

NATIONAL ENTERPRISE ARCHITECTURE FRAMEWORK KINGDOM OF BAHRAIN

Technology Standards and Guidelines

Platform Domain



© Copyright. All rights reserved with eGovernment Authority (eGA) Kingdom of Bahrain. This document is the intellectual property of eGA. No part of this work may be reproduced in any form or by any means - electronic, graphic or mechanical - including photocopying, recording, taping, or storage in an information retrieval system, without prior written permission of eGA.

DOCUMENT INFORMATION AND HISTORY

Document Reference Number: ETS-PLT-02.01		Title: Platform Domain			
Document Type: Enterprise Technology Standards		Category: Platforms			
Approver: ICT Governance Committee (ICTGC)		Approval Date: 04/12/2013			
Effective Date: 04/12/2013	Last Review Date: 02/12/2013		Next Review Date: As Required		
SPOC for Change: NEAF Chief Architect – Email ID: neaf@ega.gov.bh					
Synopsis: Establishes technology standards and guidelines in Platform Domain for Information Systems interoperability and information exchange					

Document History

Version Number	Date (dd/mm/yyyy)	Author	Remarks
1.0	06/12/2010	NEAF Team	Baseline version
2.0	02/12/2013	NEAF Team	Updated and incorporated review comments from ICTGC

Review and Approval History

Version Number	Date (dd/mm/yyyy)	Reviewer / Approver	Remarks
2.0	04/12/2013	ICTGC	Formal approval by ICTGC

TABLE OF CONTENTS

1. Introduction	5
2. Summary of Technology Standards/Specifications and Tools	6
2.1. Web Browsers.....	6
2.2. Web Servers.....	6
2.3. Portal Servers.....	7
2.4. Application Servers	7
2.5. Directory Services	7
2.6. Mobile OS	8
2.7. Desktop OS	8
2.8. Enterprise Server OS	9
2.9. Enterprise Server Virtualization.....	10
2.10. Hardware Platforms.....	10
3. Details of Standards / Specifications and Associated Guidelines	11
3.1. POSIX Compliant.....	11
3.2. DNS	11
3.3. LDAP.....	12
3.4. Windows OS.....	13
3.5. Linux OS	13
3.6. Mac OS X.....	14
3.7. X.500.....	14
3.8. x86	14
3.9. Power Architecture.....	15
3.10. SPARC.....	15
3.11. Android OS.....	16
3.12. Symbian OS	16
3.13. Blackberry OS.....	17
3.14. Microsoft Windows Phone OS	17
3.15. iOS.....	18
3.16. Microsoft Windows Server OS	18
3.17. UNIX Server OS	18
3.18. Linux Server OS	19
3.19. Logical Domains (LDOMS).....	20
4. Details of Tools Supporting Recommended Standards	21
4.1. Microsoft Active Directory.....	21
4.2. IBM Tivoli Directory Server	21
4.3. Oracle Internet Directory.....	22
4.4. Novell E-Directory	22
4.5. VMWare.....	22
4.6. Microsoft Hyper-V	23
4.7. PowerVM	23
4.8. Xen Hypervisor.....	23
4.9. IBM WebSphere Application Server	24
4.10. Oracle Application Server	24
4.11. Apache Tomcat Application Server	25
4.12. Microsoft IIS Application Server	25
4.13. Microsoft IIS Web Server	25
4.14. Apache HTTP Server.....	26
4.15. IBM HTTP Server	26
4.16. Oracle HTTP Server	26

4.17. IBM Portal Server.....	27
4.18. Oracle Portal Server	27
4.19. Microsoft Portal Server.....	28
4.20. Microsoft Internet Explorer	28
4.21. Mozilla Firefox	28
4.22. Google Chrome.....	29
4.23. Opera	29
5. Appendices	30
5.1. Appendix a: Abbreviations and Acronyms.....	30
5.2. Appendix B: Related Documents / Links.....	31

1. INTRODUCTION

This document covers tools, technologies and standards used in the Platform domain. The process of arriving at these standards has been outlined in the NEAF - Technology Standards Methodology & Process document in Section 3 - Methodology and Approach. Some of the tools, technologies and standards have been identified as potential requirements and hence been incorporated in this document. These may be considered as recommendations for current and future use.

This document shall be considered for revision in conjunction with the NEAF - Technology Standards Methodology & Process document at appropriate intervals of time as decided by the ICT Governance Committee. Any addition or upgrade to these tools and standards may be incorporated by following the process described in the NEAF - Technology Standards Methodology & Process document in Section 6 - Review and Maintenance of Technology Standards and Guidelines.

2. SUMMARY OF TECHNOLOGY STANDARDS/SPECIFICATIONS AND TOOLS

This section contains a summary of standards and tools applicable to the Platform domain. These have been grouped into sub-sections (categories), with each category addressing one aspect of the related standards and tools. Further details and links to these standards and tools have been provided in the following sections of this document.

The rationale for selection of these standards and tools are :

- Based on the usage across ministries as captured in the internal survey.
- Technology best practices.
- References from international standards bodies.

2.1. WEB BROWSERS

Introduction to Sub-Category	<ul style="list-style-type: none">▪ A web browser is a software application for retrieving, presenting, and traversing information resources on the World Wide Web. An information resource is identified by a Uniform Resource Identifier (URI) and may be a web page, image, video, or other piece of content. Hyperlinks present in resources enable users to easily navigate their browsers to related resources. Although browsers are primarily intended to access the World Wide Web, they can also be used to access information provided by web servers in private networks or files in file systems.
Applicable Standard(s)	<ul style="list-style-type: none">▪ Microsoft Internet Explorer – (Details)▪ Mozilla Firefox – (Details)▪ Opera – (Details)▪ Google Chrome – (Details)
Remarks	
Exceptions	

2.2. WEB SERVERS

Introduction to Sub-Category	<ul style="list-style-type: none">▪ A web server provides World Wide Web services on the Internet. If a web server is used internally and not by the public it may be known as an "intranet server." Web server is responsible for accepting HTTP requests from clients (user agents such as web browsers), and serving them HTTP responses along with optional data contents, which usually are web pages such as HTML documents and linked objects (images, etc.).
Applicable Standard(s)	<ul style="list-style-type: none">▪ Microsoft IIS Server (Details)

	<ul style="list-style-type: none"> ▪ Apache HTTP Server (Details) ▪ Oracle HTTP Server (Details) ▪ IBM HTTP Server (Details)
Remarks	
Exceptions	

2.3. PORTAL SERVERS

Introduction to Sub-Category	<ul style="list-style-type: none"> ▪ Portals are an application server mechanism by which organizations can manage information. They provide a single point of entry for all users, they can access Web services transparently from any device, and they are highly flexible. Portals represent focus points for interaction, providing integration and single source of organization information.
Applicable Standard(s)	<ul style="list-style-type: none"> ▪ IBM WebSphere Portal Server (Version 6.1 or later) (Details) ▪ Microsoft Office SharePoint Server 2007 (Details) ▪ Oracle Portal (WebCenter Suite) version 11g and higher (Details)
Remarks	
Exceptions	

2.4. APPLICATION SERVERS

Introduction to Sub-Category	<ul style="list-style-type: none"> ▪ In an n-tier environment, a separate component performs the business logic, although some part may still be handled by the user's machine. Referred as Application Server, it serves an Application Programming Interface (API) to expose business logic and business processes for use by third-party applications.
Applicable Standard(s)	<ul style="list-style-type: none"> ▪ IBM WebSphere Application Server (Details) ▪ Oracle Application Server (WebLogic) (Details) ▪ Microsoft IIS Server (Details) ▪ Apache Tomcat (Details)
Remarks	
Exceptions	

2.5. DIRECTORY SERVICES

Introduction to Sub-Category	<ul style="list-style-type: none"> ▪ A directory may be described as a specialized database of lists. Directory service is simply the software system that stores, organizes and provides access to information in a directory. Directories serve a wide variety of
------------------------------	--

	functions in a computing environment and are used by applications including email, security, and naming services.
Applicable Standard(s)	<p>Technologies -</p> <ul style="list-style-type: none"> ▪ LDAP – (Details) ▪ DNS – (Details) ▪ X.500 based directory structures - (Details) <p>Tools -</p> <ul style="list-style-type: none"> ▪ Windows Server 2008 Active Directory - (Details) ▪ Novell eDirectory (Version 8.8) - (Details) ▪ Oracle Internet Directory (Version 10gR3 or higher) - (Details) ▪ IBM Tivoli Directory Server (Version 6.1 or higher) - (Details)
Remarks	
Exceptions	

2.6. MOBILE OS

Introduction to Sub-Category	<ul style="list-style-type: none"> ▪ An operating system (commonly abbreviated to either OS or O/S) is an interface between hardware and user. An OS is responsible for the management and coordination of activities and the sharing of the resources of the computer. A Mobile operating system, also known as a Mobile OS, a Mobile platform, or a handheld operating system, is the operating system that controls a mobile device—similar in principle to an operating system such as Linux or Windows that controls a desktop computer. However, they are currently somewhat simpler, and deal more with the wireless versions of broadband and local connectivity, mobile multimedia formats, and different input methods.
Applicable Standard(s)	<ul style="list-style-type: none"> ▪ Symbian (Details) ▪ Windows Mobile (Details) ▪ Android (Details) ▪ Blackberry OS (Details) ▪ iOS
Remarks	
Exceptions	

2.7. DESKTOP OS

Introduction to Sub-Category	<ul style="list-style-type: none"> ▪ An operating system (commonly abbreviated to either OS or O/S) is an interface between hardware and user. An OS is responsible for the
------------------------------	--

	<p>management and coordination of activities and the sharing of the resources of the computer. The operating system acts as a host for computing applications run on the machine. As a host, one of the purposes of an operating system is to handle the details of the operation of the hardware. This relieves application programs from having to manage these details and makes it easier to write applications.</p> <ul style="list-style-type: none"> ▪ POSIX is an IEEE standard design to facilitate application portability and interoperability. This facilitates movement of applications from one platform to another if needed.
Applicable Standard(s)	<ul style="list-style-type: none"> ▪ POSIX Compliant – (Details) ▪ Windows Vista – (Details) ▪ Windows 7 – (Details) ▪ Linux – (Details) ▪ Mac OS X – (Details)
Remarks	
Exceptions	

2.8. ENTERPRISE SERVER OS

Introduction to Sub-Category	<ul style="list-style-type: none"> ▪ An operating system (commonly abbreviated to either OS or O/S) is an interface between hardware and user. An OS is responsible for the management and coordination of activities and the sharing of the resources of the computer. The operating system acts as a host for computing applications run on the machine. As a host, one of the purposes of an operating system is to handle the details of the operation of the hardware. This relieves application programs from having to manage these details and makes it easier to write applications.
Applicable Standard(s)	<ul style="list-style-type: none"> ▪ Windows Server 2008 (Details) ▪ Windows Server 2003 (Details) ▪ IBM AIX (Version 6.1 or higher) (Details) ▪ Solaris 10 (Details) ▪ Red Hat Enterprise Linux (Version 5.X) (Details) ▪ HP-UX (Version 11.31) (Details) ▪ SUSE Linux Enterprise Server (Version 10 or higher) (Details)
Remarks	
Exceptions	

2.9. ENTERPRISE SERVER VIRTUALIZATION

Introduction to Sub-Category	<ul style="list-style-type: none"> ▪ Server virtualization is the masking of server resources, including the number and identity of individual physical servers, processors, and operating systems, from server users. The server administrator uses a software application to divide one physical server into multiple isolated virtual environments. The virtual environments are sometimes called virtual private servers, but they are also known as partitions, guests, instances, containers or emulations.
Applicable Standard(s)	<ul style="list-style-type: none"> ▪ Products in VMware vSphere 4 (e.g. VMware ESX 4.0) (Details) ▪ Latest versions of products in VMware Infrastructure 3 (e.g. VMware ESX 3.5) (Details) ▪ Microsoft Hyper-V (Details) ▪ PowerVM (LPAR) (Details) ▪ LDOMs (Details) ▪ Xen hypervisor (Details)
Remarks	
Exceptions	

2.10. HARDWARE PLATFORMS

Introduction to Sub-Category	<ul style="list-style-type: none"> ▪ Hardware Platform (computer architecture) is the conceptual design and fundamental operational structure of a computer system. It is a blueprint and functional description of requirements and design implementations for the various parts of a computer, focusing largely on the way by which the central processing unit (CPU) performs internally and accesses addresses in memory. Instruction set, a primary category of hardware platform is a list of all the instructions, and all their variations, that a processor (or in the case of a virtual machine, an interpreter) can execute.
Applicable Standard(s)	<ul style="list-style-type: none"> ▪ x86 (x86-32 and x86-64) (Details) ▪ Power Architecture (Details) ▪ Itanium (Details) ▪ SPARC (Details)
Remarks	
Exceptions	

3. DETAILS OF STANDARDS / SPECIFICATIONS AND ASSOCIATED GUIDELINES

This section provides a brief description of the relevant standards listed in section 2 along with links for references to these standards.

3.1. POSIX COMPLIANT

Description	<ul style="list-style-type: none">▪ The IEEE established a validation service for the POSIX (Portable Operating System Interface). The IEEE Validation Service uses accredited POSIX testing laboratories, issue certification of validated test results, and maintains a register of accredited laboratories and successfully tested products.▪ The laboratories are accredited by the NVLAP under its POSIX program. The requirement for testing is buyer driven. Initially, federal agencies in their requests for procurement (RFP) of POSIX systems required certificates of validation prior to purchase
Applicable to	<ul style="list-style-type: none">▪ Operating System
Reference(s)	<ul style="list-style-type: none">▪ Note-qc-certif-20020102.html">http://www.w3.org/QA/2002/01>Note-qc-certif-20020102.html▪ http://standards.ieee.org/regauth posix/
Remarks:	<ul style="list-style-type: none">▪ POSIX support assures code portability between systems and is increasingly mandated for commercial applications and government contracts.▪ The benefits of POSIX testing and its acceptance in the industry has resulted in sellers requesting to be tested as a matter of course, rather than a procurement requirement.

3.2. DNS

Description	<ul style="list-style-type: none">▪ The Domain Name System (DNS) is a distributed internet directory service. DNS is used mostly to translate between domain names and IP addresses, and to control email delivery. Most internet services rely on DNS to work. If DNS fails or is too slow, web sites cannot be located and email delivery stalls. The DNS system consists of three components: DNS data (called resource records), servers (called name servers), and Internet protocols for fetching data from the servers.
Applicable to	<ul style="list-style-type: none">▪ Directory Services
Reference(s)	<ul style="list-style-type: none">▪ http://www.dns.net/dnsrd/docs/whatis.html

	<ul style="list-style-type: none"> ▪ http://www.dns.net/dnsrd/rfc/
Remarks	<ul style="list-style-type: none"> ▪ By itself, DNS doesn't appear to do much, and on top of that, DNS can seem a bit intimidating because it has number of different features and record types. One key to understanding the importance of DNS is realizing how other processes and applications depend on the services DNS provides. ▪ By understanding how DNS provides the underlying services used by various applications, you can get a clearer picture of why DNS exists and how it works. Many common applications use DNS services, including World Wide Web (WWW) E-mail other applications, such as instant messaging.

3.3. LDAP

Description	<ul style="list-style-type: none"> ▪ Used to access centrally stored information over a network. It is based on the X.500 standard for directory sharing, but is less complex and resource intensive. For this reason, LDAP is sometimes referred to as "X.500 Lite." Like X.500, LDAP organizes information in a hierachal manner using directories. These directories can store a variety of information and can even be used in a manner similar to Network Information Service (NIS), enabling anyone to access their account from any machine on the LDAP enabled network. LDAP is a client-server system. ▪ The server can use a variety of databases to store a directory, each optimized for quick and copious read operations. When an LDAP client application connects to an LDAP server, it can either query a directory or attempt to modify it. In the event of a query, the server either answers the query or, if it cannot answer locally, it can refer the querent to an LDAP server which does have the answer. If the client application is attempting to modify information an LDAP directory, the server verifies that the user has permission to make the change and then adds or updates the information.
Applicable to	<ul style="list-style-type: none"> ▪ Directory Services
Reference(s)	<ul style="list-style-type: none"> ▪ http://www.isode.com/whitepapers/ldap-standards.html ▪ http://www.redhat.com/docs/manuals/linux/RHL-9-Manual/ref-guide/ch-ldap.html
Remarks	<ul style="list-style-type: none"> ▪ The main benefit of using LDAP is that information for an entire organization can be consolidated into a central repository. For example, rather than managing user lists for each group within an organization, you can use LDAP as a central directory accessible from anywhere on the network. And because LDAP supports Secure Sockets Layer (SSL) and Transport Layer Security (TLS), sensitive data can be protected from prying eyes.

	<ul style="list-style-type: none"> ▪ LDAP also supports a number of back-end databases in which to store directories. This allows administrators the flexibility to deploy the database best suited for the type of information the server is to disseminate. Because LDAP also has a well-defined client Application Programming Interface (API), the number of LDAP-enabled applications are numerous and increasing in quantity and quality.
--	--

3.4. WINDOWS OS

Description	<ul style="list-style-type: none"> ▪ Windows Vista is a line of operating systems developed by Microsoft for use on personal computers, including home and business desktops, laptops, tablet PCs, and media center PCs ▪ Windows 7 (formerly codenamed Blackcomb and Vienna) is the latest version of Microsoft Windows, a series of operating systems produced by Microsoft for use on personal computers, including home and business desktops, laptops, tablet PCs and media center PCs.
Applicable to	<ul style="list-style-type: none"> ▪ Operating Systems
Reference(s)	<ul style="list-style-type: none"> ▪ Windows Vista http://www.microsoft.com/windows/windows-vista/default.aspx ▪ Windows 7 http://www.microsoft.com/windows/windows-7
Remarks	<ul style="list-style-type: none"> ▪ The Windows OS the most widely used OS in enterprises cross the world.

3.5. LINUX OS

Description	<ul style="list-style-type: none"> ▪ Linux is a Unix-like computer operating system assembled under the model of free and open source software development and distribution. The defining component of Linux is the Linux kernel.
Applicable to	<ul style="list-style-type: none"> ▪ Operating Systems
Reference(s)	<ul style="list-style-type: none"> ▪ SUSE Linux Enterprise Desktop http://www.novell.com/products/desktop ▪ Red Hat Linux http://www.redhat.com/
Remarks	<ul style="list-style-type: none"> ▪ The Linux OS among the fastest growing desktop OS alternatives to Windows OS in the mainstream.

3.6. Mac OS X

Description	<ul style="list-style-type: none">▪ OS X is a series of Unix-based graphical interface operating systems developed, marketed, and sold by Apple Inc. OS X runs exclusively on Macintosh computers and has been pre-loaded on all Macs since 2002.▪ Mac OS X 10.6 "Snow Leopard" was the first version of OS X to drop support for PowerPC Macs and run solely on Intel's x86-based processors. Mac OS X 10.7 "Lion" was the first version of OS X to drop support for 32-bit Intel processors and run exclusively on 64-bit Intel CPUs.▪ iOS, which runs on the iPhone, iPod Touch and iPad share the Darwin core and many frameworks with OS X.
Applicable to	<ul style="list-style-type: none">▪ Operating Systems
Reference(s)	<ul style="list-style-type: none">▪ http://www.apple.com/osx/
Remarks	

3.7. X.500

Description	<ul style="list-style-type: none">▪ X.500 is a series of computer networking standards covering electronic directory services. It is an ISO OSI Directory Service with an information model, a namespace, a functional model, an authentication framework, and a distributed operation model. X.500 directory protocol is used for communication between a Directory User Agent and a Directory System Agent.
Applicable to	<ul style="list-style-type: none">▪ Directory Services
Reference(s)	<ul style="list-style-type: none">▪ X.500 standardized under ISO/IEC 9594 http://www.iso.org
Remarks	

3.8. x86

Description	<ul style="list-style-type: none">▪ 64 bit hardware platforms are strategic for future deployment by ministries/agencies.▪ x86 is the most commercially successful instruction set architecture in the history of personal computing. x86-32 is the architecture for the 32 bit hardware platforms, where the x86-64 for the 64 bit hardware platforms.
-------------	--

Applicable to	<ul style="list-style-type: none"> ▪ Hardware Platforms
Reference(s)	<ul style="list-style-type: none"> ▪ X86 at Wikipedia http://en.wikipedia.org/wiki/X86
Remarks	

3.9. POWER ARCHITECTURE

Description	<ul style="list-style-type: none"> ▪ Power Architecture is a broad term to describe similar RISC instruction sets for microprocessors developed and manufactured by such companies as IBM. ▪ IBM System z, or earlier IBM eServer zSeries, is a brand name designated by IBM to all its mainframe computers. z/Architecture, initially and briefly called ESA Modal Extensions (ESAME), refers to IBM's 64-bit computing architecture for the current generation of IBM mainframe computers. ▪ PA-RISC is an instruction set architecture (ISA) developed by Hewlett-Packard's Systems & VLSI Technology Operation. As the name implies, it is a reduced instruction set computer (RISC) architecture, where the PA stands for Precision Architecture. HP stopped selling PA-RISC-based HP 9000 systems at the end of 2008 but will support servers running PA-RISC chips until 2013. Newer Itanium-based machines are intended to succeed PA-RISC in its market segment. ▪ Itanium is a family of 64-bit Intel microprocessors that implement the Intel Itanium architecture (formerly called IA-64). The processors are marketed for use in enterprise servers and high-performance computing systems. The architecture originated at Hewlett-Packard (HP), and was later jointly developed by HP and Intel. ▪ Alpha, originally known as Alpha AXP, was a 64-bit reduced instruction set computer (RISC) instruction set architecture (ISA) developed by Digital Equipment Corporation (DEC). Alpha supports both the OpenVMS operating system and Tru64 UNIX.
Applicable to	<ul style="list-style-type: none"> ▪ Hardware Platforms
Reference(s)	<ul style="list-style-type: none"> ▪ Power Architecture http://www-03.ibm.com/technology/power/ ▪ Itanium http://www.intel.com/products/processor/itanium/ ▪ PA-RISC http://www.hp.com/products1/servers/HP9000_family_overview.html ▪ Mainframe http://www-03.ibm.com/systems/z/
Remarks	

3.10. SPARC

Description	<ul style="list-style-type: none"> ▪ SPARC (from Scalable Processor Architecture) is a RISC instruction set architecture (ISA)
-------------	---

	developed by Sun Microsystems. SPARC processor technology is both freely available as well as world class in terms of performance.
Applicable to	<ul style="list-style-type: none"> ▪ Hardware Platforms
Reference(s)	<ul style="list-style-type: none"> ▪ SPARC at SPARC International, Inc. http://www.sparc.org/specificationsDocuments.html
Remarks	

3.11. ANDROID OS

Description	<ul style="list-style-type: none"> ▪ Android is a mobile operating system running on the Linux kernel. It was initially developed by Google and later the Open Handset Alliance. It allows developers to write managed code in the Java language, controlling the device via Google-developed Java libraries. ▪ Google releases the Android code as open-source, under the Apache License. The Android Open Source Project (AOSP) is tasked with the maintenance and further development of Android.
Applicable to	<ul style="list-style-type: none"> ▪ Mobile OS
Reference(s)	<ul style="list-style-type: none"> ▪ Android Operating System http://www.android.com ▪ http://developer.android.com/reference/android/os/package-summary.html
Remarks	

3.12. SYMBIAN OS

Description	<ul style="list-style-type: none"> ▪ Symbian OS was designed for mobile devices, with associated libraries, user interface, frameworks and reference implementations of common tools, developed by Symbian Ltd. It was a descendant of Psion's EPOC and runs exclusively on ARM processors, although a non-productized x86 port existed.
Applicable to	<ul style="list-style-type: none"> ▪ Mobile OS
Reference(s)	<ul style="list-style-type: none"> ▪ Symbian Operating System http://www.symbian.org
Remarks	

3.13. BLACKBERRY OS

Description	<ul style="list-style-type: none">▪ BlackBerry OS is the proprietary software platform made by Research In Motion for its BlackBerry line of handhelds. BlackBerry OS provides multi-tasking, and makes heavy use of the device's specialized input devices, particularly the trackball or touch screen.▪ The BlackBerry platform is perhaps best known for its native support for corporate email, through MIDP 1.0 and, more recently, a subset of MIDP 2.0, which allows complete wireless activation and synchronization with Microsoft Exchange, Lotus Domino, or Novell GroupWise email, calendar, tasks, notes, and contacts, when used with BlackBerry Enterprise Server
Applicable to	<ul style="list-style-type: none">▪ Mobile OS
Reference(s)	<ul style="list-style-type: none">▪ Blackberry Operating System http://www.blackberry.com,▪ http://en.wikipedia.org/wiki/BlackBerry_OS▪ Blackberry OS - http://us.blackberry.com/apps-software/blackberry7/
Remarks	

3.14. MICROSOFT WINDOWS PHONE OS

Description	<ul style="list-style-type: none">▪ Windows Mobile is a compact operating system combined with a suite of basic applications for mobile devices based on the Microsoft Win32 API. Devices that run Windows Mobile include Pocket PCs, Smart phones, Portable Media Centers, and on-board computers for certain automobiles.▪ Windows Phone is a mobile operating system developed by Microsoft, and is the successor to its Windows Mobile platform,[1]although incompatible with it.[2] Unlike its predecessor, it is primarily aimed at the consumer market rather than the enterprise market.
Applicable to	<ul style="list-style-type: none">▪ Mobile OS
Reference(s)	<ul style="list-style-type: none">▪ Windows Mobile http://www.microsoft.com/windowsmobile▪ Windows Phone - http://www.microsoft.com/windowsphone/en-us/default.aspx
Remarks	

3.15. iOS

Description	<ul style="list-style-type: none">▪ iOS (originally iPhone OS) is a mobile operating system developed and distributed by Apple Inc. Originally released in 2007 for the iPhone and iPod Touch, it has since been extended to support other Apple devices such as the iPad and Apple TV. Unlike Windows CE (Mobile and Phone) and Android, Apple does not license iOS for installation on non-Apple hardware.▪ iOS is derived from OS X, with which it shares the Darwin foundation, and is therefore a Unix operating system. In iOS, there are four abstraction layers: the Core OS layer, the Core Services layer, the Media layer, and the Cocoa Touch layer. The current version of the operating system (iOS 5.1.1) uses roughly 770 megabytes of the device's storage, varying for each model
Applicable to	<ul style="list-style-type: none">▪ Mobile OS
Reference(s)	<ul style="list-style-type: none">▪ Apple iOS –<ul style="list-style-type: none">○ http://www.apple.com/ios/○ https://developer.apple.com/technologies/ios/
Remarks	

3.16. MICROSOFT WINDOWS SERVER OS

Description	<ul style="list-style-type: none">▪ Windows NT is a family of operating systems produced by Microsoft, the first version of which was released in July 1993. Windows 2000, Windows XP, Windows Server 2003, Windows Vista, Windows Home Server, Windows Server 2008 and Windows 7 are based upon the Windows NT system, although they are not branded as Windows NT. Windows NT is not longer supported whereas extended support for Windows 2000 will end in July 2010.
Applicable to	<ul style="list-style-type: none">▪ Enterprise Server OS
Reference(s)	<ul style="list-style-type: none">▪ Microsoft Server Operating Systems http://www.microsoft.com/servers/os2.mspx
Remarks	

3.17. UNIX SERVER OS

Description	<ul style="list-style-type: none">▪ AIX (Advanced Interactive eXecutive) is the name given to a series of proprietary operating systems sold by IBM for several of its computer system platforms. IBM AIX version 5.2 and below are no longer supported by IBM. IBM AIX version 5.3 is currently supported and
-------------	--

	<p>version 6.1 was released in November 2007.</p> <ul style="list-style-type: none"> ▪ Solaris is a UNIX-based operating system introduced by Sun Microsystems in 1992 as the successor to SunOS. Solaris 8 has entered phase II of retirement support mode in March 2009 and thus is not recommended for future use. Solaris 9 has been announced for End of Life transition in April 2009 and thus its use should be contained. Solaris 10 is the Strategic product for NEAF. ▪ HP-UX (Hewlett Packard Unix) is Hewlett-Packard's proprietary implementation of the UNIX operating system, based on System V (initially System III). It runs on the HP 9000 PA-RISC-based range of processors and HP Integrity Intel's Itanium-based systems. HP-UX version 11.11 (11i v1) and 11.23 (11i v2) will be declared obsolete by HP in December 2009 and December 2010 respectively. However factory support will be available till December 2013. Thus they have been listed under Transitional/Contained. HP-UX 11.31 (11i v3) is the latest version and is the Tactical /Strategic component. ▪ Tru64 UNIX is a 64-bit UNIX operating system for the Alpha instruction set architecture (ISA). Tru64 Unix will not be enhanced by HP any further; however version 5.1B-X will continue to receive maintenance updates through 2012.
Applicable to	<ul style="list-style-type: none"> ▪ Enterprise Server OS
Reference(s)	<ul style="list-style-type: none"> ▪ IBM AIX Operating System http://www.ibm.com/aix ▪ Solaris Operating System http://www.sun.com/software/solaris ▪ HP-UX http://www.hp.com/products1/unix ▪ Tru64 Unix http://h30097.www3.hp.com
Remarks	

3.18. LINUX SERVER OS	
Description	<ul style="list-style-type: none"> ▪ Red Hat Enterprise Linux is a GNU/Linux distribution produced by Red Hat and targeted toward the commercial market, including mainframes. Red Hat Enterprise Linux version 4.X will enter the final phase of production approximately in final quarter of 2009 and thus listed under Transitional/Contained. Red Hat Enterprise Linux version 5.X is the Strategic component. ▪ SUSE Linux is a computer operating system. It is built on top of the Linux kernel and is distributed with system and application software from various projects. SUSE Linux Enterprise Server has been upgraded to version 11 with version 10 being released in 2006. SUSE Linux Enterprise Server 9 will be supported only till July 2011 and thus has been listed under Transitional/Contained.
Applicable to	<ul style="list-style-type: none"> ▪ Enterprise Server OS
Reference(s)	<ul style="list-style-type: none"> ▪ Red Hat Enterprise Linux http://www.redhat.com/rhel ▪ SUSE Linux Enterprise Server http://www.novell.com/products/server

Remarks	
---------	--

3.19. LOGICAL DOMAINS (LDOMS)

Description	<ul style="list-style-type: none"> ▪ Logical Domains (LDoms) is a technology from Sun Microsystems released which offers a virtualized computing environment abstracted from all physical devices. LDoms is only supported on UltraSPARC T1, the UltraSPARC T2 and the UltraSPARC T2 Plus platforms.
Applicable to	<ul style="list-style-type: none"> ▪ Enterprise Server Virtualization
Reference(s)	<ul style="list-style-type: none"> ▪ Logical Domains http://www.sun.com/servers/coolthreads/ldoms/index.jsp
Remarks	

4. DETAILS OF TOOLS SUPPORTING RECOMMENDED STANDARDS

This section provides a brief description of the relevant tools listed in section 2 along with links for references to these tools.

4.1. MICROSOFT ACTIVE DIRECTORY

Description	<ul style="list-style-type: none">▪ Active Directory is the Strategic product for domain services. Study of existing systems being used by ministries/agencies highlights that Active Directory is the directory services product predominantly being used for domain services by the ministries of Kingdom of Bahrain.▪ Active Directory is a technology created by Microsoft that provides a variety of network services, including LDAP-like directory services, Kerberos-based authentication, DNS-based naming and other network information. Active Directory also allows administrators to assign policies, deploy software, and apply critical updates to an organization.
Applicable to	<ul style="list-style-type: none">▪ Directory Services
Reference(s)	<ul style="list-style-type: none">▪ Microsoft Active Directory http://www.microsoft.com/windowsserver2008/en/us/active-directory.aspx
Remarks	

4.2. IBM TIVOLI DIRECTORY SERVER

Description	<ul style="list-style-type: none">▪ IBM Tivoli Directory Server (ITDS), formerly known as IBM Directory Server, is an IBM implementation of the Lightweight Directory Access Protocol, and is part of the IBM Tivoli Identity & Access Management portfolio.
Applicable to	<ul style="list-style-type: none">▪ Directory Services
Reference(s)	<ul style="list-style-type: none">▪ IBM Tivoli Directory Server http://www-01.ibm.com/software/tivoli/products/directory-server/
Remarks	

4.3. ORACLE INTERNET DIRECTORY

Description	<ul style="list-style-type: none">▪ Oracle Internet Directory (OID) is a directory service produced by Oracle Corporation, which functions compatibly with LDAP version 3.
Applicable to	<ul style="list-style-type: none">▪ Directory Services
Reference(s)	<ul style="list-style-type: none">▪ Oracle Internet Directory http://www.oracle.com/technology/products/oid/index.html
Remarks	

4.4. NOVELL E-DIRECTORY

Description	<ul style="list-style-type: none">▪ Novell eDirectory (formerly called NetWare Directory Services, NDS) is an X.500 compatible directory service software product initially released in 1993 by Novell, Inc. for centrally managing access to resources on multiple servers and computers within a given network.
Applicable to	<ul style="list-style-type: none">▪ Directory Services
Reference(s)	<ul style="list-style-type: none">▪ Novell eDirectory http://www.novell.com/products/edirectory
Remarks	

4.5. VMWARE

Description	<ul style="list-style-type: none">▪ VMware Infrastructure 3 (VI) and VMware vSphere 4 consists of a suite of virtualization products from VMware Inc. All versions of products under vSphere are Strategic. However, only the latest versions of products available in VMware Infrastructure 3 are considered Strategic. Other versions of products under VI are Transitional/Contained.
Applicable to	<ul style="list-style-type: none">▪ Enterprise Server Virtualization
Reference(s)	<ul style="list-style-type: none">▪ VMware http://www.vmware.com
Remarks	

4.6. MICROSOFT HYPER-V

Description	<ul style="list-style-type: none">▪ Microsoft Hyper-V formerly known as Windows Server Virtualization is a hypervisor-based virtualization system for x64 systems. However it is only applicable for x86-64 bit platforms.
Applicable to	<ul style="list-style-type: none">▪ Enterprise Server Virtualization
Reference(s)	<ul style="list-style-type: none">▪ Microsoft Hyper-V http://www.microsoft.com/windowsserver2008/en/us/hyperv.aspx
Remarks	

4.7. POWERVM

Description	<ul style="list-style-type: none">▪ PowerVM, formerly known as Advanced Power Virtualization (APV), is a chargeable feature of IBM POWER5 and POWER6 servers and is required for support of micro-partitions and other advanced features. Micro-partitioning is a form of logical partitioning. Logical partition, commonly called an LPAR, is a subset of computer's hardware resources, virtualized as a separate computer. In effect, a physical machine can be partitioned into multiple LPARs, each housing a separate operating system.
Applicable to	<ul style="list-style-type: none">▪ Enterprise Server Virtualization
Reference(s)	<ul style="list-style-type: none">▪ PowerVM http://www-03.ibm.com/systems/power/software/virtualization/index.html
Remarks	

4.8. XEN HYPERVISOR

Description	<ul style="list-style-type: none">▪ Xen is a virtual machine monitor for IA-32 (x86, x86-64), IA-64 and PowerPC 970 architectures. It allows several guest operating systems to be executed on the same computer hardware concurrently. Xen was initially created by the University of Cambridge Computer Laboratory and is now developed and maintained by the Xen community as free software, licensed under the GNU General Public License (GPL2). SUSE Linux Enterprise Server comes equipped to act as host operating system for Xen hypervisor.
Applicable to	<ul style="list-style-type: none">▪ Enterprise Server Virtualization
Reference(s)	<ul style="list-style-type: none">▪ Xen hypervisor http://www.xen.org

Remarks	
---------	--

4.9. IBM WEBSPHERE APPLICATION SERVER

Description	<ul style="list-style-type: none"> ▪ IBM WebSphere Application Server (WAS), a software application server, is the flagship product within IBM's WebSphere brand. WAS is built using open standards such as Java EE, XML, and Web Services. It works with a number of Web servers.
Applicable to	<ul style="list-style-type: none"> ▪ Application Servers
Reference(s)	<ul style="list-style-type: none"> ▪ IBM WebSphere Application Server http://www-01.ibm.com/software/webservers/appserv/was/
Remarks	

4.10. ORACLE APPLICATION SERVER

Description	<ul style="list-style-type: none"> ▪ Oracle has put WebLogic Server on "Strategic Products" list and "Oracle Application Server" on "Continue and Converge" list. Thus, WebLogic Server is the strategic product and should be preferred over Oracle Application Server for future deployments. ▪ Oracle Application Server 10g (the "g" stands for grid), consists of an integrated, standards-based software platform. It forms part of Oracle Corporation's Fusion Middleware technology stack. The heart of Oracle Application Server consists of Oracle HTTP Server (based on Apache HTTP Server) and OC4J (OracleAS Containers for J2EE) which deploys J2EE-based applications. ▪ Oracle Weblogic Server is a leading server for building and deploying Java EE applications with support for new features for lowering cost of operations, improving performance and supporting the Oracle applications portfolio.
Applicable to	<ul style="list-style-type: none"> ▪ Application Servers
Reference(s)	<ul style="list-style-type: none"> ▪ Oracle Application Server http://www.oracle.com/technology/products/ias/index.html ▪ Oracle WebLogic Server http://www.oracle.com/technology/products/weblogic/index.html
Remarks	

4.11. APACHE TOMCAT APPLICATION SERVER

Description	<ul style="list-style-type: none">▪ Apache Tomcat (or Jakarta Tomcat or simply Tomcat) is a servlet container developed by the Apache Software Foundation (ASF). Tomcat implements the Java Servlet and the JavaServer Pages (JSP) specifications from Sun Microsystems, and provides a "pure Java" HTTP web server environment for Java code to run. Apache Tomcat is an open source application server and will be considered as Strategic for NEAF only when it has vendor or equivalent level quality support. Apache Tomcat is a Strategic technology for NEAF only if used for non mission-critical applications.
Applicable to	<ul style="list-style-type: none">▪ Application Servers
Reference(s)	<ul style="list-style-type: none">▪ Apache Tomcat http://tomcat.apache.org
Remarks	

4.12. MICROSOFT IIS APPLICATION SERVER

Description	<ul style="list-style-type: none">▪ The Microsoft .NET Framework is a software framework that can be installed on computers running Microsoft Windows operating systems. It includes a large library of coded solutions to common programming problems and a virtual machine that manages the execution of programs written specifically for the framework. Microsoft .NET Framework is a Strategic technology for NEAF only when deployed over Strategic versions for IIS server.
Applicable to	<ul style="list-style-type: none">▪ Application Servers
Reference(s)	<ul style="list-style-type: none">▪ Microsoft .NET Framework http://www.microsoft.com/.NET▪ Microsoft IIS - http://www.iis.net/
Remarks	

4.13. MICROSOFT IIS WEB SERVER

Description	<ul style="list-style-type: none">▪ Internet Information Services (IIS) - formerly called Internet Information Server - is a set of Internet-based services for servers created by Microsoft for use with Microsoft Windows. It is the world's second most popular web server in terms of overall websites behind the industry leader Apache HTTP Server.
Applicable to	<ul style="list-style-type: none">▪ Web (HTTP) Servers
Reference(s)	<ul style="list-style-type: none">▪ Microsoft .NET Framework http://www.microsoft.com/.NET▪ Microsoft IIS - http://www.iis.net/

	<ul style="list-style-type: none"> ▪ Microsoft IIS Server http://www.microsoft.com/iis
Remarks	

4.14. APACHE HTTP SERVER

Description	<ul style="list-style-type: none"> ▪ Apache is developed and maintained by an open community of developers under the auspices of the Apache Software Foundation. The application is available for a wide variety of operating systems. Released under the Apache License, Apache is characterized as open source software. Since April 1996 Apache has been the most popular HTTP server on the World Wide Web. Apache 2.2.X is the HTTP server being focused for development by the Apache Software Foundation and thus is the Strategic for new deployments.
Applicable to	<ul style="list-style-type: none"> ▪ Web (HTTP) Servers
Reference(s)	<ul style="list-style-type: none"> ▪ Apache HTTP Server http://httpd.apache.org
Remarks	

4.15. IBM HTTP SERVER

Description	<ul style="list-style-type: none"> ▪ IBM HTTP Server (IHS) is a web server based on the Apache Software Foundation's Apache HTTP Server that runs on AIX, HP-UX, Linux, Solaris, Windows NT, and z/OS. The HTTP server is also included in the IBM WebSphere Application Server distribution packages. ▪ IBM and Oracle HTTP Server are Strategic only when run as a part of the IBM WebSphere Application Server and Oracle Application Server/Oracle Database Server Respectively.
Applicable to	<ul style="list-style-type: none"> ▪ Web (HTTP) Servers
Reference(s)	<ul style="list-style-type: none"> ▪ IBM HTTP Server http://www-01.ibm.com/software/webservers/httpservers
Remarks	

4.16. ORACLE HTTP SERVER

Description	<ul style="list-style-type: none"> ▪ Oracle HTTP Server (OHS) is a web server based on the Apache HTTP Server, created by the Oracle Technology Network. It is available both packaged as part of the Oracle Application Server distribution as well as a standalone product.
-------------	--

Applicable to	<ul style="list-style-type: none"> ▪ Web (HTTP) Servers
Reference(s)	<ul style="list-style-type: none"> ▪ Oracle HTTP Server http://www.oracle.com/technology/products/ias/ohs/index.html
Remarks	

4.17. IBM PORTAL SERVER

Description	<ul style="list-style-type: none"> ▪ IBM WebSphere Portal software provides a composite application or business mashup framework and the advanced tooling needed to build flexible, SOA-based solutions, as well as the scalability required by any size organization.
Applicable to	<ul style="list-style-type: none"> ▪ Portal Servers
Reference(s)	<ul style="list-style-type: none"> ▪ IBM WebSphere Portal Server <ul style="list-style-type: none"> ○ http://www-01.ibm.com/software/genservers/portal/server/index.html ○ http://www-01.ibm.com/software/websphere/portal/
Remarks	

4.18. ORACLE PORTAL SERVER

Description	<ul style="list-style-type: none"> ▪ Oracle Portal 11g Release 1 offers a complete and integrated framework for building, deploying, and managing enterprise portals running on Oracle WebLogic Server. Oracle Portal's unified and secure point of access to vital enterprise information and services improves business visibility and collaboration, reduces integration costs, and ensures investment protection. Oracle Portal 11g leverages Web 2.0 with Oracle WebCenter Services.
Applicable to	<ul style="list-style-type: none"> ▪ Portal Servers
Reference(s)	<ul style="list-style-type: none"> ▪ Oracle Webcenter - <ul style="list-style-type: none"> http://www.oracle.com/technetwork/middleware/portal/overview/index.html
Remarks	

4.19. MICROSOFT PORTAL SERVER

Description	<ul style="list-style-type: none">▪ Microsoft Office SharePoint Server (MOSS), is a product in the Microsoft SharePoint family of products, and runs on top of Windows SharePoint Services (WSS). MOSS builds on WSS by adding both core features as well as end user web parts to it. Its main strength is enabling an organization's information to be organized and aggregated in one central, web-based application and providing taxonomy for corporate data.
Applicable to	<ul style="list-style-type: none">▪ Portal Servers
Reference(s)	<ul style="list-style-type: none">▪ Microsoft Office Sharepoint Server http://sharepoint.microsoft.com
Remarks	

4.20. MICROSOFT INTERNET EXPLORER

Description	<ul style="list-style-type: none">▪ Windows Internet Explorer (formerly Microsoft Internet Explorer; abbreviated to MSIE or, more commonly, IE), is a series of graphical web browsers developed by Microsoft and included as part of the Microsoft Windows line of operating systems.
Applicable to	<ul style="list-style-type: none">▪ Web Browsers
Reference(s)	<ul style="list-style-type: none">▪ Microsoft Internet Explorer http://www.microsoft.com/windows/internet-explorer/default.aspx
Remarks	

4.21. MOZILLA FIREFOX

Description	<ul style="list-style-type: none">▪ Mozilla Firefox is a free and open source web browser descended from the Mozilla Application Suite and managed by Mozilla Corporation. Firefox had 22.47% of the recorded usage share of web browsers as of July 2009, making it the second most popular browser in terms of current use worldwide, after Microsoft's Internet Explorer.
Applicable to	<ul style="list-style-type: none">▪ Web Browsers
Reference(s)	<ul style="list-style-type: none">▪ Mozilla Firefox http://www.mozilla.com/firefox
Remarks	

4.22. GOOGLE CHROME

Description	<ul style="list-style-type: none">▪ Google Chrome is a web browser released by Google which uses the WebKit layout engine and application framework. It was first released as a beta version for Microsoft Windows on 2 September 2008, and the public stable release was on 11 December 2008.
Applicable to	<ul style="list-style-type: none">▪ Web Browsers
Reference(s)	<ul style="list-style-type: none">▪ Google Chrome http://www.google.com/chrome/intl/en/features.html
Remarks	

4.23. OPERA

Description	<ul style="list-style-type: none">▪ Opera is a web browser and internet suite developed by the Opera Software Company. Opera Mini and Opera Mobile Web Browser is considered as Strategic for NEAF only when used on mobile phones, smart phones and personal digital assistants.
Applicable to	<ul style="list-style-type: none">▪ Web Browsers
Reference(s)	<ul style="list-style-type: none">▪ Opera Web Browser http://www.opera.com
Remarks	

5. APPENDICES

5.1. APPENDIX A: ABBREVIATIONS AND ACRONYMS

Abbreviation/Acronym	Expansion
LDAP	Lightweight Directory Access Protocol
DNS	Domain Name System
POSIX	Portable Operating System Interface for Unix) Compliant
SGML	Standard Generalized Markup Language
CSS	Cascading Style Sheets
JSP	Java Server Pages
JSF	Java Server Faces
ASP	Active Server Pages
DOM	Document Object Model
LDom	Logical Domains
LPAR	logical partition
IIS	Internet Information Services
HTTP	Hypertext Transfer Protocol
SPARC	Scalable Processor Architecture

5.2. APPENDIX B: RELATED DOCUMENTS / LINKS

Acknowledgement of major references for international technology standards and Specifications:

- Internet Engineering Task Force (IETF)
<http://www.ietf.org>
- International Standards Organization (ISO)
<http://www.iso.org>
- World Wide Web Consortium (W3C)
<http://www.w3c.org>

Acknowledgement of other references for international technology standards and specifications:

- American National Standards Institute (ANSI)
<http://www.ansi.org>
- ECMA International
<http://www.ecma-international.org>
- Institute of Electrical and Electronics Engineers (IEEE)
<http://www.ieee.org>
- National Institute of Standards and Technology (NIST)
<http://www.nist.gov>
- Object Management Group (OMG)
<http://www.omg.org>
- Open Mobile Alliance (OMA) and WAP Forum
<http://www.openmobilealliance.org>
<http://www.wapforum.org>
- Organization for the Advancement of Structured Information Standards (OASIS)
<http://www.oasis-open.org>
- Unicode, Inc.
<http://www.unicode.org>