Internet Standards for the Web: Part I

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About the author

Outline of tutorial

- Part 1: Current State
  - Standards organizations & process
  - Overview of web-related standards
- Part 2: Recent activities
  - What's happening with web standards?
  - What are the hard problems

Purpose of Part I

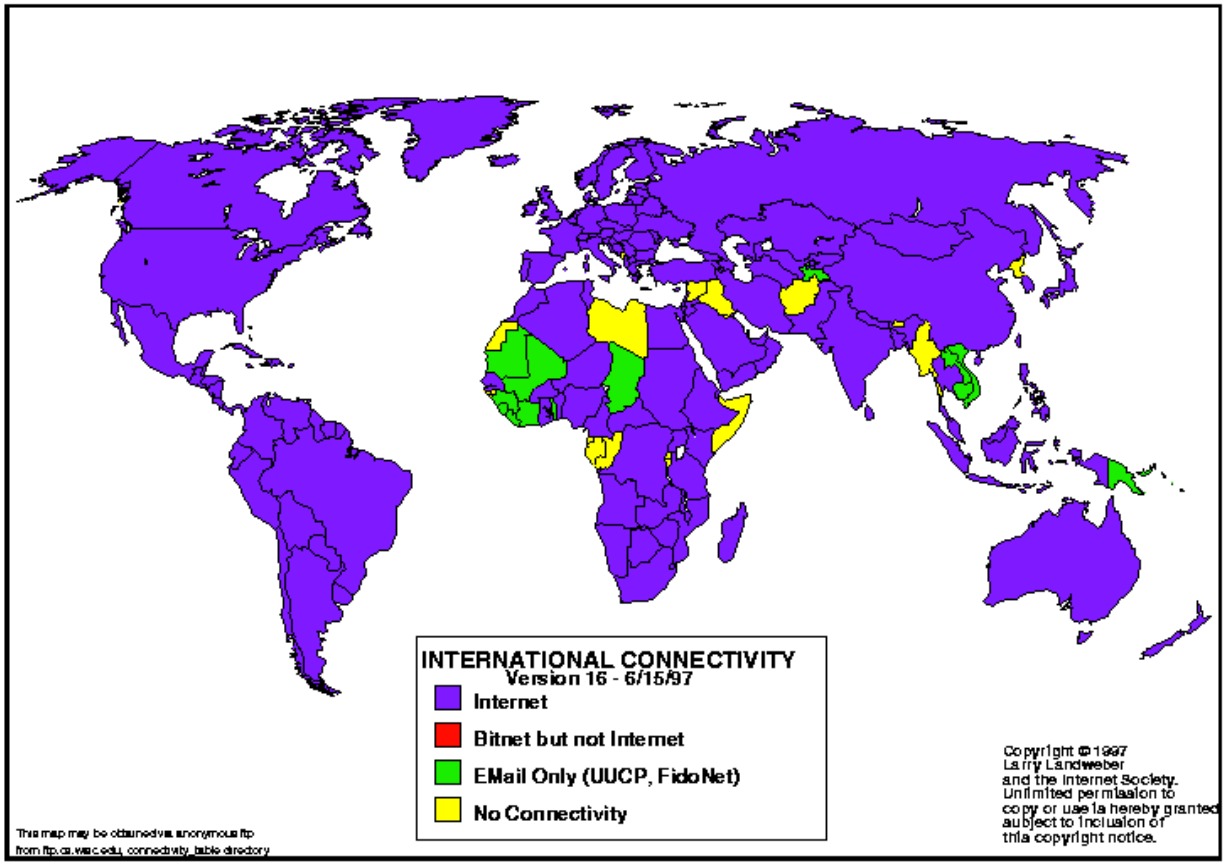
- What's a "standard"?
- How are standards made?
- What are the standards for the web?
- Introduce terms and set in context

What's the World Wide Web?

- One network, everyone on it
- Multiple media
- Multiple modes of communication

What's *important*?

One Network, Everyone On It

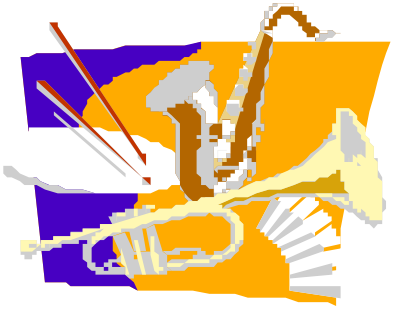


demographics

not an application or technology

All kinds of “media”

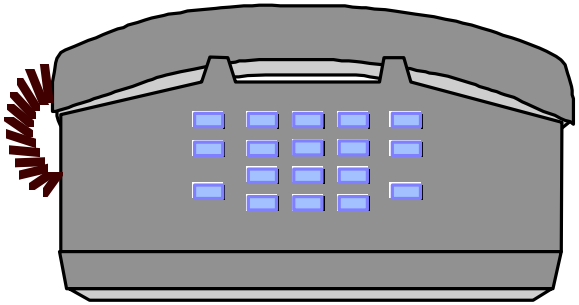
- documents
- video
- music
- interactions



Documents, videos, worlds, music

Many modes of communication

- publish
- broadcast
- interact



Broadcast, Publish, Interact, Update

"The nice thing about standards…"

- *… there are so many of them to choose from*
- *… by the time things become standards, they're obsolete.*
- *… real standards are set by the market, not committees*

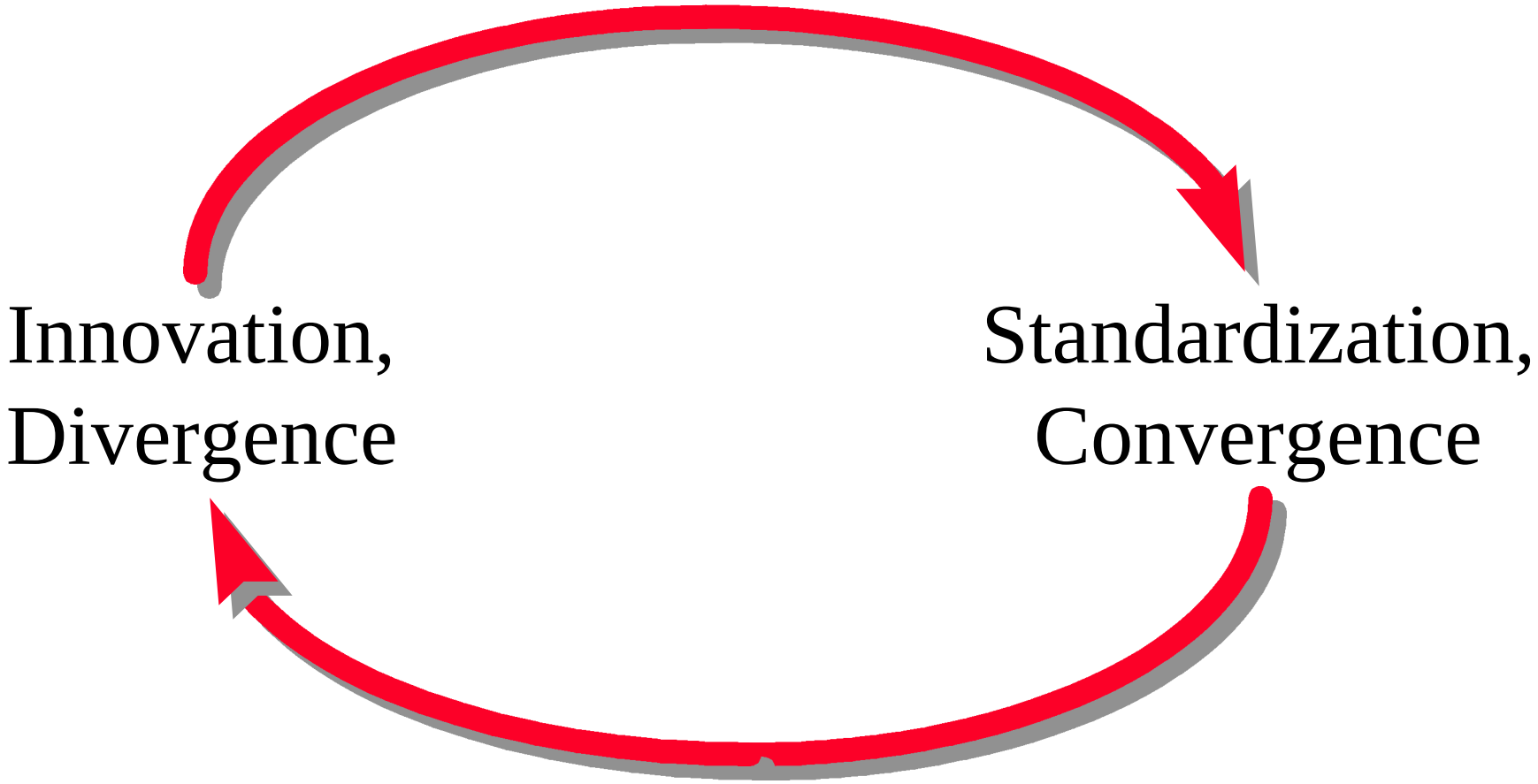
Standards the only way that everyone can play

tragedy of the common

"where do you want to go today?"

Companies on standards

Standards *follow* Innovation

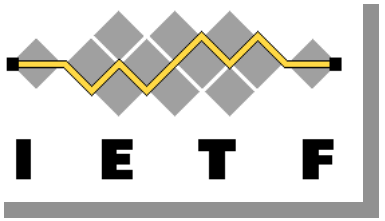


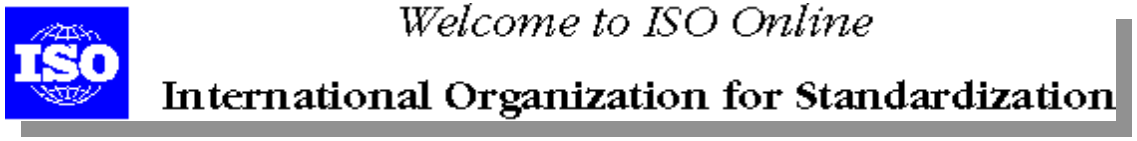
Standards vs. Design

- *Design*
  - choose between alternatives (A, B, or C)
  - optimize function, performance, reliability
- *Standard:*
  - choose one, some, all, “undefined”, “implementation dependent”, “discoverable”
  - optimize flexibility, interoperability, politics, extensibility, enforced cooperation

Who writes web standards?

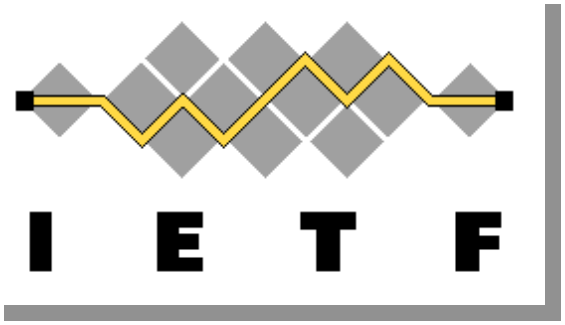
- Standards organizations
- Consortia
- Companies
- Individuals





Internet Engineering Task Force

- Defines standards for the Internet
- Different rules, structure than most other standards organizations

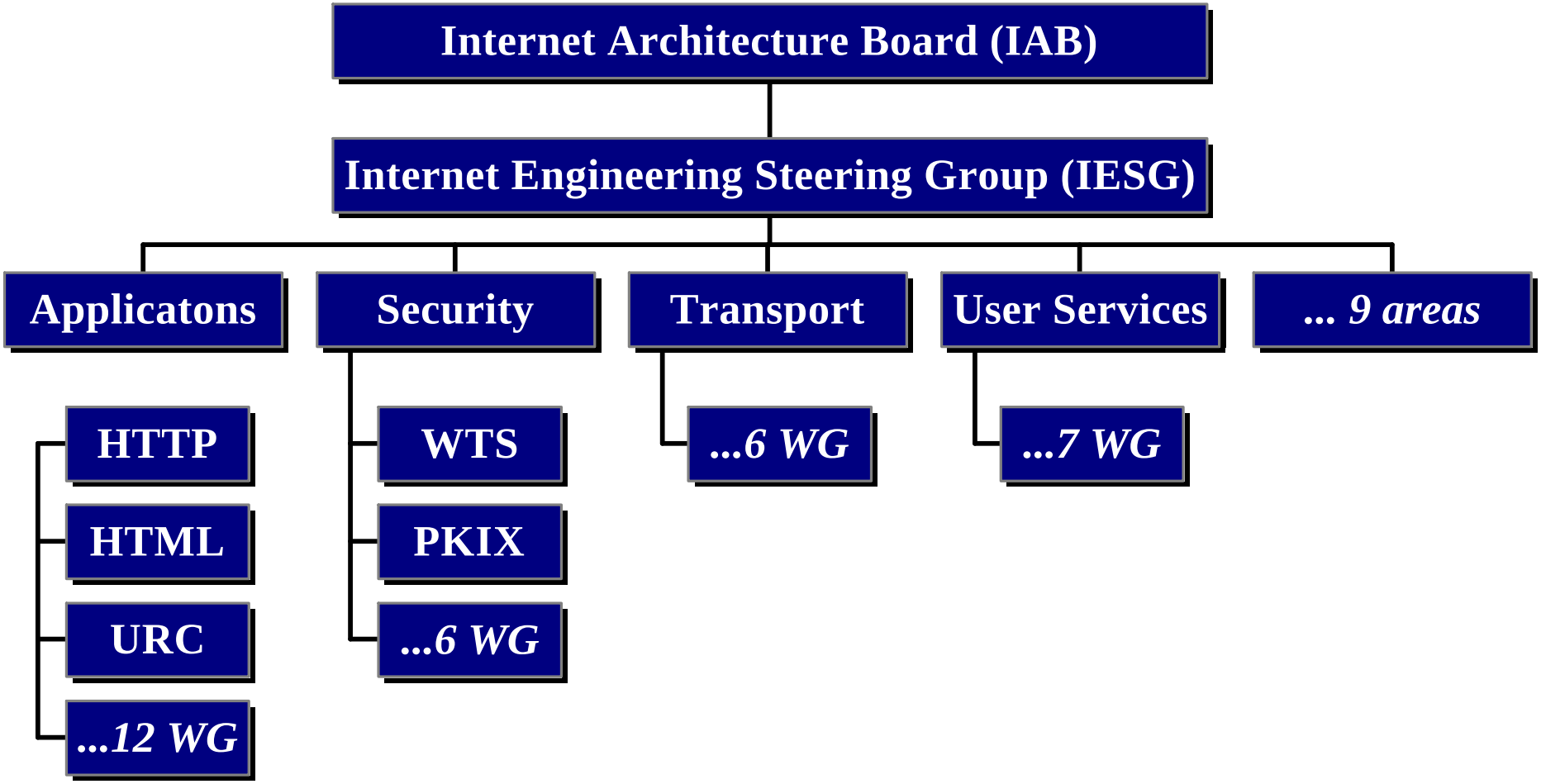


About the IETF

Internet Society

- Non-governmental organization created to coordinate Internet activities
- Umbrella organization for IETF

IETF structure



IETF Working Groups

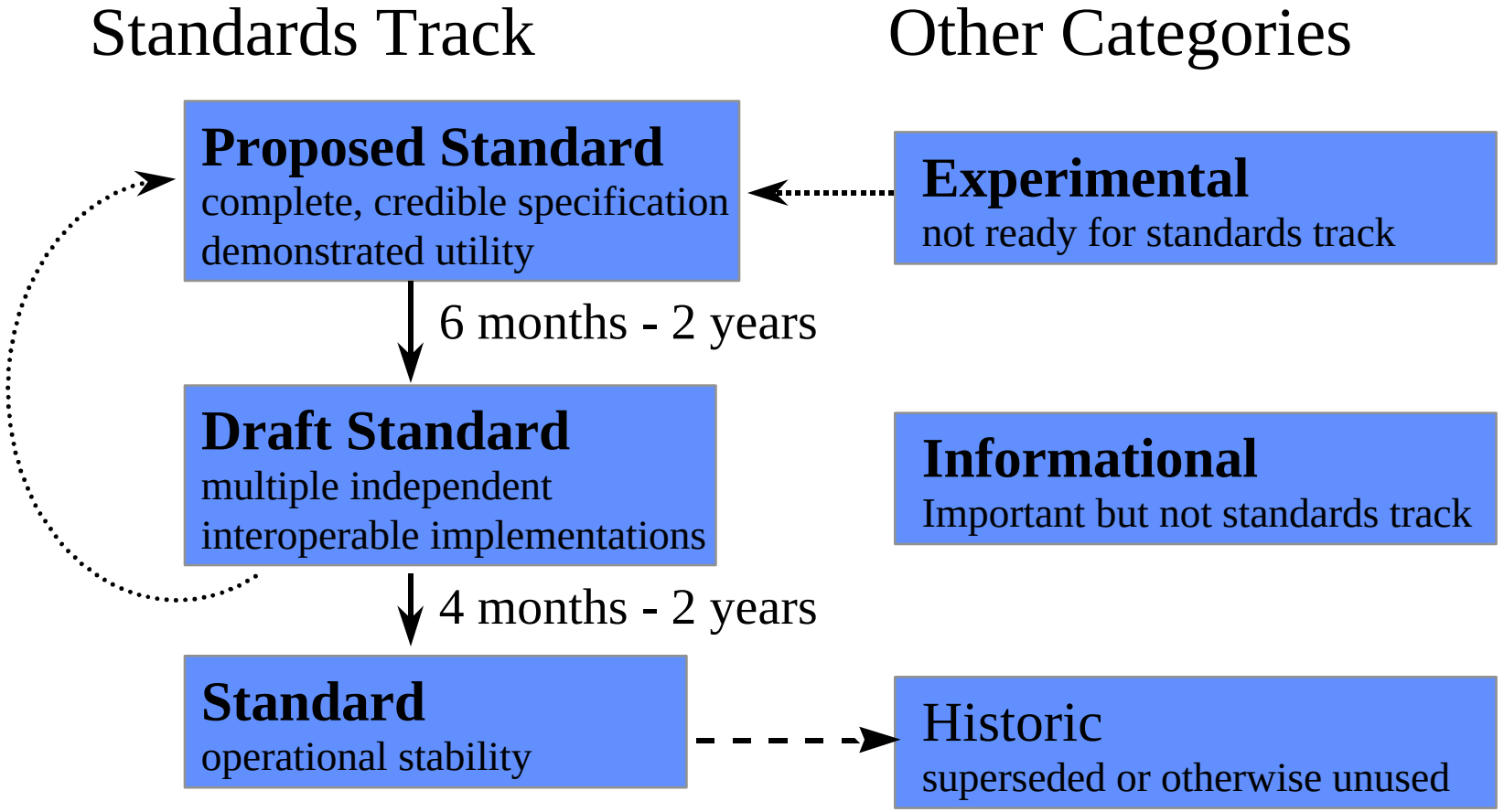
- Open organizations
  - no formal membership, all volunteer
- Most work happens via email
  - may meet at IETF meetings (3 a year)
- Small focused efforts
  - published goals and milestones
- No formal voting
  - “Rough consensus and running code”

IETF Documents

- Internet-Drafts
  - works in progress, no formal status
  - deleted after 6 months
- RFCs *(Request For Comments)*
  - Archived series of documents
  - RFC 1796: “Not all RFCs are Standards”

How to get RFCs, Internet Drafts

IETF RFC Categories and Process



World Wide Web Consortium

- Members are vendors and user organizations
- Paid (and volunteer) staff
- *Develops* web-related standards
- Hosts workshops, working groups

About W3C

W3C and IETF relationship

- W3C focus on Web; IETF general Internet
- W3C *researches and develops* protocols
- IETF *reviews and resolves* standards
- W3C staff participate actively in IETF

W3C Process

- Advisory Committee sets priorities
- New work requires member approval
- Exploratory workshops spawn working groups
- Working groups are closed
  - outside experts invited, though

Other groups setting standards

- Consortia, vendor groups, trade groups
  - European Computer Manufacturer's Association (ECMA)
  - CommerceNet
  - Internet Messaging Consortium

- ANSI, ISO, ITU

Categories for Web Standards

- Content (e.g., HTML)
  - kinds of objects we're moving around?
- References (e.g, URLs)
  - how to talk about something not in hand?
- Protocols (e.g., HTTP)
  - how do things move around the net?

Standards for Content

- Packaging
- Documents
- Images
- Media: audio, video, music
- Interactive content
- Metadata

Why standards for content?

- Preservation
  - Can you read Word 2.4 files?
- Interoperability
  - Multiple implementations
- Global communication
  - Standards designed for consistency over features

Content Packaging: labeling data

- MIME:
  Multipurpose Internet Mail Exchange
  - Originally designed for mail
- Allows
  - Multiple media
  - Multiple character sets
  - Multiple languages

MIME media types

Internet Media Types ("MIME types")

- Standard way of naming data formats
- Hierarchical structure with parameters
- Applications use MIME to decide how to interpret data (instead of file extension)

IANA, pp16-19

MIME Major Types

- **`text`**: sequences of characters
- **`image`**: bitmaps in various forms, e.g., gif, jpeg, tiff, png
- **`audio`**: sounds in various forms
- **`video`**: animations
- **`message`**, **`multipart`**: special purpose
- **`application`**: catch-all

MIME subtype

- Standard registry: “**`image/tiff`**”, “**`application/postscript`**”
- Registry rules: security, both standard & private (vnd)
- “**`application/vnd.ms-word`**”

Standards for Web Document formats

- HTML, SGML and XML
- Page layout: PDF
- proprietary application formats (word, wordperfect, etc.)

SGML and XML

- Standard Generalized Markup Language
- An ISO standard (ISO8879:1986)
- A way of writing
  (ways of writing documents)
- DTD (Document Type Definition)
  defines elements and rules about them
- XML (from W3C) is simplification

Markup: saying things about parts

- Semantic markup

  <part-no>N1025B</part-no>

- Structural markup

  <H1>N1025B</H1>

- Presentation markup

  N1025B

HyperText Markup Language (HTML)

- An application of SGML (more or less)
- A way of writing text

  that includes links

  and (mainly) structural markup

  with some other things (like images) embedded.

HTML design goals

- *lingua franca* for the web
- Hypertext views of existing documents
- Simple, scaleable
- Platform independent
- Support for visually impaired
- Interoperability with common editors

HTML standards

- 1994: 2.0 (baseline) RFC 1866
- 1996: 3.2 (tables, forms, presentation)
- 1998: 4.0 (style sheets, lots more) W3C Recommendation

HTML/4.0

- More complete tables
- File Upload
- Internationalization
- Embedded objects
- Extensions
- Style sheets

Beyond HTML: XML

- simplification of SGML
- Allows multiple kinds of documents, separate semantics from presentation
- Why XML?
  - Think beyond this year
    - Can you read Word 3.2 documents?
  - Think beyond the PC
    - Different devices
    - Different uses (searching, indexing, translation)

Character sets: beyond ASCII

- European languages: ISO-8859-1 (Latin 1)
- The rest of the world: variety of systems
- Identifying the charset used: a registry
- A single charset? Unicode (UTF-8)

Other content on the web

- Images
- Page layout
- Video
- Audio

Images on the Web

- **`gif`**: Graphics Interchange Format
  - 8-bit color, transparent areas; patent cloud
- **`jpeg`**: Joint Photographic Expert Group
  - lossy compression for photos, not line art
- **`tiff`**: Tagged Image File Format
  - issues over tag standardization
- **`png`**: Portable Network Graphics
  - calibration, hypertext links

Page layout on the Web

- Postscript
  - Designed for printer control
  - **`application/postscript`**
- Portable Document Format (PDF)
  - Useful for screen presentation and printing with exact layout
  - **`application/pdf`**

Video formats on the Web

- MPEG
- QuickTime
- AVI

Audio and Music

- **`audio/basic`**
- Audio hasn’t taken off
- MIDI and music unevenly deployed

More web content-types

- Desktop applications
  - Word, Excel, etc.
- 3-D renderings
  - VRML, etc
- Active content
  - Java
  - JavaScript, Document Object Model

Standards for MetaData and the Web

- Cataloging (Dublin Core)
- Ratings (PICs)
- Digital Signatures (proving authenticity)
- Copyright (who owns this material?)

Identifiers in the Web: URIs

- URL: locations
  - *New York Public Library, second floor, third aisle, second shelf, third book from left*
- URN: location-independent names
  - **QP:475.L95; ISBN:0-19-854529-0**
- URC: descriptions
  - *genre:* book, *title:* The Ecology of Vision; *author:* J.N.Lythgoe; *Date:* 1979; *Publisher:* Clarendon Press, Oxford

URL Requirements

An object that describes the location of a resource

- Global scope
- parsable
- transportable in many contexts
- extensible
- not loaded with other information

Some URL schemes

- **`http://host.dom/path`**
- **`ftp://host.dom/path`**
- **`gopher://host.dom/selector`**
- **`news:group.name`**
- **`news:article-id`**
- **`mailto:email-name@host.dom`**
- **`file:///C:/dos/path`**
- **`telnet://host.dom`**

Relative URLs

- “base” + “relative URL”
  => “absolute URL”
- Defines what “base” is for various contexts
- Not defined in terms of scheme

Uniform Resource Names (URN)

- name independent of location; allows for replication, migration
- separate problems of
  naming authority and name assignment
  resolution mechanism: finding information about the thing named
  - location(s), metadata

Network Protocols for the Web

Major activities:

- send and receive (email)
- publish and retrieve (web)
- broadcast and subscribe(news, push)

Of course, there's more:

real time interaction, pay for things, share secrets, query databases, etc.

Standards for Internet protocols

- Sending (**SMTP, POP, IMAP, fax**)
- Publish, retrieve (**HTTP**)
- Broadcast communication (**NNTP**), push
- and more..
  - directory access (**LDAP**)
  - interactive sessions (**TELNET**)

HyperText Transfer Protocol (HTTP)

- Started as a simple protocol, designed for the 1990 vision of the World Wide Web
- **`http://widget.com/product.html`**
  - Open connection to widget.com
  - send "**`GET /product.html`**"
  - read headers
  - read body
  - close connection

HTTP/1.0 added features

- Multiple content-types
  - Accept, language, charset, content-type
- More information
  - User-Agent, From, error codes
- Simple caching
  - last-modified, if-modified-since
- Basic Authorization

HTTP/1.1 Improvements

- Performance
  - pipelining
  - persistent connections
  - caching (Etags)
- Reliability
  - clear semantics for many headers
- New features

Putting the pieces together

- The web is just part of the Internet
- Distributed communication is built out of lots of pieces
- Integration of
  - web, mail, push, security, media,
  - worlds, libraries, identifiers, copyright

Future of Web Standards

- Innovation still leads, standards will follow
  - *This will not end*
- Organizations adapt too
  - *IETF, W3C change*
- Interoperability trumps features
  - *if you're careful, you can have both*
- Avoiding the tragedy of the commons
  - *local greed over global optimization*

Internet Standards for the Web
End of Part I

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