54**
Total Project Cost	VII. PIJ Financials tab	**$7,619,822.67**
FTE Hours	VI. Roles and Responsibilities	**4,160**

*C. Agency Approvals**

Contact	Printed Name	Signature	Email
Agency CIO:	Michael Dellner	Sent under separate cover	
Chief Strategic Officer – DT:	Linda Jewell	Sent under separate cover	
Chief Technology Officer:	Dennis Myers	Sent under separate cover	
Program Manager:	John Peckardt	Sent under separate cover	
Project Manager:	Dwayne Carter	Sent under separate cover	
DTS Financial Services (FSA:	Debra Petersen	Sent under separate cover	
Agency CISO:	Carl Carpenter	Sent under separate cover	
Agency Director:	Jim Hillyard (Interim)	Sent under separate cover	

IX. Glossary

AZ – Arizona

ACA – Affordable Care Act

ADOA – Arizona Department of Administration

DES – Department of Economic Security

DPM – Microsoft System Center Data Protection Manager

DTS – Division of Technology Services

ENS – Enterprise Networking Services (Vendor)

FTE – Full Time Employee

UCS – Cisco Unified Computing System

VM – Virtual Machine

X. Additional Information

The DES Chief Information Security Officer (CISO) will ensure that the recommended solution is in compliance with all state and federal data security requirements (NIST, HIPAA, etc.) and addresses any outstanding audit issues related to the management and backup of Agency data.

Moving to the I/O Data Center (I/O DC) will be by moving existing equipment that currently processes, and stores, sensitive data of all types using the same level of electronic security that is currently in use now. At the new IO DC, there are more physical security controls to protect the entire area as opposed to the current DC. For example, biometrics, multiple levels of badge access, multifactor authentication for doors, etc.

Links:

ADOA-ASET Website

ADOA-ASET Project Investment Justification Information Templates and Contacts

Email Addresses:

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