One Laptop per Child

Collaboration

Network Principles; Sync and Async

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Four steps

- Make our network sane (modularize)
- Asynchronous Collaboration: Journal
- Synchronous Collaboration: MPX/VNC
- Make it better

Networking 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)
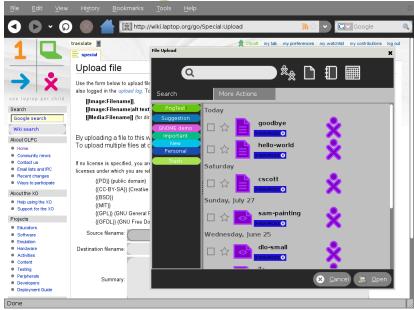 - Add protocol?

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

Asynchronous Collaboration

- Publish from the journal

- Let's see a demo!

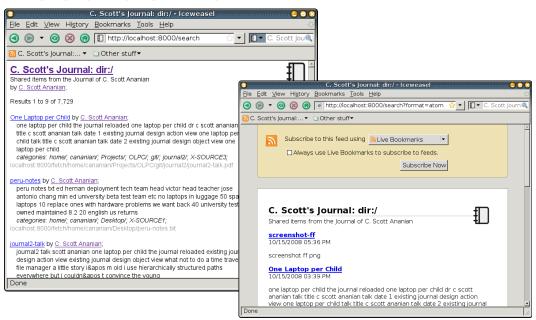- (I'm skipping a lot of the tagging stuff here)

Embedding demo (Firefox)

Bitfrost security

- Because the journal "file chooser" is out-of-process, untrusted apps don't need full access to user files

- The journal displays files, and then arranges to make available *only the selected one*

- We're also in the loop for saving, and can add metadata, etc.

I love Amazon

- Well, A9 at least
  - It died and gave us OpenSearch

- Publish journal as an OpenSearch provider
  - Can add to Firefox search bar

- Export results both as XHTML and Atom: subscribe using your favorite feed reader (or Firefox Live Bookmarks)

Feed demo

Brain-dead collaboration

- In Friends view, right click to "See Chris' shared files"

- Journal view, just like your own Journal
  - Results come via published Atom feed
  - If we're careful, results are offline cachable

Blogs

- Your published RSS feed is a very simple blog, readable from non-XOs, for free.

- For a little more control, tag some of your objects with the "blog" tag, and publish the search "in:blog" as your blog feed.

Network principles

- Hard part here is naming the remote XO
  - But that's what the first part of the talk was about!

- Blog url is:
  http://cscott.1cc.xs.laptop.org/

- See:
  http://wiki.laptop.org/go/Network_principles

Synchronous Collaboration

- Goal: **some** collaboration in **every** activity

- VNC does great, already exists

- "Launch activity in VNC session"

- MPX is the next step
  - Move my pointer on the other kid's screen

Do better

- Journal & MPX are not the **only** collaboration available

- Do better activity-by-activity

- Being able to directly represent buddies and directly connect is a great start

Next steps

- Emulate the existing Dbus-like Telepathy API

- Simple APIs for complex tasks (cf Ben Schwartz)

Bonus Slides

- Here be dragons; enter, wizards!

Depths of network 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