

The Future of the Web Technology and Standards



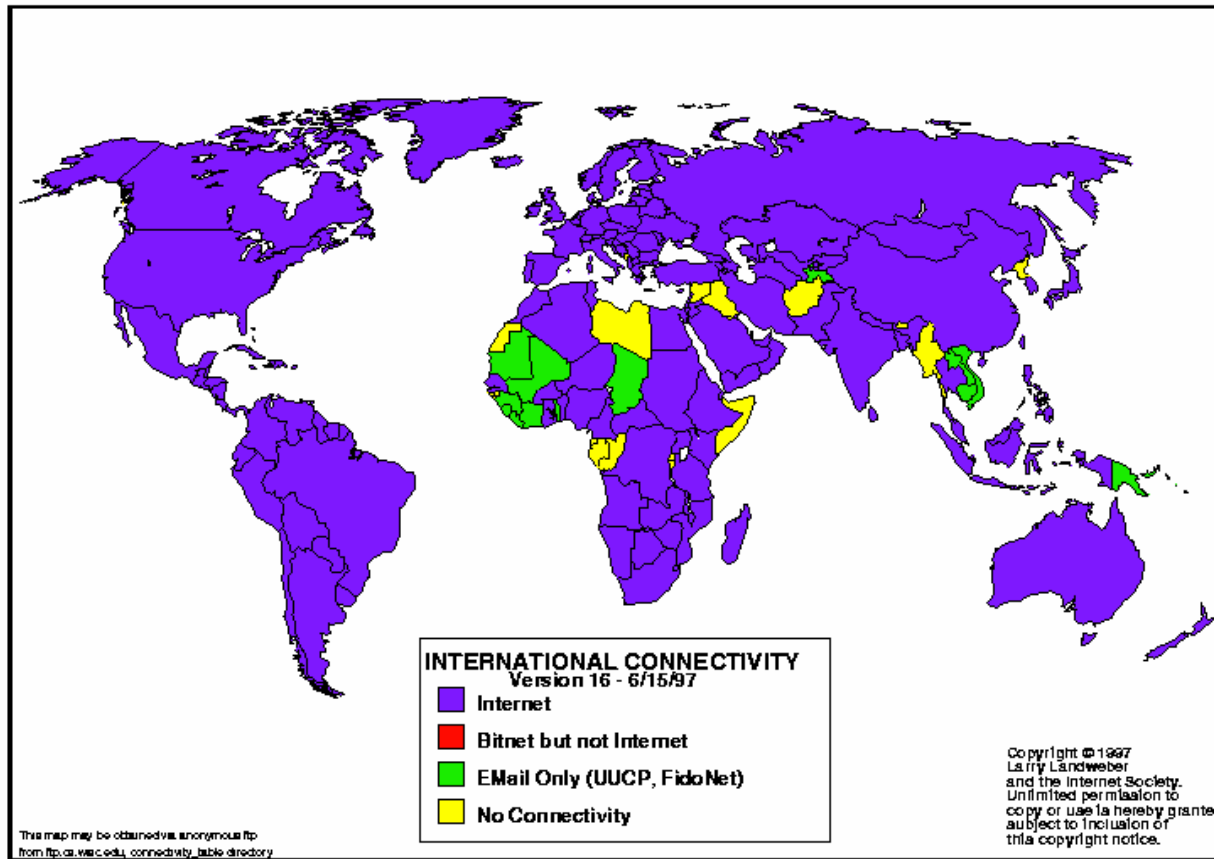
Larry Masinter
AT&T Labs

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What's *important?*

One Network, Everyone On It





What's Important?

- Not the technology
 - Not XML, Java, Beans, SOAP, etc
- There's only one
 - Two ways to get "only one"
- Global communication media, content independent
- The Web: Interactive access to applications and data



Internet standards...

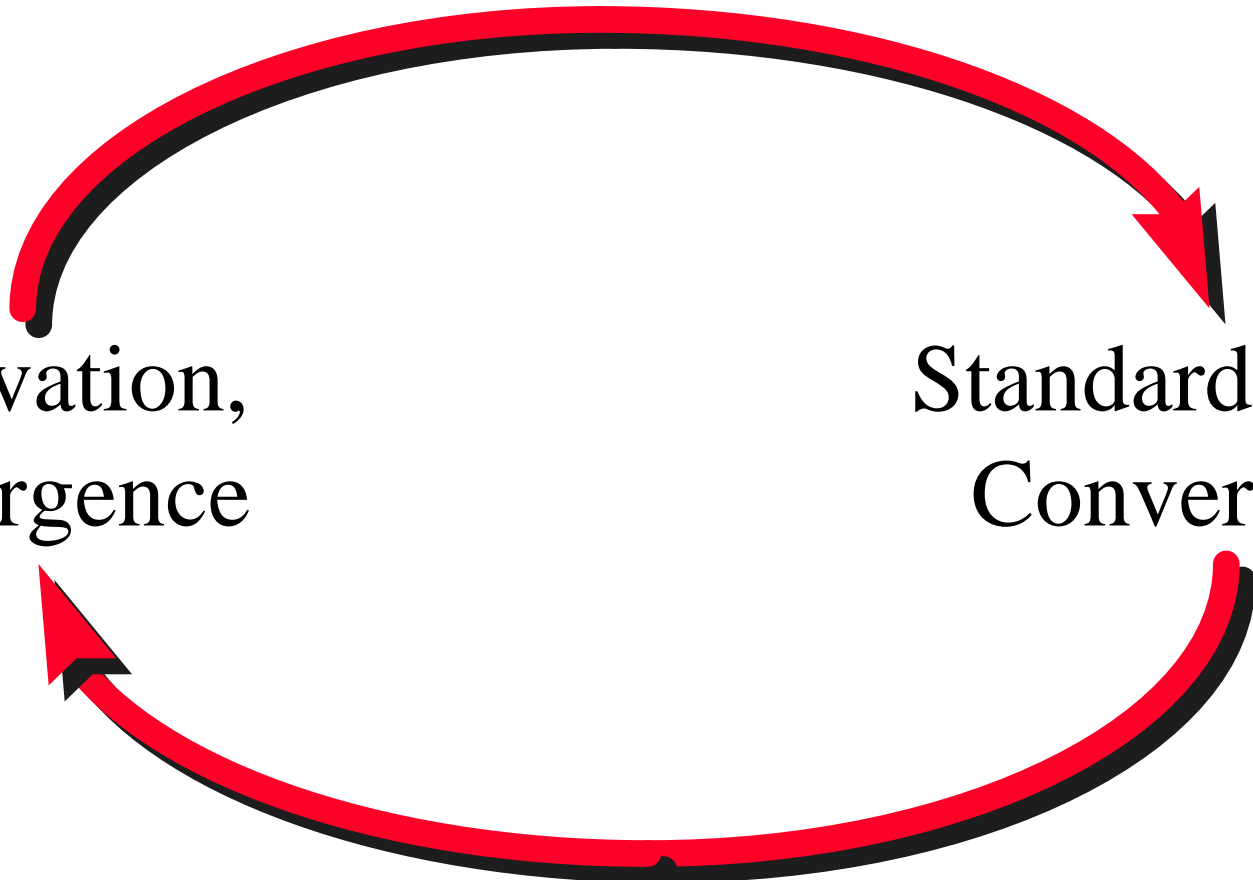
- A technical definition of a network protocol, a protocol element, a data format
- Specified in sufficient detail that it can be implemented by someone else without too much reverse engineering
- Supported by industry and users
- (Usually) openly available
- (Often) published by a standards body



Standards *follow* Innovation

Innovation,
Divergence

Standardization,
Convergence





Qualities for standards

- Permanence
 - Stability over time and version
- Interoperability
 - different vendors, platforms, contexts
- Independent evolution a requirement for distributed engineering
- Different design criteria than for product design

Who creates Internet standards?

- Standards organizations: ISO, IETF
- Consortia: WAP Forum, W3C
- Companies: Sun, Microsoft



Welcome to ISO Online

International Organization for Standardization



American National Standards Institute



Internet Engineering Task Force

- Defines standards for the Internet
 - Different rules, structure than most other standards organizations
- “Rough Consensus and Running Code”





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”



World Wide Web Consortium

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





W3C Process

- Advisory Committee sets priorities
- New work requires member approval
- Exploratory workshops spawn working groups
- Working groups for members
 - outside experts may be invited



Summary: Standards process

- Increasing Number of Organizations
 - Common goal: improve the value
 - Many opportunities to participate
 - Common element: wide review and consensus
- Evolution along many fronts
 - Web, Mail, commerce, devices
 - some overlap
- Standards come after innovation
 - market forces countervail



Basics of the Web

- 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?



The future of the web

- New kinds of content
 - Everybody's inventing specialized content
- New kinds of references
 - Internationalization, Internet Keywords..
- New kinds of protocols
 - Higher performance content distribution, transactions



Web Content

- HTML: ad-hoc markup language with lots of variations
- XML: creating a more principled approach
- Lots of other document formats: Adobe Acrobat, PDF, Microsoft Word, ...
- Embedded images (Mosaic added GIF)
- Animation, active content

Battle of control: the unstoppable author meets the immovable reader for control of presentation



Future of Web Content

- HTML -> XML
- Convergence of new image types
- Accessibility
 - Blind, disabled
 - Driving in your car
 - Sitting in a meeting room
 - Walking with a cell phone
 - Watching TV
- Authoring device-independent, using "style" to device-specific



Web References

■ URL: locations <http://www.sun.com/pr/1999/announce.html>

- *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 & citations

- *genre: book, title: The Ecology of Vision; author: J.N.Lythgoe; Date: 1979; Publisher: Clarendon Press, Oxford*



Future of Web References

- Copyright, metadata, content indexing
- Internet Keywords: using existing brand names for navigation
- Internationalization: allowing the web to work in Chinese



Design Criteria for Protocols

- performance (make it faster)
- bandwidth (amount of data sent in a particular time)
- reliability (entire system is stable even if some things go wrong)
- extensibility (can new features be added and still work with old implementations)
- security (doesn't let others mess with you)



Additional Design Criteria

- Privacy (users don't want sites to know too much about them)
- Marketing information (sites want maximum information about users)
- Individual responsiveness (users want maximum use of shared resources)
- Fairness (intermediaries want to allocate resources among users fairly)

Hard problem: Designing protocols to be stable under conflicting goals of participants



Future of Web Protocols

- Tunneling through the firewalls & security holes
- Engineering for “flash crowds”
- 80% of traffic to less than 1% of sites
- Getting a handle on content distribution
- Transactions with security
- Blurring the line between data & protocols



New Internet Applications

- Wireless access, linked with geographic information
- Instant Messaging
- Unified Messaging (voice, fax, document)
- Integration of voice & data networks
- Multi-purpose interactive systems
- Integration of TV, interactive TV and web
- “B2B” communication at protocol level



Tragedy of the Common

- A common resource
- Individuals access common as needed
- Everyone using the common resource optimizes self-interest
- Result destroys the common good



Avoiding the “tragedy of the common”

- Common resource: the Internet
- Individual access: offering products and services
- Common good: Internet interoperability
- Individual use: “use my software”
- Tragedy: everyone has proprietary extensions, destroys interoperability