

Making your industrial device IoT compatible with Wi-Fi

9 April, 2019
Manfred Schommarz



Overview



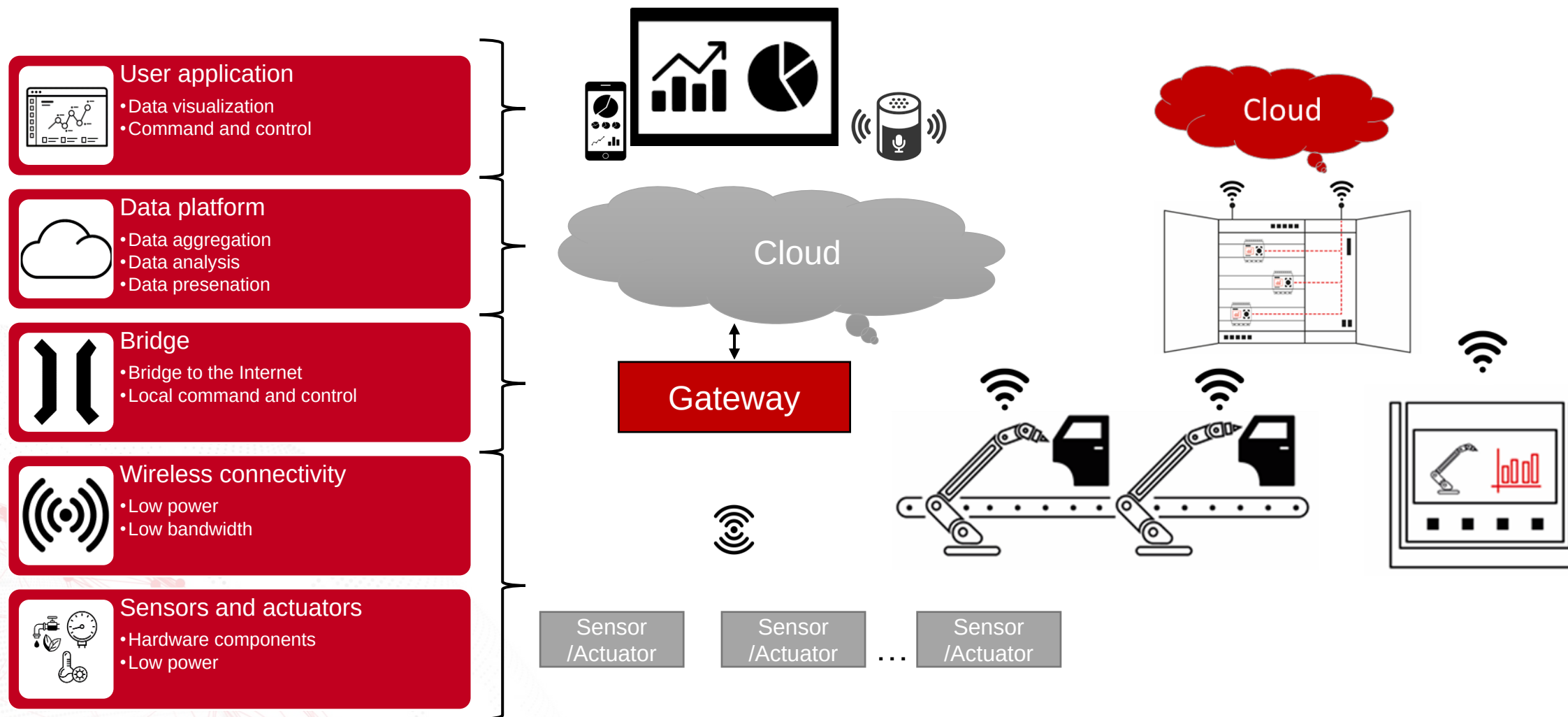
- What is IoT?
- Typical IoT application
- Wi-Fi for IoT
- MQTT
- Calypso highlights
 - AT-command interface
 - Provisioning
 - Security features
- Summary



What is IoT ?

IoT is connecting any “thing” to the “Internet” and further “things”.

Typical IoT application



Why Wi-Fi ?



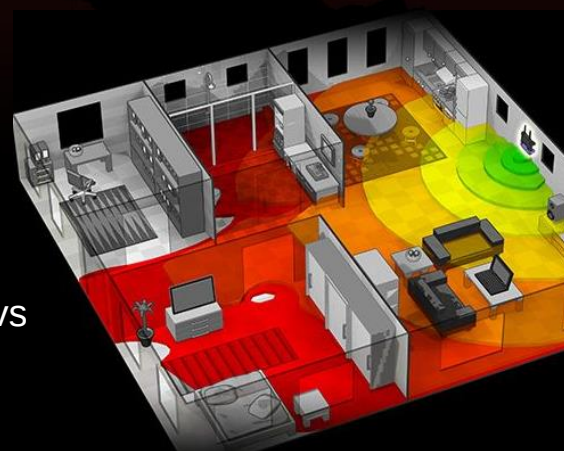
All pervading



Standard compliant



IP Connectivity



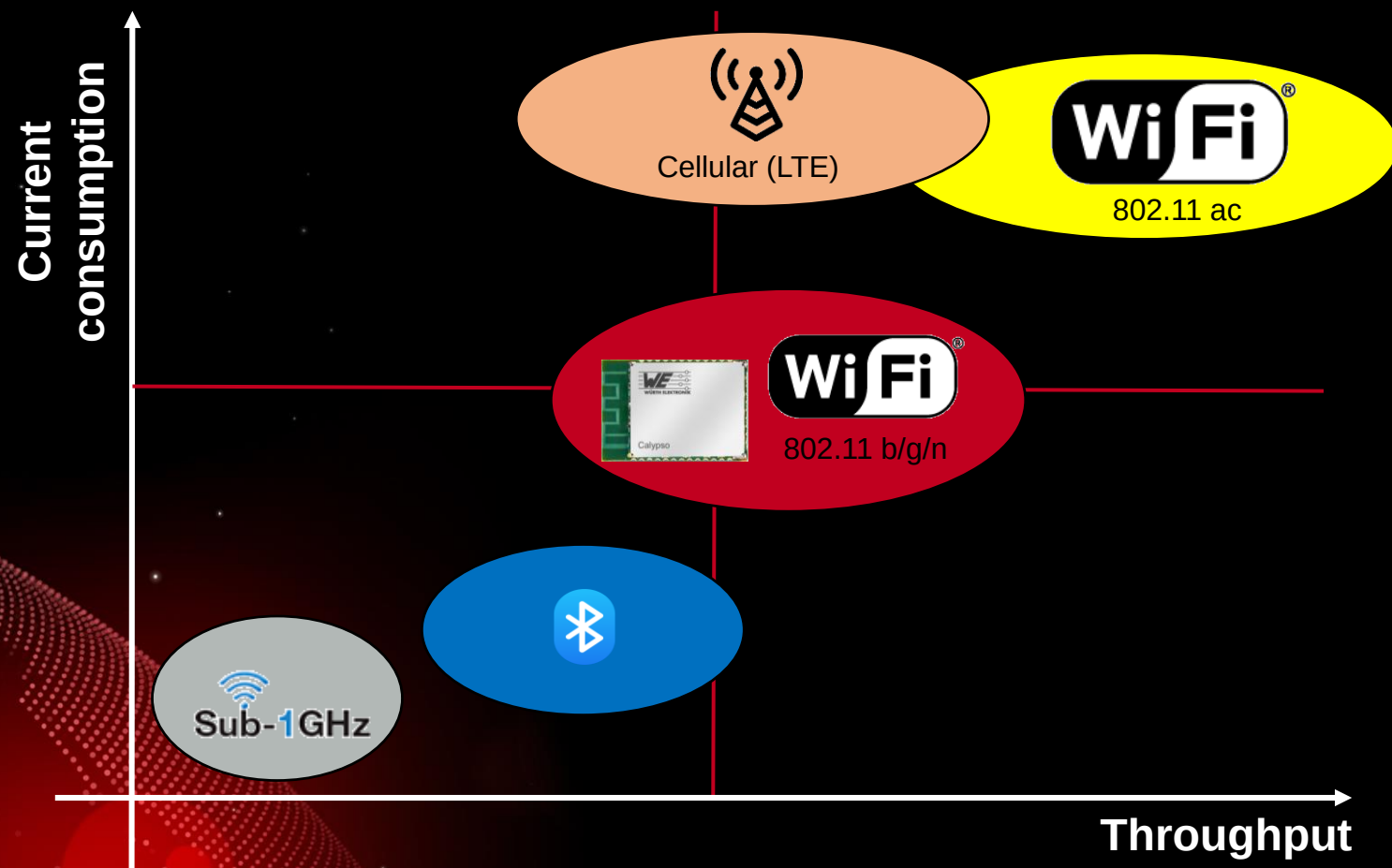
Range vs Power vs
Throughput



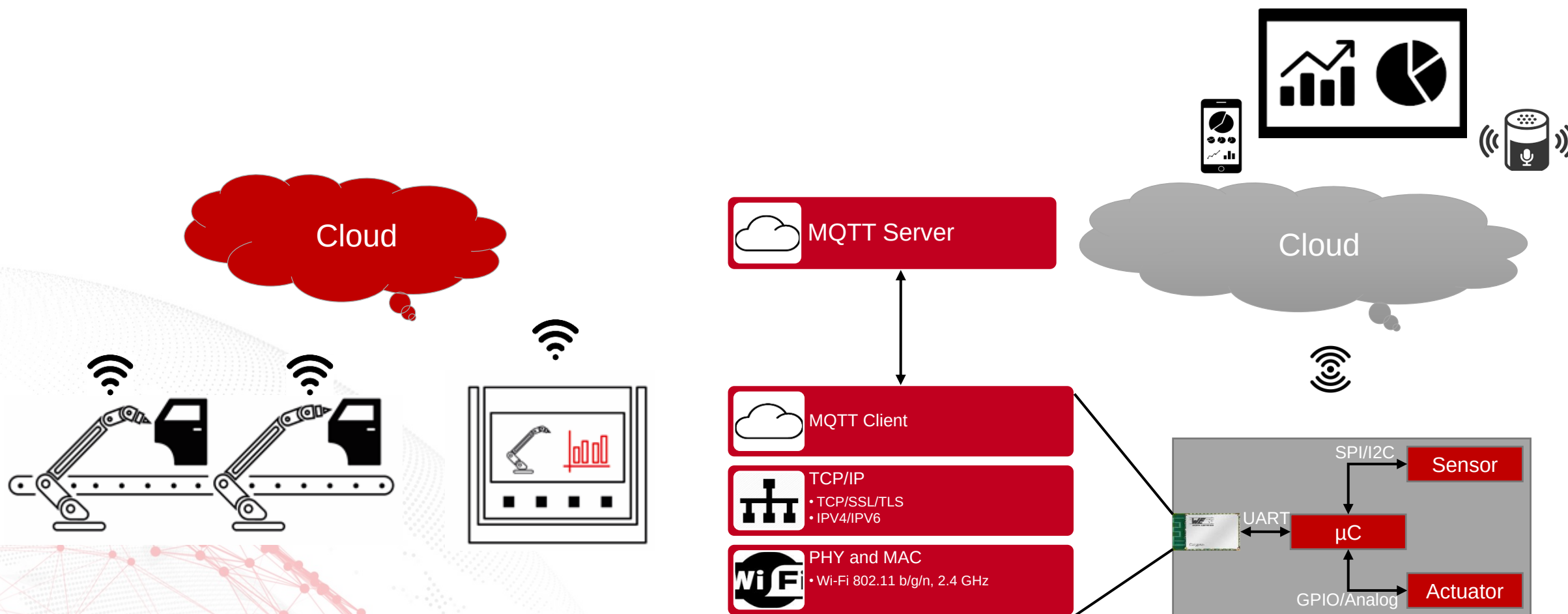
Unlicensed spectrum



Wi-Fi for IoT?



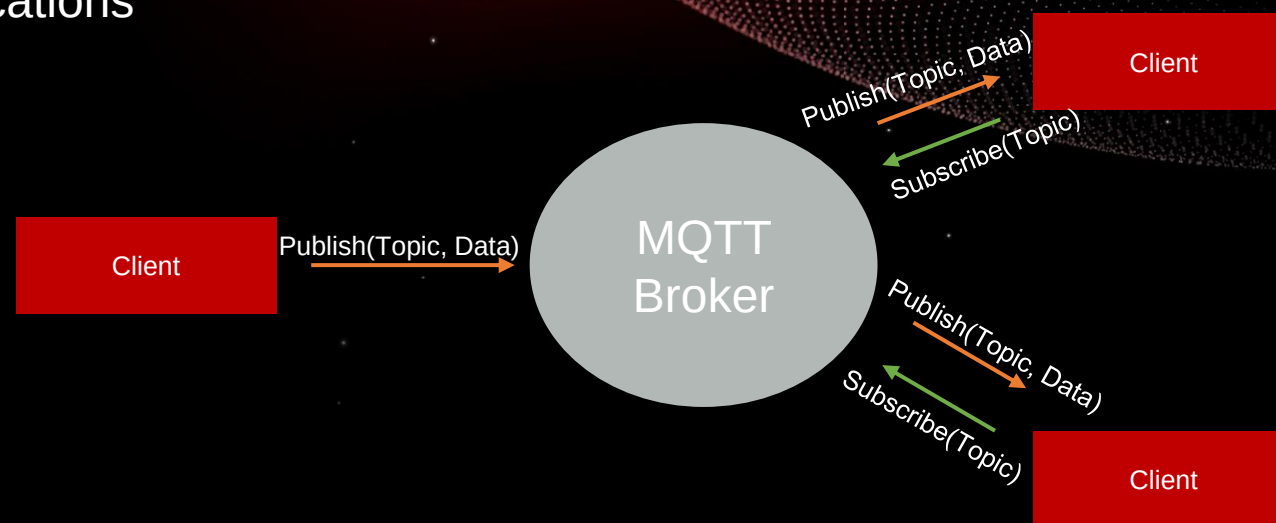
IoT application design using Calypso



MQTT

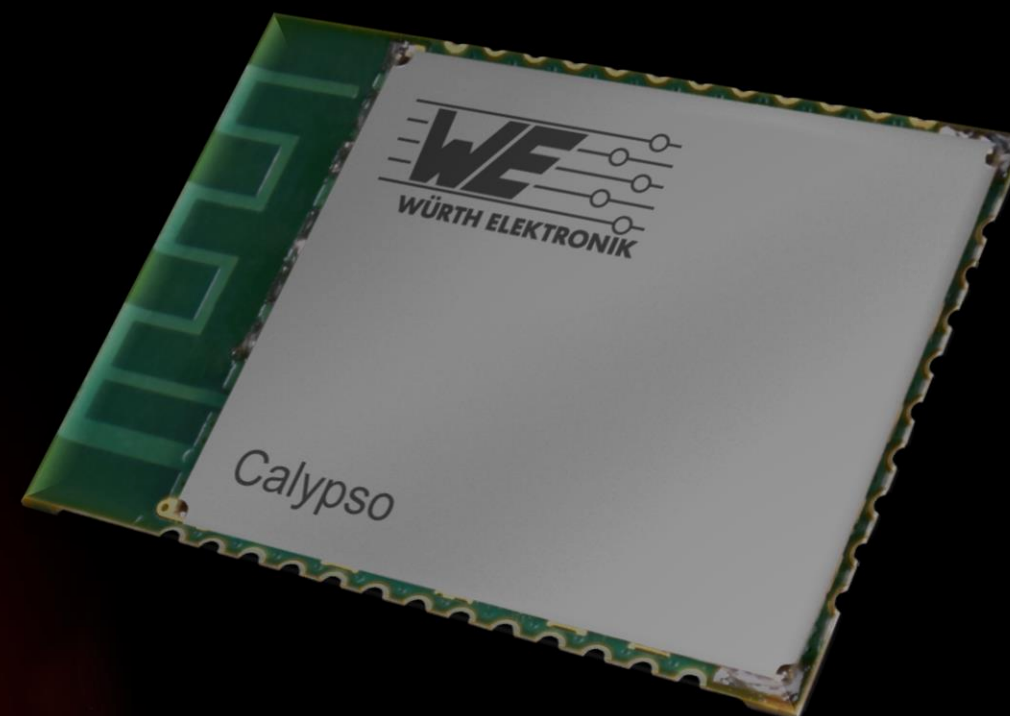


- MQTT - MQ Telemetry Transport
- Lightweight application layer protocol
- Publish/Subscribe mechanism
- Runs on top of TCP/TLS
- Suitable for low-power, low-bandwidth applications
- Used extensively in M2M, IoT applications
- Calypso implements MQTT client



Calypso Highlights

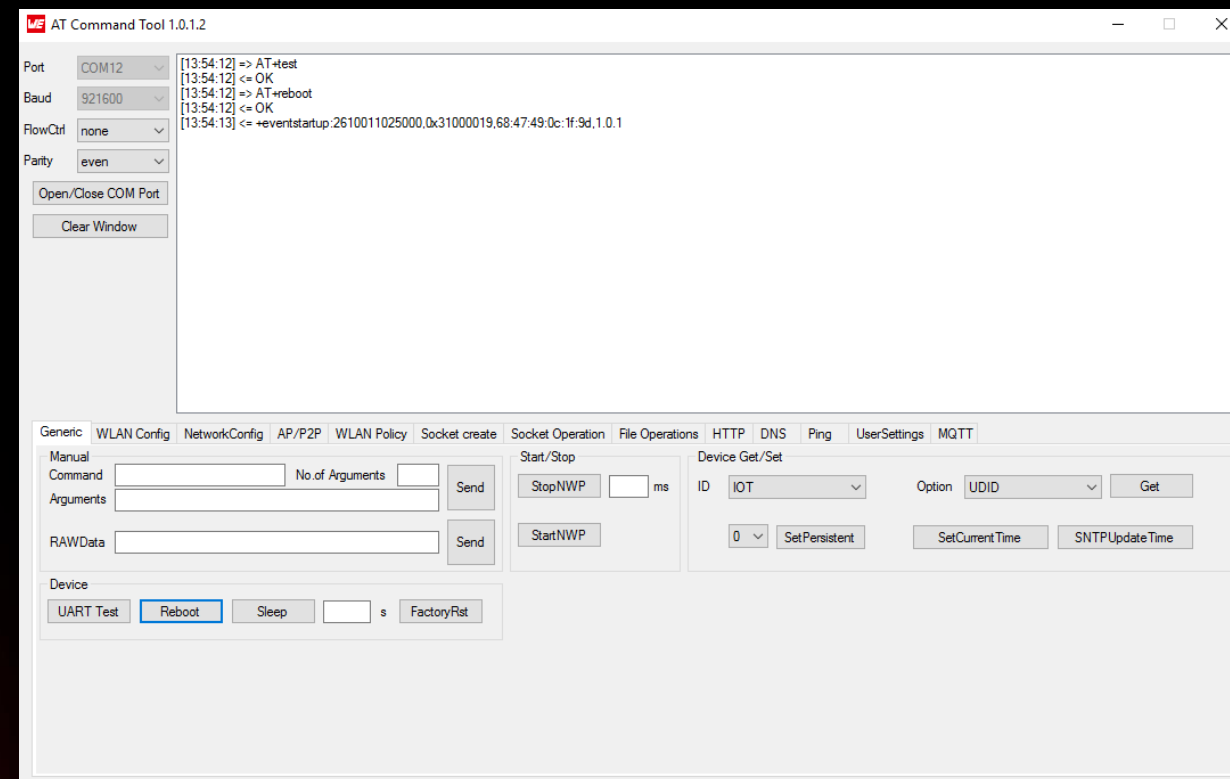
- Easy hardware integration
- Connection to existing network
- Provisioning into the network
- Easy software integration
- Low-power consumption
- Security



AT-command interface



- Complete control over UART
- ASCII based “Human readable” commands
- Normal command mode – μ C interface
- Terminal mode – Unix styled console
- Intuitive request/response/event mechanism
- PC tool for quick prototyping



AT Command Tool



AT Command Tool 1.0.1.2

Port: COM17
Baud: 921600
FlowCtrl: none
Parity: even

Open/Close COM Port
Clear Window

```
[14:31:13] COM Port opened.  
[14:31:43] => AT+wlanscan=0,9  
[14:31:43] <= ERROR: process command,-2073  
[14:31:44] => AT+wlanscan=0,9  
[14:31:44] <= +wlanscan:KDG-44EDB,0xdc:0x53:0x7c:0x94:0xe0:76,1,wpa2,0,ccmp,psk  
[14:31:44] <= +wlanscan:WLAN-OS,0x38:0x10:0xd5:0xca:0xe9:0x6d,-87,1,wpa2,0,ccmp,psk  
[14:31:44] <= +wlanscan:be-IP-6497,0x0:0x9:0x4f:0xb2:0xb1:0xbb,-84,1,wpa2,0,ccmp,psk  
[14:31:44] <= +wlanscan:WLAN-LDFPFK,0xac:0xcf:0x85:0x5b:0xbc:0xcf,-80,1,wpa2,0,ccmp,psk  
[14:31:44] <= +wlanscan:OS-GAST,0x3a:0x10:0xd5:0xca:0xe9:0x6d,-88,1,wpa2,0,ccmp,psk  
[14:31:44] <= +wlanscan:gigacube-ABBA,0x7c:0x76:0x68:0xb0:0xab:0xba,-66,4,wpa2,0,ccmp,psk  
[14:31:44] <= +wlanscan:we-global,0x2c:0xd0:0x2d:0x84:0x31:0xc0,-60,11,wpa2,0,ccmp,802_1_x  
[14:31:44] <= +wlanscan:we-guest,0x2c:0xd0:0x2d:0x84:0x31:0xc5,-59,11,open,0,none,none  
[14:31:44] <= +wlanscan:KDG-E7AB0,0xdc:0x53:0x7c:0xe:0x7a:0xb5,-80,6,wpa_wpa2,0,psk  
[14:31:44] <= OK
```

Generic | WLAN Config | NetworkConfig | AP/P2P | WLAN Policy | Socket create | Socket Operation | File Operations | HTTP | DNS | Ping | UserSettings | MQTT

General Configuration

Mode/Connection: Get STA Set
Country code: Get EU Set
TX power STA: Get 0 Set
TX power AP: Get 0 Set
Ent. ServerAuth. (1 = Disable): 0 Set

** TX power [0...15] : 0 = Max

WLAN profiles

SSID: Security type: open
BSSID*: Security key: 2
SecurityExtUser: SecurityExtAnonUser: ^
SecurityExtEapMethod: TLS Profile priority: 0
Profile Index: Connect Add Disconnect Get Delete

*optional, ^optional in some modes, ^ignored if security is not WPA_ENT

WLAN Scan

Start Index (0-29): 0
Count (max 30): 9
Scan

Provisioning

Start
Stop

WLAN Scan

Start Index (0-29)

0

Count (max 30)

9

Scan

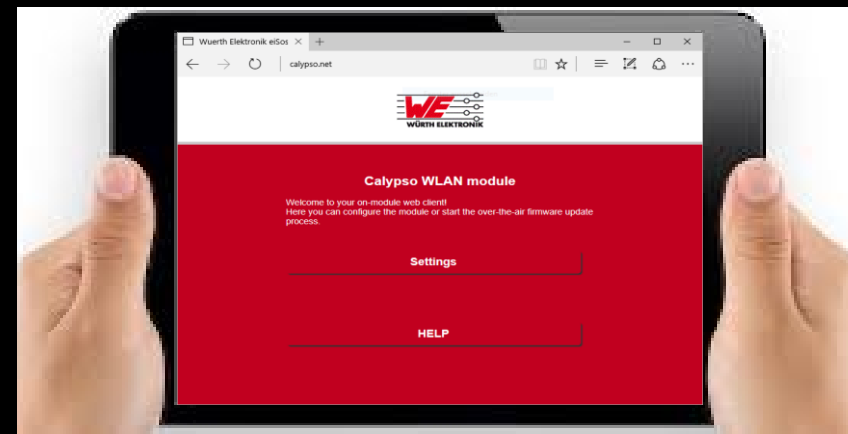
Provisioning | https://



- Bring the device into an existing Wi-Fi network
- In field device configuration
- Access Point mode
- Host triggered (pin/command from host)
- Web-interface – Platform independent



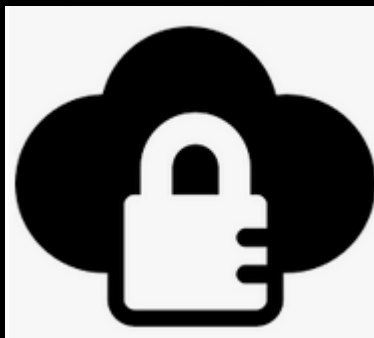
SSID : MY_Coffee_shop
PW : *****



Security with Calypso



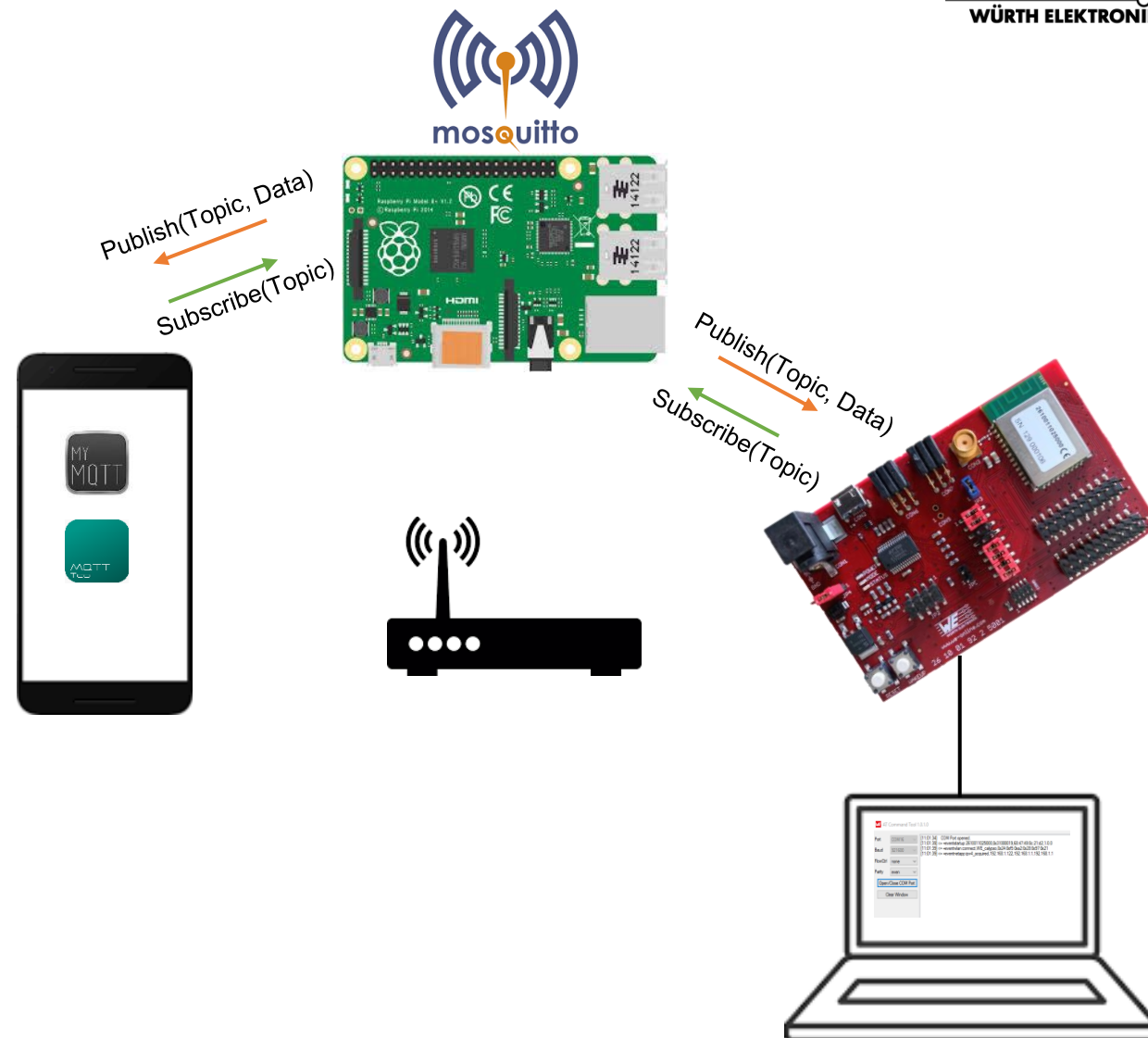
- ✓ Secure boot
- ✓ Secure storage
- ✓ Wi-Fi security - WPA2...
- ✓ Secure socket
- ✓ Hardware accelerated crypto engine
- ✓ Software tamper detection



A good basis for secure end application !!!

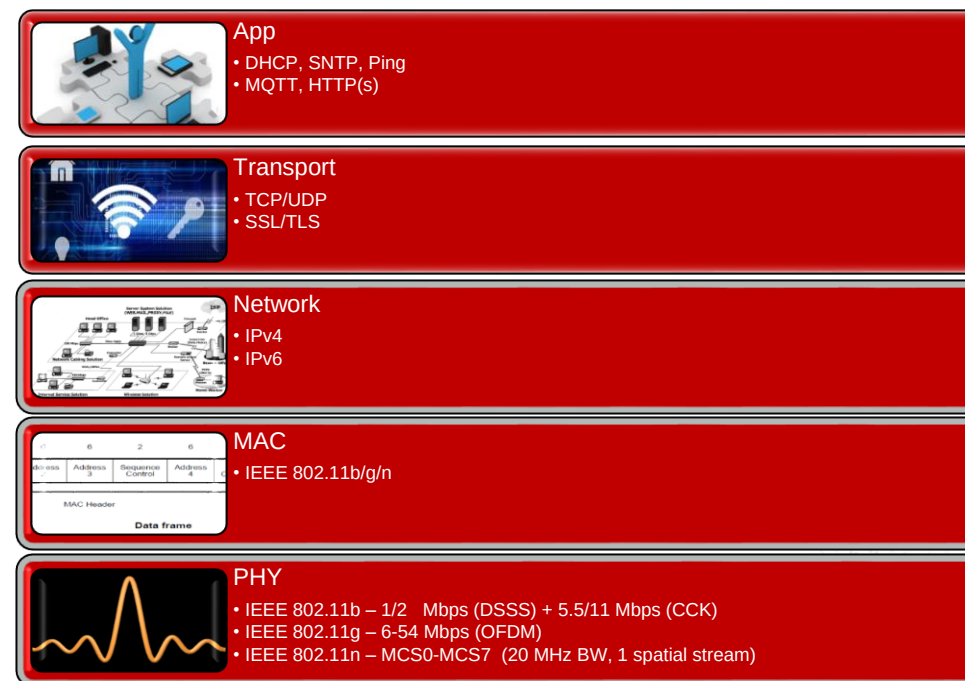
IoT demo using Calypso

- ✓ Calypso EV board simulates sensor data
- ✓ Eclipse Mosquitto broker on Raspberry Pi
- ✓ MQTT client on Calypso
- ✓ AT command tool on PC
- ✓ MQTT client application on smartphone



Calypso Features

- IEEE 802.11 b/g/n
- Wi-Fi modes
 - Wi-Fi station
 - Wi-Fi Direct®
- TCP/IP with IPv4 and IPv6
- Advanced security features
- On-board provisioning
- AT command interface
- UART Baud rate – 921600 bps



Thank you for your attention



**And now we will stand by
to answer your questions via the webinar tool.**

Don't hesitate to ask!