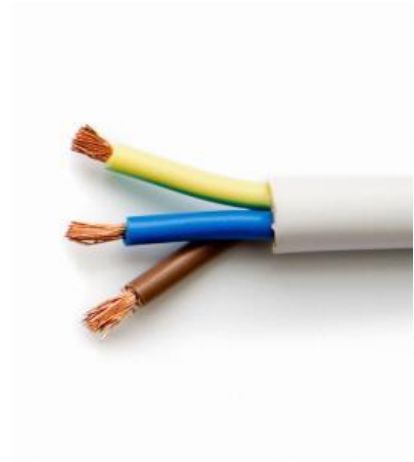


Design. Create. Certify. *Connect.*

Design for Success:
Designing for the Internet of Things with TiWiConnect™



Today's presenters



Scott Lederer
Senior Software Architect



Dave Burleton
Vice President of Marketing

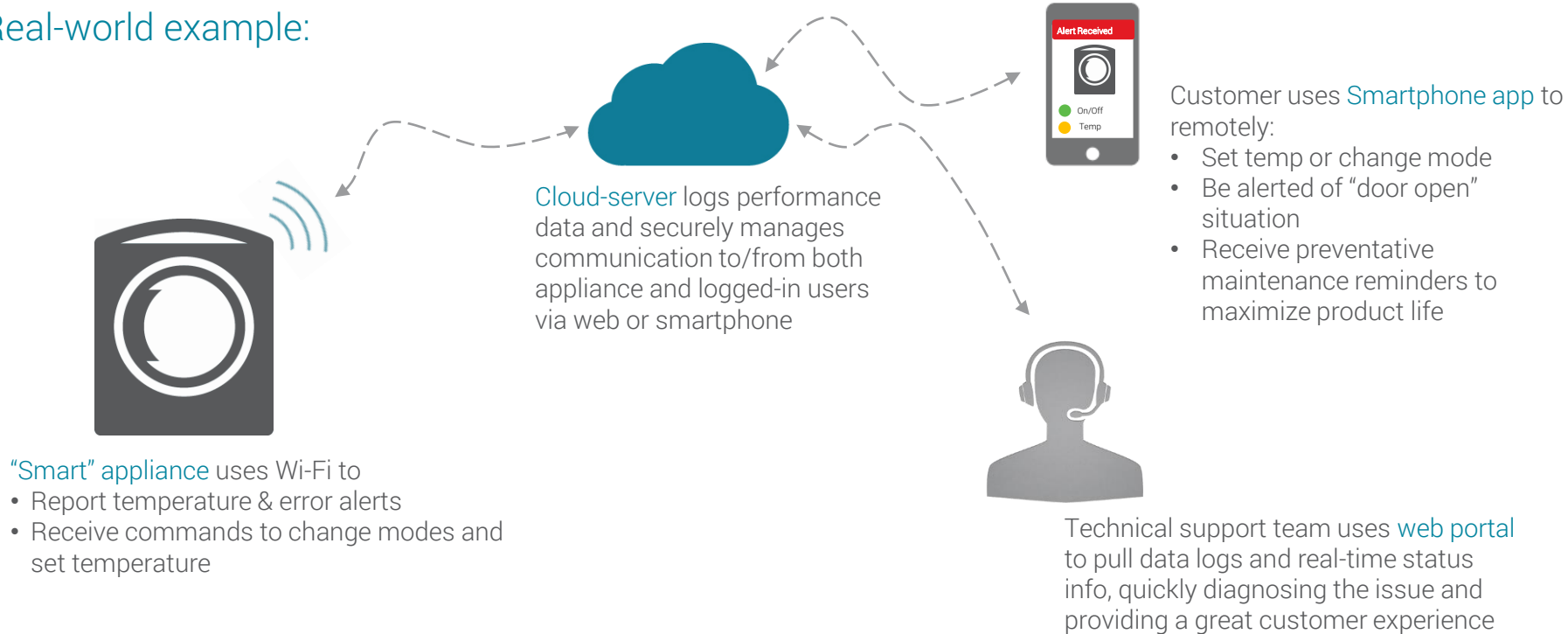
Today's Agenda

- Why leverage the value IoT for your products
- Getting from *Idea* to *Solution* faster with [TiWi-C-W™](#) & [TiWiConnect™](#)
- [TiWiConnect LIFT](#): Innovative alternative to AT Command Sets
- The [TiWi-C-W Dev Kit](#) experience
- Bringing it All Together

Leveraging the value of IoT

Cloud connectivity can re-define both your **user's experience** and your **service delivery model**



Real-world example:



What is holding companies back from capitalizing on the technology of IoT ?

Top 5 obstacles to companies increasing use of IoT

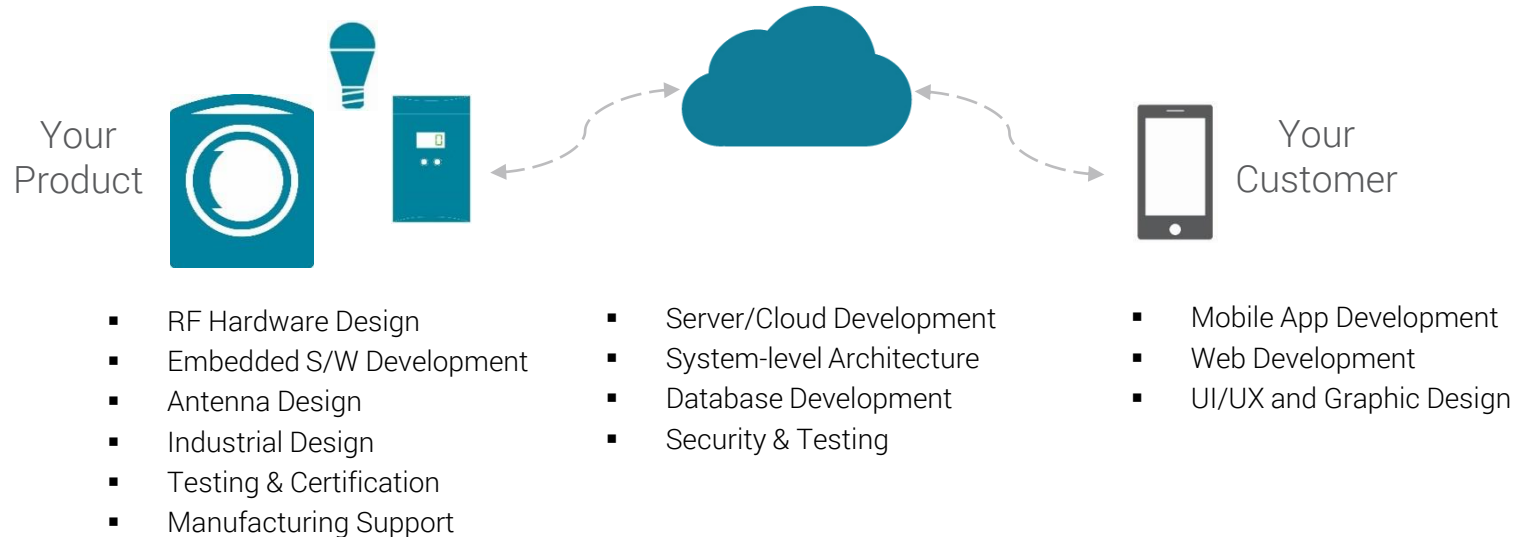
(Top responses)

- 
- 
1. Lack of employee skills/knowledge
 2. Lack of senior management knowledge/commitment
 3. Products or services do not have an obvious IoT element to them
 4. Immaturity of industry standards around the IoT
 5. High costs of required investment in IoT infrastructure

Source: The Economist Intelligence Unit.

Designing a complete cloud-connectivity system is complex

Requires engineering expertise & capabilities in a diverse array of domains

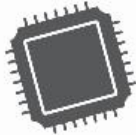


... to name just a few.

Getting from Idea to Solution faster with
TiWi-C-W™ & TiWiConnect™

LSR's TiWiConnect **end-to-end** IoT solution is far more than just a cloud provider

1. Wireless Modules &
Custom Firmware



2. Cloud Connectivity
& Storage



3. Mobile & Web
App Development



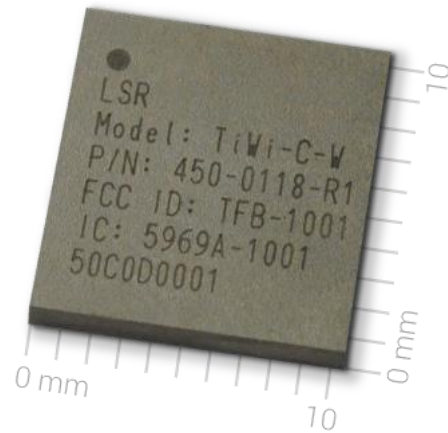

TiWiConnectTM
Module | Cloud | App

Delivering simple, straight-forward Wi-Fi integration to **elevate your products** to the cloud

Introducing the **TiWi-C-W™**

Wi-Fi module with Application Processor

- On-board ARM Cortex-M3
- Host Mode with TiWiConnect LIFT interface software via UART
- Features latest Broadcom SoC (BCM4390) and WICED™ Wi-Fi SDK
- Embedded TCP/IP Stack
- Pre-Integrated Cloud Agent for **TiWiConnect**



Download reference designs at www.lsr.com/embedded-wireless-modules

TiWi-C-W™ Dev Kit featuring TiWiConnect™

- From 'out of the box' to the Cloud in less than 5 minutes!
- Wi-Fi development kit includes a lifetime subscription to TiWiConnect's IoT Platform for cloud-connectivity
- Web portal contains guided tutorials, drag-and-drop dashboards, and more!
- **NOW AVAILABLE** Companion iOS and Android Apps for further flexibility in demonstrating proof-of-concept



Personal web portal to test and demonstrate internet-connectivity




TiWiConnect™
Module | Cloud | App
Lifetime Subscription
included!

TiWiConnect LIFT software

Innovative alternative to AT Command Sets

Why the continued presence of AT Command Sets?

- AT Command Sets have a strong historical precedence for communication between a host MCU and a communication device
 - First created in 1981 by Dennis Hayes for a 300 Bd modem
 - Helped overcome the limitations of memory size and a single serial port for data & commands
- Benefits of AT Command Sets
 - Short ASCII strings were able to represent high-level commands such as dialing or hanging up
 - Human Readable
 - Easy to experiment with a new module using a terminal and serial port



Reliance on AT Command Set approach results in design trade-offs

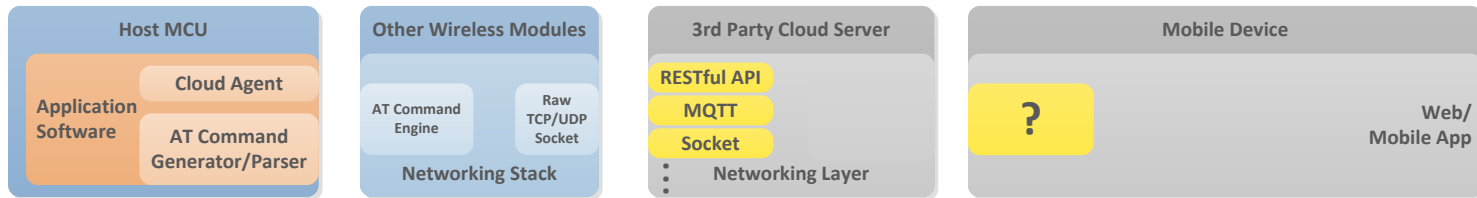
- To effectively implement a Wi-Fi module with an external host using AT Command Set, this most likely requires:
 - A fairly strong understanding of Wi-Fi by the developer
 - Long learning curve to adopt the AT Command Set
 - Command Sets typically are composed of dozens or even hundreds of commands
 - One command for each Wi-Fi parameter that you may want to control
 - Hence the sequencing of the commands is critical, which adds to the complexity

Using a Web Service with an AT Command Set

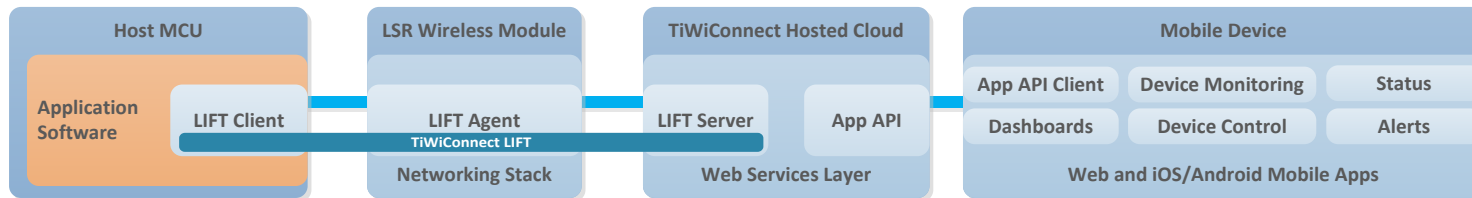
```
... MCU awakes on a timer interrupt
... MCU reads sensor values to report to the cloud
... Wake up the Wi-Fi radio and wait for it to enter command mode
$$$
... scan for the first 8 nearby Wi-Fi networks on all channels
AT+SCAN 0 8
... wait for list of nearby access points by SSID
... parse the list for SSID of interest
... parse security mode settings for SSID of interest
AT+SECMODE WPA2
AT+ENCMODE AES
AT+PASS mySecurePassphrase
AT+JOIN 4
... wait for confirmation of joining network 4 in the scan list
AT+DHCP 1
... Enable DHCP to request an IP address, wait for confirmation
... Open a connection to a web server using socket 1
AT+OPEN 1 tcp 192.168.1.32 80
... Send the HTTP request from the MCU as raw bytes
... MCU receives the HTTP response as raw bytes
... Process the HTTP response on the MCU
... Take action in response to the HTTP transaction
... Close the open connection on socket 1
AT+CLOSE 1
... Disconnect from the Wi-Fi network
AT+DISCONNECT
... Put the radio in low power mode
AT+SLEEP 1
... MCU configures next wake timer interval and enters low power mode
```

For cloud-connectivity systems, LSR built a solution to do far more

Software Features Provided by Typical Wireless Module Vendors



Software Features Provided by LSR's TiWiConnect Platform



TiWiConnect™ LIFT
Device-to-Cloud Software

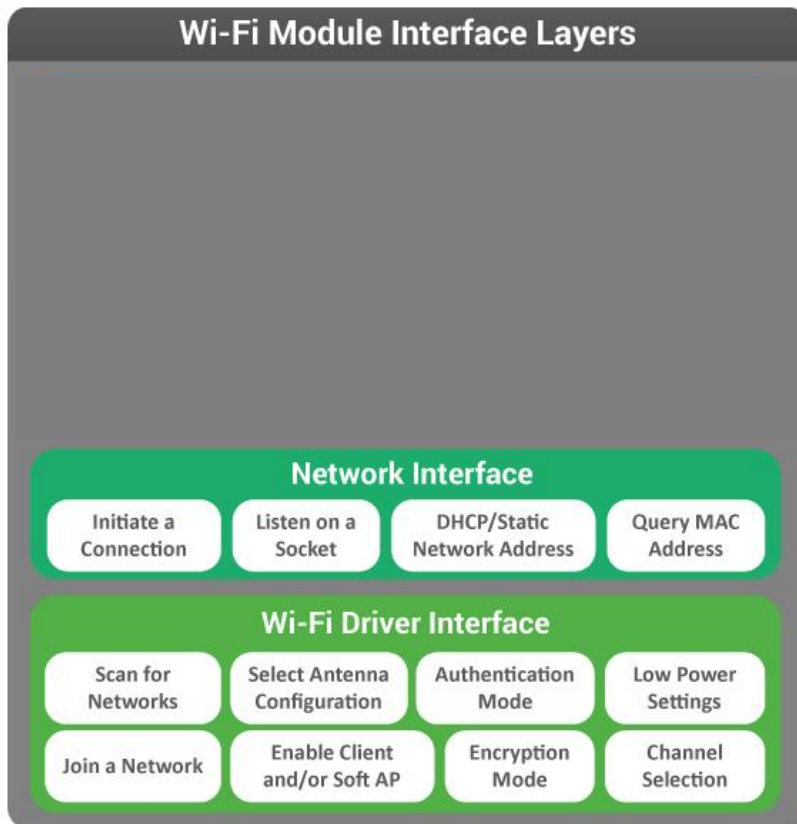
- AT Command Sets facilitate *host-to-module* communication, TiWiConnect LIFT facilitates *host-to-cloud* communication
 - Sharing data with the cloud looks just like any other API library call!
- Using a data format familiar to the cloud (JSON) accelerates development effort
- Furthermore, cloud-server and app developers are already familiar with JSON, facilitating collaboration amongst the development team

All Wi-Fi modules are **not** created equal

TiWi-C-W's **LIFT Agent** firmware goes one step further, providing **System Interface** functionality for direct integration with cloud services and mobile apps

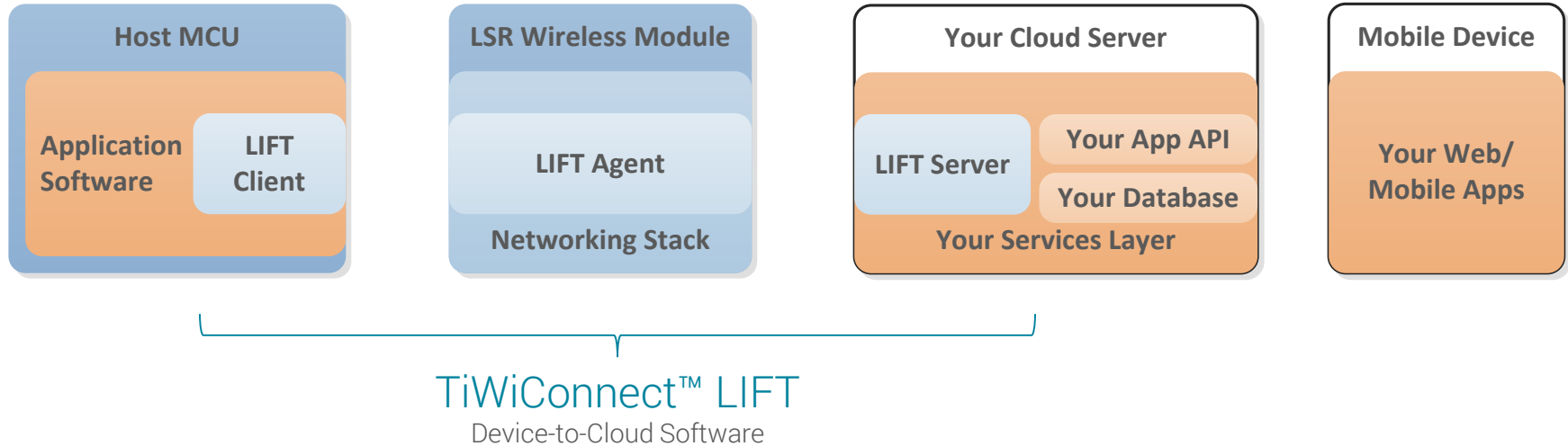
Some also provide Application Interface functionality to simplify common network operations

Most Wi-Fi modules will provide Wi-Fi Driver and Network Interface capabilities



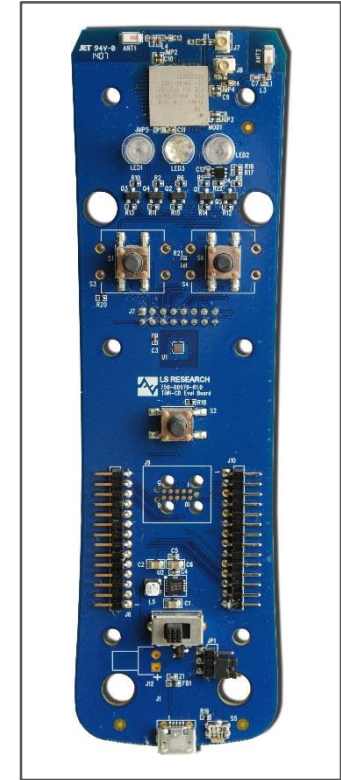
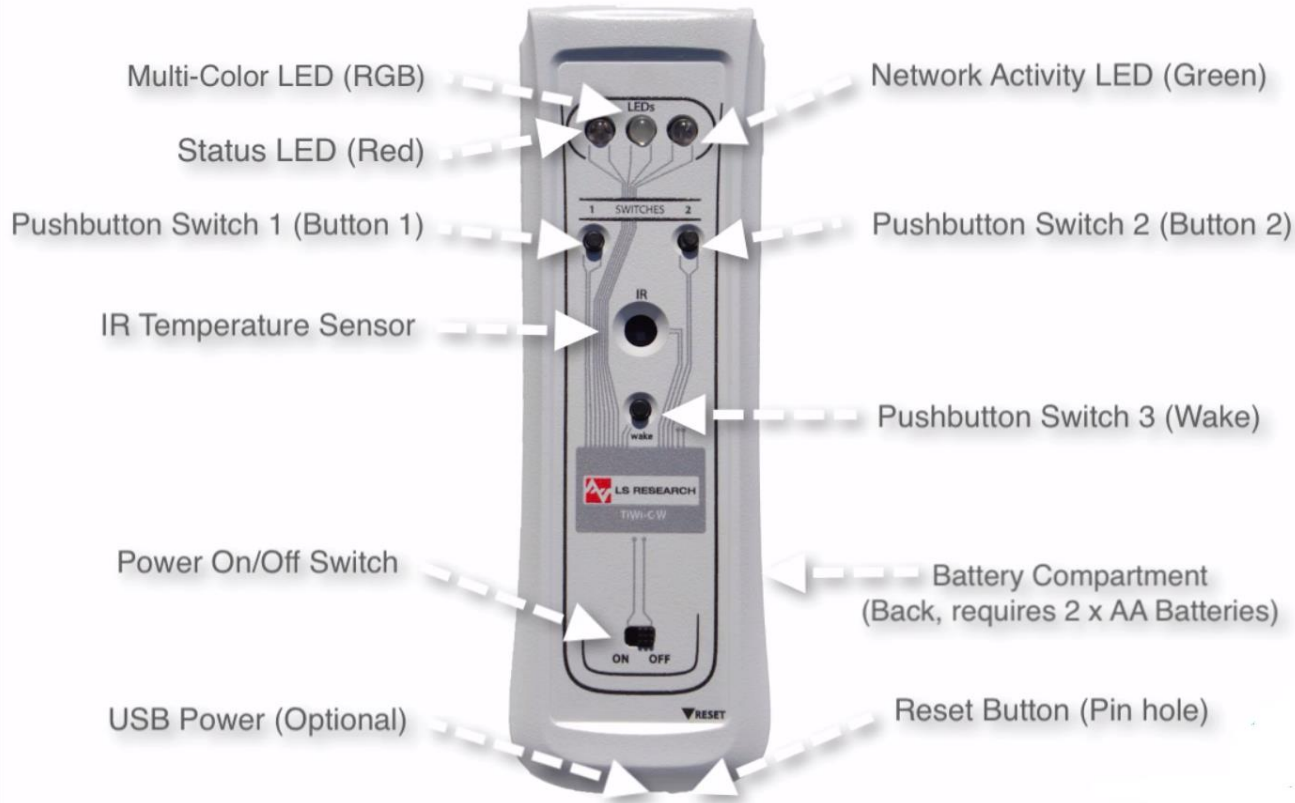
Developing on TiWiConnect gives you unmatched freedom in connecting to YOUR cloud

Advanced Design Option: Host TiWiConnect-compatible service on your own server



The TiWi-C-W Dev Kit Experience

Meet the Dev Kit



Opening the Box

- What comes in the box?
 - Eval Board in enclosure
 - 2 AA batteries
 - Instructions insert

TiWi-C-W™ Development Kit featuring TiWiConnect™

Ready to Cloud Connect?

To get started with your TiWi-C-W Development Kit, visit:
<https://devkit.tiwiconnect.com>

Setup Information

Device ID: **0025ca000000**

Device Pin: **5243**

Config Mode Network Name: **TiWi-000000**

Config Mode Wi-Fi Password: **84746205**

Download the iOS or Android App onto your Smartphone

Scan this QR code from your smartphone to download
the TiWi-C-W Dev Kit's companion app

or

Search "TiWiConnect" in the App Store to find and
download



LSR Part Number: 450-xxxx | Rev. X



A guided experience that progresses from demonstration through full development

Quickstart



Beginner



Advanced



Demonstrate

Using real world product example, have kit communicating with the cloud in < 5 minutes

Evaluate

Explore drag-and-drop GUI dashboards, alerts, and more

Develop


Use LIFT Device Designer tool to create YOUR product's proof of concept

devkit.tiwiconnect.com

WebEx Meeting Center

Apps Market Intelligence LSR Customers Google Tools Vendors Competitors Black Carder™ Mesh... Personal LSR Marketing

LSR Register or Log In



TiWiConnect™

Module | Cloud | App

by **LSR**

Out-of-the-box to the cloud in 5 minutes.
It's never been this easy!

Enter your Dev Kit's Device ID to get started.

[Quickstart](#)

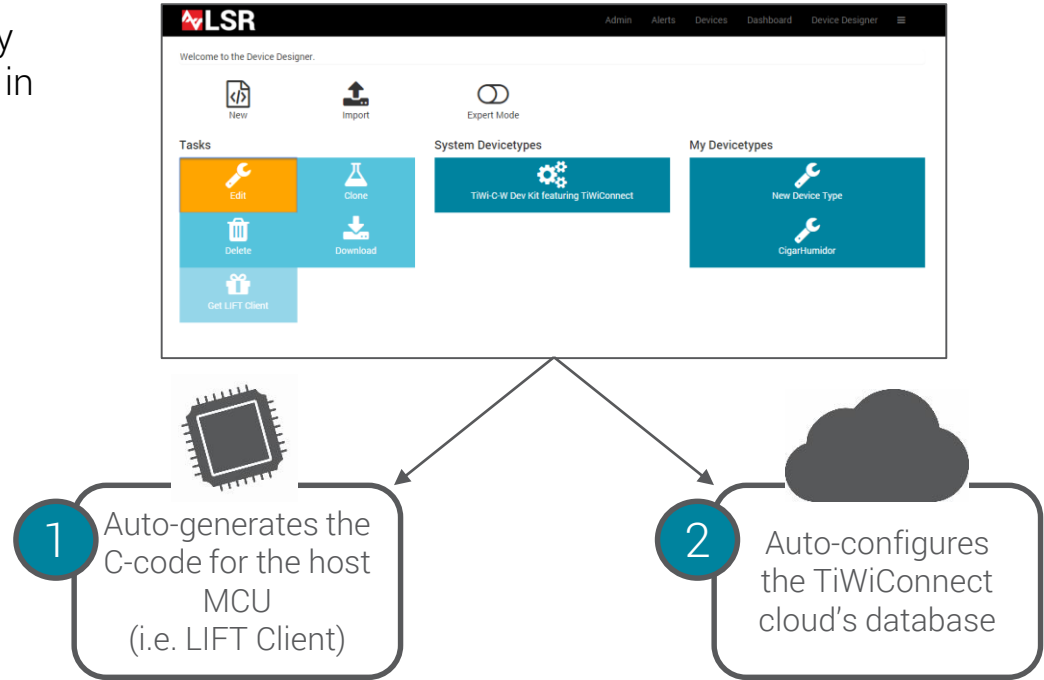
What is the LIFT Device Designer?

A web-based drag-and-drop tool to quickly define your product's unique Device Type in terms of Attributes and Actions...

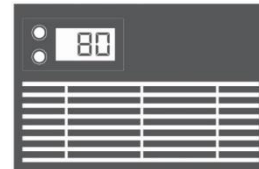
... without having to program directly in JSON...

... which dramatically simplifies the 2 key tasks for creating a data tunnel between MCU and Cloud...

... so users have a minimal learning curve AND can continue developing in the software tools they're comfortable with !



How is data organized in TiWiConnect?



Room A/C Unit example

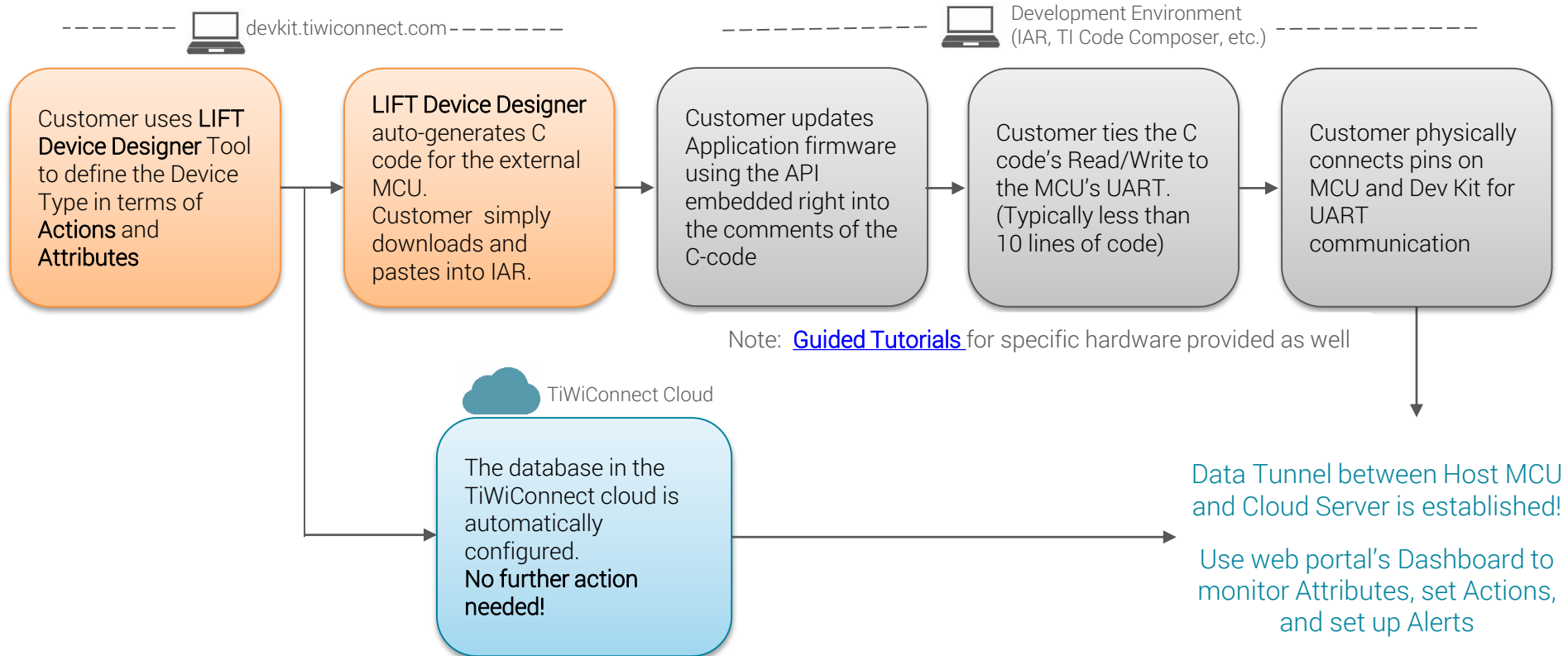
Attributes	What would you like to remotely monitor? The captured data, device state, and other critical runtime information on your product.	<ul style="list-style-type: none">▪ Room temperature▪ Set-point▪ Mode of system▪ Energy usage
Actions	What does your “remote control” need to do? The abilities to remotely adjust specific parameters of your product	<ul style="list-style-type: none">▪ Change set-point▪ Change mode of system
Alerts	What info needs to be shared immediately? Messages your product sends to notify a user or another device that a user-defined condition has been met (In App, Email, SMS)	<ul style="list-style-type: none">▪ SMS fault codes▪ Email preventative maintenance (e.g. filter change)

Bringing it All Together

Real-World Product Example

- Looking to turn your line of fish tanks into IoT products
- Use [LIFT Device Designer](#) to create a Device Type
- Quickly create Dashboard Environment using GUI tools

Creating proof-of-concept with external MCU and TiWi-C-W Dev Kit

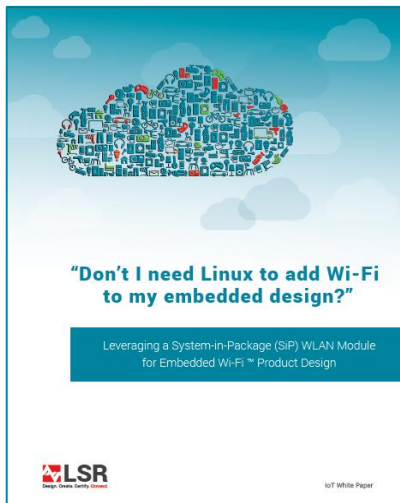


Questions and Answers

Want to learn more?

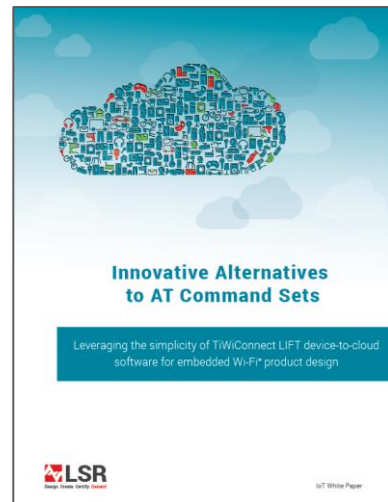


"Is there an App for that?"



"Don't I need Linux to add Wi-Fi?"

New



Innovative Alternatives to AT Command Sets

Download these free white papers at www.lsr.com/white-papers



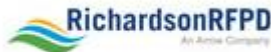
Taking full advantage of LIFT Device Designer



To learn more, check out
LSR's video tour of this powerful tool at
www.tiwiconnect.com

Where can I find the TiWi-C-W Dev Kit?

Learn More and find your preferred Distributor for purchasing the Dev Kit at www.tiwiconnect.com



Part # 450-0137





Thanks for your time!

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Dave Burleton | dburleton@lsr.com



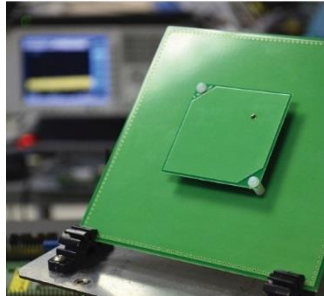
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