Benefits of IP
In IoT and M2M systems

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Chair 6LoWPAN
Building the Internet of Things:
New protocols need not apply
IP is Essential

Leverage existing knowledge, tools, protocols, experience

Support for multiple PHYs

End to end connectivity, security

No gateways/translation
But – *Is v6 essential*

Need the address space

SLAAC is good

No NAT!

Better header compression
6Lowpan is a mechanism to fit IPv6 into small data frames and improve transmission efficiency.
MUST HAVE SOMETHING TO DO WITH WIRELESS TECHNOLOGY...
6LowPAN Compression
Not just for 15.4

Originally designed for IEEE 802.15.4

Draft to use with Bluetooth Low Energy

Power Line Control (P1901.2, G3)

Low Power WiFi
Inventing new protocols

- Zigbee - delayed the market by years
  - Only recently adopted IP (for Smart Energy)
  - Multiple non-interoperable stacks
- COAP – interesting but not required
  - HTTP can be made small
  - TCP can be improved
- RPL – good for specific scenarios
  - AODV, OLSR, DSR, even RIP work just fine

“Premature optimization is the root of all evil”

– Donald Knuth
IPSO Application Framework

- IPSO Alliance – www.ipso-alliance.org
  - 60+ member companies promoting IP in sensor/control, M2M and IoT applications
- Application Framework
  - Application agnostic
  - "Restful" compatible – COAP or HTTP
  - License Free
Contributors:
Aidon Oy ~ Concept Reply ~ ConnodeCubic GTS ~ Econocom ~ ElectroTest Sweden ~ Eliko Elster ~ Emerson ~ EPRI ~ Google ~ Inria ~ ISMB ~ Lulea Univ of Tech ~ MAXFOR Maxim Integrated Products ~ Millennial Net ~ Nokia ~ Novo ~ Sensus ~ Synapse Wireless Tampere Univ of Tech ~ Texas Instruments ~ TMC ~ UTRC-I ~ Watteco ~ WISENET
About IPSO:
The IPSO Alliance is the leading organization promoting the use of Internet Protocol (IP) for smart object communications for use in energy, consumer, healthcare and industrial applications.

Vision:
Providing the foundation for a network that will allow any sensor-enabled physical object to communicate to another as individuals do over the Internet.

Value Proposition:
Create awareness of available and developing technology with IP for Smart Objects
Coordinate marketing efforts to complement the standard work of the IETF
Support, organize and market interoperability events
Really, IP for stand-alone M2M?

Most computing devices use IP
No matter if isolated, private or public

Software and tools use IP

Knowledge, tools and protocols apply equally
Embedded IP – it can be small

<table>
<thead>
<tr>
<th>Layer</th>
<th>6LowPAN</th>
<th>Zigbee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packet Size</td>
<td>3 to 12 bytes</td>
<td>14+ bytes</td>
</tr>
<tr>
<td>Code Size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End Node (RFD)</td>
<td>11K</td>
<td>64K+</td>
</tr>
<tr>
<td>Routing Node (FFD)</td>
<td>17K</td>
<td>128K+</td>
</tr>
<tr>
<td>RAM</td>
<td></td>
<td></td>
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<tr>
<td>End Node (RFD)</td>
<td>2K</td>
<td>8K</td>
</tr>
<tr>
<td>Routing Node (FFD)</td>
<td>4K-8K</td>
<td>8K+</td>
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<th>Layer</th>
<th>End Node (RFD)</th>
<th>Routing Node (FFD)</th>
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<tbody>
<tr>
<td>Socket</td>
<td>11K</td>
<td>64K+</td>
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<tr>
<td>SNMP</td>
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<tr>
<td>TFTP</td>
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<td>HTTP</td>
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<tbody>
<tr>
<td>IPv6 Layer</td>
<td></td>
<td></td>
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<tr>
<td>UDP / TCP</td>
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<tr>
<td>Application and other layers</td>
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<tbody>
<tr>
<td>IEEE 802.15.4 Physical Layer</td>
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<tr>
<td>IEEE 802.15.4 MAC layer</td>
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<tr>
<td>IP Adaptation Layer (6LoWPAN)</td>
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**IP Capable Modules**

- GPS Enabled
- 15.4 to Ethernet Bridge
Coin Cell Module

✓ Battery Operated
✓ 3-D accelerometer
✓ Temp Sensor
✓ Light Sensor
✓ 802.15.4
✓ IPv6/6lowpan
✓ Multi-year battery life
✓ Coin Flip application
IPv6 Enabled Light Bulb
A Use Case

Internet
A Use Case
New Product Idea

The IPv6 Ready Ethernet Cable
Thank you

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