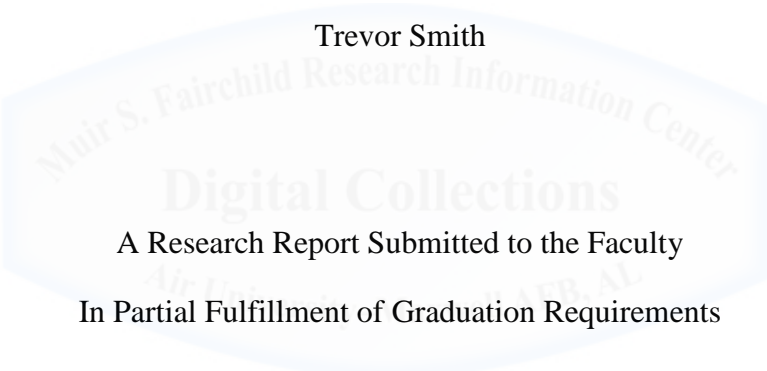AU/ACSC/2011

AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

JOINT BASING: SHARING CYBERSPACE, NOT JUST REAL ESTATE

By

Trevor Smith

A Research Report Submitted to the Faculty

In Partial Fulfillment of Graduation Requirements

Advisor: Dr. Marcia Ledlow

Maxwell Air Force Base, Alabama

June 2010

APPROVED FOR PUBLIC RELEASE – DISTRIBUTION UNLIMITED

Disclaimer

The views expressed in this academic research paper are those of the author(s) and do not reflect the official policy or position of the US government or the Department of Defense. In accordance with Air Force Instruction 51-303, it is not copyrighted, but is the property of the United States government.

Contents

Figures

Abstract

Joint basing resulted from the 2005 Base Realignment and Closure proceedings and dictated that 26 military service component installations combine to form 12 new joint installations under the supervision of a single component service at each join base. For example, Joint Base Lewis-McChord sprung from joining Ft Lewis and McChord AFB under Army management. The Department of Defense (DOD) developed implementation guidance for the services in several functional areas including information technology systems management (ITSM). According to official guidance, some ITSM sub-functions remained separately managed by each individual service and this research paper asked the question – how can ITSM systems further integrate to enable a truly joint environment? Using the problem solution research method, it examined three possible solutions including the current ITSM guidance based solution, a minimal network integration effort, and a complete network infrastructure redesign effort. The criteria included enterprise architecture adherence, interoperability and standardization measurements, and cost savings measurements. The research showed that the current implementation of joint basing represented the least efficient option while a fully integrated redesign of joint infrastructure produced the greatest cost benefit and ITSM synergies in the joint environment. The paper concludes that strong DOD leadership enables highly integrated ITSM joint environments and effectively realizes federal data center consolidation efforts.

Introduction

In 1986, US Congress passed the Goldwater-Nichols Act to improve cooperation between military services in light of several recent operational failures where the services could not work together.[1] Ten years later while seeking efficiencies across federal government, Congress passed the Clinger-Cohen Act to standardize information technology (IT) practices.[2] Nearly 25 years after the Goldwater-Nichols Act and 15 years after the Clinger-Cohen Act, Air Force service members cannot lookup Navy service member's email information using Air Force email resources because the two services use completely separate networks and databases. This is true even if they work in buildings directly across the street from each other and are using exactly the same types of computer systems. While this fact may not directly affect mission completion capabilities resulting in the loss of military members, it is very similar to the radio and operational interoperability issues that prompted US Congress to pass laws reorganizing military command structure and forcing the services to work together. To see the full potential of IT efficiencies and joint operations, the Department of Defense (DOD) should demonstrate adherence to the aforementioned legislation and fully integrate common IT functions as part of the 2005 Base Realignment and Closure (BRAC) joint basing initiative.

2005 Base Realignment and Closure

The Base Realignment and Closure process started in 1988 to reduce costs in the DOD by closing or realigning excess installations, functions, and organizations.[3] Subsequent BRAC proceedings occurred in 1991, 1993, and 1995 all resulting in BRAC reports outlining duplicate capabilities and functions in the US military.[4,5,6] Since the 2005 BRAC represented the fifth effort in less than twenty years, finding excess capacities proved conceivably more difficult than

previous BRAC rounds. Luckily, the transformation and capability based planning themes of the

early 2000 years eased some of the BRAC commission's challenges and they documented

hundreds of opportunities to streamline the military, reduce footprints, and increase joint

capabilities.[7]

Joint Basing

The 2005 BRAC report included recommendation number 146, Joint Basing, expected to

produce annual savings of almost \$184 million per year.[8] This recommendation contended that

consolidating select military installations at several locations around the DOD eliminated many

duplicate support functions. Twenty-six military installations around the world prepared to

combine and form twelve new joint base installations. One service acts as the Installation

Supporting Component and controls the majority of resources at the joint installation.[9] The Air

Force participated in joint base efforts at ten installations and assumed lead service

responsibilities – the supporting component role – at six.[10] The supporting component at a joint

installation provides support for all other service components and manages the installation. The

justification for joint basing from the 2005 BRAC report stems from the idea that "all

installations employ military, civilian, and contractor personnel to perform common functions in

support of installation facilities and personnel."[11] The potential reduction of duplicate activities

and facility requirements existed due to the proximity of these installations.[12]

Information Technology Systems Management Functional Area

The list of common functions performed by each service contained information

technology systems management (ITSM) as a candidate for consolidation and the DOD

established ITSM specific guidance for transferring assets between service components. This

guidance stated that each military service retained their respective network domains and certain

network management functions[13]. This means separate operations and maintenance costs for

network equipment and continued interoperability issues between service specific systems.

Critics claim it is too difficult to combine service networks and consolidate those ITSM

functions retained by service components at joint installations. While difficult, it is not

impossible especially when determined leadership champions these changes.[14] The DOD will

not fully capitalize on the potential benefits of joint basing until the joint environment

consolidates ITSM functions as much as possible. This research paper used the problem solution

research method and addressed the question – how can ITSM functions further integrate at joint

bases? It examined three solution options accomplishing this task to various degrees and showed

that greater integration facilitated greater annual savings to the DOD while enabling the joint

environment and joint interoperability.

Joint Basing Implementation

As expected with any amount of change to normal operating procedures, challenges and

unforeseen obstacles present themselves without fail. Forcing multiple services to combine

under a new support structure will most assuredly generate opposition along the way. Joint

basing involves all service components at many locations around the globe illustrated in figure 1.

Figure 1: Geographical map showing joint base locations[15]

Joint basing has been described as an effort to "identify, capture, and continue significant savings…to consider the best business practices and ensure that warfighting capabilities are preserved or enhanced."[16] If successful, joint basing implementation demonstrates high levels of joint cooperation and potential business practice improvements across the DOD.

Official DOD implementation guidance

Anytime the federal government and DOD engage in new initiatives, the affected agencies follow leadership's guidance along the way. Each joint base implementation followed several official guidance documents from the Office of the Secretary of Defense (OSD). One

key element, a memorandum of agreement (MOA) between the associated service components, detailed support responsibilities in all functional areas.[17] Table 1 summarizes the joint basing structures, shows the signing date of the MOAs, and lists the initial and final operating capability dates for each location. The first service component listed in each row signifies the supporting component at each joint base.

	Joint Base	Service components				MOA signed
		Army	Navy	Air Force	Marines	
Phase I*	Little Creek-Story	NAB Little Creek / Ft Story				7-Nov-08
	Myer-Henderson Hall	Ft Myer / Henderson Hall				10-Oct-08
	Andrews-NAF Washington	Andrews AFB / NAF Washington				30-Oct-08
	McGuire-Dix-Lakehurst	McGuire AFB / Ft Dix / NAES Lakehurst				10-Apr-09
	Marianas	Navy Base Guam / Andersen AFB				23-Jan-09
Phase II**	Anacostia-Bolling	Anacostia Annex / Bolling AFB				21-Dec-09
	Pearl Harbor-Hickam	NS Pearl Harbor / Hickam AFB				24-Aug-09
	Lewis-McChord	Ft Lewis / McChord AFB				16-Aug-09
	Charleston	Charleston AFB / NWS Charleston				2-Jul-09
	Elmendorf-Richardson	Elmendorf AFB / Ft Richardson				9-Oct-09
	Lackland-Sam Houston-Randolph	Lackland AFB / Randolph AFB / Ft Sam Houston				16-Nov-09
	Langley-Eustis	Langley AFB / Ft Eustis				1-Sep-09
*Phase I joint bases Initial Operating Capability (IOC) is 31 Jan 2009, Full Operating Capability (FOC) is 1 Oct 2009						
**Phase II joint bases Initial Operating Capability (IOC) is 31 Jan 2010, Full Operating Capability (FOC) is 1 Oct 2010						

Table 1: Joint Base list with MOA, IOC, and FOC dates[18,19,20,21,22,23,24,25,26,27,28,29,30,31]

The initial DOD joint base guidance outlined key functional areas, clarified responsibilities, and indicated supplemental guidance will provide further implementation details to help joint bases draft support agreements.[32] The MOA between supporting and supported component services follows a template provided by the OSD and each functional area covered by that MOA follows supplemental guidance from OSD delegated authorities.[33] Each functional area section of the MOA, called an annex, addresses the level of service provided by the supporting component. Supplemental guidance details the many facets of joint basing from

command authorities to real property management to personnel actions both civilian and military. Table 2 lists all the annex sections included in a MOA. This paper only discusses the information technology services management (ITSM) supplemental guidance.

The Annex Areas of each Memorandum of Agreement		
Command Authority	Facilities Operation	Emergency management
Real Property	Personal Property and Plant Equipment	Environmental
Command Support	**Information Technology Services Management (ITSM)**	Community Services
Logistic Services	Community Logistics	Transportation Logistics
Directory of Variances	Directory of Deviations	Organizational Structure
Support Plans	Military Personnel Services	Facilities Investment
Security Services	Operational Mission Services	Resource Transfer
Installation Capabilities Council (ICC) Approved Common Output Level Standards (COLS)		

Table 2: Annex Areas of the Joint Base Memorandum of Agreement[34]

Information Technology Guidance

ITSM supplemental guidance defines IT related systems and services and dictates how those items function under the joint base structure.[35] Service component commanders and personnel must manage and operate the many IT and communication systems at the installation according to the ITSM guidance. Table 3 shows a brief definition and the associated transfer actions affected by the ITSM supplemental guidance.

Information Technology Services Management (ITSM) Service Areas		
Sub-function	**Examples/Definition**	**Managed by**
Wireless (non-network)	Wireless voice, data, and video: mobile phones, pagers, PDAs, land mobile radios (LMR) satellite communications	Installation Lead Component
(VTC) Video Teleconferencing	Provide, operate and maintain unclassified and secret common user VTC suite services	Installation Lead Component
Cable Infrastructure	Physical hardware and cabling plant (MOA defines demarcation points), cable TV, Giant Voice/PA system	Installation Lead Component
Service Desk Support	Central point of contact (call center) between users and ITSM service personnel (technicians)	Installation Lead Component
Fixed Voice	Dial tone services: land telephone systems, switches, secure voice, voice over IP (VOIP), internal cabling, etc.	System/Service Specific
Continuity of Operations Plan and Disaster Recovery	COOP and Disaster Recovery for IT services necessary to continue mission essential common user functions	System/Service Specific
Mulitmedia – Visual Information	Graphic illustrations, charts, posters, photographic/video documentation, etc.	System/Service Specific
Information Assurance	IA and Communication security (COMSEC) for network services, voice services, etc.	System/Service Specific
Collaboration and Messaging	Services and tools to communicate and share information: email, DMS, instant messaging, virtual meeting, etc.	Supported Component
Application/Web hosting	Operating systems, web and database management: service specific applications, web servers, etc.	Supported Component
IT Operations Center	Main communications facility for housing servers, network equipment, data and network security, etc.	Supported Component
Desktop Management	Support for end-used hardware and software services and tools	Supported Component
Requirements and Training	Procedures and mechanisms for users to submit and track new IT requirements, training for common software	Supported Component

Table 3: Information Technology Services Management Areas and Responsible Entities[36]

Table 3 shows the basic implementation plan for ITSM sub-functions. The installation

lead component managed sub-functions fully transfer responsibility to the lead component. The

system/service specific managed sub-functions partially transfer according to ITSM guidance.

The supported component managed sub-functions remain with the individual service

components. With only four of the thirteen sub-functions fully transferring, the ITSM guidance missed several opportunities to consolidate sub-functions and realize cost saving efficiencies.

Issues and opportunities to optimize Joint Basing efforts

Recommendations from the 2005 BRAC process intended to reduce DOD operating costs. BRAC officials expected joint basing to benefit the DOD with annual net savings. Previous research on the general Joint Basing efforts outlined the shortfalls of the current implementation of joint basing efforts. Namely, the savings associated with recommendation 146 are primarily based on manpower reductions in civilian and military billets.[37] Furthermore, as a consequence of some statements by upper military leadership, the focus during joint basing implementation efforts strayed from finding efficiencies and enforcing manpower reductions.[38] In fact, analysis showed the overall manpower requirement actually increased and joint basing will cost money instead of generating the expected savings.[39]

The initial joint base guidance required each joint base to reflect financial savings and operational efficiencies in their respective MOAs.[40] Initial joint basing efforts appear indifferent to efficiencies and best practices since there are no savings or manpower reductions indicated in the MOAs.[41] The joint basing guidance directs the development of standards in functional areas. These standards generally adopt the highest service component standard and extend the same level of service to all joint base members creating additional financial requirements instead of reduced operational costs.[42]

An ITSM workshop held in November 2009 highlighted several common issues at joint installations. Many of these issues could not have been realized by the 2005 BRAC process that resulted in the joint basing recommendation.[43] Issues related to existing contract scopes and responsibilities, appropriated vs. non-appropriated networks, misunderstanding of official

guidance, access to multiple service networks, and requirements for Defense Information Service

Agency (DISA) support represent the majority of common issues.[44]   Even though the

Government Accountability Office (GAO) lists joint basing as number 22 of the top 29

recommendations that will produce 85% of the 2005 BRAC savings over the next 20 years,

recent research analysis warrants a call for change to the implementation efforts across the

board.[45] Combined with the current issues in ITSM implementations, opportunities in the ITSM

realm must materialize to help alleviate the potential reversal of savings from joint basing

efforts.[46]

ITSM Integration Solution Criteria

The DOD developed department level guidance based on federal laws and mandates that

direct intelligent implementation of IT systems and services along specific design criteria.[47] This

guidance helps DOD agencies develop sound IT business practices and investments while

meeting mission requirements and keeping joint interoperability issues to a minimum. These

ideas also govern joint basing efforts and joint base ITSM sub-functions. The next few sections

explored the general ideas of IT practices from private industry and federal sources to provide a

basis for analyzing and improving ITSM joint basing efforts.

Information Technology Architectures

IT architectures provide the target environment in which an IT system operates and help

dictate what products and services those IT systems deliver. It follows that a poorly designed,

incorrect, or misunderstood architecture used by an organization achieves less than optimal

results for the services and products produced with their IT systems. Enterprise architectures

provide the means to link technology standards and capabilities with information requirements. It provides an overarching plan that "details policies and standards for the design of infrastructure technologies, databases, and applications."[48] By following an appropriate enterprise IT architecture, system designers produce the necessary connections and components to link processes, infrastructure, data, and applications but this design must be aware of strategic requirements and shortfalls.[49] The best enterprise IT architectures enable an organization's most critical IT capabilities to directly meet strategic objectives as opposed to enabling countless possible IT capabilities that may not provide added value but are nice to have.[50] By comparing the current joint basing ITSM implementation efforts and other possible implementation solutions against an enterprise IT architecture, the merits of each effort can be quantified and ranked. The architecture stage in which an organization finds itself indicates the level of IT architecture maturity or competency.[51]

Table 4 lists each architecture stage with a brief description. It is fairly easy to identify aspects of US military IT elements that fit into each of the stages. Many functional areas operate application specific solutions and data bases that do not interface well with other systems but web-based applications also exist that serve all service components across the DOD.

IT Architecture Stage	Characteristics
Application Silo	Consists of Architectures of individual applications instead of an entire enterprise; (i.e. stovepipe solutions)
Standardized Technology	Architecture becomes enterprise-wide and provides efficiencies through technology standardization and in most cases centralization
Rationalized Data	Architecture expands to include standardization of data and processes
Modular	Builds into enterprise-wide global standards with loosely coupled applications, data, and technology components to preserve global standards while enabling local differences

Table 4: Enterprise IT Architecture stages of maturity/competency[52]

Service components often practice system standardization within their respective IT systems, widely considered the most economical stage.[53] Organizations see process benefits by working

up through the rationalized data stage to the modular stage. Through well defined enterprise

architecture, the modular stage enables local requirements while using widely applicable

standards and practices.[54] Categorizing the main components of each proposed solution into the

four architecture stages provides a measure of maturity. Held as the ultimate goal in architecture

maturity, the modular stage produces the greatest return on investment and meets all

organizational strategic objectives.

DOD Interoperability and Standardization

There are differing opinions as to the level of enterprise architecture development

accomplished within the DOD. Indeed, the DOD has a tool designed to help agencies and

component services develop enterprise architectures called the DOD architecture framework

(DODAF).[55] This data centric based tool enables users to "make key decisions more effectively

through organized information sharing across the Department, Joint Capability Areas (JCAs),

Mission, Component, and Program boundaries."[56] While this framework enables the

development of architectures for an organization, the data centric approach does not capture the

overall benefit of including technology standards across the DOD. This approach encourages

services to present their specific IT data structures in similar ways but allows the freedom to

develop and use systems that do not interface, creating interoperability issues. The DOD does

however, include guidance that dictates joint capabilities and interoperability issues remain a key

focus when developing IT solutions and investing in IT resources.[57] This joint mindedness

coupled with the DOD initiative to reduce the number and footprint of currently existing data

centers also highlights the need for ITSM integration and standardization at joint bases. The

DOD initiative memorandum from March 2010 defines a data center and outlines the goals of

reduced operating and real estate costs, use of efficient technologies, and increased security posture.[58] Standardization is directly related to interoperability and offers another measure of IT systems. Standardization fosters several cost lowering opportunities but also simplifies maintenance, replacement, and IT security operations.[59]

Joint bases represent prime targets for mitigating interoperability and standardization issues between component services. In this research effort, each proposed solution for joint base ITSM earned a ranking for interoperability and standardization based on the number of ITSM components that serve all IT users at a joint base.

Harnessing Best Business Practices

Establishing high levels of efficiency and IT capability for all its agencies while still meeting mission requirements, represents one of the greatest challenges to the DOD, independent of joint basing efforts. Many times the difficulty of finding areas to trim costs plays second fiddle to ensuring the mission succeeds. Recent DOD guidance reignited the intensity with which DOD agencies seek business efficiencies and cost savings, particularly in the IT field.[60] In addition, since cost savings exists at the heart of the BRAC process, some criteria associated with expected cost savings should evaluate the proposed ITSM solutions. Manpower reduction, system consolidation, and foot print reduction provided the cost saving measures in the following evaluations.

Manpower reductions occur through elimination or redesign of processes, systems, and administrative management functions. The original BRAC report envisioned manpower reductions "will be realized by paring unnecessary management personnel and achieving greater efficiencies through economies of scale."[61]

System consolidation occurs when the number of duplicate systems – telephone systems, servers, databases, or network devices – diminishes by using more powerful or capable systems that perform all necessary activities with fewer devices. A recent end user example from popular culture is a blackberry. It provides telephone, email access, data storage, text messaging, and other personal services like playing music and taking pictures all in one device.

Consolidation of facilities accomplishes foot print reduction by co-locating all data center systems into area or regional processing centers. This type of consolidation reduces the total number of systems, total facility operation costs, and total number of personnel required to provide IT services to an organization.

Several measures exist to gauge the cost savings benefits of ITSM solutions. The manpower reduction, system consolidation, and foot print reduction characteristics of each proposed solution constitute the measures used for evaluation in this effort. Each of joint base ITSM solution earned a ranking for cost saving benefits based on those measures of efficiency.

When the US government officials mention taking advantage of best business practices, they typically refers to finding efficiencies that translate to cost savings or improved processes. The previous sections described the three criteria groups selected to evaluate the ITSM integration solutions examined in this research effort. Current and past IT initiatives helped select the architecture maturity, interoperability and standardization, and cost savings criteria.

Alternatives Discussion: What possible solutions enable the joint base?

While there are numerous options for solving IT challenges, three possible solutions to integrate joint base ITSM functions gained the attention of this section. The first solution presents the current ITSM implementation dictated by existing DOD joint base guidance. The

second solution involved integrating network technologies to further integrate systems and management functions. The third solution described re-engineering the joint base ITSM environment to integrate the component services as much as possible at joint bases.

What the current guidance suggests

The initial DOD implementation memorandum for ITSM, summarized in Table 3, remains largely unchanged. Each of the 13 sub-functions of ITSM provides a different level of integration between the services at each joint installation. By combining Table 3 with Table 4 and adding a short justification the following table shows how the current joint basing ITSM solution faired when judged against the IT architecture criteria.

IT Architecture Stage Criteria Summary for Current Joint Base Guidance	
IT Architecture Stages in this Solution	**Justification**
Rationalized Data Stage	Supporting component managed sub-functions allow common IT system and process synergies across service boundaries
Standardized Technology	Transferred systems & services allow efficiencies, retained systems indicate interoperability issues
Application Silo	Supported component managed sub-functions do not integrate services or systems, no gain in efficiency and limited use of enterprise architecture
Supporting Component Managed Wireless, Video Teleconferencing, Cable Infrastructure, Service Desk Support	
System/Service specific Fixed Voice, COOP & Disaster Recovery, Multimedia/Visual Information, Info Assurance	
Supported Component Collaboration and Messaging, Application and Webhosting, IT Operations Center, Desktop Management, Requirements and Training	

Table 5: IT Architecture Stage Criteria Summary

Table 5 assumed the best case scenario for ITSM sub-function management from an architecture point of view meaning all sub-functions achieved the highest practical level of architecture maturity according to the ITSM implementation guidance. For example, an Army specific database or network system that only serves Army personnel cannot achieve architecture

maturity levels above the application silo stage. In contrast, service desk support functions serving all joint base personnel achieved the rationalized data stage maturity level because it displayed standardized data and process synergies.

Looking at the joint basing ITSM guidance for interoperability and standardization characteristics showed that many of the systems that could experience the greatest benefit remained with each service. The December 2008 Joint Base Program Management Office (JBPMO) monthly newsletter demonstrated the lack of initiative to address interoperability and standardization issues stating, "it is important to note that there is no initiative to determine an optimal database or joint database (e.g., no plan for system integration); the goal is to simply migrate data from one existing database to another."[62] Conditions such as these supported the conclusion of no interoperability and standardization practices implemented and no well planned IT strategy.

Similar unfortunate lack of vision and diligence towards cost savings existed in the third criteria group used to examine the current joint basing ITSM solution. Under the current guidance for the ITSM functional area, each joint installation identified a shortfall of civilian personnel.[63] Consequently, no manpower savings documentation exists. Since each service retains and operates their respective network resources, system consolidation and foot print reduction is virtually non-existent as well.

Review of the current joint basing ITSM guidance revealed some potential from an architectural perspective but the interoperability and standardization and cost savings benefits criteria do not show any merit to the solution.

Converging Active Directory

The existing ITSM guidance indicated the areas of focus for alternative solutions by dictating which areas remain with their respective services. These ITSM functional areas – service networks, messaging systems, application access, IT operations, and management of all these systems – provide huge challenges in themselves but are precisely where the DOD must look to achieve synergies and cost savings.[64] One solution to further integrate the component networks at each joint installation includes integrating the Active Directory (AD) databases, Microsoft's network operating system used to define user rights and allow access to network resources.[65] Table 6 shows some of the benefits a network experiences by implementing a single AD database system for its network users, all of which are highly desirable capabilities of network management.

Advantages of Active Directory Managed Network
Centralized management of large networks (millions of users, printers, servers, applications, etc.)
Policy based desktop lockdown and software distribution
Dictate administrative control of network resources
Centralized location and use of shared resources
Integrated public key infrastructure (PKI) services (common access card (CAC) authentication)

Table 6: Some advantages of using Active Directory databases in large networks[66]

The advantages listed in table 6 represent some of the greatest enablers of IT synergies. These advantages make it easy to see why services use Active Directory systems as part of their service networks. Despite its use as a common service component IT system, independent implementation of AD systems created interoperability issues that inspired two separate DOD level efforts to bridge the interoperability gap.[67]

Service parochialism arrives quickly when joint requirements of any kind are considered for consolidation. Service components traditionally stand very reluctant to concede superior processes or practices to a sister service and this sometimes fosters an untrusting attitude

between services. An ITSM workshop from November 2009 highlighted the need to breakdown this untrusting culture between services when it comes to networks.[68] This culture does not support the joint environment and is illogical. All service networks and components must comply with DOD regulations to gain certification and accreditation authority to operate (ATO) on the defense information systems network (DISN).[69] Service networks operate in the ".mil" internet domain – the internet protocol (IP) address space reserved for the US military.[70] Nearly all DOD networks exist in the ".mil" domain, have an ATO, and use AD databases. These facts should encourage an attitude of trust, instead of distrust, between the military services.

AD integration would provide an environment to manage all routine network users at a joint installation with a single system, particularly those associated with everyday network processes like email. Users could be granted access to servers, applications, the internet, and a consolidated global address list (GAL) of joint base email users through the use of one AD instead of multiple AD systems for each component service. Combining the component services AD databases at joint installations would require considerable coordination and cooperation between component services and DISA. Many technical challenges correlate to implementation of this solution to integrate networks at a joint base. This solution would require significant cooperation and will cross boundaries that current DOD regulations and instructions do not cover. The scope of this paper did not specifically address those issues but simply asked a question – Is this solution technically possible? –answered with a yes.

The next question asked: how did this solution perform against the research criteria? The following paragraphs present the results of the AD solution with the assumption that its implementation gained the highest levels of integration and system management consolidation while ensuring service specific mission systems remained available.

17

In the first area of enterprise architecture, table 7 shows how the AD integration solution weighed against the first criteria. The table reflects which functions transferred to the supporting component but the overall architecture rating changed very little. The AD solution allowed more functions to follow enterprise architecture and enabled merged network management features but failed to establish or encourage further development of a specific architecture. All component services already used AD as part of their respective network management systems. This solution simply integrated the databases to allow management across service boundaries.

IT Architecture Stage Criteria Summary for Active Directory Integration	
IT Architecture Stages in this Solution	Justification
Rationalized Data Stage	Supporting component managed sub-functions allow common IT system and process synergies across service boundaries
Standardized Technology	Transferred systems & services allow efficiencies, retained systems indicate interoperability issues
Application Silo	Supported component managed sub-functions do not integrate services or systems, no gain in efficiency and limited use of enterprise architecture
Supporting Component Managed Wireless, Video Teleconferencing, Cable Infrastructure, Service Desk Support, Desktop Management, IT Operations Center, Requirements and Training	
System/Service specific Collaboration and Messaging, Application and Webhosting, Fixed Voice, COOP & Disaster Recovery, Multimedia/Visual Information, Info Assurance	
Supported Component IT Operations Center, Requirements and Training	

Table 7: IT Architecture Stage Criteria Summary for Active Directory Integration

The main AD solution attribute highlighted by table 7 places more ITSM sub-functions into the supporting component managed and the partially transferred sub-function arena. Only two sub-functions remained fully supported component managed.

From an interoperability and standardization viewpoint this solution also allowed progress toward reduced issues. The availability of a multi-service global address list (GAL) greatly enhances the joint environment. By transferring the network management functions to

the supporting component, the affected services are encouraged to further develop processes that meet all service's requirements for network resource access and availability. Although this solution does not introduce any new standardized systems, it addresses interoperability between service AD databases and forces services to collaborate on network management processes while strengthening consolidation practices.

The AD solution initially showed potential against the cost savings criteria group. Converging the AD databases and network management functions could consolidate the AD systems at each joint installation and reduce the requirement for system maintenance, upgrades, and replacement. No significant manpower reduction occurs because only the AD systems would experience consolidation and the manpower requirement still remains for all other IT operations center systems. For the same reason of minimal total IT systems consolidation and remaining IT operation center facility requirement, no footprint reduction results. The service component specific systems still need a housing facility for their service specific databases and information systems.

The solution to consolidate AD databases showed some merit with its potential to lower the total number of systems required to operate the joint base networks. This solution could accomplish further integration of ITSM functions and interoperability mitigation at joint bases. It performed less effectively in its ability to advance enterprise architecture and cost savings efficiencies due to the limited scale of consolidation.

Complete Network Infrastructure Redesign

The third ITSM integration solution examined in this research effort presents the biggest change to existing component practices and will require the greatest effort to establish a joint

environment. This solution attempts to integrate separate component functions to the fullest extent, particularly for unclassified systems. The joint base concept has great potential to break down service specific IT systems and practices but can succeed only on the foundation of strong leadership and DOD direction. Network infrastructure redesign would require DOD mandates similar in effort to the Goldwater-Nichols act that forced services to develop joint operational capabilities. This solution assumes firm DOD direction to establish a functioning, capable, ITSM environment, ambiguous from a service perspective, and takes full advantage of manpower reduction opportunities. The main focus of the network infrastructure redesign integrates the ITSM sub-functions that remained with the supported component – Collaboration and Messaging, Application and Webhosting, IT Operations Center, Desktop Management, and Requirements and Training.

The first step in this solution would involve obtaining a new network domain from DISA for each joint installation in which to build the joint base network. The new joint network could inherit primary information security barrier duties but would also allow service components to access their respective service resources and would facilitate collaboration and messaging services, and application and webhosting services. The next aspect would relocate all IT systems to a single IT operations center for each joint installation, made possible by each new joint network. IT operations center consolidation in turn facilitates centralized desktop management functions and requirements and training efforts. All these integration techniques include implementation and design features adhering to the most recent DOD guidance for IT architecture development and IT cost saving efficiencies.

Since the third solution focused on IT architecture by design, it achieved a high level of enterprise architecture integration but still left room for improvement in the architecture category. Table 8 shows the results of the analysis.

IT Architecture Stage Criteria Summary for Network Infrastructure Redesign	
IT Architecture Stages in this Solution	**Justification**
Rationalized Data Stage	Supporting component managed sub-functions allow common IT system and process synergies across service boundaries
Standardized Technology	Transferred systems & services allow efficiencies, retained systems indicate interoperability issues
Supporting Component Management Wireless, Video Teleconferencing, Cable Infrastructure, Service Desk Support, Collaboration and Messaging, Desktop Management, IT Operations Center, Requirements and Training	
System/Service Specific Management Application and Webhosting, Fixed Voice, COOP & Disaster Recovery, Multimedia/Visual Information, Info Assurance	

Table 8: IT Architecture Stage Criteria Summary for Network Infrastructure Redesign

The redesign solution would allow all ITSM functions to fully or partially transfer to the supporting service component at each joint installation. Of the components that remain partially transferred, many could not fully transfer due to the nature of these ITSM functions and the differences between each service's requirements for these functions. For example, in the Air Force Multimedia/Visual Information is no longer an IT managed function and COOP & Disaster Recovery functions are service specific requirements. The network infrastructure redesign solution could take great advantage of architecture synergies but would exist in a very specific joint base environment and therefore will not reach the highest levels of architecture implementation where repeatable and flexible IT practices meet individual service requirements across the DOD.

The next evaluation criteria also exhibited benefits to the joint base resulting from the established joint network environment. Single service maintained and operated joint infrastructure will allow standard technologies across the joint installation. This standardization

would enable lower costs during systems upgrades and replacement as well as mitigate interoperability issues. Joint installations will see interoperability issues reduced by establishing a joint network environment that facilitates the existence of individual service network characteristics. Again, this would become possible because the joint network will establish the security boundaries instead of the individual service component networks and the service specific network components could operate as part of the joint environment.

In addition to desirable architecture synergies and mitigated interoperability issues, the third solution showed great potential for cost savings against the third evaluation criteria. This solution will encourage manpower reductions through reduction in the total number of facilities required for IT operation centers and system consolidation that could reduces the number of systems required to operate the joint network. Fewer buildings equate to fewer technicians operating the facilities and fewer systems equates to fewer positions required to operate and maintain the network resources.

This solution will provide the means to follow IT architectures, improve interoperability and standardization between service components, lower manpower requirements, cut the number of IT operation centers, and consolidate IT systems. While these are very admirable achievements this solution will depend critically on the stern leadership and direction of the DOD and willful cooperation between service components to implement these ITMS solutions.

Solution Comparison Discussion

The previous section described three possible solutions to the current joint basing ITSM implementation effort. The following section discusses the merits of each solution and presents

a comparison between each solution. Through this comparison the most beneficial solution emerged.

The first solution left the greatest number of ITSM sub-function responsibilities with separate components at each joint installation. It provided the means to meet joint basing ITSM requirements with little initial investment required but did not allow the joint base to take advantage of IT synergies through standardization, manpower reduction, system consolidation, or footprint reduction.

The second solution would further integrate the ITSM sub-functions leaving only two responsibilities with the separate components at each joint installation. It requires cooperation between service components and DISA to consolidate the AD systems and creates some synergies through resource management and availability. These consolidation efforts require initial resource investment to relocate and reconfigure IT systems. No significant manpower or footprint reductions occur and system consolidation generates only minimal cost benefits.

The third solution option would integrate the ITSM functions as much as possible while still meeting service specific requirements. The solution requires ground breaking coordination between DISA and the service components to establish a new joint network environment that facilitates security, service specific resources, and IT synergies. This solution requires the greatest initial investment, to relocate IT operation centers, consolidate IT systems, and reconfigure IT systems. Although the initial investment is significant, these efforts would result in better use of IT resources and overall cost reductions through reduced overhead, simplified infrastructure, and IT service-centric architectures.[71]

Table 9 shows a direct comparison between the three solutions based on the three criteria groups used in this research. The results of the criteria evaluation summarized in the table

indicate the level of adherence to IT architectures, and the benefits fostered from the other two criteria groups.

Solution	Criteria		
	IT Architecture	Interoperability and Standardization	Cost Benefits (manpower reduction, system consolidation, footprint reduction)
Current Guidance	Contained ITSM elements at three levels of IT architecture maturity	limited to no benefits in this criteria group	No benefits in this criteria group
AD integration	Contained ITSM elements at three levels of IT architecture maturity	Improvement in three non-integrated ITSM functions	Systems consolidation benefits, no other benefits
Network Redesign	Contained ITSM elements at two levels of IT architecture maturity	Improvement in five non-integrated ITSM functions	Benefits in all areas of this criteria group

Table 9: Direct Comparison of the Three ITSM Solutions

The table suggests that the network redesign solution would produce the greatest integration of service component ITSM functions at joint installations and produces the greatest cost benefits as a result of this integration. Although initial cost investment was not a specific criteria used in this research, it is noteworthy that the network redesign solution requires the greatest initial resource investment but still expects the greatest cost benefit. In addition, the other solutions provided limited or no cost saving benefits.

Recommendations

Current ITSM guidance dictates the implementation methods and procedures for the joint basing recommendation from the latest BRAC proceedings. This guidance also indicated that the ITSM guidance "will be continuously refined…to develop a single coherent, secure and consolidated joint basing information enterprise providing unity of effort and optimizing DOD information superiority at the joint bases."[72] The current ITSM implementation exists far from the envisioned end state illustrated by the analysis completed in this research effort. Combined

with recent DOD memorandums on data center consolidation, the initial ITSM revisions must begin.[73] Joint bases offer a nearly perfect environment for cross-service ITSM integration and data center consolidation efforts. They present an ideal opportunity for the DOD to implement ITSM solutions similar to the network infrastructure redesign solution examined in this research paper. The following recommendations facilitate attaining ITSM synergies at joint bases and by virtue of best industry practices, meet federal data center consolidation goals in an example of joint cooperation and operations.

DOD guidance commands direct influence over joint basing efforts and DOD leadership dictates that guidance. The first recommendation from this research says DOD leadership must enforce further integration of ITSM services at joint installations. The research indicated that further integration produces greater efficiencies in the joint base environment. It also demonstrates that joint synergies attained across service boundaries also satisfy separate DOD initiatives for cost savings through data center consolidation. Without strong, willful leadership ready to enforce initiatives, these efficiencies and interoperability synergies will disappear.[74]

The next recommendation also addresses a needed change in leadership philosophy. The lack of manpower reduction earned several discussion points throughout this research paper. One cause of this came directly from comments of upper military leadership but remains consistent with federal attitudes on manpower reductions. The frequently asked questions document on the federal data center consolidation initiative indicates personnel reductions are not the goal of data center consolidation.[75] This attitude must change to see the biggest benefit from IT consolidation initiatives, in the joint base environment or otherwise. What is the use of seeking technology efficiencies if unnecessary manpower positions are retained?

25

The third recommendation is to pursue the first two recommendations while refining the joint base ITSM guidance. If leadership took a strong stance on finding efficiencies across joint basing functional areas many process efficiencies would materialize. Attaining IT synergies consistently remains a primary endeavor in which private industry strives to attain optimized cost versus capability practices in IT systems. This alignment enables companies to grow and survive in the market place. Joint basing in many ways resembles acquisition and merger operations in private industry and the DOD needs to integrate IT processes and systems as much as possible while capitalizing on cost saving opportunities of joint basing ITSM efforts. Many of the difficulties of ITSM implementation emerged over the past two years of joint basing efforts.[76] The DOD should keep these difficulties in mind as lessons learned, embrace the data center consolidation initiative, and rework the ITSM guidance for joint basing implementation.

Conclusion

BRAC 2005 identified joint basing as a cost saving initiative for the DOD. ITSM guidance allowed several ITSM sub-functions to remain service component managed essentially ignoring the opportunity for joint collaboration and cost savings in that area. Private industry goes to great lengths to achieve IT synergies that reduce costs and enable business strategies. Similarly, the DOD pursues several initiatives designed to meet those goals. The DOD missed a prime opportunity to demonstrate sound IT business practices and joint cooperation by dictating limited integration of ITSM sub-functions at joint bases. The current DOD implementation guidance for joint basing ITSM functions warrants revision. The guidance itself dictates this revision to ensure IT synergies result from joint basing efforts while enabling joint capabilities and missions. BRAC congressional laws identified joint basing as a cost saving initiative.

Under the current joint basing implementation guidance, congressional legislation similar to the forced cooperation effects of the Goldwater-Nichols act offers the only saving grace for service components to achieve joint basing ITSM synergies, integration, and envisioned cost savings.

Notes

(All notes appear in shortened form. For full details see the appropriate entry in the bibliography.)

1. Locher, James R., JFQ, Spring 2003, 39.
2. DOD CIO, DOD CIO Desk Reference: Volume I Foundation Documents, August 2006, 2.
3. Base Realignments and Closures Report to the Defense Secretary's Commission, December 1988, 6.
4. Defense Base Closure and Realignment Commission, 1991 Report to the President, July 1991, 1.
5. Defense Base Closure and Realignment Commission, 1993 Report to the President, July 1993, 1.
6. Defense Base Closure and Realignment Commission, 1995 Report to the President, July 1995, 1.
7. Department of Defense Base Closure and Realignment Report Volume I Part 1of 2: Detailed Recommendations, May 2005, Preface.
8. Ibid, H&SA-43.
9. 2005 Department of Defense Base Closure and Realignment Commission Report Volume I, Sept 2005, 221.
10. Department of Defense Base Closure and Realignment Report Volume I Part 2 of 2: Detailed Recommendations, May 2005, H&SA-41.
11. Ibid, H&SA-41.
12. Ibid, H&SA-41 - H&SA-42.
13. Information Technology Services Management (ITSM) Supplemental Guidance for Implementing and Operating a Joint Base, 21 April 2008, 5-6.
14. Government Accountability Office, GAO-10-98R, BRAC: Estimated Costs have increased while savings estimates have decreased since FY 2009, 13 Nov 2009, 4.
15. Joint Base Map, Joint Basing Program management Office website on Army Knowledge Online, accessed 4 June 2010.
16. Department of Defense Initial Guidance for BRAC 2005 Joint Base Implementation, 22 January 2008, 2.
17. Department of Defense Supplemental Guidance for Implementing and Operating a Joint Base, 15 April 2008, 1.
18. 2005 Department of Defense Base Closure and Realignment Commission Report Volume I, Sept 2005, Q-70.
19. JB Little Creek-Story MOA, 7 November 2008, 8.
20. JB Myer-Henderson Hall MOA, 10 October 2008, 8.
21. JB Andrews-NAF Washington MOA, 30 October 2008, 7.
22. JB McGuire-Dix-Lakehurst MOA, 10 April 2009, 7.
23. JB Marianas MOA, 23 January 2009, 8.
24. JB Anacostia-Bolling MOA, 21 December 2009, 8.
25. JB Pearl harbor-Hickam MOA, 24 August 2009, 8.
26. JB Lewis-McChord MOA, 16 August 2009, 7.
27. JB Charleston MOA, 2 July 2009, 8.
28. JB Elmendorf-Richardson MOA, 9 October 2009, 7.
29. JB San Antonio MOA, 16 November 2009, 7.
30. JB Langley-Eustis MOA, 1 September 2009, 7.
31. Department of Defense Initial Guidance for BRAC 2005 Joint Base Implementation, 22 January 2008, G-1.
32. Ibid, 1.
33. Ibid, 3, E-1 – E-2.
34. Department of Defense Supplemental Guidance for Implementing and Operating a Joint Base, 15 April 2008, 11-13.
35. Information Technology Services Management (ITSM) Supplemental Guidance for Implementing and Operating a Joint Base, 21 April 2008, 1-8.
36. Ibid, 1-8.
37. McNeely, Jeffery, Joint Basing Funding, Air War College, 17 February 2010, 4.
38. CJCS Memo to Service Chiefs, Joint Basing Implementation, 16 September 2008, 1.
39. McNeely, Jeffery, Joint Basing Funding, Air War College, 17 February 2010, 14-15.
40. Department of Defense Initial Guidance for BRAC 2005 Joint Base Implementation, 22 January 2008, 30.
41. McNeely, Jeffery, Joint Basing Funding, Air War College, 17 February 2010, 24.

42. Government Accountability Office, GAO-09-336, Defense Infrastructure: DOD Needs to Periodically Review Support Standards and Costs at Joint Bases and Better Inform Congress of Facility Sustainment Funding Uses, March 2009, 4.

43. Joint Basing ITSM Workshop, 17-18 November, 2009, 12, 22-26, 29-31,56,61.

44. Joint Basing IRC and PMR Information Technology Services management (ITSM) and Data Migration (DM) Lessons Learned, 20-21 January 2010, 4.

45 Government Accountability Office, GAO-10-98R, BRAC: Estimated Costs have increased while savings estimates have decreased since FY 2009, 13 Nov 2009, 17.

46. Ibid, 4.

47. Fetters, Michael A. Achieving alignment: An Analysis of Enterprise Architecture, March 09, 21.

48. Ross, Jeanne. Creating a Strategic IT Architecture Competency: Learning in Stages. April 2003, 2.

49. Ibid, 2.

50. Ibid, 2.

51. Ibid, 5.

52. Ibid, 5.

53. Ibid, 7.

54. Ibid, 12.

55. DOD CIO, DOD Architecture Framework Version 2.0, May 2009, 1.

56. Ibid, 1.

57. DOD Directive 4630.05, Interoperability and supportability of Information Technology (IT) and National Security Systems, Certified current as of 23 April 2007, 3.

58. DOD CIO, Federal Data Center consolidation Initiative, March 2010, 1.

59. Ross, Jeanne W., Creating a Strategic IT Architecture Competency, April 2003, 7.

60. Ibid, 1.

61. 2005 Department of Defense Base Closure and Realignment Commission Report Volume I, Sept 2005, 220.

62. JBPMO Monthly Newsletter, December 2008, 3.

63. McNeely, Jeffery, Joint Basing Funding, Air War College, 17 February 2010, 13-14.

64. DOD CIO, Federal Data Center consolidation Initiative, March 2010, 1

65. Desmond, Brian et al., *Active Directory*, 2009, 3.

66. Best Practice Active Directory Design for Managing Windows Networks, Microsoft Technet website, accessed 21 June 2010.

67. DISA Global Directory Service efforts, DISA Website, accessed 22 June 2010.

68. November 2009 ITSM Workshop Briefings, 2009, slide 25.

69. CJCSI 6510.01E, INFORMATION ASSURANCE (IA) AND COMPUTER NETWORK DEFENSE (CND), 12 August 2008, A-1.

70. IANA website, accessed 21 June 2010.

71. Blowers, Mark. Data Center Consolidation, October 2007, 2.

72. Information Technology Services Management (ITSM) Supplemental Guidance for Implementing and Operating a Joint Base, 21 April 2008, 1.

73. DOD CIO, Federal Data Center consolidation Initiative, March 2010, 1.

74. Government Accountability Office, GAO-08-519, DOD Business Systems Modernization: Military Departments Need to Strengthen Management of Enterprise Architecture Programs, May 2008, 4.

75. OMB, FDCCI-FAQ, 2010, 1.

76. Joint Basing ITSM Workshop, 17-18 November, 2009, 12, 22-26, 29-31,56,61.

Abbreviations

AD	**Active Directory**
BRAC	**Base Realignment and Closure**
CJCS	**Chairman of the Joint Chiefs of Staff**
COMSEC	**Communication Security**
COOP	**Continuity of Operations Plan**
DISA	**Defense Information Service Agency**
DISN	**Defense Information Systems Network**
DMS	**Defense Messaging System**
DOD	**Department of Defense**
DODAF	**DOD Architecture Framework**
EA	**Enterprise Architecture**
FOC	**Full Operating Capability**
GAL	**Global Address List**
GAO	**Government Accountability Office**
IA	**Information Assurance**
IOC	**Initial Operating Capability**
IT	**Information Technology**
ITSM	**Information Technology Systems Management**
LMR	**Land Mobile Radios**
MOA	**Memorandum of Agreement**
OSD	**Office of the Secretary of Defense**
PA	**Public Address**
PDA	**Personal Digital Assistant**
VTC	**Video Teleconferencing**

Bibliography

2005 Defense Base Closure and Realignment Commission Report. Volume I. Washington, DC: Department of Defense, September 2005.

Base Closure and Realignment Report. Volume I, Part 2 of 2: Detailed Recommendations. Washington, DC: Department of Defense, May 2005.

Base Realignments and Closures. Report of the Defense Secretary's Commission. Washington, DC: Department of Defense, December 1988.

Blowers, Mark. *Data Center Consolidation*. Butler Group White Paper. Butler Direct Limited, October 2007.

Chairman of the Joint Chiefs of Staff. Joint Basing Implementation. Memorandum 16 September 2008.

Chairman of the Joint Chiefs of Staff (CJCS) Instruction 6510.01E. *Information Assurance (IA) and Computer network Defense (CND).* 12 August 2008.

Defense Base Closure and Realignment Commission. 1991 Report to the President. Washington, DC: Department of Defense, July 1991.

Defense Base Closure and Realignment Commission. 1993 Report to the President. Washington, DC: Department of Defense, July 1993.

Defense Base Closure and Realignment Commission. 1995 Report to the President. Washington, DC: Department of Defense, July 1995.

Defense Information Service Agency, "Global Directory Service". http://www.disa.mil/services/gds.html

Department of Defense (DOD). *DOD Architecture Framework, Version 2.0*, May 2009.

Department of Defense Chief Information Officer. Federal Data Center Consolidation Initiative. Memorandum, 30 March 2010.

Department of Defense Chief Information Officer. Supplemental Guidance for Implementing and Operating a Joint Base, Information Technologies Services Management (ITSM), 21 April 2008.

Department of Defense Chief Information Officer Desk Reference. *Volume I, Foundation Documents,* August 2006.

Department of Defense Deputy Secretary of Defense. Transforming Through Base Realignment and Closure (BRAC 2005) – Joint Basing, Department of Defense (DOD) Initial Guidance for BRAC 2005 Joint Basing Implementation, 22 January 2008.

Department of Defense (DOD) Directive 4630.05. *Interoperability and Supportability of Information Technology (IT) and National Security Systems,* Certified current 23 April 2007.

Deputy Under Secretary of Defense Installations and Environment. Department of Defense Supplemental Guidance for Implementing and Operating a Joint Base, Memorandum of Agreement Template, 15 April 2008.

Desmond, Brian, Joe Richards, Robbie Allen, and Alistair G. Lowe-Norris. *Active Directory.* Sebastopol, CA: O'Reilly Media, 2009.

Fetters, Michael A. "Achieving Alignment: An Analysis of Enterprise Architecture Best Practices Within the United States Air Force" Thesis, Air Force Institute of Technology, Air University, March 2009.

Government Accountability Office. *Base Realignment and Closure: Estimated Costs Have Increased While Savings Estimates Have Decreased Since FY2009*. GAO-10-98R. Washington, DC: 13 November 2009.

Government Accountability Office. *Defense Infrastructure: DOD Needs to Periodically Review Support Standards and Costs at Joint Bases and Better Inform Congress of Facility Sustainment Funding Uses*. GAO-09-336. Washington, DC: March 2009.

Government Accountability Office. *DOD Business Systems Modernization: Military Departments Need to Strengthen Management of Enterprise Architecture Programs.* GAO-08-519. Washington, DC: May 2008.

Installation Support Memorandum of Agreement (MOA) for Joint Base Myer -Henderson Hall, 10 October 2008.

Installation Support Memorandum of Agreement (MOA) for Joint Base Andrews-Naval Air Facility Washington, MD, 30 October 2008.

Installation Support Memorandum of Agreement (MOA) for Joint Expeditionary Base, Little Creek-Fort Story, 7 November 2008.

Installation Support Memorandum of Agreement (MOA) for Joint Region Marianas, 23 January 2009.

Installation Support Memorandum of Agreement (MOA) for Joint Base McGuire-Dix-Lakehurst, 10 April 2009.

Installation Support Memorandum of Agreement (MOA) for Joint Base Charleston, SC, 2 July 2009.

Installation Support Memorandum of Agreement (MOA) for Joint Base Elmendorf-Richardson, 9 October 2009.

Installation Support Memorandum of Agreement (MOA) for Joint Base Lewis-McChord, 16 August 2009.

Installation Support Memorandum of Agreement (MOA) for Joint Base Langley-Eustis, 1 September 2009.

Installation Support Memorandum of Agreement (MOA) for Joint Base Pearl Harbor-Hickam, 24 August 2009.

Installation Support Memorandum of Agreement (MOA) for Joint Base San Antonio, 16 November 2009.

Installation Support Memorandum of Agreement (MOA) for Anacostia – Bolling, 21 December 2009.

Internet Assigned Numbers Authority, "Delegation record for .MIL". http://www.iana.org/domains/root/db/mil.html

Joint Base Site Map. Joint Basing Program Management Office (JBPMO) Website https://www.us.army.mil/suite/page/560093

Joint Basing ITSM Workshop. *Joint Basing ITSM Workshop Briefings.* 17-18 November 2009.

Joint Basing Program Management Office (JBPMO) monthly newsletters, December 2008

Locher, James R. "Taking Stock of Goldwater-Nichols." *Joint Force Quarterly,* no. 34 (Spring 2003): 34-41.

McNeely, Jeffery K. "Joint Basing Funding." Master's Thesis, Air War College, Air University, 2010.

Microsoft Technet Library, "Best Practice Active Directory Design for Managing Windows Networks". http://technet.microsoft.com/en-us/library/bb727085.aspx

Office of Management and Budget (OMB). "Federal Data Center Consolidation Initiative – Frequently Asked Questions", 2010.

Ross, Jeanne W. *Creating a Strategic IT Architecture Competency: Learning in Stages.* Cambridge MA: Center for Information Systems Research, April 2003.

Rossano, Tracey. *Joint Basing IRC and PMR Information Technology Services Management (ITSM) and Data Migration (DM) Lessons Learned.* 20-21 January 2010.