Coming soon…
The Internet of Things

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Why IP for Wireless Sensor Networks?

- Standardized and open protocol
- Interoperability
  - between different sensor networks
  - with existing IP networks
- Link-layer agnostic
- Reuse established protocols running in the Internet
  - Transport protocols
  - Easy management and troubleshooting
  - End-to-end security
  - etc

Two Key Steps to Establish IP as the Protocol for Wireless Sensors

- IPSO
  - The IP for Smart Object alliance
  - Marketing effort

- Contiki - µIPv6
  - Joint project between Cisco, SICS, and Atmel
  - The smallest, open-source, IPv6 Ready stack

TIME IN PARTNERSHIP WITH CNN

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30. The Internet Of Things

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In September, a group of high-tech companies that includes Cisco and Sun formed the IP for Smart Objects Alliance. Simply put, the organization intends to create a new kind of network that will allow sensor-enabled physical objects — appliances in your home, products in a factory, cars in a city — to talk to one another, the same way people communicate over the Internet.

ILLUSTRATION FOR TIME BY CHRISTOPH NIEMANN

Objectives of IPSO

- Create awareness of IP technology for Smart Objects
- Generate tutorials, white papers and use cases
- Support the IETF
- Combine / coordinate member marketing efforts
- Organize interoperability events

The IPSO Alliance Funding Members

www.ipso-alliance.org

PicosNet

ROAM

EDF R&D

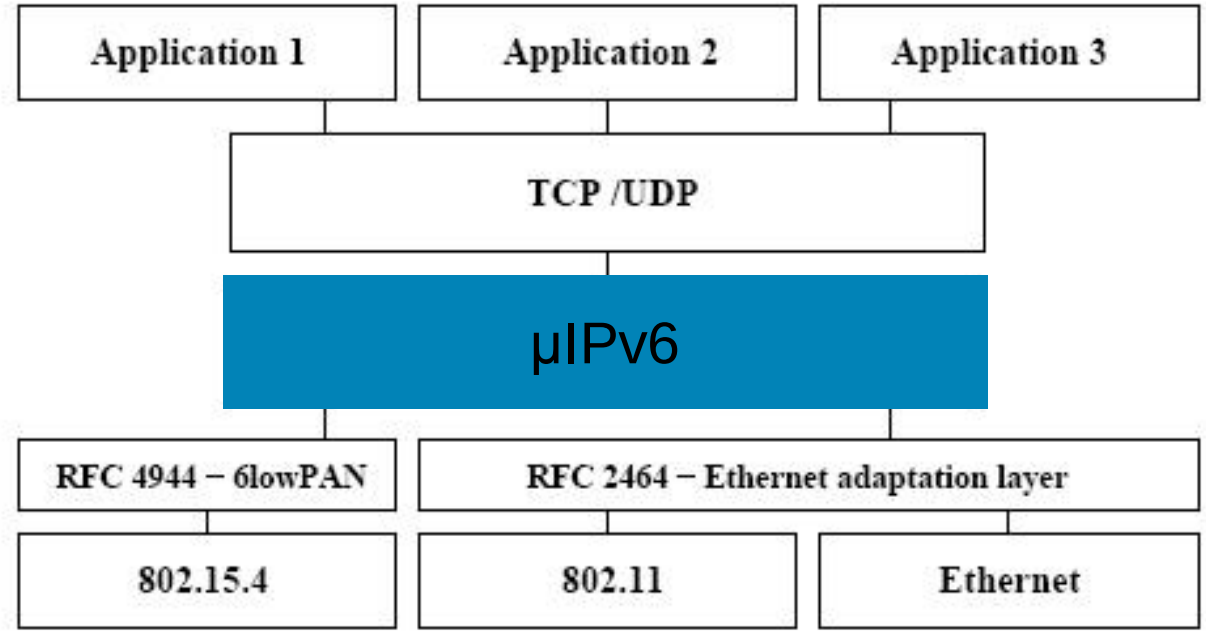
Kinney
Consulting

The µIPv6 Stack – Overview

- Open-source
  - Released in October, now part of Contiki 2.2.2
  - Available for commercial and non-commercial use
- Small footprint
  - Code size ≈ 11.5 KB
  - RAM usage ≈ 0.2+1.6 =1.8KB
  - Fit on the most constrained platforms
- Certified
  - IPv6 Ready Phase-1 Logo
  - Interoperable with stacks of all main vendors

3 addresses, 3 prefixes, 4 neighbors, 2 routers + a 1280 packet buffer

The µIPv6 – Design



- IPv6 Specification (RFC2460), and IPv6 Addressing Architecture (RFC4291)
- Neighbor Discovery (RFC 4861)
- Stateless Address Autoconfiguration (RFC4862)
- ICMPv6 (RFC4443)

Feedback to IETF

- Fragmentation
- Per neighbor buffering

space

- Avoid large packets – ICMP errors

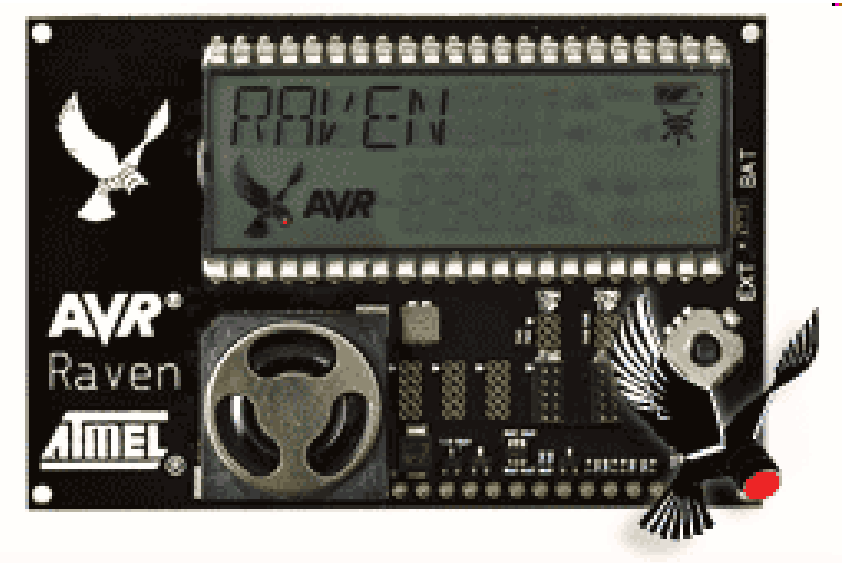
power

- Neighbor cache updates
- Options and extension headers processing

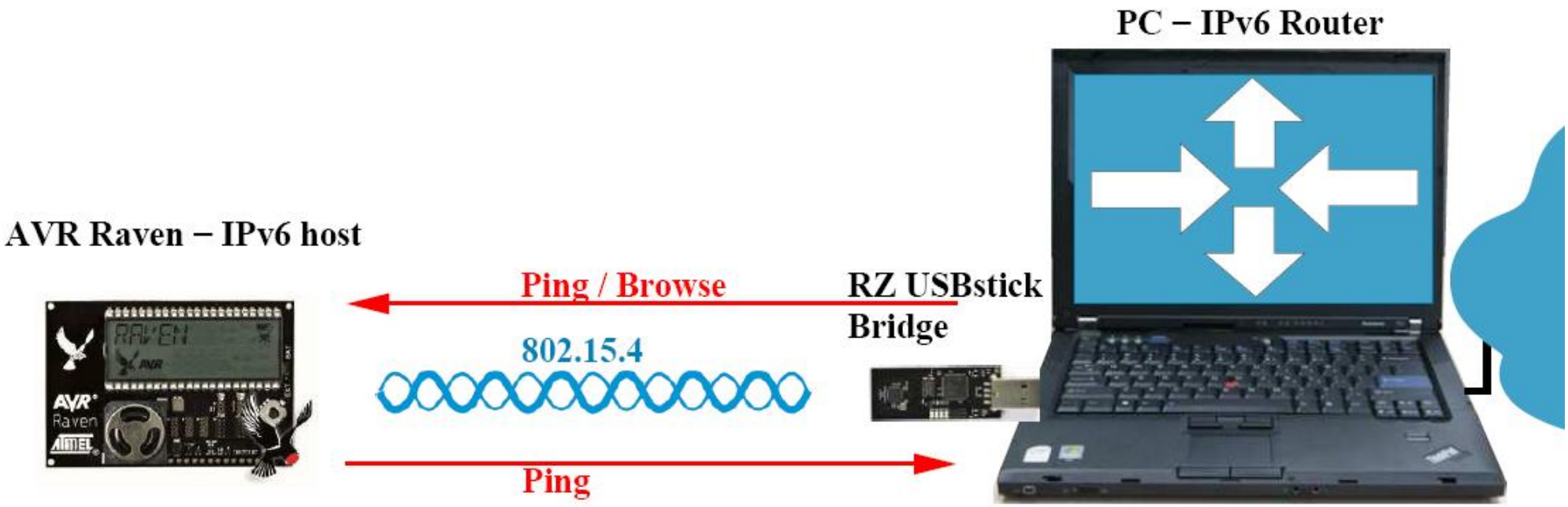
complexity

The Platform – Atmel's AVR RAVEN

- AT86RF230
  - 2.4GHz transceiver
- ATmega1284P
  - Communication stack
  - 128KB Flash, 16KByte SRAM
- ATmega3290P
  - User interface
  - Audio



Sensys 2008 Best Poster Award



MAC	**02:11:11:ff:fe:11:11:11**
Link-local IPv6	**fe80::11:11ff:fe11:1111**
Global IPv6	**aaaa::11:11ff:fe11:1111**

Default Router

Advertizes prefix aaaa::/64

Summary

The *Internet of Things* is happening

Marketing tool = IPSO

IP to the sensors = µIPv6