

# **NATIONAL ENTERPRISE ARCHITECTURE FRAMEWORK KINGDOM OF BAHRAIN**

## **Technology Standards and Guidelines**

### **Collaboration and Productivity Domain**



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## 1. INTRODUCTION

This document covers tools, technologies and standards used in the Collaboration and Productivity 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 Collaboration 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. SOFTWARE CONFIGURATION MANAGEMENT	
Introduction to Sub-Category	<ul style="list-style-type: none"> <li>▪ Software Configuration Management is applicable to all aspects of software development from design to delivery. It focuses on the control of all work products and artifacts generated during the development process. Version Management (a subset of Configuration Management) refers to the tracking and controlling of file versions. It includes capabilities such as labeling, branching, merging, version content comparisons, and security and permission management. An initial step on the path to Configuration and Version Management is to implement a source code repository with supporting processes. Code management is crucial to maintain application integrity through the development and maintenance lifecycle.</li> </ul>
Applicable Standard(s)	<ul style="list-style-type: none"> <li>▪ Concurrent Versions System – (<a href="#">Details</a>)</li> <li>▪ Subversion – (<a href="#">Details</a>)</li> <li>▪ IBM Rational ClearCase – (<a href="#">Details</a>)</li> <li>▪ Microsoft Visual SourceSafe – (<a href="#">Details</a>)</li> <li>▪ Microsoft Visual Studio Team System – (<a href="#">Details</a>)</li> </ul>
Remarks	
Exceptions	

2.2. ENTERPRISE CONTENT MANGEMENT (ECM)	
Introduction to Sub - Category	<ul style="list-style-type: none"> <li>▪ Content management is a critical technology that helps organizations manage important documents and other unstructured information, such as photographs, XML components, video clips, podcasts and e-mail messages. Content management vendors address a range of user needs and offer a range of functionality. Enterprise content management (ECM) represents a vision and a framework for implementing a broad range of content management technologies and for extracting higher value from disparate content formats throughout an enterprise.</li> </ul>

Applicable Standard(s)	<ul style="list-style-type: none"> <li>▪ IBM FileNet v8, Data Capture – (<a href="#">Details</a>)</li> <li>▪ Oracle ECM 11g – (<a href="#">Details</a>)</li> <li>▪ EMC Documentum – (<a href="#">Details</a>)</li> <li>▪ Open Text – (<a href="#">Details</a>)</li> <li>▪ Microsoft – (<a href="#">Details</a>)</li> </ul>
Remarks	
Exceptions	

2.3. OFFICE SUITES	
Introduction to Sub - Category	<ul style="list-style-type: none"> <li>▪ Office suite, sometimes called an office software suite or productivity suite is a collection of programs intended to be used by typical clerical workers and knowledge workers. The components are generally distributed together, have a consistent user interface and usually can interact with each other, sometimes in ways that the operating system would not normally allow.</li> </ul>
Applicable Standard(s)	<ul style="list-style-type: none"> <li>▪ Microsoft Office – (<a href="#">Details</a>)</li> <li>▪ OpenOffice.org – (<a href="#">Details</a>)</li> </ul>
Remarks	
Exceptions	

2.4. PROJECT AND PORTFOLIO MANAGEMENT	
Introduction to Sub - Category	<ul style="list-style-type: none"> <li>▪ Project management is the discipline of planning, organizing, and managing resources to bring about the successful completion of specific project goals and objectives. Project and portfolio management (PPM) applications can provide visibility into the current state of organizational initiatives, resources, and spending through the centralized collection of data from multiple sources and perspectives. Integration across multiple business and IT process domains through PPM system functions provides multidimensional views of this data for better visibility and understanding of resource supply versus project (and other work) demand in IT and other project environments.</li> </ul>
Applicable Standard(s)	<ul style="list-style-type: none"> <li>▪ CA Clarity – (<a href="#">Details</a>)</li> <li>▪ HP PPM Center – (<a href="#">Details</a>)</li> <li>▪ Microsoft EPM – (<a href="#">Details</a>)</li> <li>▪ Microsoft Project 2007 (current version is MS Project 2010) – (<a href="#">Details</a>)</li> <li>▪ Oracle Primavera – (<a href="#">Details</a>)</li> <li>▪ Planview Enterprise – (<a href="#">Details</a>)</li> </ul>
Remarks	

Exceptions	
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2.5. E- MAIL TECHNOLOGIES	
Introduction to Sub - Category	<ul style="list-style-type: none"> <li>▪ Email transport protocols are used for transporting – sending/receiving of email messages between servers and from email clients to mail servers.</li> <li>▪ Exchange of messages in different languages with different character sets as well as emails with attachments are achieved via these protocols.</li> </ul>
Applicable Standard(s)	<ul style="list-style-type: none"> <li>▪ SMTP – (<a href="#">Details</a>)</li> <li>▪ MIME – (<a href="#">Details</a>)</li> <li>▪ IMAP4 – (<a href="#">Details</a>)</li> <li>▪ MAPI – (<a href="#">Details</a>)</li> <li>▪ RFC 3207 - E-mail transport security – (<a href="#">Details</a>)</li> <li>▪ S/MIME v3 - E-mail content security – (<a href="#">Details</a>)</li> <li>▪ XSL – (<a href="#">Details</a>)</li> <li>▪ IMAP – (<a href="#">Details</a>)</li> <li>▪ POP3 – (<a href="#">Details</a>)</li> </ul>
Remarks	
Exceptions	

2.6. E- MAIL TOOLS	
Introduction to Sub - Category	<ul style="list-style-type: none"> <li>▪ Electronic Mail, abbreviated email or email, is a method of composing, sending, storing, and receiving messages over electronic communication systems or Email Systems. The term email applies both to the Internet email system based on the Simple Mail Transfer Protocol (SMTP) and to intranet systems allowing users within organization to send messages to each other. Email Systems are software and hardware systems that transport electronic mail messages from one computer user to another.</li> <li>▪ The tools comprise of a server to route and administer the messages and a client that is used to access the emails.</li> </ul>
Applicable Standard(s)	<ul style="list-style-type: none"> <li>▪ Microsoft Exchange Server – (<a href="#">Details</a>)</li> <li>▪ Microsoft Outlook – (<a href="#">Details</a>)</li> </ul>
Remarks	
Exceptions	

## 2.7. INSTANT MESSENGERS

Introduction to Sub - Category	<ul style="list-style-type: none"><li>Instant messaging (IM) is a form of communication over the Internet, that offers an instantaneous transmission of text-based messages from sender to receiver. In push mode between two or more people using personal computers or other devices, along with shared clients, instant messaging basically offers real-time direct written language-based online chat. The user's text is conveyed over a network, such as the Internet. It may address point-to-point communications as well as multicast communications from one sender to many receivers. More advanced instant messaging allows enhanced modes of communication, such as live voice or video calling, video chat and inclusion of hyperlinks to media.</li></ul>
Applicable Standard(s)	<ul style="list-style-type: none"><li>CuteSoft – (<a href="#">Details</a>)</li><li>IBM Sametime – (<a href="#">Details</a>)</li><li>Microsoft Lync – (<a href="#">Details</a>)</li><li>AOL Instant Messenger – (<a href="#">Details</a>)</li></ul>
Remarks	
Exceptions	

## 2.8. INSTANT MESSENGER CLIENTS

Introduction to Sub - Category	<ul style="list-style-type: none"><li>Each modern IM service generally provides its own client, either a separately installed piece of software, or a browser-based client. These usually only work with the supplier company's service, although some allow limited function with other services. Third party client software applications exist that will connect with most of the major IM services.</li><li>This provides flexibility for the users to be able to connect with contacts across multiple providers from the same client, thus reducing the need for multiple client software required for Instant Messaging.</li></ul>
Applicable Standard(s)	<ul style="list-style-type: none"><li>Trillian – (<a href="#">Details</a>)</li><li>Pidgin – (<a href="#">Details</a>)</li></ul>
Remarks	
Exceptions	

## 2.9. CONTACT CENTER INFRASTRUCTURE

Introduction to Sub - Category	<ul style="list-style-type: none"><li>The traditional call center—rows of agents in headsets answering calls—is becoming obsolete. In a consumer-driven, Internet-enabled world, in addition to call customers can reach via email, IM, text, and more. A contact center is a central point in an enterprise from which all customer contacts are managed. Contact center infrastructure includes a wide range of technologies, such as:</li></ul>
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	<ul style="list-style-type: none"> <li>○ Telephony infrastructure</li> <li>○ Automated call attendant and distribution systems</li> <li>○ Speech-enabled self-service applications for IVR</li> <li>○ Outbound dialing/proactive contact.</li> <li>○ Computer-telephony integration (CTI)/Web service interfaces.</li> <li>○ Optimization tools for workforce management, session recording and e-learning</li> </ul> <ul style="list-style-type: none"> <li>▪ Contact center infrastructure market continues to consolidate as vendors seek to broaden their product and service offerings. Vendors now offer support for both inbound and outbound services and the delivery of information by voice, email, text, or SMS. Based on this consolidated approach for the table below provides the standard for contact center infrastructure.</li> </ul>
Applicable Standard(s)	<ul style="list-style-type: none"> <li>▪ Genesys Telecommunications Laboratories – (<a href="#">Details</a>)</li> <li>▪ Avaya – (<a href="#">Details</a>)</li> <li>▪ Cisco Systems – (<a href="#">Details</a>)</li> </ul>
Remarks	
Exceptions	

2.10. IP TELEPHONY	
Introduction to Sub - Category	<ul style="list-style-type: none"> <li>▪ Voice over Internet Protocol (VoIP) is a general term for a family of transmission technologies for delivery of voice communications over IP networks such as the Internet or other packet-switched networks.</li> <li>▪ Other terms frequently encountered and synonymous with VOIP are IP telephony, Internet telephony, voice over broadband (VoBB), broadband telephony, and broadband phone.</li> </ul>
Applicable Standard(s)	<ul style="list-style-type: none"> <li>▪ H.323 – (<a href="#">Details</a>)</li> <li>▪ SIP – (<a href="#">Details</a>)</li> </ul>
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. SMTP	
Description	<ul style="list-style-type: none"> <li>Simple Mail Transfer Protocol (SMTP), documented in RFC 821, is Internet's standard host-to-host mail transport protocol and traditionally operates over TCP, port 25. SMTP uses a style of asymmetric request-response protocol popular in the early 1980s, and still seen occasionally, most often in mail protocols. The protocol is designed to be equally useful to either a computer or a human, though not too forgiving of the human.</li> <li>From the server's viewpoint, a clear set of commands is provided and well-documented in the RFC. For the human, all the commands are clearly terminated by newlines and a HELP command lists all of them. From the sender's viewpoint, the command replies always take the form of text lines, each starting with a three-digit code identifying the result of the operation, a continuation character to indicate another lines following, and then arbitrary text information designed to be informative to a human.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>E- Mail Transport</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li><a href="http://tools.ietf.org/html/rfc821">http://tools.ietf.org/html/rfc821</a></li> <li><a href="http://tools.ietf.org/html/rfc772">http://tools.ietf.org/html/rfc772</a></li> </ul>
Remarks:	<ul style="list-style-type: none"> <li>The main function of text based SMTP protocol is to "push" emails - it cannot "pull" them from servers which is why you also need POP. The "outgoing" mail server protocol helps servers communicate with each other and facilitate the delivery of the email message.</li> <li>SMTP functions in two ways. Firstly, it verifies the configuration of the computer from where the email is being sent and grants permission for the process. Secondly, it sends out the message and follows the successful delivery of the email. If the email cannot be delivered, it's returned-to-sender or bounces back.</li> <li>The enhanced version of SMTP called Extended SMPT or (ESMTP) is employed for sending images and other file attachments along with emails.</li> </ul>

3.2. MIME	
Description	<ul style="list-style-type: none"> <li>Multipurpose Internet Mail Extensions (MIME) is an Internet standard that extends the format of e-mail to support:</li> </ul>

	<ul style="list-style-type: none"> <li>• Text in character sets other than ASCII</li> <li>• Non-text attachments</li> <li>• Message bodies with multiple parts</li> <li>• Header information in non-ASCII character sets</li> </ul> <ul style="list-style-type: none"> <li>▪ MIME's use, however, has grown beyond describing the content of e-mail to describing content type in general, including for the web.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>▪ E- Mail Transport</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>▪ <a href="http://tools.ietf.org/html/rfc2387">http://tools.ietf.org/html/rfc2387</a></li> <li>▪ <a href="http://tools.ietf.org/html/rfc2822">http://tools.ietf.org/html/rfc2822</a></li> </ul>
Remarks:	<ul style="list-style-type: none"> <li>▪ MIME defines mechanisms for sending other kinds of information in e-mail. These include text in languages other than English using character encodings other than ASCII, and 8-bit binary content such as files containing images, sounds, movies, and computer programs.</li> <li>▪ MIME is also a fundamental component of communication protocols such as HTTP, which requires that data be transmitted in the context of e-mail-like messages even though the data might not (and usually doesn't) actually have anything to do with e-mail. Mapping messages into and out of MIME format is typically done automatically by an e-mail client or by mail servers when sending or receiving Internet (SMTP/MIME) e-mail.</li> </ul>

3.3. H.323	
Description	<ul style="list-style-type: none"> <li>▪ H.323 standards describe how multimedia terminals on a non-guaranteed bandwidth network should interoperate. Call setup can be centralized in a server or handled directly between terminals. Since there was strong participation by organizations familiar with IP LAN conventions, the standards are suitable for IP networks.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>▪ IP Telephony</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>▪ <a href="http://www.itu.int/rec/T-REC-H.323/en/">http://www.itu.int/rec/T-REC-H.323/en/</a></li> <li>▪ <a href="http://www.cs.columbia.edu/~hgs/papers/Schu9807_Comparison.pdf">http://www.cs.columbia.edu/~hgs/papers/Schu9807_Comparison.pdf</a></li> </ul>
Remarks	<ul style="list-style-type: none"> <li>▪ In addition to call control services, both SIP (when used with SDP) and H.323, provide capabilities exchange services. In this regard, H.323 provides a much richer set of</li> </ul>

	<p>functionality. Terminals can express their ability to perform various encodings and decodings based on parameters of the codec, and based on which other codecs are in use.</p> <ul style="list-style-type: none"> <li>▪ However, most implementations don't require (or implement) these, and the basic receiver capability indication supported by SIP ("choose any subset of these encodings for this list of media streams") seems sufficient and equivalent to current H.323 capabilities actually implemented.</li> </ul>
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3.4. SIP	
Description	<ul style="list-style-type: none"> <li>▪ The Session Initiation Protocol (SIP) is an IETF-defined signaling protocol, widely used for controlling multimedia communication sessions such as voice and video calls over Internet Protocol (IP).</li> <li>▪ The protocol can be used for creating, modifying and terminating two-party (unicast) or multiparty (multicast) sessions consisting of one or several media streams. The modification can involve changing addresses or ports, inviting more participants, adding or deleting media streams, etc...</li> <li>▪ Other feasible application examples include video conferencing, streaming multimedia distribution, instant messaging, presence information, file transfer and online games.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>▪ IP Telephony</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>▪ <a href="http://tools.ietf.org/html/rfc3261">http://tools.ietf.org/html/rfc3261</a></li> <li>▪ <a href="http://datatracker.ietf.org/wg/sipcore/charter/">http://datatracker.ietf.org/wg/sipcore/charter/</a></li> </ul>
Remarks	<ul style="list-style-type: none"> <li>▪ The SIP protocol is an Application Layer protocol designed to be independent of the underlying transport layer; it can run on Transmission Control Protocol (TCP), User Datagram Protocol (UDP), or Stream Control Transmission Protocol (SCTP).</li> <li>▪ It is a text-based protocol, incorporating many elements of the Hypertext Transfer Protocol (HTTP) and the Simple Mail Transfer Protocol (SMTP), allowing for direct inspection by administrators.</li> </ul>

3.5. IMAP	
Description	<ul style="list-style-type: none"> <li>▪ The Internet Message Access Protocol allows a client to access and manipulate electronic mail messages on a server. IMAP permits manipulation of remote message folders, called "mailboxes", in a way that is functionally equivalent to local mailboxes.</li> </ul>

	<ul style="list-style-type: none"> <li>IMAP also provides the capability for an offline client to resynchronize with the server. Messages in IMAP4 are accessed by the use of numbers. These numbers are either message sequence numbers or unique identifiers.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Mail</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li><a href="http://www.ietf.org/rfc/rfc2060.txt">http://www.ietf.org/rfc/rfc2060.txt</a></li> </ul>
Remarks	<ul style="list-style-type: none"> <li>IMAP includes operations for creating, deleting, and renaming mailboxes; checking for new messages; permanently removing messages; setting and clearing flags and parsing; searching; and selective fetching of message attributes, texts, and portions thereof.</li> </ul>

3.6. POP3	
Description	<ul style="list-style-type: none"> <li>In computing, the Post Office Protocol (POP) is an application-layer Internet standard protocol used by local e-mail clients to retrieve e-mail from a remote server over a TCP/IP connection. POP and IMAP (Internet Message Access Protocol) are the two most prevalent Internet standard protocols for e-mail retrieval.</li> <li>Virtually all modern e-mail clients and servers support both. The POP protocol has been developed through several versions, with version 3 (POP3) being the current standard.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Mail</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li><a href="http://tools.ietf.org/html/rfc1081">http://tools.ietf.org/html/rfc1081</a></li> </ul>
Remarks	<ul style="list-style-type: none"> <li>POP supports simple download-and-delete requirements for access to remote mailboxes (termed maildrop in the POP RFC's). Although most POP clients have an option to leave mail on server after download, e-mail clients using POP generally connect, retrieve all messages, store them on the user's PC as new messages, delete them from the server, and then disconnect.</li> <li>The original POP3 specification supported only an unencrypted USER/PASS login mechanism or Berkeley .rhosts access control. POP3 currently supports several authentication methods to provide varying levels of protection against illegitimate access to a user's e-mail. Most are provided by the POP3 extension mechanisms. POP3 clients support SASL authentication methods via the AUTH extension. MIT Project Athena also produced a Kerberized version.</li> </ul>

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3.7. IMAP4	
Description	<ul style="list-style-type: none"> <li>Internet Message Access Protocol version 4 (IMAP4) is the standard protocol for access to email services. Unlike Post Office Protocol (POP3), IMAP4 provides the user the option of storing and manipulating messages on the mail server. IMAP4 allows the user to select which specific messages to download.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Email Technologies</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>IETF RFC 2060 establishes the standard for IMAP4 <a href="http://www.ietf.org/rfc/rfc2060.txt">http://www.ietf.org/rfc/rfc2060.txt</a></li> </ul>
Remarks	

3.8. MAPI	
Description	<ul style="list-style-type: none"> <li>Mail programs that interface with Windows clients (such as Outlook) use Microsoft's Messaging Application Programming Interface (MAPI) to interface with exchange and other email systems.</li> <li>Messaging Application Programming Interface (MAPI) is a messaging architecture and a Component Object Model based API for Microsoft Windows. MAPI allows client programs to become (e-mail) messaging-enabled, -aware, or -based by calling MAPI subsystem routines that interface with certain messaging servers.</li> <li>Simple MAPI is a subset of 12 functions which enable developers to add basic messaging functionality. Extended MAPI allows complete control over the messaging system on the client computer, creation and management of messages, management of the client mailbox, service providers, and so forth.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Email Technologies</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>MAPI <ul style="list-style-type: none"> <li><a href="http://en.wikipedia.org/wiki/Messaging_Application_Programming_Interface">http://en.wikipedia.org/wiki/Messaging_Application_Programming_Interface</a></li> <li><a href="http://msdn.microsoft.com/en-us/library/cc765775.aspx">http://msdn.microsoft.com/en-us/library/cc765775.aspx</a></li> </ul> </li> </ul>
Remarks	

3.9. RFC 3207	
Description	<ul style="list-style-type: none"> <li>RFC 3207 is a SMTP Service extension considered to be secure when compared to TLS. service that allows an SMTP server and client to use TLS (Transport Layer Security) to provide private, authenticated communication over the Internet</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Email Technologies</li> </ul>

Reference(s)	<ul style="list-style-type: none"> <li>▪ RFC 3207 - <a href="http://www.rfc-editor.org/rfc/rfc3207.txt">http://www.rfc-editor.org/rfc/rfc3207.txt</a></li> </ul>
Remarks	

### 3.10. S/MIME

Description	<ul style="list-style-type: none"> <li>▪ S/MIME (Secure/Multipurpose Internet Mail Extensions) provides a consistent way to send and receive secure MIME data. Based on the popular Internet MIME standard, S/MIME provides the following cryptographic security services for electronic messaging applications: authentication, message integrity and non-repudiation of origin (using digital signatures) and privacy and data security (using encryption).</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>▪ Email Technologies</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>▪ S/MIME - <a href="http://www.ietf.org/rfc/rfc2633.txt">http://www.ietf.org/rfc/rfc2633.txt</a></li> </ul>
Remarks	

### 3.11. EXTENSIBLE STYLESHEET LANGUAGE (XSL)

Description	<ul style="list-style-type: none"> <li>▪ Extensible Stylesheet Language (XSL), a family of transformation languages, allows one to describe how to format or transform files encoded in the XML standard. Provides users flexibility for presentation style and content.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>▪ Email Technologies</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>▪ XSL - <a href="http://www.w3.org/Style/XSL/">http://www.w3.org/Style/XSL/</a></li> </ul>
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 EXCHANGE SERVER	
Description	<ul style="list-style-type: none"> <li>Microsoft Exchange Server is a messaging and collaborative software product developed by Microsoft. It is part of the Microsoft Servers line of server products and is widely used by enterprises using Microsoft infrastructure solutions. Exchange's major features consist of electronic mail, calendaring, contacts and tasks; support for mobile and web-based access to information; and support for data storage.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Email Tools</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>Microsoft Exchange Server <a href="http://www.microsoft.com/exchange">http://www.microsoft.com/exchange</a></li> </ul>
Remarks	<ul style="list-style-type: none"> <li>Study of existing systems being used by ministries/agencies highlights that Microsoft Exchange is the email system server products predominantly being used by the ministries of Kingdom of Bahrain.</li> </ul>

4.2. MICROSOFT OUTLOOK	
Description	<ul style="list-style-type: none"> <li>Microsoft Outlook is a personal information manager/email client from Microsoft, available both as a separate application as well as a part of the Microsoft Office suite. The current version is Microsoft Office Outlook 2010 for Windows and Microsoft Office Outlook 2011 for Mac. Although often used mainly as an email client application, it also includes a calendar, task manager, contact manager, note taking, a journal and web browsing.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Email Tools</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>Microsoft Outlook - <a href="http://office.microsoft.com/en-us/outlook">http://office.microsoft.com/en-us/outlook</a></li> </ul>
Remarks	<ul style="list-style-type: none"> <li>Study of existing systems being used by ministries/agencies highlights that Microsoft Outlook is the email client product predominantly being used by the ministries of Kingdom of Bahrain.</li> </ul>

4.3. IBM ENTERPRISE CONTENT MANAGEMENT	
Description	<ul style="list-style-type: none"> <li>IBM is the largest enterprise content management vendor based on total software</li> </ul>

	revenue and offers the full breadth of ECM functionality. Their main offerings in the ECM space are FileNet and Data Capture.
Applicable to	<ul style="list-style-type: none"> <li>Enterprise Content Management</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>IBM content management products <a href="http://www-01.ibm.com/software/data/content-management/">http://www-01.ibm.com/software/data/content-management/</a></li> </ul>
Remarks	

#### 4.4. ORACLE ENTERPRISE CONTENT MANAGEMENT

Description	<ul style="list-style-type: none"> <li>Oracle provides a number of products as a part of its content management platform. Oracle WebCenter Content provides leading-edge solutions for all types of content management needs. From file server consolidation to sophisticated multisite web content management, OracleWebCenter Content provides a robust, scalable solution, along with a powerful infrastructure that allows you to create content-enabled applications.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Enterprise Content Management</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>Oracle ECM - <a href="http://www.oracle.com/technetwork/middleware/webcenter/content/overview/index.html">http://www.oracle.com/technetwork/middleware/webcenter/content/overview/index.html</a></li> </ul>
Remarks	

#### 4.5. EMC ENTERPRISE CONTENT MANAGEMENT

Description	<ul style="list-style-type: none"> <li>EMC has been a consistent leader in the enterprise content management space. Their offering has been bolstered by the acquisition of Documentum</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Enterprise Content Management</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>EMC content management products <a href="http://www.emc.com/products/category/content-management.htm">http://www.emc.com/products/category/content-management.htm</a></li> </ul>
Remarks	

#### 4.6. OPENTEXT ENTERPRISE CONTENT MANAGEMENT

Description	<ul style="list-style-type: none"><li>Open Text is another leader for enterprise content management products and Open Text's products and solutions address all-inclusive challenges that span the enterprise.</li></ul>
Applicable to	<ul style="list-style-type: none"><li>Enterprise Content Management</li></ul>
Reference(s)	<ul style="list-style-type: none"><li>Open Text <a href="http://www.opentext.com/">http://www.opentext.com/</a></li></ul>
Remarks	

#### 4.7. MICROSOFT ENTERPRISE CONTENT MANAGEMENT

Description	<ul style="list-style-type: none"><li>Microsoft has integrated the Web content management capabilities of CMS 2002 into the new Microsoft Office SharePoint Server 2007 and added new functionality for enterprise content management.</li></ul>
Applicable to	<ul style="list-style-type: none"><li>Enterprise Content Management</li></ul>
Reference(s)	<ul style="list-style-type: none"><li>Microsoft content management <a href="http://www.microsoft.com/cmserver">http://www.microsoft.com/cmserver</a></li></ul>
Remarks	

#### 4.8. MICROSOFT OFFICE

Description	<ul style="list-style-type: none"><li>Microsoft Office is an office suite of interrelated desktop applications, servers and services for the Microsoft Windows and Mac OS X operating systems. According to Forrester Research, as of June 2009, some version of Microsoft Office is used in 80% of enterprises and the latest Office versions hold roughly 80% of those installations.</li></ul>
Applicable to	<ul style="list-style-type: none"><li>Office Suites</li></ul>
Reference(s)	<ul style="list-style-type: none"><li>Microsoft Office <a href="http://office.microsoft.com/en-us/default.aspx">http://office.microsoft.com/en-us/default.aspx</a></li></ul>
Remarks	

#### 4.9. OPEN OFFICE

Description	<ul style="list-style-type: none"><li>OpenOffice.org (OO.o or OOo), commonly known as OpenOffice, is an office application</li></ul>
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	suite available for a number of different computer operating systems. It is distributed as free software and written using the gtk toolkit.
Applicable to	<ul style="list-style-type: none"> <li>Office Suites</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>OpenOffice.org - <a href="http://www.openoffice.org/">http://www.openoffice.org/</a></li> </ul>
Remarks	

#### 4.10. MICROSOFT PROJECT AND PORTFOLIO MANAGEMENT

Description	<ul style="list-style-type: none"> <li>Microsoft's Enterprise Project Management provides higher-level visibility into projects managed in a centralized project management system, as well as optimization capabilities. Microsoft Project Server is one of the cornerstones of the Microsoft Office Enterprise Project Management (EPM) product.</li> <li>Microsoft Project (or MSP) is a project management software program developed and sold by Microsoft which is designed to assist project managers in developing plans, assigning resources to tasks, tracking progress, managing budgets and analyzing workloads.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Project And Portfolio Management</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>Microsoft Project Server <a href="http://office.microsoft.com/en-us/projectserver/FX100739841033.aspx">http://office.microsoft.com/en-us/projectserver/FX100739841033.aspx</a></li> <li>Microsoft EPM <a href="http://www.microsoft.com/industry/government/solutions/EnterpriseProjectManagement/default.aspx">http://www.microsoft.com/industry/government/solutions/EnterpriseProjectManagement/default.aspx</a></li> <li>Microsoft Project <a href="http://office.microsoft.com/en-us/project">http://office.microsoft.com/en-us/project</a></li> </ul>
Remarks	

#### 4.11. CA CLARITY PROJECT AND PORTFOLIO MANAGEMENT

Description	<ul style="list-style-type: none"> <li>CA is a leading vendor for project and portfolio management technologies. CA's PPM product is CA Clarity that provides PPM process automation capabilities.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Project And Portfolio Management</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>CA Clarity <a href="http://www.ca.com/us/project-portfolio-management.aspx">http://www.ca.com/us/project-portfolio-management.aspx</a></li> </ul>
Remarks	

#### 4.12. ORACLE PROJECT AND PORTFOLIO MANAGEMENT

Description	<ul style="list-style-type: none"><li>Oracle Primavera provides mature project planning and scheduling system in addition to a strong portfolio management product.</li><li>Oracle Primavera P3 is a project management software package that is used for scheduling and tracking project related activities. Resources representing labor, materials and equipment are used to track time and costs for the project.</li></ul>
Applicable to	<ul style="list-style-type: none"><li>Project And Portfolio Management</li></ul>
Reference(s)	<ul style="list-style-type: none"><li>Oracle Primavera <a href="http://www.oracle.com/applications/primavera/index.html">www.oracle.com/applications/primavera/index.html</a></li><li>Oracle Primavera P3 Project Planner <a href="http://www.oracle.com/applications/primavera/primavera-p3-project-planner.html">http://www.oracle.com/applications/primavera/primavera-p3-project-planner.html</a></li></ul>
Remarks	

#### 4.13. HP PROJECT AND PORTFOLIO MANAGEMENT

Description	<ul style="list-style-type: none"><li>HP Project and Portfolio Management Center is the PPM product from HP which has been placed as leader by various research reports. It provides a broad scope of the PPM and other IT processes.</li></ul>
Applicable to	<ul style="list-style-type: none"><li>Project And Portfolio Management</li></ul>
Reference(s)	<ul style="list-style-type: none"><li>HP PPM Center <a href="https://h10078.www1.hp.com/cda/hpms/display/main/hpms_content.jsp?zn=bto&amp;cp=1-11-16-18_4000_100__">https://h10078.www1.hp.com/cda/hpms/display/main/hpms_content.jsp?zn=bto&amp;cp=1-11-16-18_4000_100__</a></li></ul>
Remarks	

#### 4.14. PLAINVIEW PROJECT AND PORTFOLIO MANAGEMENT

Description	<ul style="list-style-type: none"><li>Planview Enterprise is another leading PPM product from Planview that provides flexible project and portfolio management capabilities while leveraging accessible best practices.</li></ul>
Applicable to	<ul style="list-style-type: none"><li>Project And Portfolio Management</li></ul>
Reference(s)	<ul style="list-style-type: none"><li>Planview Enterprise <a href="http://www.planview.com/">http://www.planview.com/</a></li></ul>
Remarks	

#### 4.15. GENESYS CONTACT CENTER INFRASTRUCTURE

Description	<ul style="list-style-type: none"><li>▪ Genesys's Customer Interaction Management Platform and other components of its contact center portfolio support a broad suite of highly scalable and fully-featured contact center infrastructure applications. These include call and multimedia routing, network-level routing, voice response, contact recording and outbound dialing, workforce management and analytics.</li></ul>
Applicable to	<ul style="list-style-type: none"><li>▪ Contact Center Infrastructure</li></ul>
Reference(s)	<ul style="list-style-type: none"><li>▪ Genesys Telecommunications Laboratories<ul style="list-style-type: none"><li>○ <a href="http://www.genesyslab.com">http://www.genesyslab.com</a></li><li>○ <a href="http://www.genesyslab.com/?product=All&amp;page=Directory">http://www.genesyslab.com/?product=All&amp;page=Directory</a></li></ul></li></ul>
Remarks	

#### 4.16. AVAYA CONTACT CENTER INFRASTRUCTURE

Description	<ul style="list-style-type: none"><li>▪ Avaya's Interaction Solutions, Performance Solutions and Mid-Market Solutions form a broad portfolio of fully-featured contact center infrastructure and applications, including call and multimedia routing, an IVR/voice portal and outbound dialing. Avaya has a broad global reach for sales and support, and a strong market share worldwide.</li></ul>
Applicable to	<ul style="list-style-type: none"><li>▪ Contact Center Infrastructure</li></ul>
Reference(s)	<ul style="list-style-type: none"><li>▪ Avaya<ul style="list-style-type: none"><li>○ <a href="http://www.avaya.com">http://www.avaya.com</a></li><li>○ <a href="http://www.avaya.com/usa/portfolios/contact-centers/">http://www.avaya.com/usa/portfolios/contact-centers/</a></li></ul></li></ul>
Remarks	

#### 4.17. CISCO CONTACT CENTER INFRASTRUCTURE

Description	<ul style="list-style-type: none"><li>▪ Cisco's Unified Contact Center represents a broad product portfolio, including call and multimedia routing, network-level routing, IVR/voice portal and outbound dialing. It ties Cisco's contact center products to its unified communications offerings.</li></ul>
Applicable to	<ul style="list-style-type: none"><li>▪ Contact Center Infrastructure</li></ul>
Reference(s)	<ul style="list-style-type: none"><li>▪ Cisco Systems <a href="http://www.cisco.com/en/US/products/sw/custcosw/ps1844/">http://www.cisco.com/en/US/products/sw/custcosw/ps1844/</a></li></ul>

Remarks	
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#### 4.18. CUTESOFT

Description	<ul style="list-style-type: none"> <li>▪ Cute live support is a Live Chat Software for live help, live support, visitor tracking, and proactive chat support for your ASP.NET websites. It allows operators to chat with visitors in real time.</li> <li>▪ One operator can handle Multiple Simultaneous Chat Sessions at the same time.</li> <li>▪ It is based on rich AJAX Based Interface.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>▪ Instant Messengers</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>▪ <a href="http://cutesoft.net/live-support/">http://cutesoft.net/live-support/</a></li> </ul>
Remarks	

#### 4.19. IBM SAMETIME

Description	<ul style="list-style-type: none"> <li>▪ IBM Sametime® software provides users a unified user experience across a broad range of integrated real-time communications services—voice, data and video. It also provides a unified communications and collaboration platform, with built-in integration with many productivity and collaborative applications and with open-standards-based tools to help developers provide Sametime services into business processes.</li> <li>▪ Those capabilities include presence information, enterprise instant messaging, web conferencing, community collaboration, and telephony capabilities and integration.</li> <li>▪ includes the IBM Sametime Connect client for end-users and the IBM Sametime Server for control and administration.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>▪ Instant Messengers</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>▪ <a href="http://www-01.ibm.com/software/lotus/sametime/">http://www-01.ibm.com/software/lotus/sametime/</a></li> </ul>
Remarks	

#### 4.20. MICROSOFT LYNC

Description	
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	<ul style="list-style-type: none"> <li>▪ Microsoft Lync (formerly Microsoft Office Communicator) and Microsoft Lync for Mac are instant messaging clients used with Microsoft Lync Server or Lync Online available with Microsoft Office 365 and Live@Edu.</li> <li>▪ Both Microsoft Lync and Microsoft Lync for Mac are enterprise software and have a feature set that is targeted toward corporate environments.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>▪ Instant Messengers</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>▪ <a href="http://lync.microsoft.com/en-us/Pages/unified-communications.aspx">http://lync.microsoft.com/en-us/Pages/unified-communications.aspx</a></li> </ul>
Remarks	

#### 4.21. AOL INSTANT MESSENGER

Description	<ul style="list-style-type: none"> <li>▪ AOL Instant Messenger (abbreviated AIM) is an instant messaging and presence computer program which uses the proprietary OSCAR instant messaging protocol and the TOC (Talk to OSCAR) protocol to allow registered users to communicate in real time. It was released by AOL in May 1997. Stand-alone official AIM client software includes advertisements and is available for Microsoft Windows, Windows Mobile, Mac OS, Mac OS X, Android, iOS, BlackBerry OS.</li> <li>▪ The standard protocol that AIM clients use to communicate is called Open System for CommunicAtion in Realtime (OSCAR). Most AOL-produced versions of AIM and popular third party AIM clients use this protocol. However, AOL also created a simpler protocol called TOC that lacks many of OSCAR's features but is sometimes used for clients that only require basic chat functionality. The TOC/TOC2 protocol specifications were made available by AOL, while OSCAR is a closed protocol that third parties have had to reverse-engineer.</li> <li>▪ AOL also offers limited Extensible Messaging and Presence Protocol (XMPP) support.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>▪ Instant Messengers</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>▪ <a href="http://www.aim.com/">http://www.aim.com/</a></li> </ul>
Remarks	

#### 4.22. TRILLIAN IM CLIENT

Description	<ul style="list-style-type: none"> <li>▪ Trillian is a proprietary multiprotocol instant messaging application for Windows, Mac OS X, Android, iOS, BlackBerry OS, and the Web, created by Cerulean Studios. It can connect to multiple IM services, such as AIM, ICQ, Windows Live Messenger, Yahoo! Messenger,</li> </ul>
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	<p>IRC, Novell GroupWise Messenger, Bonjour, XMPP, and Skype networks; as well as social networking sites, such as Facebook, Twitter and MySpace; and email services, such as POP3, IMAP, Gmail, Hotmail and Yahoo! Mail.</p> <ul style="list-style-type: none"> <li>▪ The current versions for Trillian are - <ul style="list-style-type: none"> <li>○ 5.1.0.19 (Windows)</li> <li>○ 1.2.40 (Mac OS X)</li> <li>○ 1.6.4.1 (iOS)</li> <li>○ 1.1.0.30 (BlackBerry)</li> <li>○ 1.1.0.221 (Android)</li> <li>○ 2.0.0.616 (Web-based)</li> </ul> </li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>▪ Instant Messenger Clients</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>▪ <a href="http://www.trillian.im/">http://www.trillian.im/</a></li> </ul>
Remarks	

#### 4.23. PIDGIN IM CLIENT

Description	<ul style="list-style-type: none"> <li>▪ Pidgin (formerly named Gaim) is an open-source multi-platform instant messaging client, based on a library named libpurple. Libpurple has support for many commonly used instant messaging protocols, allowing the user to log into various services from one application.</li> <li>▪ Pidgin supports multiple operating systems, including Windows as well as many Unix-like systems such as Linux, BSD, Mac OS X, and AmigaOS (through the X11 engine). It has built-in support for NSS, offering client-to-server message encryption for protocols that support it. The program is extendable through plugins, including "Off-the-Record Messaging" and Pidgin encryption, providing end-to-end message encryption.</li> <li>▪ The current version of Pidgin is 2.10.4</li> <li>▪ Supported chat networks: <ul style="list-style-type: none"> <li>○ AIM</li> <li>○ Bonjour</li> <li>○ Gadu-Gadu</li> <li>○ Google Talk</li> <li>○ Groupwise</li> <li>○ ICQ</li> <li>○ IRC</li> <li>○ MSN</li> <li>○ MXit</li> <li>○ MySpaceIM</li> <li>○ SILC</li> <li>○ SIMPLE</li> <li>○ Sametime</li> <li>○ XMPP</li> <li>○ Yahoo!</li> <li>○ Zephyr</li> </ul> </li> </ul>
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Applicable to	<ul style="list-style-type: none"> <li>Instant Messenger Clients</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li><a href="http://www.pidgin.im/">http://www.pidgin.im/</a></li> </ul>
Remarks	

#### 4.24. CONCURRENT VERSIONS SYSTEM (CVS)

Description	<ul style="list-style-type: none"> <li>The Concurrent Versions System (CVS), also known as the Concurrent Versioning System is a free software revision control system in the field of software development. Version control system software keeps track of all work and all changes in a set of files, and allows several developers (potentially widely separated in space and/or time) to collaborate.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Software Configuration Management</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>Concurrent Version System <a href="http://www.nongnu.org/cvs">http://www.nongnu.org/cvs</a></li> </ul>
Remarks	

#### 4.25. SUBVERSION (SVN)

Description	<ul style="list-style-type: none"> <li>Subversion (SVN) is a version control system initiated in 2000 by CollabNet Inc. It is used to maintain current and historical versions of files such as source code, web pages, and documentation. Its goal is to be a mostly-compatible successor to the widely used Concurrent Versions System</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Software Configuration Management</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>Subversion <a href="http://subversion.tigris.org">http://subversion.tigris.org</a></li> </ul>
Remarks	

#### 4.26. RATIONAL CLEARCASE

Description	<ul style="list-style-type: none"> <li>Rational ClearCase is a software tool for revision control of source code and other software development assets. It is developed by the Rational Software division of IBM. ClearCase forms the base of version control for many large and medium sized businesses</li> </ul>
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	and can handle projects with hundreds or thousands of developers.
Applicable to	<ul style="list-style-type: none"> <li>Software Configuration Management</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>IBM Rational ClearCase <a href="http://www.ibm.com/software/awdtools/clearcase">http://www.ibm.com/software/awdtools/clearcase</a></li> </ul>
Remarks	

#### 4.27. MICROSOFT VISUAL SOURCESAFE (VSS)

Description	<ul style="list-style-type: none"> <li>Microsoft Visual SourceSafe (VSS) is a source control software package oriented towards small software development projects. Like most source control systems, SourceSafe creates a virtual library of computer files.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Software Configuration Management</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>Microsoft Visual SourceSafe <a href="http://msdn.microsoft.com/en-us/vstudio/aa700907.aspx">http://msdn.microsoft.com/en-us/vstudio/aa700907.aspx</a></li> </ul>
Remarks	

#### 4.28. MICROSOFT VISUAL STUDIO TEAM SYSTEM

Description	<ul style="list-style-type: none"> <li>Microsoft Visual Studio Team System provides multi-disciplined team members with an integrated set of tools for architecture, design, development, database development and testing of applications.</li> </ul>
Applicable to	<ul style="list-style-type: none"> <li>Software Configuration Management</li> </ul>
Reference(s)	<ul style="list-style-type: none"> <li>Microsoft Visual Studio Team System <a href="http://msdn.microsoft.com/en-us/teamsystem/default.aspx">http://msdn.microsoft.com/en-us/teamsystem/default.aspx</a></li> </ul>
Remarks	

## 5. APPENDICES

### 5.1. APPENDIX A: ABBREVIATIONS AND ACRONYMS

Abbreviation / Acronym	Collaboration And Productivity
SMTP	Simple Mail Transfer Protocol
IMAP	Internet Message Access Protocol
SIP	Session Initiation Protocol
POP3	Post Office Protocol 3
MAPI	Messaging Application Programming Interface
S/MIME	Secure/Multipurpose Internet Mail Extensions
XSL	Extensible Stylesheet Language
ECM	Enterprise Content Management
EPM	Enterprise Project Management
PPM	Project and Portfolio Management
RFC	Request For Comments
IM	Instant Messenger
OSCAR	Open System for CommunicAtion in Realtime
TOC	Talk to OSCAR

## 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>