

# Internet Protocols and Innovation

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# Innovation – Key to Internet Progress

- New protocols and applications introduced regularly
  - Some for special uses or economic sectors
  - Some in the hope of being the next “killer app”
- Historically, no centralized or regulatory impediment to doing this.
- Should not have one organization as the gatekeeper for progress, even in minor ways.

# Using DNS Names, not Addresses

- Better for users
- Better for understanding
- More stable as ISPs change or sites make “multihoming” arrangements
- But: Makes the DNS part of the critical infrastructure

# Innovation as Economic Driver

- New applications can breed new companies and developments
- Should avoid centralizing key functions, requiring approval or changes for a new protocol or application, or even about today's inter-enterprise ones.
- Most network traffic today is web, email, and maybe file-sharing. But...
- “There is little or no usage on port N” is relevant only if we don't care about tomorrow's application.
- Very important for new applications that the infrastructure – including the DNS – behave predictably.

# An Application and the DNS

- Can it depend on getting “no domain” if no registration?
  - “yes” for 250+ top level domains
  - “no” for a few
- For those few, can it depend on specific behavior to detect the situation?
  - With “fixes” for wildcards, depends on which domain, which tables, where one asks from
  - “Reset, timeout, or answer” – different behavior in different domains (and each has legitimate –non-wildcard– meanings)

# Impact on Applications Writers and Users

- Makes it difficult or impossible to
  - Write new code, or keep old code working, acceptably and predictably
  - At least without a table of domains and their behavior
- Tables of domains and behavior
  - Another workaround
  - Inhibit the successful deployment of new top-level domains
- These are subtle technical issues, but ones that have a direct impact on the user experience... and, potentially, on the economy.

# Attention to Backward Compatibility

- Key to design of protocol upgrades
- Otherwise
  - We invent a new protocol on a new port or
  - Use explicit negotiation for permission to use new features

# Example – Internationalization of DNS

- Specifications permit any binary string (see RFC2181)
- Applications expect ASCII “hostname” (recommendation of RFC1035)
- How many applications would break, or get confused, if non-ASCII used?
  - Some
  - And that is far too many
- Solution: Standardize a special encoding that IDN-aware applications can interpret into international characters. But old applications see (very odd-looking) hostnames



# Example – Internationalization of Email

- Several different aspects, different solutions over some time
  - Initially: NVT ASCII expected throughout
  - Step 1: Specify body formats to permit use and identification of non-ASCII characters, but keep all coding in ASCII (users of old MUAs see trash... usually with a warning)
  - Step 2: Extend header formats to permit encoded international chars in Subject, Personal name, etc.
  - Step 3: Extend transport structure to permit explicit negotiation. Old senders don't see the stuff; old receivers reject.
  - Step 4: Use extended transport to negotiate 8bit. Downgrade or reject if not available
  - Step 5: Start thinking about internationalized addresses now that we have domain names. Tough problem: tradeoffs between working well and “looking right” long term versus quick deployment of a solution that may expose specially-coded forms to users.

# A Registry-database Directory without Infrastructure Impact

- If one wanted to support a directory based on a registry database, it could be done by a naming convention, without a wildcard
  - `http://directory.com/ ?? http://whois.com./ ??`
  - `http://com./ ??`
- Users must be trained either way
  - To make typing errors
  - To use the naming convention
- But no wildcard or other infrastructure-threatening tricks.
- This is, at this point, a technical suggestion only – there might be economic or policy issues that would make it problematic.

# DNS Internationalization in Practice

- Move now underway to add characters to DNS other than those used for English
- Important to many populations, but new opportunities for consumer confusion for everyone.
- Examples – user sees link or URL in browser line, thinks it is something else.
  - eBay problem: worse with EBAY.com? (is that really “eBay”?)
  - USA.net (is that really in Thai characters?)
- Best solution appears to be prohibition of some combinations, not requiring eBay to register all 32 (or more) names.
- Wildcard causes unregistered names to map to search site.

“With all these problems... it is amazing the thing works at all”

- Internet is incredibly robust against many types of abuse
  - Not just the ability to get the bits through under stress
  - Misconfigured email systems often work acceptably anyway, and produce good diagnostics when they don't (even though configuration errors should not occur).
  - Configuration programs select defaults based on names or environments that usually work (although this is not a good idea without several precautions).
  - Email –and fax and voice over the Internet– actually are fairly secure and private as long as you can trust the sending system, the receiving one, and the ISP(s) in between

# That Robustness Depends On

- Very stable infrastructure, including predictable responses to unexpected conditions
- Very conservative behavior about what one sends in response to queries or other actions
- The principle of conservatism about what is sent is a part of every Internet standard protocol, even if not explicitly stated with each one.
- That a behavior is defined does not make its use reasonable, appropriate, or even permitted.

# Ultimately

This discussion is

Not about preventing innovation

But about continuing to enable it for new  
applications