Putting IPv6 to work

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Protocols for the IoT: The Current State of Affairs

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Background

- Worked on ARPAnet
- Helped designed IPv6
- Created 6lowpan
- A founder of Zigbee
- A founder of IPSO
- Co-creator White House SmartAmerica Challenge
- US Representative ISO Smart & Sustainable Cities
Intro to the IoT

• Many view the IoT as:
  – Intrusive
  – Big Brother
  – Just a lot of hype
  – A way to sell us more stuff we don’t need

• The term was coined in 1999

• Internet of Things, Internet of Everything, Industrial Internet, M2M, ...
Why IPv6 for the IoT

- Great big address space
  - 8.37 trillion light years
- Stateless Address Auto-Configuration
- DHCP not required
- NAT not required
- Preserve end-to-end connectivity
- Stateless header compression
- No Gateways
Why eliminate Gateways

• Break end-to-end security
  – Multiple security domains
• Single point of failure / Single point of attack
• Complex to manage
  – Upgrades
  – Configuration
  – Security
• Added Cost
Protocols for the IoT

- IPv6
- 6lowpan – header compression
- RPL/Babel/IS-IS – routing
  - Route over vs Mesh Under
- TCP and UDP
- DTLS / TLS
- HTTP/COAP
- MQTT/DDS/AMQP/XMPP/SNMP
- IPSO Smart Objects
TCP vs UDP

- Conventional Wisdom suggests UDP for sensors
- UDP:
  - Simple, single message
  - App must deal with window size and Acks
- TCP:
  - Negotiated window size, Acks
  - Delays from RTT and 3way HS
HTTP vs COAP

• HTTP:
  – Complex headers can be large, uses TCP, TLS

• COAP:
  – Limited headers, uses UDP, DTLS
IPSO Smart Objects

- Data definition framework for the IoT
- Protocol agnostic
- Framework and Starter Pack available now
- Extension Pack coming soon
- Interop Event in May
IoT Alliance Landscape

• IPSO Alliance
  – Promotes use of open standards across the IoT
  – Why and How to use IP for the IoT

• Industrial Internet Consortium
  – Architecture, protocols and security for industrial application

• Open Interconnect Consortium
  – IP based, open source
  – COAP and IPSO Smart Objects
  – Certification
IoT Alliance Landscape

• Thread Group
  – IP based
  – 6lowpan, COAP, DTLS, Zigbee ZCL

• Open Mobile Alliance
  – Lightweight M2M, IPSO SO

• AllSeen
  – IP based

• OneM2M
  – IP maybe
IoT Privacy and Security

Security is a technology  ~  Privacy is a policy
IoT Device

- Battery Operated
- 3-D accelerometer
- Temp Sensor
- Light Sensor
- 802.15.4
- IPv6/6lowpan
- Multi-year battery life
- Coin Flip application
Getting Involved – IPSO Challenge

• Goal: To find innovative ideas, products, prototype showing benefits of IP
• Now accepting entries; completes in December
• Over $25K in prizes
• New feature this year: dev hardware and software
• http://challenge.ipso-alliance.org
Thank you

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