Communications in IoT

Communications

Joseph Kehoe[1]

[1]Department of Computing and Networking
Institute of Technology Carlow

CDD101, 2017

Table of Contents

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Table of Contents

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Connectivity

- Connectivity is the next great step in computing
- Reduced size and power allows devices to become invisible
- and also to be everywhere
- Being continously connected gives them immense potential

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

What we look for

We judge communication technologies by:

- Speed of data transfer (including latency)
- Coverage provided
- Power Requirements
- Cost
- Reliability
- and ...

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Table of Contents

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Network Architectures

- Client Server
  - Can be tiered
  - Central node(s) act as servers
  - Other nodes work through servers
- Peer 2 Peer
  - No hierarchy
  - All nodes equal
  - Robust

Mesh Networks

- Allows new nodes to join and leave network easily
- Robust
- allows nework to grow "organically"

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Protocols

6LowPAN

- Based on IPv6
- Uses a Mesh architecture
- Robust Scalable, Self healing

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Protocols

Thread

- Based on IPv6 and 6LowPAN
- Compliment to WiFi
- Mesh Network (up to 250 nodes)
- Includes Authentication and Encryption

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Table of Contents

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

WiFi

- in most homes/offices
- 2.4 and 5GHz
- Range 50M
- 600 Mbps (but 150-200 more typical)

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Cellular

- Coverage is almost complete
- cost per message
- 900/1800/1900/2100 MHz
- Range 35km (GSM) 200km (HSPA)
- 35Kbps to 10 Mbps

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Bluetooth

Bluetooth Low Energy or Bluetooth Smart

- 2.4 GHz
- Range 50-150M
- 1 Mbps
- Small data transfers
- In most (all) smartphones

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Table of Contents

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

NFC

Near Field Communication

- used for contactless payment
- soon to be in most phones
- 13.56 MHz
- 10cm
- 100-420 Kbps

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

ZigBee

Designed for Industrial automation

- Relaible and low latency
- Impervious to interference from WiFi/BLE/ZigBee
- Mesh Networks (232 nodes)
- Simple protocol
- 900 MHz
- 30M
- 9.6/40/100 Kbps

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Z-Wave

Designed for Home automation

- Low power, high security and scalability
- 2.4 GHz
- 10-100M
- 250 Kbps

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

Table of Contents

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

SigFox

- UNB (Ultra Narrow Band)
- 50 microwatts versus 5000 for cellular
- 20 year stand by time for 2.5A battery
- Closed source
- Infrastructure in place
- 900 Mhz
- 30-50km
- 10-1000bps

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster

LoRaWAN

- Open Source
- Low Power
- uses television white space frequency
- 2-5km
- 0.3-50Kbps

Institiúid Teicneolaíochta Cheatharlach
INSTITUTE of TECHNOLOGY CARLOW
At the Heart of South Leinster