



LoRa WorkShop

Daniel Quant
VP Product Management
& Strategic Marketing

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MultiTech



- 45+ years focused on Machine-to-Machine (M2M) Communications
- 80+ patents
- 22+ millions devices, thousands of customers worldwide
- U.S. based Engineering, Manufacturing, Certifications and Support
- Top 100 M2M Company
- The “Go To” Partner for your Connected Strategy
- Product Design and Certification Services – Connected Development



FM31060



FM 586973



Broad Family of Products

MULTITECH
CREATE • CONNECT • COMMUNICATE

Programmable Gateways for the Internet of Things

Industrial Grade M2M Modems & Routers

Embedded Modems

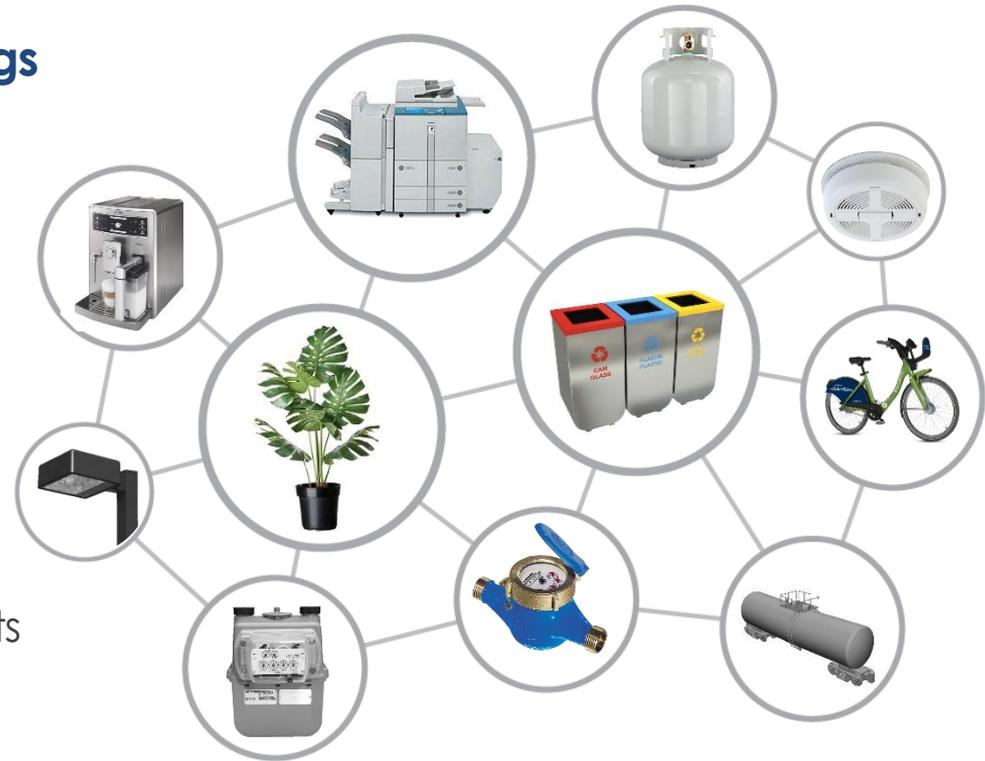
Plug & Play Wireless Dongles

Developer Kits & Support

Connectivity Has Challenges

Connecting the Internet of Things

- Long battery life (5+ yrs)
- Low cost communications
- Range & in-building penetration
- Outdoor & harsh environments
- Low cost infrastructure
- Robust communications
- Permits mobility
- Scalable
- Low touch - Easy to attach assets
- Highly fragmented connectivity



IoT Needs a New Network and its LoRaWAN

Feature	LoRaWAN Now	Sigfox Now	LTE Cat-1 2016	LTE Cat-0 2018	LTE Cat-M 2020??
Modulation	DSS with Chirp	UNB / BPSK	OFDMA	OFDMA	OFDMA
Rx bandwidth	125 KHz	200 Hz	20 MHz	20 - 1.4 MHz	200 KHz
Data Rate	287 - 22K bit/sec	100 bit/sec	10 Mbit/sec	1 Mbit/sec - 200 Kbit/sec	10-20K bit/sec??
Max. # Msgs/day	Unlimited	UL: 140 msgs/day DL BC: 4 msgs/day	Unlimited	Unlimited	Unlimited
Max Output Power	20 dBm	20 dBm	23 - 46 dBm	23/20 dBm	20 dBm
Link Budget	154 dB	151 dB	130 dB+	146 dB	150 dB
Communication channel	Half Duplex	Quasi Half Duplex	Full Duplex	Half Duplex	Half Duplex
Power Efficiency	Very High	Very High	Low	Medium	High
Complexity	Very Low	Very Low	High	Medium	Low
Coexistence	Yes	No	Yes	Yes	Yes

MultiConnect[®] mDot[™] - Long Range, Low Power RF

Connecting the “Things”

Programmable LoRaWAN ready Module

- **Low touch install**
 - Works out of the box with MultiTech Conduit Gateways
- **Powerful ARM Cortex-M4 processor**
 - Easy to customize – Config, monitor and control field assets
 - Bring decision making to the very edge
- **Rich development environment via ARM's mbed ecosystem**
 - Developer friendly mbed Libraries to abstract away the complexity of managing the radio
- **FCC/CE Certified module, built in security, middleware protocols and radio support**
 - Over-the-Air firmware upgrades, app hosting, device management via DeviceHQ



mDot Interfaces:
**Analog, Digital,
UART, I2C, & SPI**

MultiConnect[®] Conduit[™]

Connecting the Internet to the Things

Manage Thousands of End Points

- mDot - Inexpensive 2-way LoRaWAN ready module
- Industry certified, up to 10 miles range

Private, Public & Managed Deployment options

- Single tenant, private network – your data your way!
- Single / multi tenant public managed network

Connectivity

- Connect any field asset with mCards incl LoRa
- 4G-LTE, 3G, 2G or Ethernet backhaul

First Application Store for Things - DeviceHQ

- Customize, deploy, manage & scale globally



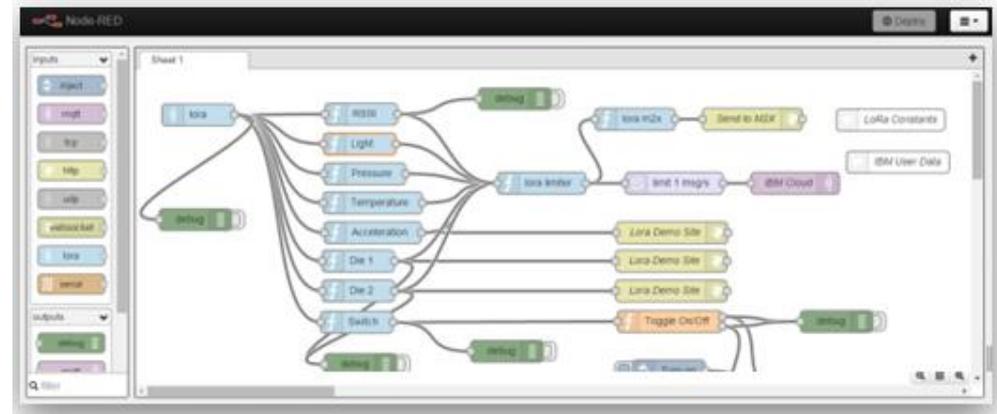
Application Development- Node-RED

Open up to other user groups

- Library of defined nodes

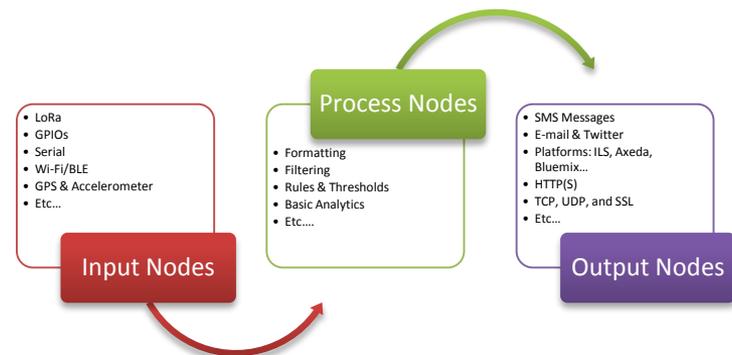
Your Data Your Way

- Graphical programming through Node-RED integration



Structured Customization

- Library of defined nodes
- Nodes = inputs, functions or outputs
- Nodes have structured variables
- Nodes can be created by users



DeviceHQ

Reduce cost and complexity of remote device management

- Simplify field deployment of gateways with zero touch provisioning

Enable intelligence at the edge of the network

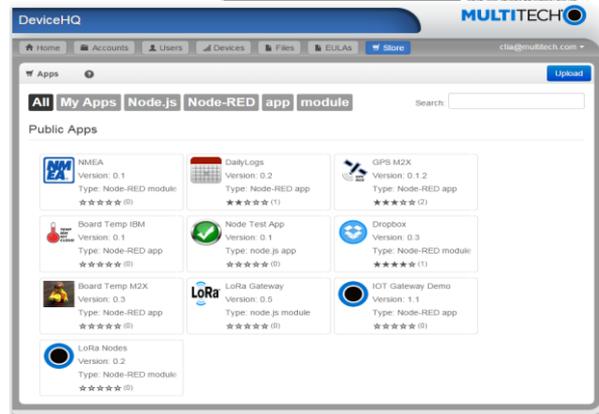
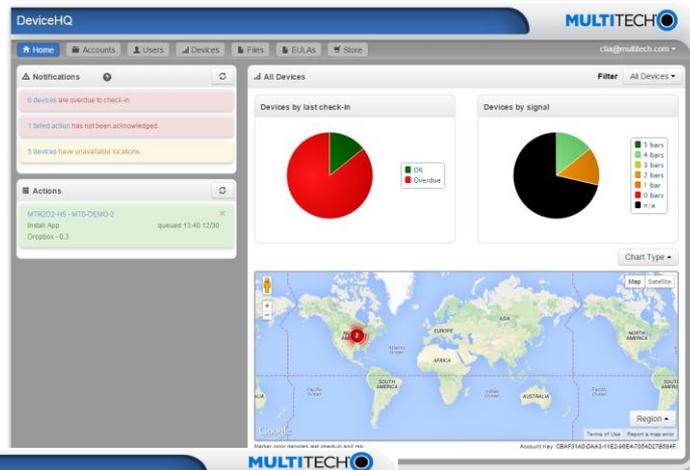
- Process events at the point of incident

Open to Developers

- Reduces cost of developing custom apps

Scale network deployment

- Go from a single unit to many quickly & easily



LoRaWAN Site Survey – The Elevator Ask

Need:

- Control & Monitor elevator equipment, often located under ground, 50K(NAM)/ 200K(Global) TAM
- Used Analog - difficult to find, cellular - signal often not received, tried many other approaches with no satisfaction ...

Survey Equipment:

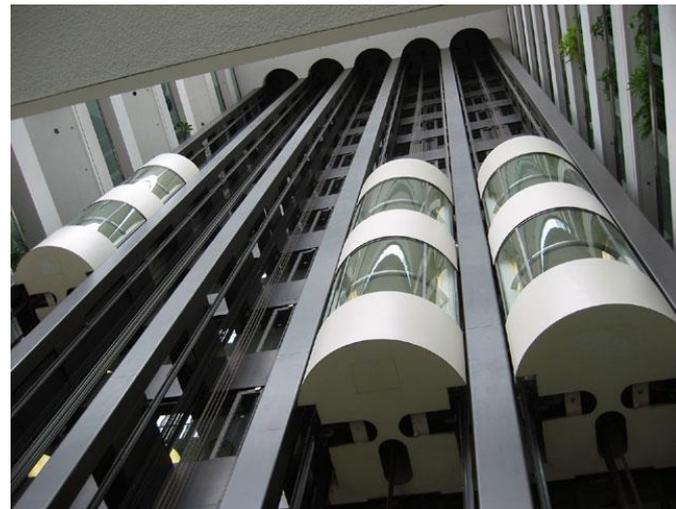
- 1 Conduit-LoRa 915 MHz Gateway
- 1 Handheld mDot 915 MHz site survey transceiver

Location:

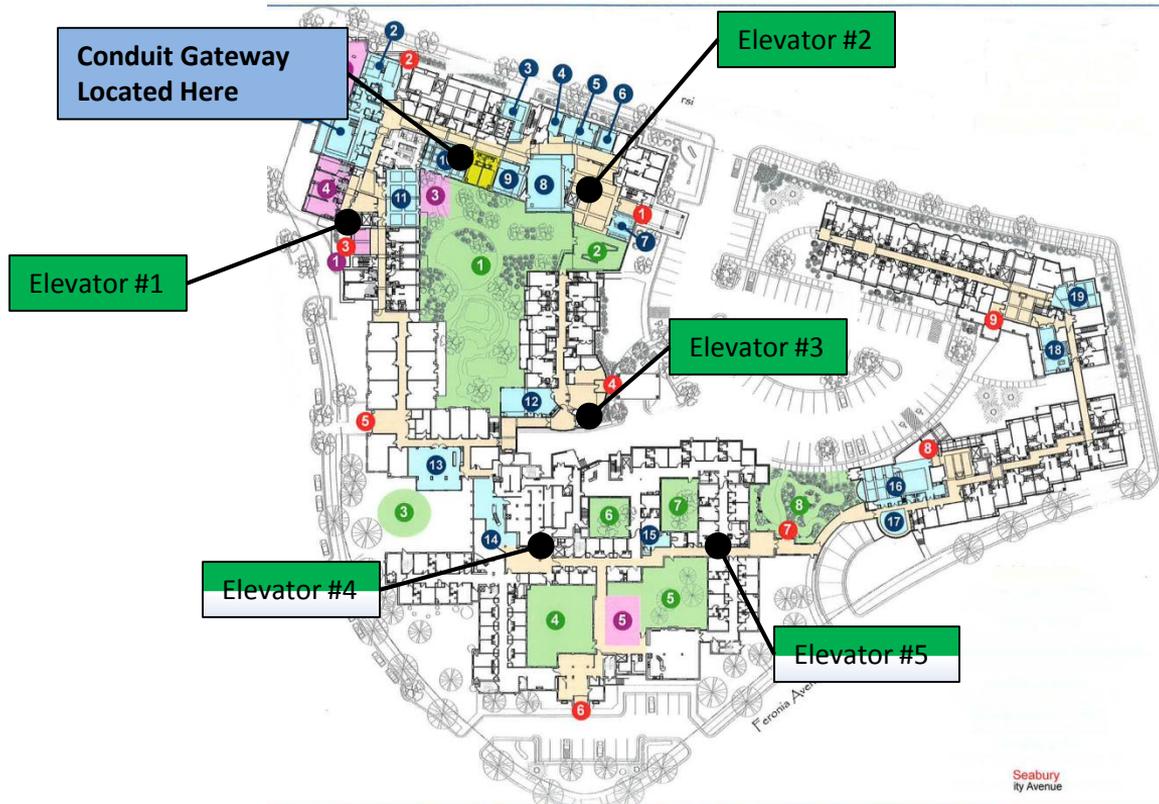
- Elevator company - St. Paul, MN USA
- Conduit was located on a table using standard antenna.
- Antenna oriented in vertical position

Methodology:

- Each elevator maintenance room (#1-3) was surveyed
- Measurements taken from within sealed room



LPWAN Site Survey – The Campus

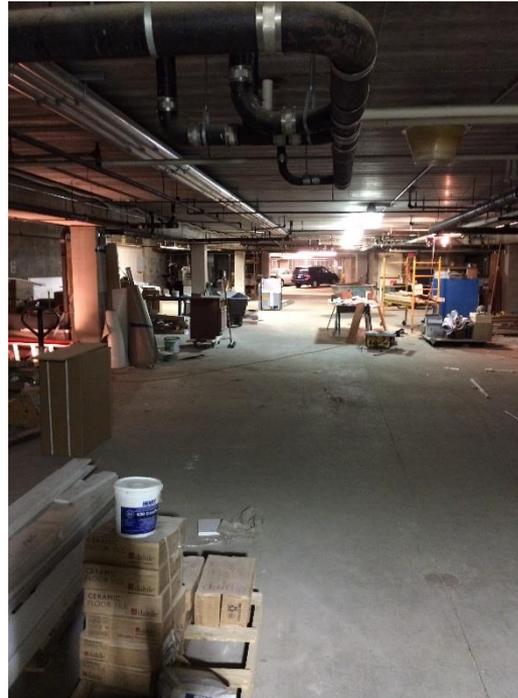


Notes:

Conduit configured at 14dBm transmit power (not the max)

1. Main Building: Entire main building was covered with a single Conduit gateway
2. Secondary Building: Elevators #4 & #5 could be heard by Conduit, some packet loss in downlink

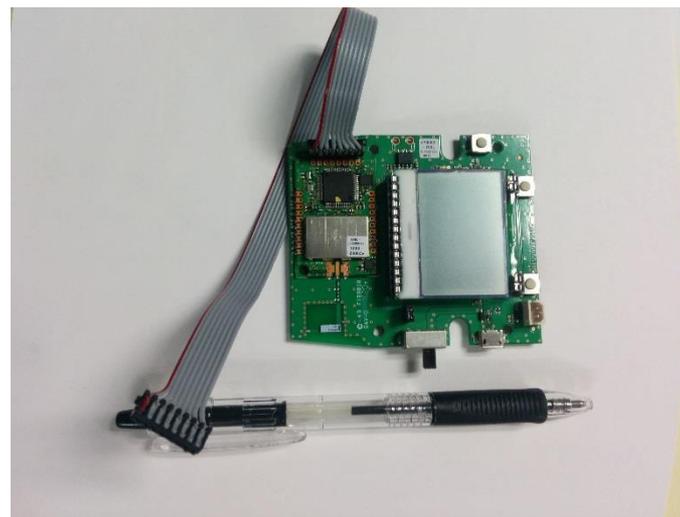
LoRaWAN Site Survey - Basement Action



mDotBox Evaluation Kit

Intelligence to the Edge:

- Monitor and harvest sensor data and asset behavior
- Control remote appliances and devices
- Create more actionable information and act on it
- Optimize radio performance and usage
- An ARM mbed.org platform with developer libraries
 - <https://developer.mbed.org/platforms/mdotevb/>



4 sensors and LCD screen
connected to an mDot LoRaWAN
ready module

1. Temperature
2. Light
3. Pressure
4. 3-D Accelerometer



Daniel Quant
VP Product Management &
Strategic Marketing
dquant@multitech.com

www.multitech.com