Technical Standards for

Interoperability Framework for E-Governance in India

(Phase-I)

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Government of India
Department of Information Technology
Ministry of Communications and Information Technology
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Table of Contents

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Interoperability Framework for E-Governance in India (Phase-I)

1. BACKGROUND

Providing integrated citizen centric services at different levels of Central, State and grass root level Governance bodies is a key objective of e-Governance initiatives. Current e-Governance solutions are usually based on different technology platforms, and most of them work in Silos. For the purpose of Integrated Services Delivery through a unified services gateway, the data from various applications distributed logically, as well as physically needs to be seamlessly integrated in a secured way by following Open Standards for data interchange / exchange and archival. An Interoperability Framework for e-Governance is essential to support flow of information, through which two or more e-Governance Applications can inter-operate. Open standards are also important to ensure long-term access and retrievability of important data, preventing it from vendor and technology lock-in. Considering such factors, Government of India (GoI) has decided to use Open Standards. "Policy on Open Standards for e-Governance " (Version 1.0) (hereinafter referred to as 'Policy') was announced by GoI in November 2010 to provide a framework for selection of technical standards in identified areas, within domains of Interoperability.

Interoperability Framework for E-Governance (IFEG) in India identifies domains for interoperability, and each domain can be further sub-divided, which is referred as Interoperability Areas (hereinafter referred to as "Areas"), for which Technical Standards need to be identified and vetted for openness, from this perspective. A committee, "Expert Committee for Mapping Open Standards Principles to Technical Standards of IFEG" (hereinafter referred to as 'Committee') was formed for this purpose, to recommend appropriate standards for adoption, primarily based on their openness by following the institutional mechanism.

1.1 Scope

This document describes technical standards to be adopted for e-Governance application in the areas covered under IFEG, as per the Policy. Since technical standards are globally evolving, this document will be periodically reviewed and updated.

This document should be read in conjunction with the Policy and a Enforcement Process Guideline document (to be prepared by GoI) which outlines when and how to use the Technical Standards prescribed by this Committee.

1.2 Objective/Purpose

Refer to *section 1. Objective* of the Policy.

1.3 Applicability

Refer *section 3.Applicability* of the Policy.

1.4 Description

This section describes how this document is organised.

Section 1 describes background information.
Section 2 describes the target audience for this document.

Section 3 describes type of document and enforcement category.
Section 4 describes definitions of terms acronyms of the abbreviations used in this document.
Section 5 describes the list of Technical Standards prescribed by this Committee with additional information.

2. TARGET AUDIENCE

The Technical Standards listed in this document shall be used in all e-Governance applications by

- Developers of e-Governance applications at Central / State Government level by all Departments
- Contractual Policy framing agencies for development of e-Governance Applications
- All integrators / service providers for Indian e-Governance Applications

3. TYPE OF STANDARDS DOCUMENT

Type of Standards Document	:	**Technical Standards**
Enforcement Category	:	**Mandatory**

4. DEFINITIONS AND ACRONYMS

Refer Annexure-I

5. LIST OF TECHNICAL STANDARDS FOR E-GOVERNANCE

In IFEG , the 'Areas' for e-Governance applications have been categorized under 7 broad Domains viz.

Presentation And Archival

Process

Data Integration

Meta-data

Data Interchange

Network access and application

Security.

Given the large number of standards that need to be considered overall, certain areas have been prioritized from the above Domains, which are covered in Phase–I

The selected Technical Standards are tabulated for each Domain. The description of columns of the table is given below:

Interoperability Area	Name of the interoperability area, which serves a specific purpose within the domain.		
Standard/Specification	Name of the standard/specification with its version number with hyper-link to the respective sites, if any.		
Standards Body	Name of the Standards Body which published the standard/specification.		
Status of Standard as per "Policy"	This can have any of the following values		
	O	Open Standard: Which meets the Mandatory Characteristics of the Policy	
	I	Interim Standard: As per section 4.3 & 4.4 of Policy	
	A	Additional Standard: As per section 5 of Policy	
Maturity level	This can have any of the following values		
	M	Matured: As per definition of "Maturity" in the "Policy on Open Standards"	
	E	Evolving: A standard, which meets the maximal functional requirements and progressing towards Maturity	
Enforcement Category	This can have any of the following values		
	M	Mandatory	Matured Standards
	R	Recommended	Evolving Standards
	-	-	Additional Standard
For additional information, refer the Table No. under this column	For additional information, refer the Table Numbers under section "5.2 Additional Information on Technical Standards" in this column		

5.1 Domain-wise List of Technical Standards

5.1.1 Presentation And Archival Domain

The Presentation part of this Domain provides the interface to the user for accessing information. The Archival part of this Domain provides interface for storing and retrieving the data.

Sl. No.	Interoperability Area	Standard / Specification	Standards Body	Status of Standard as per "Policy" O-Open I-Interim A-Additional	Maturity Level M-Matured E-Evolving	Enforcement Category (M-Mandatory R-Recommended)	For additional information, refer the Table No. in this column
1	Document type for Simple Hypertext Web Content	HTML 4.01 (ISO/IEC 15445:2000)	W3C, ISO/IEC	O	M	M	5.2.2
2	Document type for Complex, Strict Hypertext Web Content (XML or non-XML)	XHTML v1.1	W3C	O	M	M	5.2.14
3	Style Sheets (to define Look & Feel of Web-page)	CSS 2.	W3C	O	M	M	5.2.1
4	Extensible Style Sheets (to transform format and addressing parts of documents)	XSL 1.1	W3C	O	M	M	5.2.18
5	Document Type for Editable documents (with formatting)	ODF (OpenDocument) v1.0 ISO/IEC 26300:2006	ISO/IEC	O	M	M	5.2.4
6	Document Type for Presentation	ODF (OpenDocument) v1.0 ISO/IEC 26300:2006	ISO/IEC	O	M	M	5.2.4
7	Document Type for Spreadsheet	ODF (OpenDocument) v1.0 ISO/IEC 26300:2006	ISO/IEC	O	M	M	5.2.4
8	Document type for Non-editable documents	PDF 1.7 (ISO 32000-1:2008)	ISO/IEC	I	M	M	5.2.7
9	**Graphics –** Raster Image (Lossy Compression)	JPEG2000 Part 1	ISO/JPEG Committee	I	M	M	5.2.3
10	**Graphics –** Raster Image (Lossless Compression)	PNG ISO/IEC 15948:2004	W3C ISO/IEC	O	M	M	5.2.9
11	Audio Compression	OGG Vorbis I	Xiph Foundation	O	M	M	5.2.6
12	Video Compression	Ogg Theora I	Xiph Foundation	O	M	M	5.2.5
13	Image Storage/Archival	PNG ISO/IEC 15948:2004	W3C ISO/IEC	O	M	M	5.2.9
14	Scanned Document	PDF/A (ISO 19005-	ISO/IEC	O	M	M	5.2.8

Sl. No.	Interoperability Area	Standard / Specification	Standards Body	Status of Standard as per "Policy" O-Open I-Interim A-Additional	Maturity Level M-Matured E-Evolving	Enforcement Category (M-Mandatory R-Recommended)	For additional information, refer the Table No. in this column
	Storage/Archival	1:2005)					
15	E-Forms	XFORMS with XHTML.	W3C	O	E	R	5.2.13

5.1.2 Data Integration Domain

This domain covers standards that allow data exchange between homogeneous and heterogeneous systems.

Sl. No.	Interoperability Area	Standard / Specification	Standards Body	Status of Standard as per "Policy" O-Open I-Interim A-Additional	Maturity Level M-Matured E-Evolving	Enforcement Category (M-Mandatory R-Recommended)	For additional information, refer the Table No. in this column
1	Data Description Language (for exchange of data)	XML 1.0	W3C	O	M	M	5.2.15
2	Data Schema Definition	XML Schema (XSD) 1.0 Part 1: Structures, XML Schema Part 2:Datatypes	W3C	O	M	M	5.2.16
3	Data Transformation for Presentation	XSL 1.1	W3C	O	M	M	5.2.18
4	Data Transformation for conversion from XML schema format to another format	XSLT 2.0	W3C	O	M	M	5.2.19
5	Content searching and navigation in an XML document.	Xpath 2.0	W3C	O	M	M	5.2.17
6	XML vocabulary for specifying formatting semantics	XSL 1.1	W3C	O	M	M	5.2.18
7	Modelling Language including Data Modelling	UML 2.3	OMG	O	M	M	5.2.11

5.1.3 Data Interchange Domain

This domain covers standards that allow data interchange services support the exchange of data between homogeneous and heterogeneous systems.

Sl. No.	Interoperability Area	Standard / Specification	Standards Body	Status of Standard as per "Policy" O-Open I-Interim A-Additional	Maturity Level M-Matured E-Evolving	Enforcement Category (M-Mandatory R-Recommended)	For additional information, refer the Table No. in this column
1	Web Services Description Language	WSDL 2.0	W3C	O	M	M	5.2.12
2	Web service request delivery	SOAP 1.2	W3C	O	M	M	5.2.10

5.2 Additional Information on Technical Standards

This section documents additional information on each of the recommended standard for IFEG arranged in alphabetical order in tabulated format with the following columns:

Interoperability Area	*Name of the interoperability area.*	
Standard/Specification with Version and Publication Date (if applicable)	*Name of the Standard/specification with version, where ever applicable (eg. HTML v4.01). Publication date (Month & Year) of the Standard/specification, if applicable (eg. Dec 1999).*	
Description	*Brief description of the Standard/Specification. Largely based on the description in the official specification of the standard.*	
Reference	*Reference or the links to the official specification of the standard.*	
Standards Body	*Name of the Standard Body which published the standard/specification with links to the respective sites (if any).*	
Status of standard as per Policy on open standards	*Open Standard* *Interim Standard* *Additional Standard*	
Maturity Level	*Matured* *Evolving*	
Enforcement Category	*Mandatory* *Recommended* -	*Matured Standards* *Evolving Standards* *Additional Standards*
Applicability/Scope	*Basis for selection, applicability and scope.*	
Additional remarks	*Additional remarks such as limitations, specific recommendation / remarks if any.*	
For Interim Standard, the clauses of Policy it violates	*If the Standards is 'Interim', the list of Mandatory Characteristics which it violates.*	
History of revision with dates	*History of the Standards recommended under this Area in earlier Committee's reports, if any.*	

5.2.1 CSS

Interoperability Area	Style Sheets (to define Look & Feel of Web Page)
Standard/Specification with Version and Publication Date (if applicable)	**CSS2** **May 1998 (Revised Apr 2008)**
Description	Cascading Style Sheets, level 2 (CSS2) is a style sheet language that allows authors and users to attach style (e.g., fonts, spacing, and aural cues) to structured documents (e.g., HTML documents and XML including SVG and XUL applications). By separating the presentation style of documents from the content of documents, CSS2 simplifies Web authoring and site maintenance.
Reference	http://www.w3.org/TR/2008/REC-CSS2-20080411/
Owner	W3C
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	CSS is designed primarily to enable the separation of document content (written in HTML or a similar markup language) from document presentation, including elements such as the layout, colors, and fonts.
Additional remarks	CSS2 builds on CSS1 and, with very few exceptions, all valid CSS1 style sheets are valid CSS2 style sheets. CSS2 supports media-specific style sheets so that authors may tailor the presentation of their documents to visual browsers, aural devices, printers, braille devices, handheld devices, etc.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.2 HTML

Interoperability Area	Document type for Simple Hypertext Web Content
Standard/Specification with Version and Publication Date (if applicable)	**HTML 4.01 Dec 1999** **(ISO/IEC 15445:2000 May 2000)**
Description	Hyper Text Markup Language (HTML) is the encoding scheme used to create and format a web document. HTML 4 extends HTML with mechanisms for style sheets, scripting, frames, embedding objects, improved support for right to left and mixed direction text, richer tables, and enhancements to forms, offering improved accessibility for people with disabilities.
Reference	http://www.w3.org/TR/html401/ http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=27688
Standards Body	W3C, ISO/IEC
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	HTML is widely adopted global standard for simple hypertext web content (See also XHTML). HTML 4.01 is the latest version. The scope of HTML is to: •Publish online static documents with headings, text, tables, lists, photos, etc. •Retrieve online information via hypertext links, at the click of a button. •Design forms for conducting transactions with remote services, for use in searching for information, making reservations, ordering products, etc. •Include spread-sheets, video clips, sound clips, and other applications directly in the documents. And not recommended for complex/dynamic web pages.
Additional remarks	The popular browsers implement HTML 4.01 differently with non-standard extensions. The e-Governance web content authors are strongly recommended to consult the appropriate browser vendor's documentation and test the compatibility of their content with respective browsers in popular Operating System configurations. HTML 5.0 is W3C's proposed next standard for HTML 4.01, XHTML 1.0 and DOM level 2 HTML and is expected to replace HTML in the future.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.3 JPEG 2000 Part 1

Interoperability Area	Graphics - Raster (Lossy Compression)
Standard/Specification with Version and Publication Date (if applicable)	**JPEG2000 Part 1 (ISO/IEC 15444-1:2004)** **Second Edition Sep 2004**
Description	JPEG 2000 is an image coding system that uses compression techniques based on wavelet technology. Its architecture should lend itself to a wide range of uses from portable digital cameras through to advanced pre-press, medical imaging and other key sectors. JPEG 2000 refers to all parts of the standard; Part 1 is the Core coding system. JPEG 2000 Part 1 supports both lossless and lossy compressions.
Reference	http://www.iso.org/iso/search.htm?qt=15444&searchSubmit=Search&sort=rel&type=simple&published=on
Standards Body	ISO/IEC
Status of recommendation as per Policy	Interim Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	As lossy method can produce a much smaller compressed file than any lossless method, it can be used for low bandwidth transmission, storing in limited storage size like smart cards, etc. Only for such situations, this should be used.
Additional remarks	There is no eligible standard (as per the Policy on Open Standards for e-Governance) currently available for using image with high compression ratios by compromising the quality; the Committee recommends that JPEG 2000 Part-1 may be used where high compression ratios are required, with loss in quality. This decision should be reviewed regularly (at least once in two years) keeping in mind the following: *i. If JPEG Committee/Consortium's intent to make it royalty free with no submarine patents is achieved then no further reviews will be necessary* *ii. Otherwise, if evolving open standards achieved the required high compression, migration away from JPEG 2000 Part-1 may be undertaken.* JPEG 2000 has poor support in popular web browsers especially in Linux.
For Interim Standard, the clauses of Policy it violates	2
History of revision with dates	-

5.2.4 ODF

Interoperability Area(s)	Document Type for Editable documents (with formatting), Spreadsheet, Presentation.
Standard/Specification with Version and Publication Date (if applicable)	**ODF (ISO/IEC 26300:2006) ODF v1.0 Dec 2006**
Description	The OpenDocument Format (ODF) is an XML-based file format for representing electronic documents such as spreadsheets, charts, presentations and word processing documents.
Reference	http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=43485
Standards Body	ISO/IEC
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	This is the specification of the Open Document Format for Office Applications (OpenDocument) format, an open, XML-based file format for office applications. The most common filename extensions used for OpenDocument documents are: • .odt for word processing (text) documents • .ods for spreadsheet • .odp for presentation • .odg for graphics • .odf for formulae, mathematical equations There are many free and proprietary implementations that support the OpenDocument format including office suites (both stand-alone and web-based) and individual applications such as word-processors, spreadsheets, presentation, and data management applications. Few of the office suites supporting OpenDocument fully or partially include: AbiWord, Adobe Buzzword, Atlantis Word Processor, Aspose.Words, Google Docs, IBM Lotus Symphony, Koffice, Microsoft Office 2010/Office 2007 SP2, NeoOffice, OpenOffice.org, Sun Microsystems StarOffice, SoftMaker Office, WordPad 6.1, Corel WordPerfect Office X4, Zoho Office Suite, Ecince, Inkscape exports, Okular, Scribus imports, etc.
Additional remarks	• OpenDocument 1.1 was approved as an OASIS Standard during Feb 2007. This version was not submitted to ISO/IEC, because it is considered to be a minor update to ODF 1.0 • OpenDocument 1.2 is currently being written by the ODF TC.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.5 Ogg Theora

Interoperability Area(s)	Video Compression Format
Standard/Specification with Version and Publication Date (if applicable)	**Ogg Theora I** **Aug 2009**
Description	*Ogg* Ogg is the name of Xiph.org's container format for audio, video, and metadata. Theora Video Compression Theora is a free and open video compression format from the Xiph.org Foundation. Like other multimedia technology it can be used to distribute film and video online and on disc without the licensing and royalty fees or vendor lock-in associated with other formats. Theora scales from postage stamp level to HD resolution, and is considered particularly competitive at low bit rates.
Reference	http://www.theora.org/
Standards Body	Xiph.Org Foundation (http://www.xiph.org/)
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	Ogg is a stream oriented container, meaning it can be written and read in one pass, making it a natural fit for internet streaming and use in processing pipelines. This stream orientation is the major design difference over other file-based container formats. Theora is a variable-bitrate, Discrete Cosine Transform (DCT)-based video compression scheme. Like most common video codecs, Theora also uses Chroma subsampling, block-based motion compensation and an 8-by-8 DCT block. Theora video streams can be stored in any suitable container format. Most commonly it is found in the Ogg container with Vorbis or FLAC audio streams which provides a completely open, royalty-free multimedia format. It can also be used with the Matroska container.
Additional remarks	Based on the initial HTML5 recommendations, some web browsers natively support Theora Video (without a plug-in) using the <video> element. Ogg Theora is fully suported since Opera 10.50, browsers based on Gecko 1.9.1 engine (Mozilla Firefox 3.5, SeaMonkey 2.0) and Google Chrome 3.0.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.6 Ogg Vorbis

Interoperability Area(s)	Audio Compression Format
Standard/Specification with Version and Publication Date (if applicable)	**Ogg Vorbis I** **Jun 2009**
Description	*Ogg* Ogg is the name of Xiph.org's container format for audio, video, and metadata. Vorbis Vorbis is the name of a specific audio compression scheme that's designed to be contained in Ogg. Vorbis is most commonly used in conjunction with the Ogg container format and it is therefore often referred to as Ogg Vorbis.
Reference	http://xiph.org/vorbis/
Standards Body	Xiph.Org Foundation (http://www.xiph.org/)
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	Ogg is a stream oriented container, meaning it can be written and read in one pass, making it a natural fit for internet streaming and use in processing pipelines. This stream orientation is the major design difference over other file-based container formats. Vorbis is a general-purpose compressed audio format for mid to high quality (8kHz-48.0kHz, 16+ bit, polyphonic) audio and music at fixed and variable bitrates from 16 to 128 kbps/channel. This places Vorbis in the same competitive class as audio representations such as MPEG-4 (AAC), and similar to, but higher performance than MPEG-1/2 audio layer 3, MPEG-4 audio (TwinVQ), WMA and PAC.
Additional remarks	Based on the initial HTML5 recommendations, some web browsers natively support Vorbis audio (without a plug-in) using the <audio> element: Mozilla Firefox 3.5 (and later versions), Google Chrome (as of version 3.0.182.2), SeaMonkey (as of version 2.0), Opera 9.5 experimental video builds released in 2007 and 2008 have only <video> support and play back Vorbis audio included in Ogg video files. Opera 10.5_ browser has support for Vorbis audio, WAVE PCM audio and Theora video.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.7 PDF

Interoperability Area	Document type for Non-editable documents
Standard/Specification with Version and Publication Date (if applicable)	**PDF (ISO 32000-1:2008)** **1.7 Jul 2008**
Description	Portable Document Format (PDF) is a file format for document exchange. PDF is used for representing two-dimensional documents in a manner independent of the application software, hardware, and operating system. Each PDF file encapsulates a complete description of a fixed-layout 2D document that includes the text, fonts, images, and 2D vector graphics which compose the documents
Reference	http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=51502
Standards Body	ISO/IEC
Status of recommendation as per Policy	Interim Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	PDF files are viewable and printable on virtually any platform — Mac OS, Microsoft® Windows®, UNIX®, Linux and many mobile platforms. PDF files look like original documents and preserve source file information — text, drawings, video, 3D, maps, full-color graphics, photos, and even business logic — regardless of the application used to create them.
Additional remarks	There is no eligible standard (as per the Policy) currently available for Non-editable documents and Scanned Document Storage/Archival ; the Committee recommends that PDF 1.7 (ISO/IEC 32000-1:2008) may be used as an interim standard. This decision should be reviewed regularly (at least once in two years) keeping in mind the following: *i. If Adobe Systems Incorporated's intent to make it royalty free is achieved then no further reviews will be necessary* *ii. Otherwise, if evolving open standards achieved the functional requirements, migration away from PDF 1.7 (ISO/IEC 32000-1:2008) may be undertaken.*
For Interim Standard, the clauses of Policy it violates	2
History of revision with dates	-

5.2.8 PDF/A

Interoperability Area	Scanned Document Storage/Archival
Standard/Specification with Version and Publication Date (if applicable)	**PDF/A-1 (ISO 19005-1:2005) Oct 2005**
Description	PDF/A is a standard which turns Portable Document Format (PDF) into a "electronic document file format for long-term preservation". PDF/A-1 is the first part of the standard. It is based on PDF 1.4 It is published as an ISO Standard under ISO 19005-1:2005 on 1st Oct 2005 (Document Management - Electronic document file format for long term preservation - Part 1: Use of PDF 1.4 (PDF/A-1)). ISO 32000-1, which is based on PDF 1.7 is under development (ISO/DIS 19005-2).
Reference	http://www.iso.org/iso/catalogue_detail?csnumber=38920
Standards Body	ISO/IEC
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	PDF/A, an electronic document, can be used for long-term preservation of documents. PDF/A is a subset of PDF and are viewable and printable on virtually any platform — Mac OS, Microsoft® Windows®, UNIX®, Linux and many mobile platforms. Many document handling softwares support PDF/A: ABBYY FineReader, Adlib Software, Adobe Acrobat, ghostscript, Kofax Express, Microsoft Office 2007, Open Office 2.4 and above, PDF/A Manager, etc.
Additional remarks	The reproducibility requirement for PDF/A documents is to be 100% self-contained. All of the information necessary for displaying the document in the same manner every time is embedded in the file. A PDF/A document is not permitted to be reliant on information from external sources (e.g. font programs and hyperlinks). Other key elements to PDF/A compatibility include: • Executable file launches, Sound, Movie, Reset Form, Import Data and JavaScript are forbidden. • All fonts must be embedded and also must be legally embeddable for unlimited, universal rendering. • Colorspaces specified in a device-independent manner. • Encryption is disallowed. • Use of standards-based metadata is mandated.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.9 PNG

Interoperability Area	Graphics – Raster Image (Lossless Compression)
Standard/Specification with Version and Publication Date (if applicable)	**PNG (ISO/IEC 15948:2004)** **Nov 2003**
Description	Portable Network Graphics (PNG) is an extensible file format for lossless, portable, well-compressed storage of raster images. PNG provides a patent-free replacement for GIF and can also replace many common uses of TIFF. Indexed-color, grayscale, and truecolor images are supported, plus an optional alpha channel for transparency.
Reference	http://www.w3.org/TR/PNG/
Standards Body	W3C, ISO/IEC
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	The Portable Network Graphics (PNG) format was designed as an image-file format not requiring a patent license to replace the older and simpler GIF format and, to some extent, the much more complex TIFF format. PNG supports palette-based (palettes of 24-bit RGB or 32-bit RGBA colors), greyscale, RGB, or RGBA images. PNG can be used for image archival in systems having normal storage size and also for transmission through high bandwidth networks. PNG can also used in areas where repeated editing involved, since there will not be any quality degradation.
Additional remarks	Animated PNG (APNG) is an unofficial extension to PNG. APNG files works similarly to animated GIF files, while supporting 24-bit images and 8-bit transparency not available for GIFs. It also retains backward compatibility with non-animated PNG files. APNG has web-browser support for Firefox, SeaMonkey and Opera; image processing applications like GIMP, ImageJ also support APNG. PNG in combination with SVG and SMIL can be used to animate images.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.10 SOAP

Interoperability Area	Web Services Request Delivery
Standard/Specification with Version and Publication Date (if applicable)	**SOAP 1.2 – Part 1 (Second Edition)** **Apr 2007**
Description	SOAP stands for Simple Object Access Protocol. SOAP Version 1.2 is a lightweight protocol intended for exchanging structured information among machines in a decentralized, distributed network environment. The framework has been designed to be independent of any particular programming model and other implementation specific semantics.
Reference	http://www.w3.org/TR/soap12-part1/
Standards Body	W3C
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	SOAP is a protocol specification for exchanging structured information in the implementation of Web Services in computer networks using XML as its message format. This XML based protocol consists of three parts: an envelope, which defines what is in the message and how to process it, a set of encoding rules for expressing instances of application-defined datatypes, and a convention for representing procedure calls and responses.
Additional remarks	Limitations •The limitations of SOAP arise from its adherence to the client server model.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.11 UML

Interoperability Area	Modelling Language including Data Modelling
Standard/Specification with Version and Publication Date (if applicable)	**UML 2.3** **May 2010**
Description	The Unified Modeling Language (UML) is a specification defining a graphical language for visualizing, specifying, constructing, and documenting the artifacts of distributed object systems. The Unified Modeling Language (UML) is a general-purpose modeling language with a semantic specification, a graphical notation, an interchange format, and a repository query interface. It is designed for use in object-oriented software applications, including those based on technologies recommended by the Object Management Group (OMG).
Reference	http://www.omg.org/spec/UML/2.3/
Standards Body	OMG
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	The Unified Modeling Language (UML) is a graphical language for visualizing, specifying, constructing, and documenting the artifacts of a software-intensive system. The UML offers a standard way to write a system's blueprints, including conceptual things such as business processes and system functions as well as concrete things such as programming language statements, database schema, and reusable software components.
Additional remarks	UML 1.4.2 is available as ISO/IEC 19501; 19505 (which is under development http://www.iso.org/iso/catalogue_detail.htm?csnumber=32624 , http://www.iso.org/iso/catalogue_detail.htm?csnumber=52854) assigned to UML 2.1.2; ITU-T Recommendations Z.100 (SDL) and Z.109 (SDL UML profile).
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.12 WSDL

Interoperability Area	Web Services Description Language
Standard/Specification with Version and Publication Date (if applicable)	**WSDL 2.0** **June 2007**
Description	Web Services Description Language Version 2.0 (WSDL 2.0) provides a model and an XML format for describing Web services. WSDL 2.0 enables one to separate the description of the abstract functionality offered by a service from concrete details of a service description such as "how" and "where" that functionality is offered.
Reference	http://www.w3.org/TR/wsdl20/
Standards Body	W3C
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	WSDL is used to provide web services over Internet in combination with SOAP and XML Schema. The operations available on the server can be determined by a client program connecting to a web service by reading the WSDL file on the server. Using XML Schema, special data-types are embedded in the WSDL file. The client can then use SOAP to actually call one of the operations listed in the WSDL file. By accepting binding to all the HTTP request methods, WSDL 2.0 specification offers better support for RESTful web services, and is much simpler to implement.
Additional remarks	WSDL 2.0 became a W3C recommendation on June 2007. WSDL 1.2 was renamed to WSDL 2.0 because it has substantial differences from WSDL 1.1.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.13 XForms

Interoperability Area	E-Forms
Standard/Specification with Version and Publication Date (if applicable)	**XForms v 1.1** **Oct 2009**
Description	XForms is an XML format for the specification of a data processing model for XML data and user interface(s) for the XML data, such as web forms. XForms is an XML application that represents the new generation of forms for the Web. XForms is not a free-standing document type, but is intended to be integrated into other markup languages, such as XHTML, ODF or SVG. An XForms-based web form gathers and processes XML data using MVC architecture that separates presentation, purpose and content.
Reference	http://www.w3.org/TR/xforms11/
Standards Body	W3C
Status of recommendation as per Policy	Open Standard
Maturity Level	Evolving
Enforcement Category	Recommended
Applicability/Scope	XForms accommodates form component reuse, fosters strong data type validation, eliminates unnecessary round-trips to the server, offers device independence and reduces the need for scripting. Xforms can be used both in on-line mode and off-line mode.
Additional remarks	There are many implementations available for Xforms (http://www.w3.org/MarkUp/Forms/wiki/XForms_Implementations). Some of the solutions are classified below. (1) Client-side Solutions: Client-side solution can use Plug-in and client side API's like Native rendering solutions: Firefox -XForms Plug-in (OSS – Open Source Software), MozzIE for Internet Explorer (OSS), X-Smiles (OSS), etc. Transformation: XSLTForms for all browsers (OSS), FormFaces (PSS – Proprietary Software Solution), formsPlayer (PSS), EMC Documentum XForms Engine -Formula (PSS) etc. These solutions can be used for both off-line and on-line forms. (2) Server-based solutions: Orbeon Forms (OSS), Chiba (OSS), betterFORM (OSS) can be used for server-based applications. Orbeon has its own form designer. Orbeon also has limited off-line support. (3) Mobile solutions:

	XFolite is a light-weight XForms client for the J2ME platform. (4) Other Commercial Solutions (Which may have other presentation layer options) • IBM Lotus Forms - Both Designer and runner(engine) • Mobile: PicoForms, DataMovil
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.14 XHTML

Interoperability Area	Document type for Complex Hypertext Web Content
Standard/Specification with Version and Publication Date (if applicable)	**XHTML 1.1 Module-based XHTML** **May 2001**
Description	XHTML is a XML based stricter and cleaner markup language.
Reference	http://www.w3.org/TR/xhtml11/
Standards Body	W3C
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	XHTML offers freedom of introducing new elements or additional element attributes to express developers/designers discovering ideas through markup. XHTML is widely adopted global standard for complex hypertext web content, including Content Management System.
Additional remarks	As the XHTML family evolves, documents conforming to XHTML 1.1 will be more likely to inter operate within and among various XHTML environments. XHTML content can be parsed using standard XML parsers. XHTML content can also be transformed to other XML formats by using XSLT. HTML 5.0 is W3C's proposed next standard for HTML 4.01, XHTML 1.1 and DOM level 2 HTML, and is expected to replace XHTML in the future.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.15 XML

Interoperability Area	Data Description Language for exchange of Data
Standard/Specification with Version and Publication Date (if applicable)	**XML 1.0 (Fifth Edition)** **Nov 2008**
Description	Extensible Markup Language (XML) is a simple, very flexible text format with a set of rules for encoding documents electronically. It is derived from SGML (ISO 8879), the Standard Generalized Markup Language.
Reference	http://www.w3.org/TR/xml/
Standards Body	W3C
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	XML's design goals emphasize simplicity, generality, and usability over the Internet. It is a textual data format, with strong support via Unicode for the languages of the world. It is also widely used for the representation of arbitrary data structures, like in Web Services.
Additional remarks	XML is currently having 2 versions, viz. XML 1.0 and XML 1.1. XML 1.0 was initially defined in 1998 and currently in Fifth Edition published during Nov 2008. It is widely used and hence recommended for general use. *XML 1.1*, was initially published during Feb, 2004. The features of XML 1.1 are intended to make XML easier in cases like enabling the use of line-editing characters used on EBCDIC platforms, and the use of scripts and characters absent from Unicode 3.2. XML 1.1 is not widely implemented.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.16 XML Schema

Interoperability Area	Data Schema Definition
Standard/Specification with Version and Publication Date (if applicable)	**XML Schema Part 1: Structures (Second Edition),** **XML Schema Part 2:Datatypes (Second Edition)** **Oct 2004**
Description	*XML Schema: Structures* specifies the XML Schema definition language, which offers facilities for describing the structure and constraining the contents of XML 1.0 documents, including those which exploit the XML Namespace facility. The schema language, which is itself represented in XML 1.0 and uses namespaces, substantially reconstructs and considerably extends the capabilities found in XML 1.0 document type definitions (DTDs). This specification depends on *XML Schema Part 2: Datatypes*. *XML Schema: Datatypes* is part 2 of the specification of the XML Schema language. It defines facilities for defining datatypes to be used in XML Schemas as well as other XML specifications. The datatype language, which is itself represented in XML 1.0, provides a superset of the capabilities found in XML 1.0 document type definitions (DTDs) for specifying datatypes on elements and attributes.
Reference	http://www.w3.org/TR/xmlschema-1/ http://www.w3.org/TR/xmlschema-2/ http://www.w3.org/XML/Schema
Standards Body	W3C
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	The scope of *XML Schema: Structures* is to define the nature of XML schemas and their component parts, provide an inventory of XML markup constructs with which to represent schemas, and define the application of schemas to XML documents. The scope of *XML Schema: Datatypes is to* discuss datatypes that can be used in an XML Schema. These datatypes can be specified for element content that would be specified as #PCDATA and attribute values of various types in a DTD. It is the intention of this specification that it be usable outside of the context of XML Schemas for a wide range of other XML-related activities such as [XSL] and [RDF Schema].
Additional remarks	The technical benefits of using XML Schemas (also called as XSD-XML Schema Document or WXL – W3C XML Schema) over other languages, though not exhaustive, are listed below: •XML Schemas are themselves XML documents •Refers XML Schema namespaces •Provides more powerful means to define XML documents structure and

	limitations •Support for primitive (built-in) data types (eg: xsd:integer, xsd:string, xsd:date, and so on), which facilitates using XML in conjunction with other typed-data, including relational data. •The ability to define custom data types, using object-oriented data modeling principles: encapsulation, inheritance, and substitution. •Compatibility other XML technologies, for example, Web services, XQuery, XSLT, XForms and other technologies can optionally be schema-aware.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.17 XPath

Interoperability Area	Content searching and navigation in an XML document.
Standard/Specification with Version and Publication Date (if applicable)	**Xpath 2.0** **23 January 2007**
Description	XML Path Language (XPath) is a query language for selecting nodes from an XML document and also can be used to compute values (eg. Strings, numbers or Boolean) from the content of an XML document.
Reference	http://www.w3.org/TR/xpath20/
Standards Body	W3C
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	XPath 2.0 is an expression language that allows the processing of values conforming to the data model defined in **[XQuery/XPath Data Model (XDM)]**. The data model provides a tree representation of XML documents as well as atomic values such as integers, strings, and booleans, and sequences that may contain both references to nodes in an XML document and atomic values. The result of an XPath expression may be a selection of nodes from the input documents, or an atomic value, or more generally, any sequence allowed by the data model.
Additional remarks	The name of the language derives from its most distinctive feature, the path expression, which provides a means of hierarchic addressing of the nodes in an XML tree. XPath 2.0 is a superset of **[XPath 1.0]**, with the added capability to support a richer set of data types, and to take advantage of the type information that becomes available when documents are validated using XML Schema. A backwards compatibility mode is provided to ensure that nearly all XPath 1.0 expressions continue to deliver the same result with XPath 2.0.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.18 XSL

Interoperability Area	Data Transformation for Presentation
Standard/Specification with Version and Publication Date (if applicable)	**XSL 1.1** **5th Dec 2006**
Description	Extensible Stylesheet Language (XSL) is a language for expressing stylesheets. It consists of two parts: 1. a language for transforming XML documents (XSLT), and 2. an XML vocabulary for specifying formatting semantics. An XSL stylesheet specifies the presentation of a class of XML documents by describing how an instance of the class is transformed into an XML document that uses the formatting vocabulary.
Reference	http://www.w3.org/TR/xsl11/
Standards Body	W3C
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	With XML we can use any tags we want, and the meaning of these tags are not automatically understood by the browser: <table> could mean a HTML table or maybe a piece of furniture. Because of the nature of XML, there is no standard way to display an XML document. In order to display XML documents, it is necessary to have a mechanism to describe how the document should be displayed. One of these mechanisms is Cascading Style Sheets (CSS), but XSL (eXtensible Stylesheet Language) is the preferred style sheet language of XML, and XSL is far more sophisticated than the CSS used by HTML.
Additional remarks	XSL Formatting Objects (XSL-FO) is part of XSL.
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

5.2.19 XSLT

Interoperability Area	Data Transformation for conversion from XML format to another format
Standard/Specification with Version and Publication Date (if applicable)	**XSLT 2.0** **Jan 2007**
Description	XSLT is a language for transforming XML documents into other XML documents.
Reference	http://www.w3.org/TR/xslt20/
Standards Body	W3C
Status of recommendation as per Policy	Open Standard
Maturity Level	Matured
Enforcement Category	Mandatory
Applicability/Scope	XSLT is designed for use as part of XSL, which is a stylesheet language for XML. In addition to XSLT, XSL includes an XML vocabulary for specifying formatting. XSL specifies the styling of an XML document by using XSLT to describe how the document is transformed into another XML document that uses the formatting vocabulary. XSLT is also designed to be used independently of XSL. However, XSLT is not intended as a completely general-purpose XML transformation language. Rather it is designed primarily for the kinds of transformations that are needed when XSLT is used as part of XSL.
Additional remarks	XSLT 2.0 is a revised version of the XSLT 1.0 Recommendation [XSLT 1.0] published on 16 November 1999. XSLT 2.0 is designed to be used in conjunction with XPath 2.0, which is defined in [XPath 2.0]. XSLT shares the same data model as XPath 2.0, which is defined in [Data Model], and it uses the library of functions and operators defined in [Functions and Operators]. XSLT 2.0 also includes optional facilities to serialize the results of a transformation, by means of an interface to the serialization component described in [XSLT and XQuery Serialization].
For Interim Standard, the clauses of Policy it violates	-
History of revision with dates	-

6. Steps / Best practices for implementation of Technical standards

1. For new e-Governance projects, right from the conceptualization and design stage, the usage of listed Technical Standards in this document, and other e-Governance standards published by GoI from time to time, must be kept in mind. For this, all Areas requiring use of Standards must be identified, for areas covered by this document, the listed standards must be used. If any Area is not covered already in this document , it should be flagged at the earliest for evaluation by GoI.
2. The project proposals /Request For Proposals (RFP) should ensure compliance to technical standards published through this standard document.
3. Conformance to the identified standards in the specified areas should be ensured during the e-Governance project life cycle using suitable mechanism in consultation with DIT.
4. In case of Interim or Evolving standards, one should look for updates, if any from time to time.
5. New versions of legacy applications should ensure adherence to the standard specifications .

7. ANNEXURES

Annexure-I: Definitions and Acronyms

GoI's 'Policy on Open Standards for e-Governance' (Ver 1.0 November 2010) can be referred for the definition of the following terms:

- Designated Body
- Domain
- Interim Standard
- Maturity
- Not-for-profit
- Open Standard
- Standard

GoI's 'Manual on Implementation of Policy on Open Standards for e-Governance' (Ver 1.0 November 2010) can be referred for the definition of the following terms:

- Interoperable

Definitions of other terms used in this document are as follows:

Definitions	
Evolving Standard	The standard which are not yet widely implemented/adopted or which are under formulation
Mandatory Standard	The standard which meets all requirements of openness as per the Policy and hence must be followed at all times.
Recommended Standard	The standard which does not meet all requirements of openness as per the Policy, and hence likely to be reviewed in the future

Acronyms	
DIT	Department of Information Technology
GoI	Government of India
IFEG	Interoperability Framework for E-Governance
NeGP	National e-Governance Plan

8. References

This document builds on the Areas identified in 'Interoperability Framework for e-Governance' Version 2.4 prepared by working group on Technical Standards & e-Governance Architecture.

This document vets the Technical Standards for their openness as per the procedure laid down in 'Policy on Open Standards for e-Governance' (GoI notification, Ver-1.0, Nov., 2010 http://egovstandards.gov.in/).

Specific references for individual standards are listed in respective tables. Some useful general references are listed below:

1.International Standards Organisation (ISO) (http://www.iso.org)

2.Word Wide Web Consortium (W3C0 (http://www.w3c.org)

3.Internet Engineering Task Force (IETF) (http://www.ietf.org)

4.Object Managemtn Group (OMG) (http://www.omg.org)

5.Xiph.org Foundation (http://www.xiph.org)

6.Unicode Consortium (http://unicode.org/)

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