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One Laptop per Child

## Networking

Principles; Caching

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# Manifesto

- No Assumption of Universal Connectivity
- Direct XO-to-XO serverless communication
- Human-readable unique identifiers for each XO
- Direct presence interrogation

# No Assumption of Universal Connectivity

- Every one is an island (of some size)
- Best service possible within our walls

# Direct XO-to-XO communication

- Servers may be used as aides or proxies, but are never necessary
- Sockets and IP, like Jon Postel gave us
- Firewalls are there for a reason
  - But we can provide tunnels where needed

# Human-readable ids

- Sometime I can tell my non-XO using friend
  - cscott.1cc-cambridge-ma.us.xs.laptop.org ?
- Indirect, but globally unique.
- Maybe more than one name!

# Direct presence interrogation

- Allow many discovery mechanisms
- Once discovered, direct means for presence
  - Rate and bandwidth limited
- More efficient alternates may augment

# Brass Tacks

- The previous slides presented the principles
- Now let's consider an implementation
- You're welcome to suggest others!

# DNS

- XOs are identified as:  
`name.xxx.school.country.xs.laptop.org`
  - Name: encoding of XO nickname
  - Xxx: only used for serverless bootstrapping
  - school....laptop.org: filled in by registration



# Resolving

- Standard dynamic DNS to school server/other
- Map to link-local IPv6 by hashing

# My friends

- Standard XMPP scheme for adding friends:
  - `xmpp:xo@nickname.xxx.school.country.xs.laptop.org?roster;name=Full%20Name`
- Internally: 'user@domain' (usually `xo@domain`)
  - Add protocol?

# Presence

- Lightweight XMPP server on the XO for basic IM presence
  - Using SD-DNS redirection on school server if present
- Additional XO specific info?
  - Xmpp extensions, separate service?
  - Should not interfere with IM/VOIP interop

# The jungle

- Tunnels
- Split DNS
- Security

# Tunnels

- When I register with my school server (or xofriends.org) I might get back some tunnel information
- I can establish an IPv6 tunnel using this to bypass NAT and allow my class to collaborate
- School-to-school tunnels to allow penpals

# Split DNS

- cscott.1cc.xs.laptop.org might resolve to one thing at school, and something else at home
- Allows school server to remain firewalled off from external networking, without requiring students to use new identity at home
- Also provide tunneling?

# XO-to-XO security

- When I befriend mstone, I might obtain a public key from him
- Lookups of mstone.1cc.xs.laptop.org notice the keypair and lie to me
  - They give me a localhost IP address
- Now connections to mstone get proxied
  - Verify that mstone is authentic
  - Protect content of communication

# Asynchronous web

- We want to cache web content for offline use
- But these will still trigger DNS lookups
  - One solution is to provide “offline DNS” server as well, or use explicit proxy
  - OR: School server can provide unique link-local IPv6 addresses in response to query
  - Server (or peer) answers connections to these and responds



# Bonus: reinventing .xol

- Define structure for cached web content
- Most .xols have two parts:
  - Push some content in the offline cache
  - Indexing information: sidebar links, etc
- But why not just push this into the .xo format
  - And kill the .xol

# Super bonus: requests

- Once we have a cache, there will be misses
- How do we collect the misses...
- ...and fulfill them next time we have connectivity
- ...or *our teacher* has connectivity