

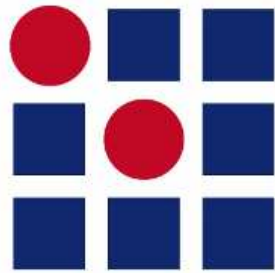


IØ - Standardization

Rob Beverly

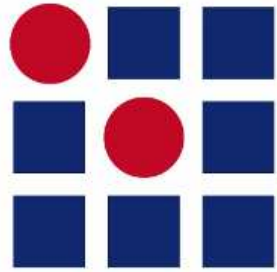
MIT CSAIL

January 16, 2007



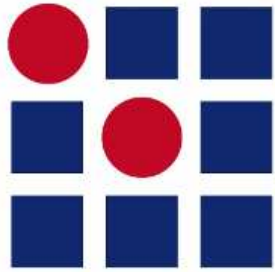
Changing Face of the Internet

- Network participants no longer just servers and humans in front of a PC
- Small, simple, inexpensive, low-bandwidth on-net devices
- InternetØ design goals:
 - Primary emphasis on simplicity and cost (both production *and* installation)
 - Not speed! Light switch does not need high bandwidth to send “on” instruction



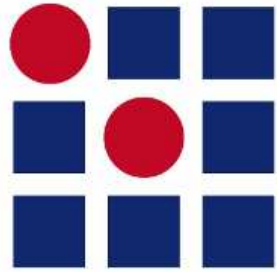
An Embedded World

- Can we apply the architectural principles embodied in the Internet (End-to-End [Saltzer, Reed, Clark], Fate-Sharing [Carpenter], etc) to this new embedded device world?
- Are there new architectural principals in this an embedded world to guide future Internet connectivity/design?



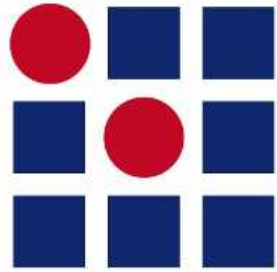
Competing Standards

- Other projects have had similar design goals
- Standards proliferation (whew!)
 - X10, HomePlug, LonWorks, BACnet, CEBus, Fieldbus, ModBus, CAN, Lin, I2C, SPI, SSI, ASI, USB, EPC, IrDA, Bluetooth, 802.15.4, ZigBee
- Each optimized for a particular domain
- Use architectural lessons of the Internet?
- InternetØ: not optimized for any single medium or application, but suitable for any



IETF Requests for Comments (RFCs)

- Internet Engineering Task Force (IETF)
- An important component of Internet's success (past/present/future)!
- Differs from formal standardization bodies (ANSI, ISO, etc)
- Open submission, no support from external institutions required
- Rounds of open peer review by Internet community
- Multiple interoperating implementations

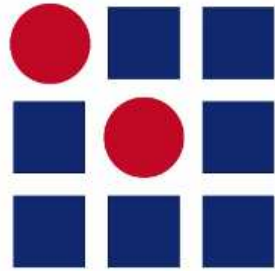


Internetø Drafts

- Two Internet Drafts submitted to IETF
- `draft-gershenfeld-thtp-00:`
 - Trivial Hypertext Transfer Protocol
- `draft-gershenfeld-i0-00:`
 - An end-to-end modulation scheme

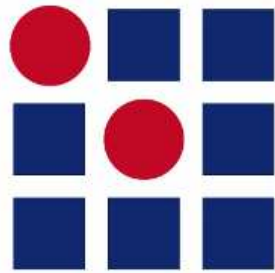


- HTTP:
 - powerful URI naming construct
 - standards based
- iO devices cannot tolerate overhead of tight HTTP/TCP coupling
- Enter THTTP: scaled down adaptation of HTTP for UDP transport



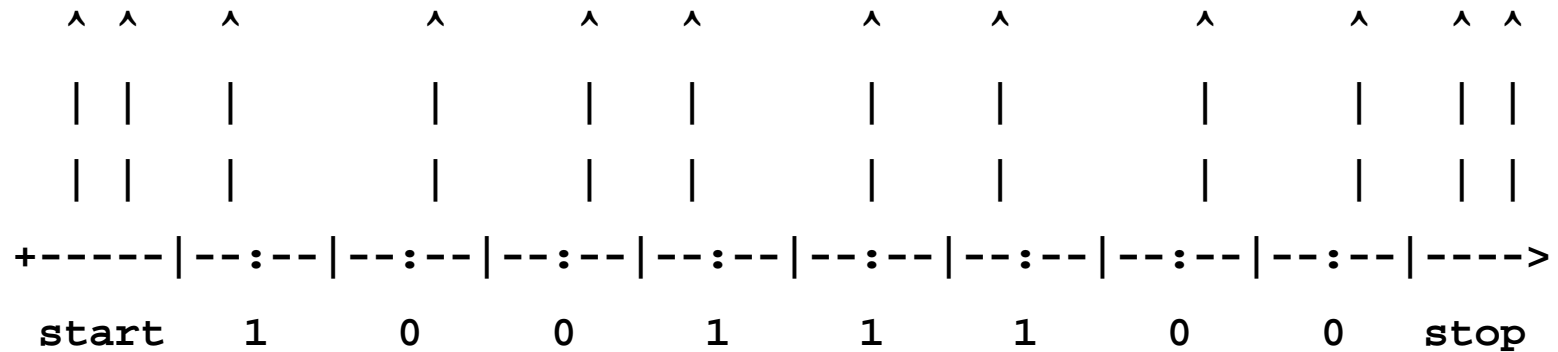
i0 End-to-End Modulation

- Simple:
 - Encode packets via pulse-position “click” impulses
- Medium Independent:
 - Same encoding scheme irrespective of underlying medium
 - Clicks as electrical, optical, radio or acoustic impulses
- Inexpensive:
 - Minimize both production, installation and debugging costs
- End-to-End:
 - Allow the same encoding scheme across interconnections between media



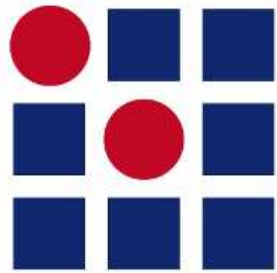
i0 Clicks

- Click byte transmission:



- Logical and physical representation the same:





InternetØ Drafts

- Informational RFCs drive “standardization” via community backing
- Quality of draft = ability to implement a working system based on that draft
- Backing from Sun, Cisco, Schneider!
- Today’s demos are working implementations of the drafts!