Your LoRa Hardware Partner

BOCON
博控自动化
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www.bocon.com.cn
Tel: 010-51663110
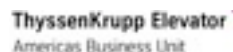
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MultiTech

- 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

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Brands That Trust MultiTech

AVAYA   Medtronic   GE imagination at work   Honeywell   Coca-Cola   United Technologies

FedEx   Sun Microsystems   Boston Scientific Advancing science for life™   Johnson Controls   ProTech   SIEMENS

EATON Powering Business Worldwide   HACH   Fresenius Medical Care   RAIN BIRD   tyco   PEPSICO

HARRIS   PHILIPS sense and simplicity   Landis+Gyr manage energy better   EMERSON   APC by Schneider Electric   NCR

Lat-Lon   DELL   PitneyBowes   TRANE   xerox   DOOSAN

BOSCH Invented for life   DAKTRONICS   ThyssenKrupp Elevator Americas Business Unit   hp invent

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Key Alliances

4

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MultiTech Key Vertical Markets

Transportation
- Asset Tracking
- Fleet Management
- Parking Meters/ Terminals
- Driver behavior

Energy
- Energy Monitoring
- Smart Grid
- Renewables/Wind
- Car Charging Stations
- Utility Controls
- Environmental Monitoring

Healthcare
- Home & Mobile
- Tele-Monitoring
- Disease Management
- Assisted Living

Finance
- ATM
- POS
- Temporary Kiosks
- Vending Machines
- Cash Registers

Monitoring
- Asset Monitoring
- Security & Surveillance
- Remote Service Alarming
- Smart Robotics
- Smart Metering

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Manufacturing and Quality

- On-site Manufacturing
- Maximum control and flexibility
- 100% functional testing
- Global Forward and Reverse Logistics
- Custom Manufacturing
- Activation, provisioning & testing
- Highly trained and cross-trained workforce with an average tenure of more than 15 years
- ISO 9001: 2008 certified
- ISO: 13485 certified, a step above ISO: 9000
  - Traceability of parts down to the component level

FM31060

FM 586973

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Why MultiTech?

Superior Quality

From our US-based manufacturing plant to our countless product and process certifications, we're committed to the utmost quality in everything we do.

That's why you can find more than 22 Million MultiTech products performing essential duties for businesses around the globe.

Service Excellence

From our comprehensive portfolio to the extensive reach of our distribution network, MultiTech is easy to choose and easy to buy.

Thanks to in-house manufacturing and custom design services; broad-reaching expertise and fast, agile development we deliver customization and flexibility you simply can't get anywhere else.

History of Innovation

From the earliest analog systems, to the cellular heart of today's industrial Internet of things to the latest low-power wireless technology, MultiTech has consistently connected businesses in ways previously unimaginable – and has been doing so for more than 40 years. We have no intention of slowing down.

We're continuing our legacy of firsts with the world's first commercially deployable LoRA-based suite of communications devices.

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Agenda

1. Low-Power, Wide Area (LPWA) IoT Market
2. Conduit Intelligent Gateway Platform
   A. mCards for Conduit
   B. mLinux vs. Node Red User Target Profile
   C. mDot and the ARM® mbed Partnership
   D. mDot Value and Intelligence at the Edge
   E. DeviceHQ
   F. Pricing & Delivery
   G. Common Conduit Platform Ordering Scenarios

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Low Power Wide-Area IoT Market

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The Internet of Things Market is Large and Growing Fast

Estimated that **14 Billion** devices are connected today

- **50 Billion connected devices by 2020** – Cisco, Ericsson

- **1.5 Trillion by 2030** – Samsung

- **300 Billion IoT supplier revenue** – Gartner

- **7.1 Trillion IoT solutions revenue** – IDC

- **5 Billion connection by 2022 will be on LPWA** – Strategy Analytics

ERICSSON

CISCO

SAMSUNG

Gartner

IDC

STRATEGY ANALYTICS

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LPWA target requirements
Low-Power, Wide-Area (LPWA)

Many of the next wave of devices to be connected will be fixed location sensors that:

- Must operate on batteries for 7 to 10 years
- Will send less than 1,000 bytes of data a day
- Must be extremely low cost to buy and operate
- Indoor units will need good building penetration
- Outdoor units will need exceptional range
- Security will be a major issue

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A New Network – LoRa®

To meet the needs of new IoT devices, MultiTech has partnered with Semtech, ARM®, IBM and others to deliver a low cost network platform using LoRa

Semtech provides the LoRa radio chip
- 15 mile outdoor range
- 2 mile indoor range

ARM® provides mBed operating system
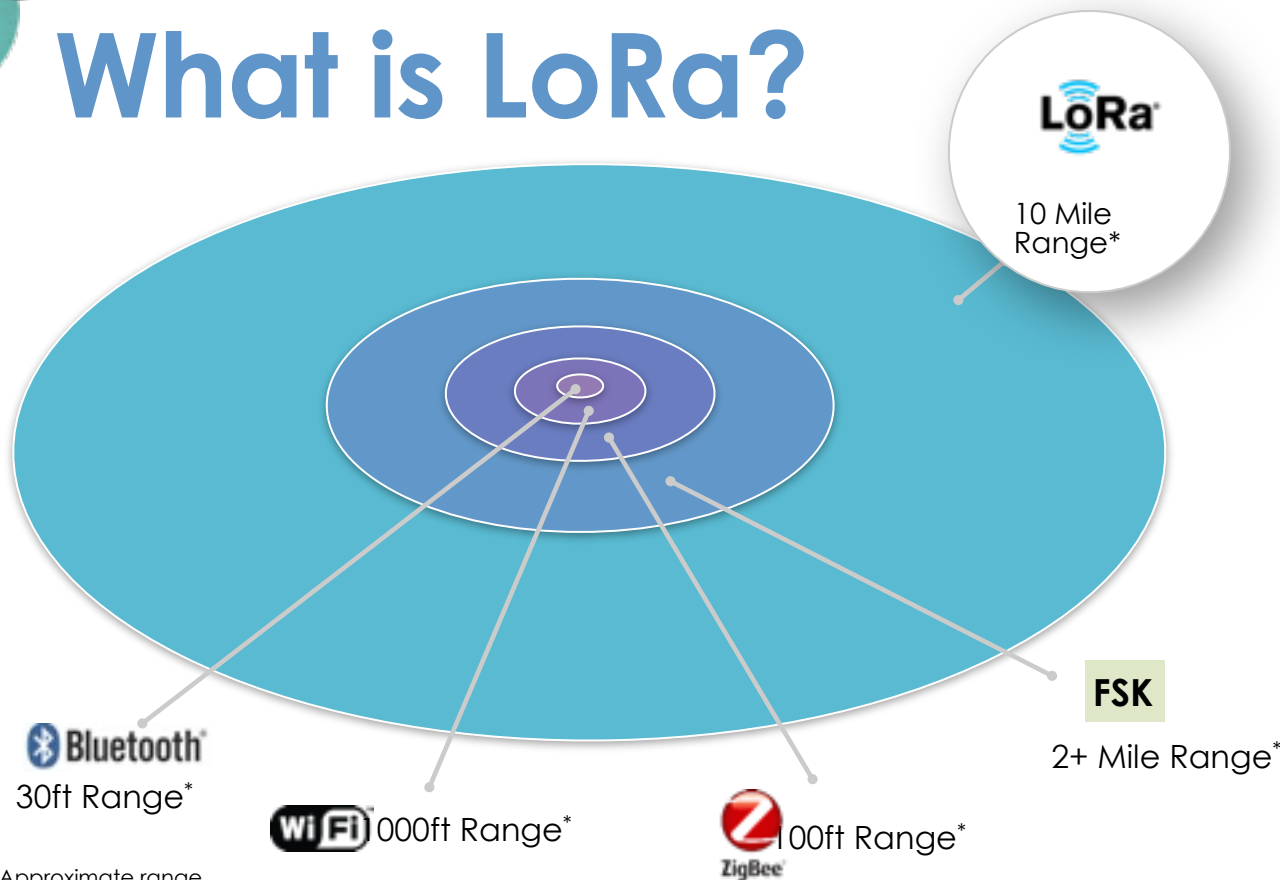- Intelligence at the edge

IBM Research
- Software and platform

The LoRa® name and associated logo are trademarks of Semtech Corporation or its subsidiaries.

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What is LoRa?

LoRa
10 Mile Range*

LoRa

Long range and low power
At +14dbm output power, 868MHz
- In Sub-GHz>5km dense urban >13km suburban > 80VLOS

Robust communication
- Not susceptible to interference from Wi-Fi, Bluetooth, GSM, LTE, etc

High accuracy localization and ranging
- Modulation format permits high accuracy localization
- Not RSSI based and accounts for multi-path and fading
- Permits high volume additional features

Improved network capacity
- Connect more nodes
- Additional capacity for features

FSK
2+ Mile Range*

Bluetooth
30ft Range*

WiFi 000ft Range*

ZigBee 100ft Range*

* Approximate range

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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

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LPWA Applications

Smart City

- Metering and sub metering
- Parking
- Security and fire alarms

Smart Agriculture

- Environmental sensors

Building Management

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Connected Devices: Access

LAN
Short Range
Communicating Devices

Well established standards

Good for:
- Mobile
- In-home
- Short range

Not good for:
- Battery life
- Long range

Cellular
Long Range w/ Power
Traditional M2M

Well established standards

Good for:
- Long range
- High data-rate
- Coverage

Not good for:
- Battery life

Low Power WAN
Long Range w/ Battery
Internet of Objects

Emerging PHY standards

Good for:
- Long range
- Long battery
- Low cost

Not good for:
- High data-rate

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Mission:
To standardize Low Power Wide Area Networks
to enable IoT, M2M, smart-city and industrial applications

- Publicly launched at MWC, Barcelona 2015

- Recognized as one of the fastest growing Technology Alliances ever.

- Membership includes broad cross section of telecommunication industry

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Partial Membership List

- Semtech
- IBM
- Kerlink
- Bouygyes Telecom
- Actility
- Orbiwise
- MicroChip
- IMST
- KPN
- Stream Technologies
- Espotel
- Fastnet

- MultiTech
- Sensing Labs
- Proximus
- Swisscom
- Echologics (Div. of Mueller)
- NKE
- LinkLabs
- Belgacom
- Sagemcom
- 1M2M
- Alpwise

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MultiTech and the LoRa® Alliance

MultiTech is one of the initial members of the Alliance

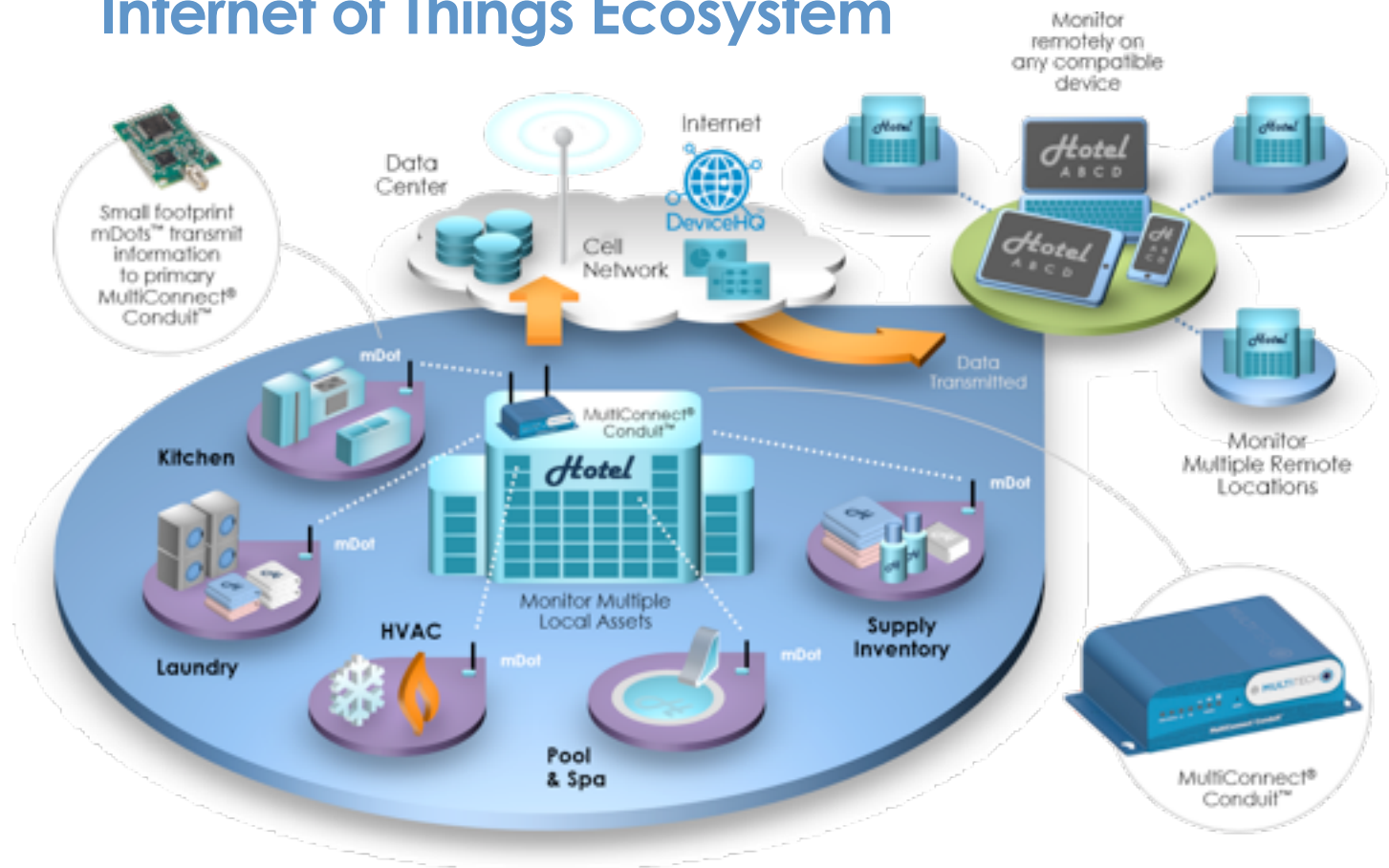## MultiTech is a key member of 3 of the 4 Steering Committees:

- Strategy
- Technology
- Certification

LoRa® Alliance
Wide Area Networks for IoT

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Conduit

MultiConnect® Conduit™

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Internet of Things Ecosystem

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MultiConnect® Conduit™
Connecting the Internet of Things

Manage Thousands of End Points

- High throughput programmable cellular gateway
- Long range, low power mDots up to 10 miles range

Flexible IoT Gateway

- Optimized with your preferred radio & interfaces
- Open & highly programmable Linux, Java & Node.js
- Graphically develop applications in Node-RED

Optional mCards

- Connect any asset with mCards
- GPIO, Serial, Semtech LoRa™, & Ethernet, WiFi/BLE….

First Application Store for Things

- Customize, deploy, manage & scale globally

Ethernet

GPIO

Serial

LoRa™

mCard™

mDot™

mbed

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MultiConnect® mCard™

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mCard Now & Roadmap

At Launch

- LoRa – 868 MHz (EU) or 915 MHz (NAM)
- Serial RS-232/485 both DTE and DCE variants
- GPIO

2015 Planned Cards

- Ethernet
- XBee footprint interface
- Wi-Fi and Bluetooth Low Energy
- GPS Tracker (GNSS, Motion detection only and GNSS with Motion)

Being Considered

- CAN bus
- Active RFID …

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LoRa Performance in mDots & mCards

mCard			mDot		
	North America	Europe		North America	Europe
Max Transmitted Power Output (TPO)	26 dBm	14 dBm	Max Transmitted Power Output (TPO)	15 dBm	14 dBm
Max Receive Sensitivity	-137 dBm	-137 dBm	Max Receive Sensitivity	-130 dBm	-137 dBm
Link Budget*	• 152 dB Point-to-Multipoint • 147 dB * Calculation assumes two 0 dBi antennas (Greater link budget possible with higher gain antennas) Note: Point-to-Multipoint utilizing MultiTech Gateway with MT-LORA accessory card	• 152 dB Point-to-Multipoint • 147 dB *Calculation assumes two 0 dBi antennas (This is the maximum link budget)	Link Budget*	• 145 dB Point-to-Multipoint • 147 dB * Calculation assumes two 0 dBi antennas (Greater link budget possible with higher gain antennas) Note: Point-to-Multipoint utilizing MultiTech Gateway with MT-LORA accessory card	• 151 dB Point-to-Multipoint • 147 dB *Calculation assumes two 0 dBi antennas (This is the maximum link budget)
Max Effective Isotropic Radiated Power (EiRP)	36 dBm	10 dBm	Max Effective Isotropic Radiated Power (EiRP)	36 dBm	10 dBm

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MultiConnect® Conduit™

Software Options
mLinux vs. Node-RED

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mLinux™ vs. Node-RED User Target Profile
Application Development Tailored to Individual Needs

mLinux – Customized & Highly Integrated Development Target

- Robust development environment for sophisticated **software developers**
- Complete firmware control enables full customization
- Tight integration facilitates easy extension of the IoT application to network edge
- Customer specific SKU's for high volume easy fulfillment with low touch install

Node-RED – Application Enablement Platform

- Simple GUI enables rapid application development by **IT/System engineers**
- Suite of nodes to customize common procedures (input functions/outputs)
- Ideal for quickly building prototypes or proof-of-concepts
- Easy and quick to deploy, manage and scale application

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Linux Distribution
MultiConnect® Conduit™

Open Embedded/Yocto

- Linux Build Tools
- Distribution Customization
- Linux Kernel 3.12 & Yocto1.6

Application Development

- Extensive Language Support with Java, Perl, Python, C/C++, Ruby, JavaScript, etc…
- Packages including SQL database, web server, core utilities, etc…

Product Customization

- Custom SKU development
- Custom firmware flashing
- Custom overlay and kitting

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Application Enablement - Node-Red
## Just the Beginning

Your Data Your Way

- Same development language from gateway to web
- Graphical programming

Managed Solution (DeviceHQ)

- Device Management
- Application Store

Structured Customization

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

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mDot

MultiConnect® mDot™

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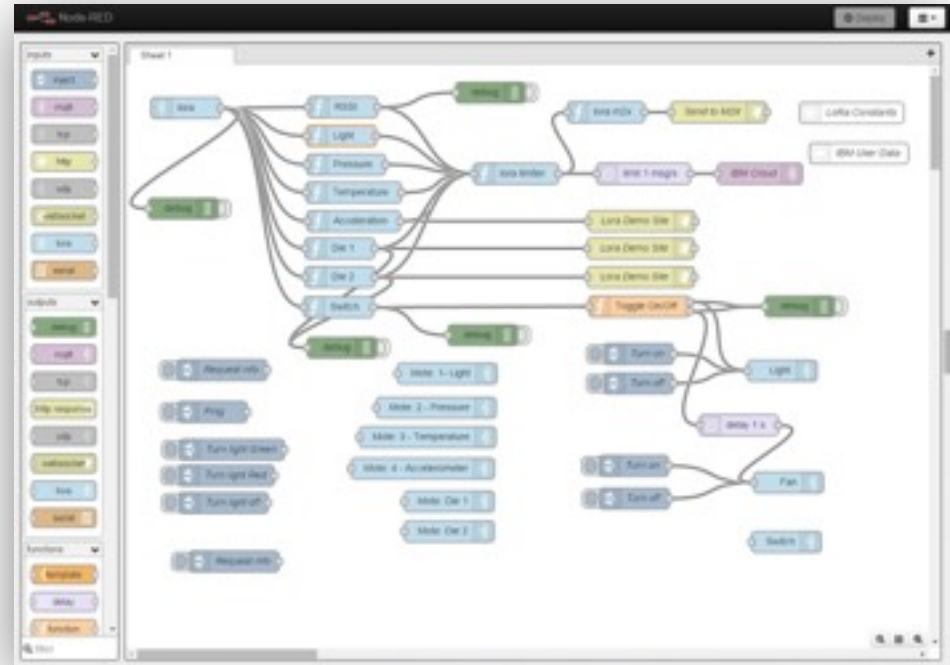
MultiConnect® mDot™ - Long Range, Low Power RF
Connecting the "Things"

First mbed Programmable ISM Module Platform
- CPU – STMicro STM32F411
  Memory - 512K Flash, 128K RAM, 1M SPI Flash
- Semtech LoRa™ single channel 868 or 915 MHz
- Operate for years on a battery, based on activity

Excellent In-building Performance
- Range up to 10 Mile line of sight,1 to 3 Miles into buildings

2-Way / Duplex Communication Channel
- More than just sensor reporting, RS485, Roadmap to 6LowPan
- Confirmation of delivery, critical for emergency apps
- Data rates 293bps-20Kbps+ LoRa up to 300Kbps FSK

Connect Most Anything …
- FCC/CE end-certified module with mbed libraries for developers
- Future capability: customize and manage end point behavior remotely
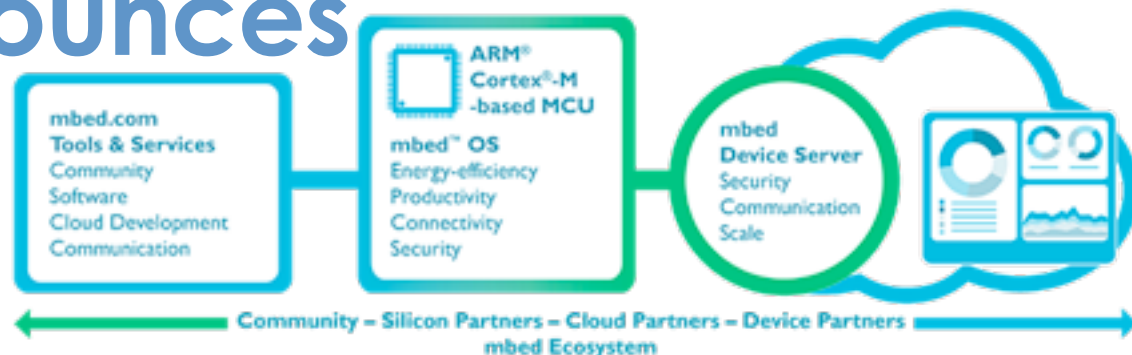

mbed

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

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ARM® Announces

ARM mbed™

mbed.com
Tools & Services
Community
Software
Cloud Development
Communication

ARM®
Cortex®-M
-based MCU

mbed™ OS
Energy-efficiency
Productivity
Connectivity
Security

mbed
Device Server
Security
Communication
Scale

Community – Silicon Partners – Cloud Partners – Device Partners
mbed Ecosystem

Let's Connect Everything

ARM® and its Partners share a disruptive vision where the creation and deployment of commercial, standards-based Internet of Things devices is possible at scale.

- MultiTech MultiConnect® mDot is the world's first mbed deployable product
- ARM® will be a co-marketing partner promoting our technology

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mDot Value

Today

- An intelligent LoRa end point Platform/Module
- Easily integrates into assets
  - Especially with legacy assets without a processor or memory
- Reduces overall BOM
- Low risk purchase - IBM LoRaWAN compliant
  - mDot will work out of the box with MultiTech Conduit Gateways and other GateWays
- Powerful ARM® Cortex®-M4 series processor
  - Why is this important? We are driving the mbed evolution
  - Rich development environment via ARM's mbed ecosystem

Platform Roadmap

Firmware Over The Air (FOTA) = no truck rolls on the roadmap
Hassle-free, low touch installation
   IP to the edge means no need for middleware expertise
   Discovery and capability exchange
Secure connectivity and trusted end points

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Why Push Intelligence to the Edge?

Gateway applications can manipulate raw sensor data locally before sending information to a cloud storage platform

Faster processing of raw data

Efficient use of data channel. Upload only "rich" data, not all data.

Intelligent Distributed
IoT Computing

Traditional IoT
Cloud Computing

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DeviceHQ™

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What is DeviceHQ?

DeviceHQ is a web based suite of tools to manage devices and custom applications for remotely deployed gateways.

Device Management Tools

- Dashboards to quickly gauge health of devices
- Tools to remotely manage devices (custom configurations, firmware upgrades, etc.)
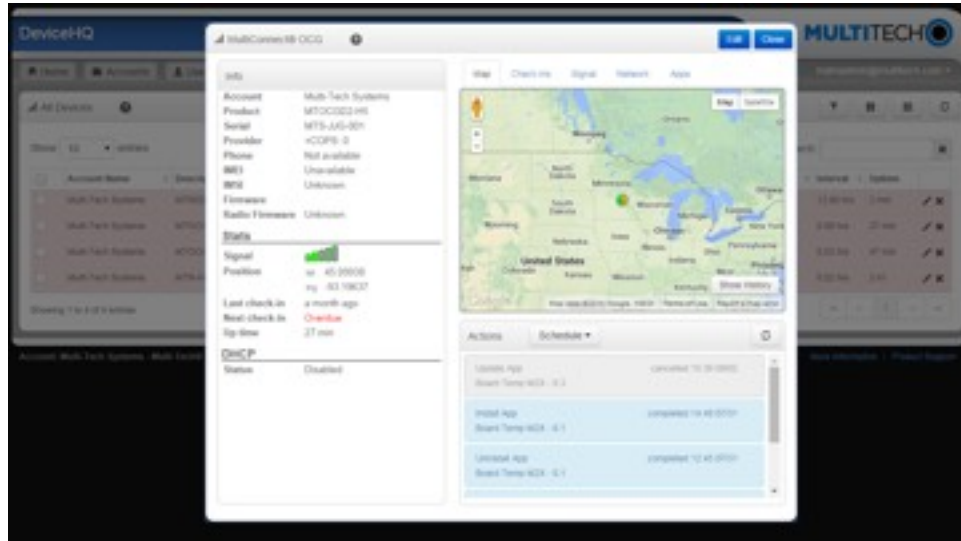- Ability to provision new devices and simplify deployments
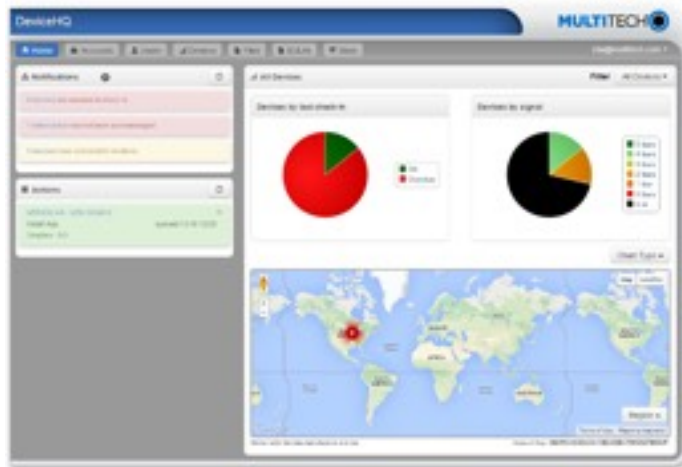
Application Store and Application Management

- Browse applications or build your own
- Deploy applications to remote devices
- Customize application settings for each device remotely

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DeviceHQ

Same powerful device management platform as the current MDM site

Conduit and rCell Support

- Signal to Noise Ratio, neighbor cells, up time & error reporting

- Firewall

- Routing and IP configuration deployment

- Remotely upgrade firmware, change configurations

- Monitor device status, statistics and notifications

- Act proactively – reduce downtime

- Aid in trouble shooting

- View location of

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Why DeviceHQ?

Reduce cost and complexity of device management

- Simplify field deployment of gateways with zero touch provisioning
- Manage the health of deployed assets from a single web based application
  - Reduce truck rolls
- Update firmware and custom applications remotely

Enable intelligence at the edge of the network

- Process events at the point of incident, not at a central server
- Increase efficiency of data channel
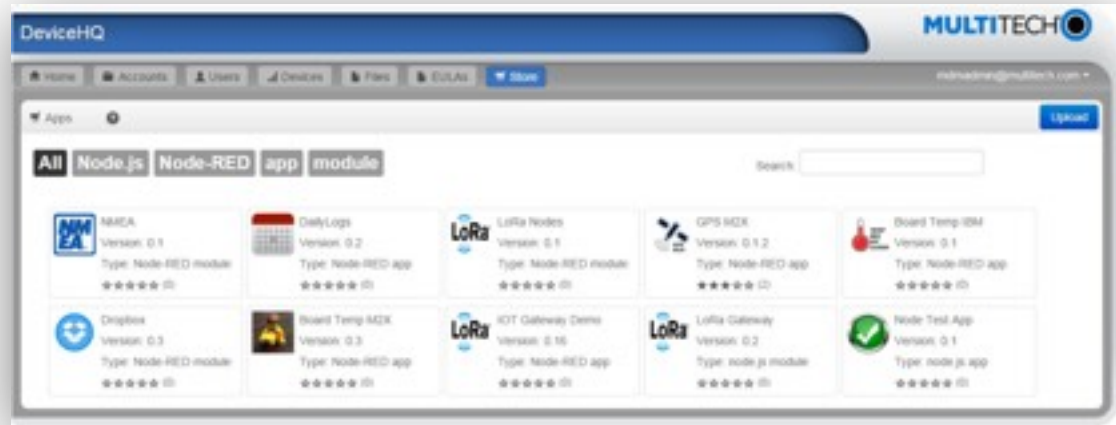- Take action locally even when no network connection is available

Open to Developers

- Third party developers can build and deploy their application on DeviceHQ

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DeviceHQ

Familiar Interface

- Customers are familiar with the concept of purchasing an app
- Tools to search, review and select apps to a user's account

Public and Private Apps

- Private apps are only available to the customers who developed them
- Public apps are available to all store users

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DeviceHQ Includes:

Quick Start Guide

- How to create a DeviceHQ account
- How to associate their Conduit with their account
- Guide to creating a Node-RED application
- How to upload and manage their application in DeviceHQ

Detailed Online Help

Detailed instructions for using DeviceHQ tools and features

Code Snippets for Node-RED

Guide for creating custom Node-RED nodes

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Delivery

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MultiConnect® Conduit™ Platform

MultiConnect Conduit		Description	Mass Production
MTCDT-H5-210L-DK		HSPA+	May 29th 2015
MTCDT-210L-DK		No Radio	May 1st 2015
MTCDT-H5-210A-DK		HSPA+	Final sample June. MP August
MTCDT-210A-DK		No Radio	Final sample June. MP August

210x: 210L is for mLinux 210A is for Node Red

Serial and GPIO support – April 2015
LoRa support in Conduit – May 2015
DeviceHQ support – August 2015

Includes: 9V wall adaptor; US, EU, UK blades; Ethernet and USB cables; radio antennas

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Utilizing MultiConnect® mCard™

Ethernet
(roadmap)

GPIO

LoRa™

Serial DTE

mCard™

mDot™

mbed
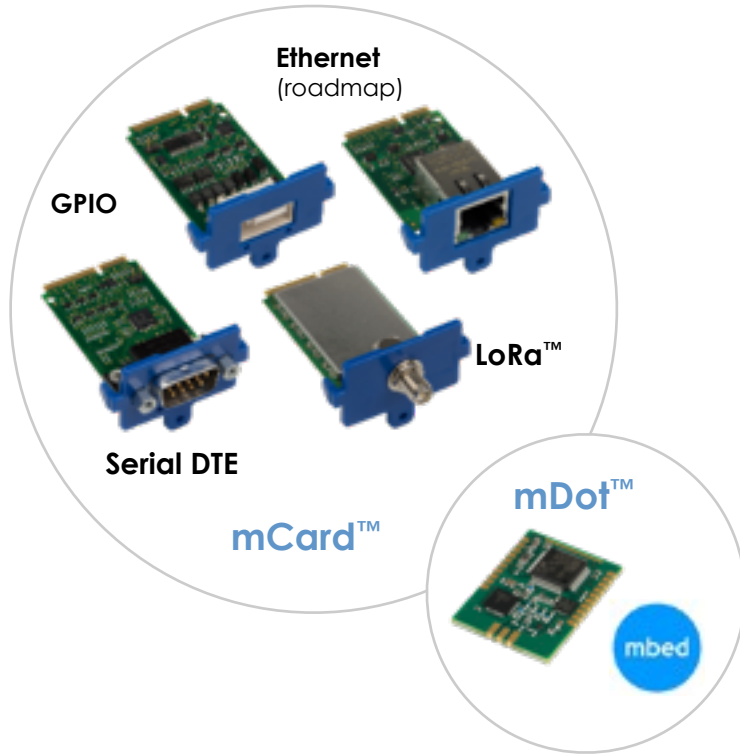
mCards	Estimated MSRP	Mass Production

Serial
  MTAC-MFSER-DCE
  MTAC-MFSER-DTE
		April 2015
		(DTE shown)

GPIO MTAC-GPIO		April 2015
LoRa MTAC-LORA-915		June 2015
mCard Accessories*		
Antenna AN868-915A-1HRA		April 2015
GPIO Cable CA-MTAC-GPIO		April 2015
Serial Cable DTE/DCE		April 2015

*Prices may change before launch. You will be informed of any price change

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MultiConnect® mDot™

mDot	
Programmable mDot MTDOT-xxx-X1P-SMA-1	
Surface mount MTDOT-xxx-M1-TRC-1 (100)	
Surface mount (not shown) MTDOT-xxx-M1-UFL-1 (100)	
PINNED (not shown) MTDOT-xxx-X1-UFL-1 (50)	
PINNED (not shown) MTDOT-xxx-X1-SMA-1 (50)	

Developer Kit using MTDOT-xxx-X1P-SMA-1	MSRP	Mass Production
MTUDK2-ST-MDOT		April 2015

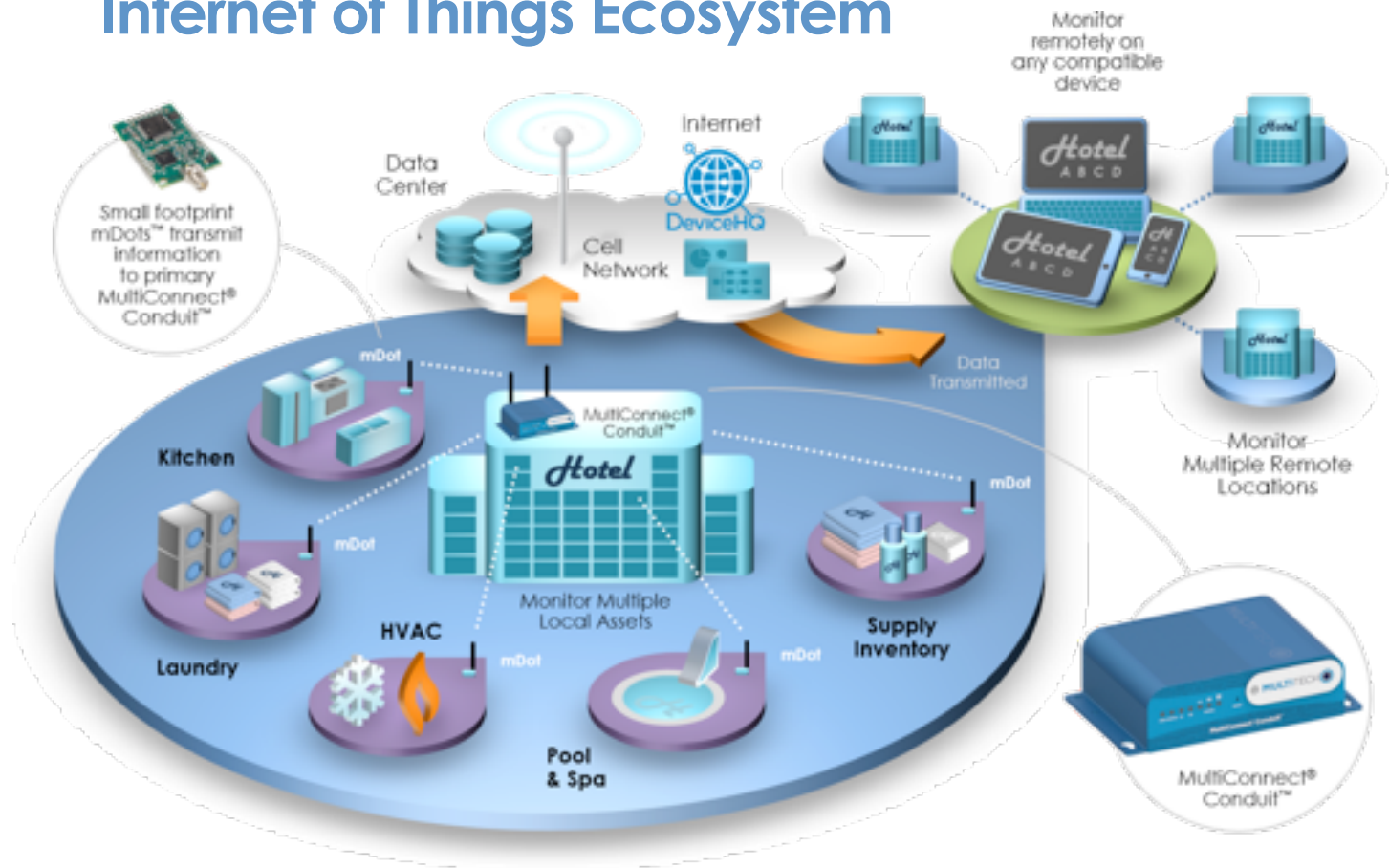Includes SMA antenna and USB cable

xxx is 915 or 868 for the base frequency range.

 868 MHz for EU and 915MHz for NAM
      Release date August (EU)/July (NAM) 2015
-1, -50 (X1), -100(M1): quantity per package

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Common Conduit Platform Ordering

Example Platform Build	Part Numbers	Quantity	MSRP
Conduit HSPA+ LoRa 915MHz Graphical programming target	MTCDT-H5-210**A**-DK MTAC-LORA-915	1 1	
Accessories mCard Antenna	AN868-915A-1HRA	(1Pk)	
			TOTAL Price
Conduit - No Radio - **mLinux** developer target – GPIO interface	MTCDT-210**L**-DK MTAC-GPIO	1 1	
			TOTAL Price

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Internet of Things Ecosystem

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Thank you!

Multi-Tech Systems, Inc.

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