Low Power Wide Area Networks (LPWAN) Overview and Applications

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Several technologies are vying to capture an emerging wide-area IoT connectivity market.

* Ericsson Mobility Report, November, 2016
** Cisco VNI, February, 2016
Mapping of LPWA Technologies

- **Long Range**
  - **Low Power Cost**
    - LPWA
      - NB-IoT, Cat-m1
    - Wi-Fi
  - **High Power Cost**
    - EGPRS, 3G, LTE

- **Short Range**
  - **Low Power Cost**
    - Bluetooth, ANT, NFC ...
  - **High Power Cost**

**Key Differentiators**:

- Power-optimized, on demand spot connectivity
- Digital on/off applications with a few messages per hour
- Multicast/broadcast, traffic symmetry are key differentiators among LPWA technologies
LPWA have an advantage in leveraging Cloud services and Big Data techniques to provide differentiated services.
IoT Applications to Technology Mapping

- **Cost**
  - (business case)
  - Connectivity
  - Support & maintenance
  - Initial capex
  - Recurring Opex
  - Design & integration
  - Hardware

- **Performance**
  - (Technology: demand = supply)
  - Security
  - Reliability
  - Latency
  - Throughput

- **Scalability**
  - Simple (plan, deploy, maintain)
  - Operational scalability
  - Business process
  - Technology scalability

- **Regulatory & Policy**
  - Spectrum
  - Incentives
  - Barriers to adoption
Wide Area IoT Use Cases

Aircraft data to airlines & suppliers
Global security tracking
Movement monitoring of elderly persons
Bike tracking

Real-time parking data
Diabetes monitoring
Connected alcohol immobilizer
Car rental process management

Industrial gas monitoring
Home security
Electric vehicle charging station connectivity
Compressor waste bins

ARPU ~$10/month ➔ with LPWA ARPU to reach lower value, e.g. $10/year ➔
Requirements for optimized cost / efficiency
Cellular IoT Application Distribution
An Example: Large & Medium Canadian Enterprises

- Average number of devices deployed per enterprise: 5,220
- 54% of projects used both wireless and wireline connectivity
- Wireless only solutions found in 28% of IoT projects
- Main platform or application deployed internally or on-premise in 72% of cases
- Cloud or hosted solutions are used in 28% of cases

Note: The survey is focused on how enterprises are using IoT and excludes many types of IoT deployments related to infrastructure businesses such as electric, water and gas utilities.

Source: TELUS/IDC Internet of Things Study 2014 (n=209)
LPWA Service Provider: Senet

- Network: 150+ Base stations covering ~40,000 sq. miles in the US
  - 20,000 Semtech LoRa sensors to track propane and oil tank fuel levels
  - Monitor cost: $40; monitoring fee: $2.45 / mo

- Services
  - Tank monitoring & automation (propane, heating oil)
  - Water metering (to come)
  - Water irrigation (to come)

- Data Aggregation Platform
  - Scalable Cloud-based server farm
  - Multiple Platforms for data access (Web Services/FTP)
  - Value add applications, metrics

Value proposition: On average, oil delivery drivers visit each customer six times per year. They typically make the delivery runs when the tanks are filled at 50%, which is at a cost per delivery of $50-100. With IoT, they can deliver at 20% capacity, saving two deliveries per customer per year. If they have between 10,000-15,000 tanks, that’s $1-$1.5 million a year in savings.

http://www.senetco.com/
LPWA Application Provider: Worldsensing

Fastprk Street Parking

- When a car parks over the sensor, it is detected automatically
- The occupancy is instantly reported to users via apps and illuminated panels in the street
- Central control gets real time analytics about parking bay occupancy
LPWA Applications

**Smart Cities**
- Alarms
- Fire detection & protection
- Building automation / control systems
- Elevator communications services
- Energy operations
- Transportation facilities
- Construction site equipment & machine monitoring
- Intelligent traffic management
  - Parking space management / payment
  - Congestion charging and road tolls
  - Traffic volume monitoring
  - Connected road signs, traffic lights and enforcement cameras and in-vehicle congestion and toll devices
- Environment and Public Safety
  - Street lighting
  - Waste collection
  - LPWA compatible with Smart City applications

**Automotive**
- Insurance
- Security & tracking
- Lease, rental, share car management

**Healthcare**
- First responder connectivity
- Connected medical environments
- Clinical remote monitoring
- Clinical trials
- Assisted living
- Worried well personal monitoring

**Environment & Agriculture**
- Environmental monitoring
- Land agriculture
- Fishing
- New energy sources

**Cellular**
- Most suitable for automotive segment

**Short range and cellular are primary in healthcare**

**LPWA**
- Most compatible

**LPWA Applications**

- Cellular most suitable for automotive segment

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How the Market Is Shaping Up

Video surveillance, electronic billboards, automotive infotainment
- Requirements: > 1 Mbps, Cost tolerant, power available
- Technology: LTE Cat-1

Smart home, connected cars / telematics
- Requirements: < 1 Mbps, Cost sensitive, power available
- Technology: LTE Cat-1, Cat-m1, SRWA

Sensors & meters, smart city, agriculture, environment, transport, industry
- Requirements: Unidirectional / non-symmetric traffic, < 100 kbps, cost sensitive, low power
- Requirements: Multicast / broadcast, High-reliability
- Requirements: Low-latency
- Technology: LPWA, Cat-m1, NB-IoT, SRWA

SRWA: Short range / wide area; peer-to-peer protocols
Opportunities for IoT Service Providers

• Business Considerations
  – Most LPWA connections will generate only minimal connectivity revenue (~$2-$3 / device / year)
  – Service providers will want to increase their revenue by providing end-to-end and support solutions in order to maintain their relevance in the value chain
  – Strategic importance of data management and analytics services
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