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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