IOT GATEWAY – BRIDGING BLE TO THE CLOUD

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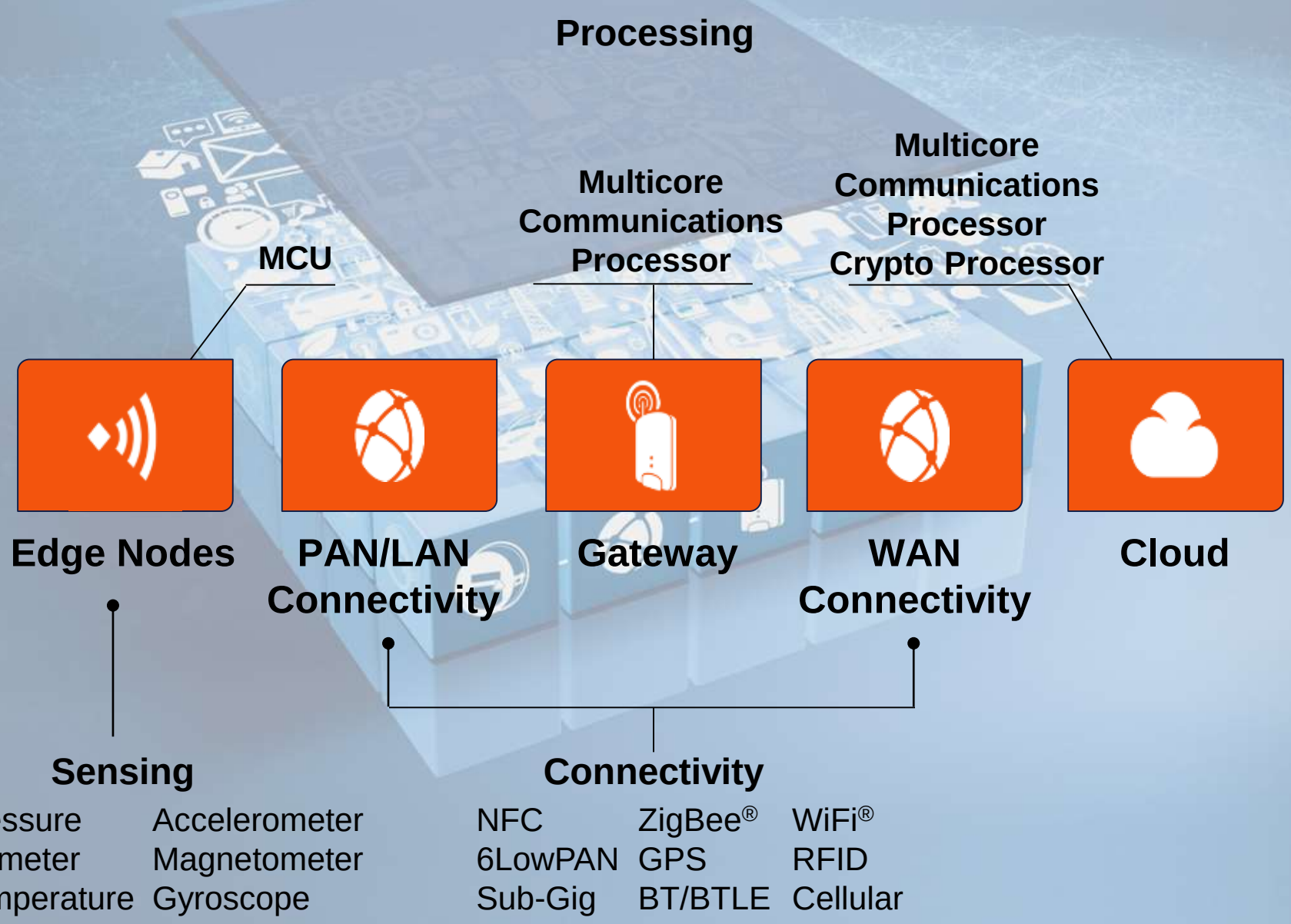
SECURE CONNECTIONS
FOR A SMARTER WORLD

AGENDA

- IoT Gateways – Overview
- Local Connectivity
- Cloud Connectivity
- Secure IoT Devices

IoT Concept


Processing
MCU
Multicore Communications Processor
Multicore Communications Processor Crypto Processor
Edge Nodes
PAN/LAN Connectivity
Gateway
WAN Connectivity
Cloud
Sensing
Pressure
Altimeter
Temperature
Accelerometer
Magnetometer
Gyroscope
Connectivity
NFC
6LowPAN
Sub-Gig
ZigBee®
GPS
BT/BTLE
WiFi®
RFID
Cellular

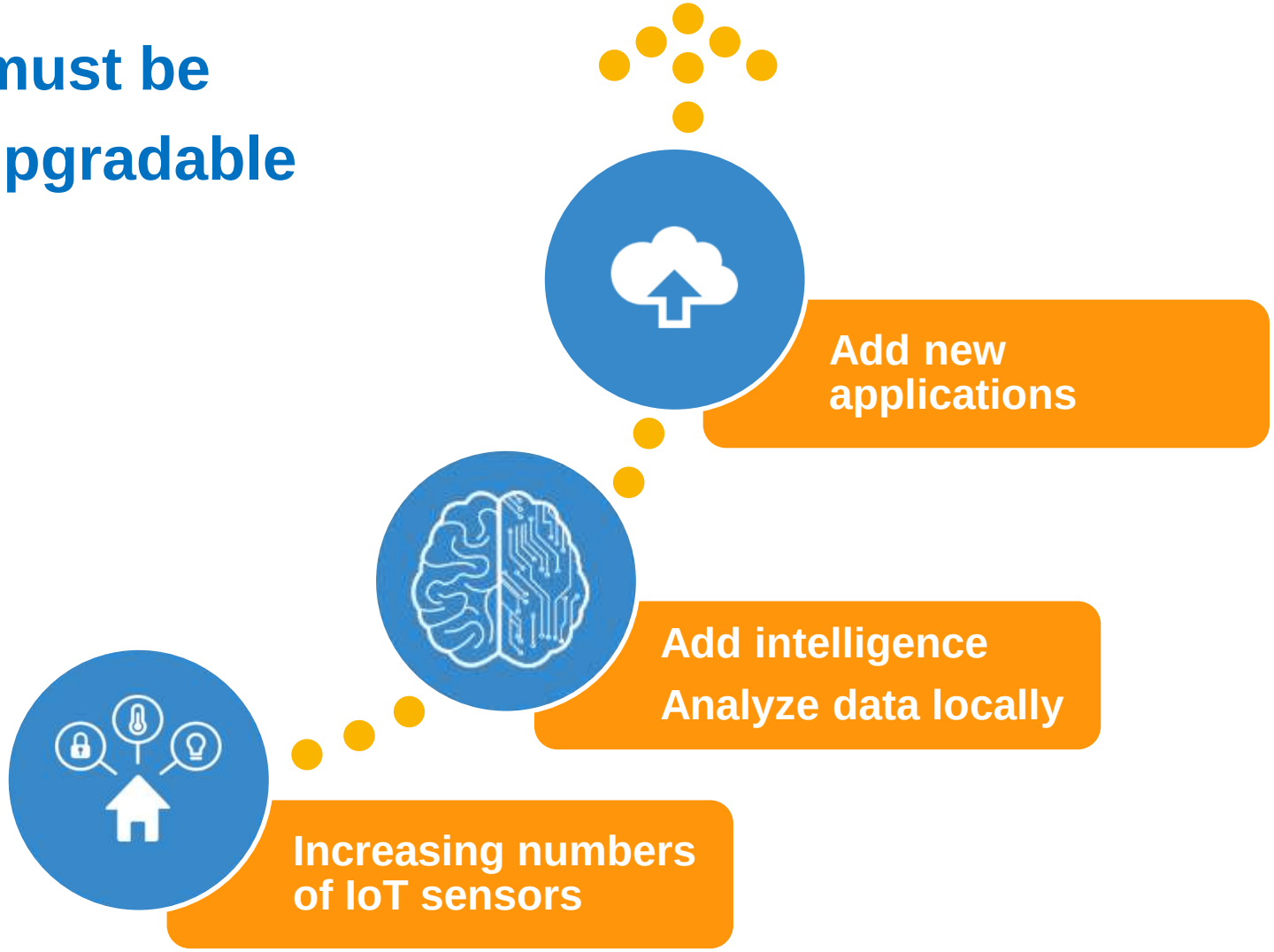
IoT Gateways

What Does a Gateway Do?

1. Support role constrained devices
   (processing performance)
2. Provide security services
   (security & trust story)
3. Have mechanisms to add functionality over time
   (virtualization, containers)

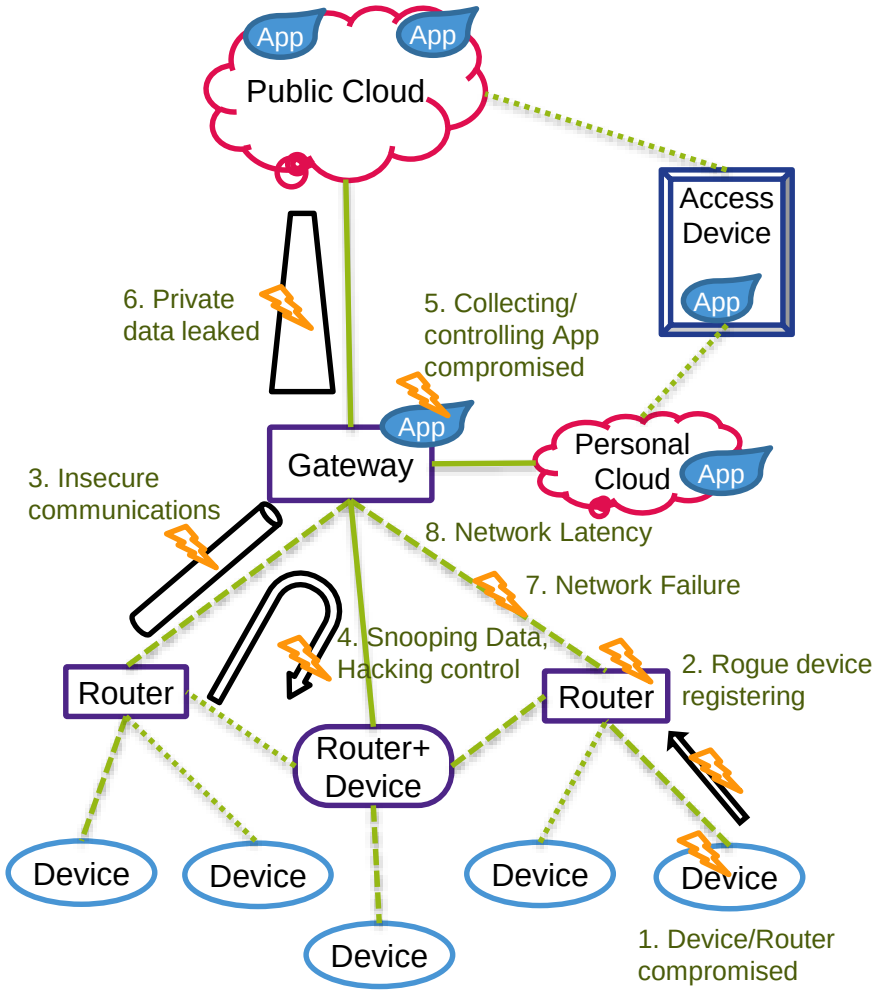
1. Support Role Constrained Devices

IoT Platforms must be Scalable and Upgradable

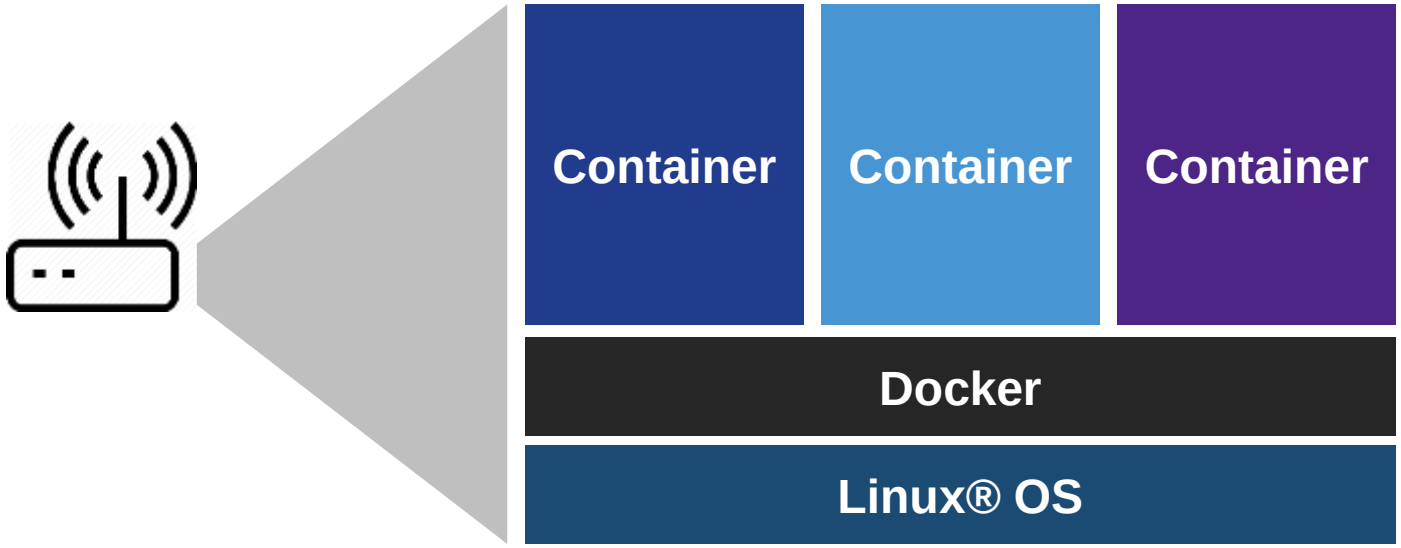


2. Provide Security Services

Concern	Solution
Device/Router compromised	Secure-boot
Rogue Device registering	Secure-ND, OpenSSL
Insecure communications	OpenSSL, IPSec
Snooping Data, Hacking control	Firewall, IPS, Anti-spoof
Collecting/Control App compromised	Trusted OS
Private Data leaked	Application/Content-recognition/firewall
Network Failure	Mesh-re-routing
Network Latency	Fast-Path, QoS, Zero-copy UDP
Mission/Life-critical communication	Real-time, QoS
Firmware upgrade compromised	Secure-FOTA



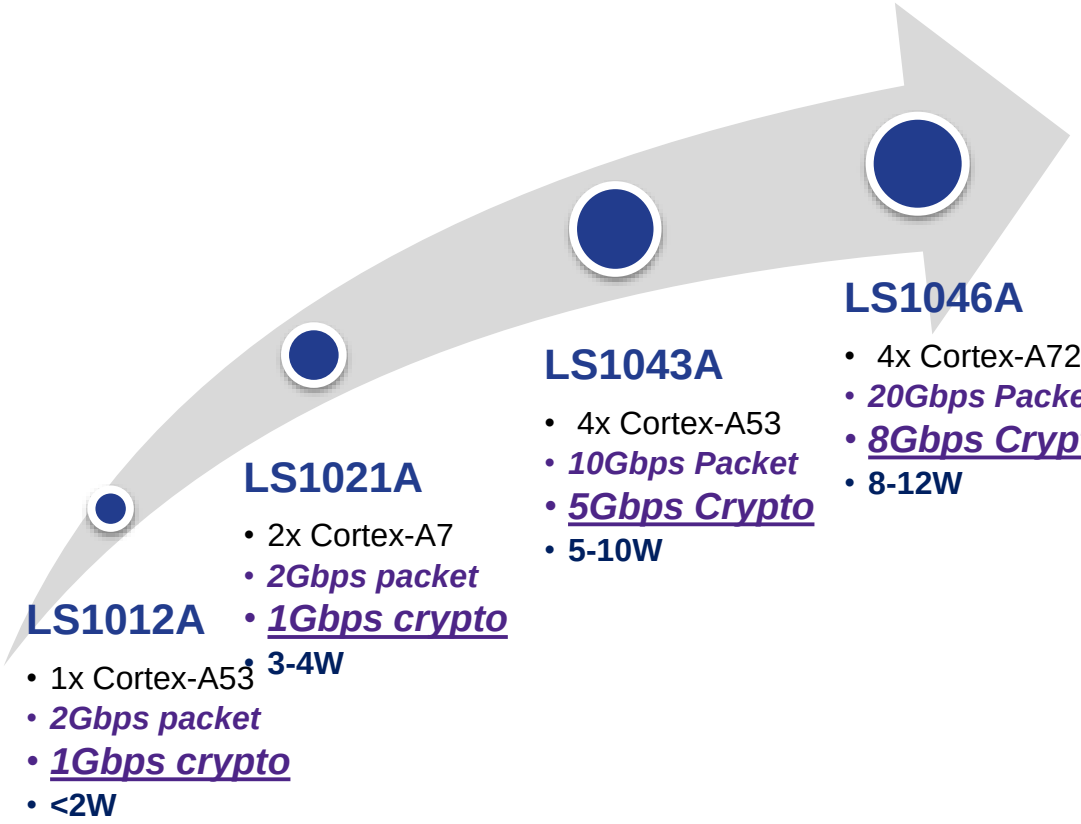
3. Add Functionality Over Time



- Technologies such as Docker or virtual machines allow quick deployment of applications
- Quickly move applications between any ARM 64-bit processor
- Secure “Over the Air” firmware upgrades with rollback for remote systems

Industrial IoT Linux SDK

Scalable IoT Solution



LEDE (OpenWRT) based SDK

OpenWrt
Wireless Freedom

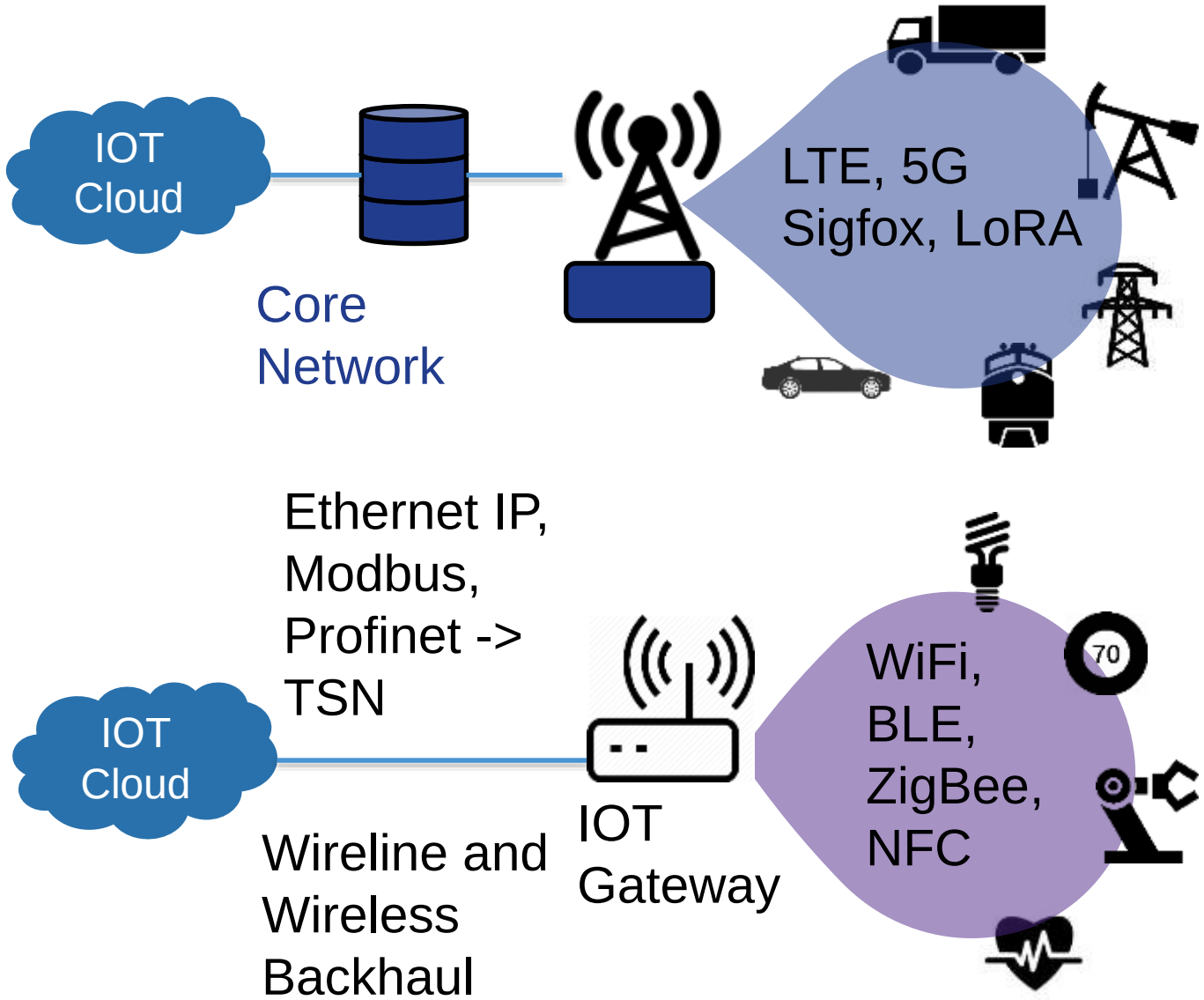
Connectivity Support

- Wi-Fi
- BLE
- Thread
- ZigBee
- NFC

01.

Local Connectivity

WAN Architecture Versus PAN/LAN Architecture



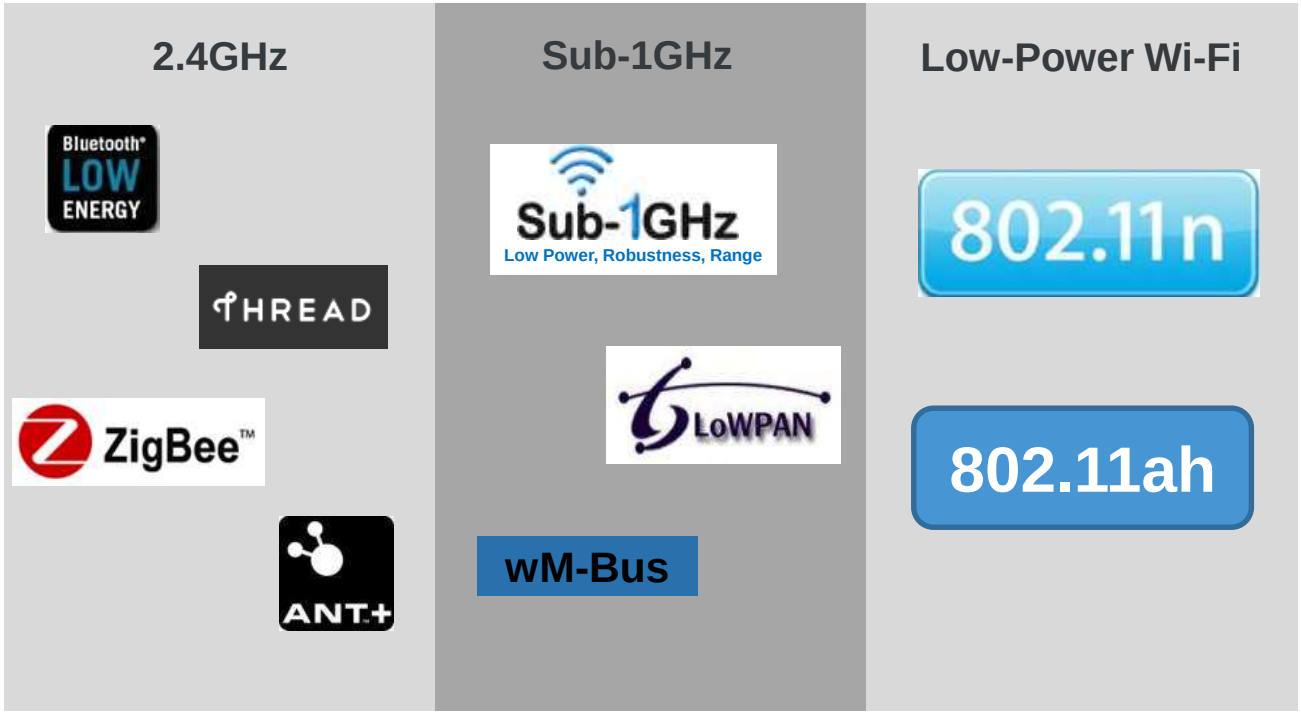
Centralized Wide Area Networks

- Mobility
- Large Coverage Area
- IOT as a Service
- Global Scale (3GPP)

- Lower Cost Devices
- Lower Operating Costs
- Lower Power Devices – Longer Battery Life
- Local processing (low latency)
- Broader Ecosystem

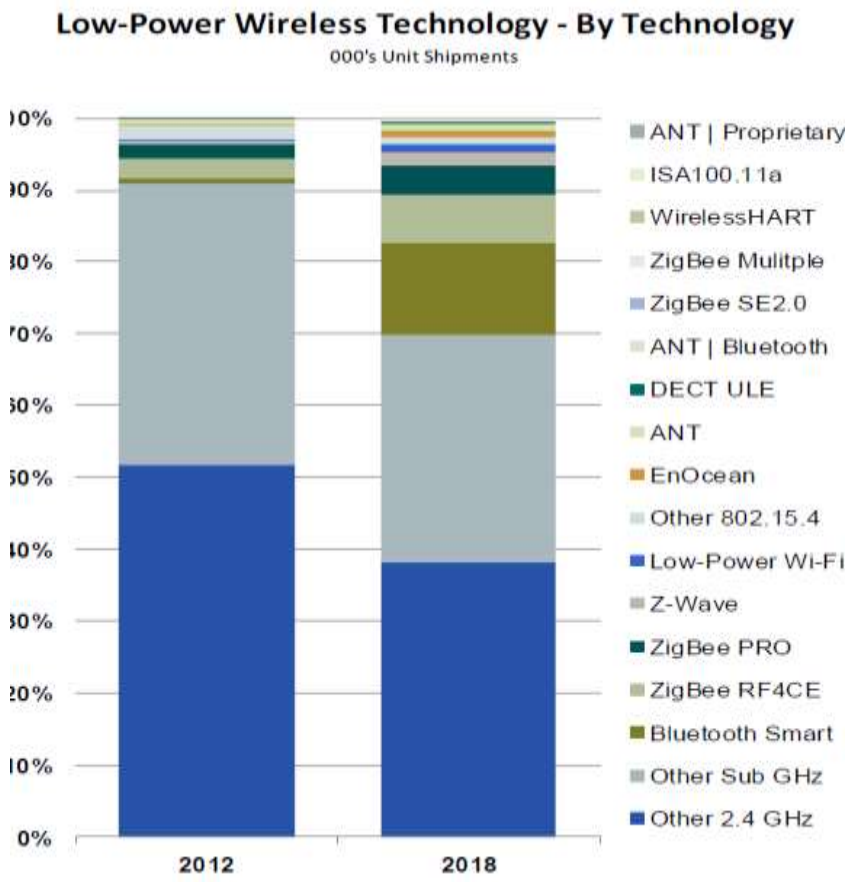
Persona/Local Area Networks

IoT Gateway to End Point Connectivity Solutions in Use Today



Remains highly fragmented

Market Dynamics – Technologies Breakout



Courtesy of IHS, 2013

Internet Connected Devices: Evolving from the “Internet of Things” to the “Internet of Everything”

- Biggest growth is going to come from BLE
  - BLE is set to become the most utilized standard in consumer health monitoring and tele health
  - Proprietary 2.4GHz is still the dominant technology in PC peripherals but is expected to gradually transition to BLE
- Sub-1GHz will remain very important due to its natural benefits in industrial applications (range, frequency spectrum, low-power)
- Ease of use is going to drive the need for Low-power Wi-Fi. 802.11n is the standard today. 802.11ah will follow

Wi-Fi Connectivity

OpenWrt
Wireless Freedom

- LEDE provides distribution for wireless router
- Support for many wireless modules
  - mPCIe slots on supported reference design boards
  - Example: WNC DNXA-H1 module (ATH9K driver)

LS1012ARDB

LS1021A-IOT

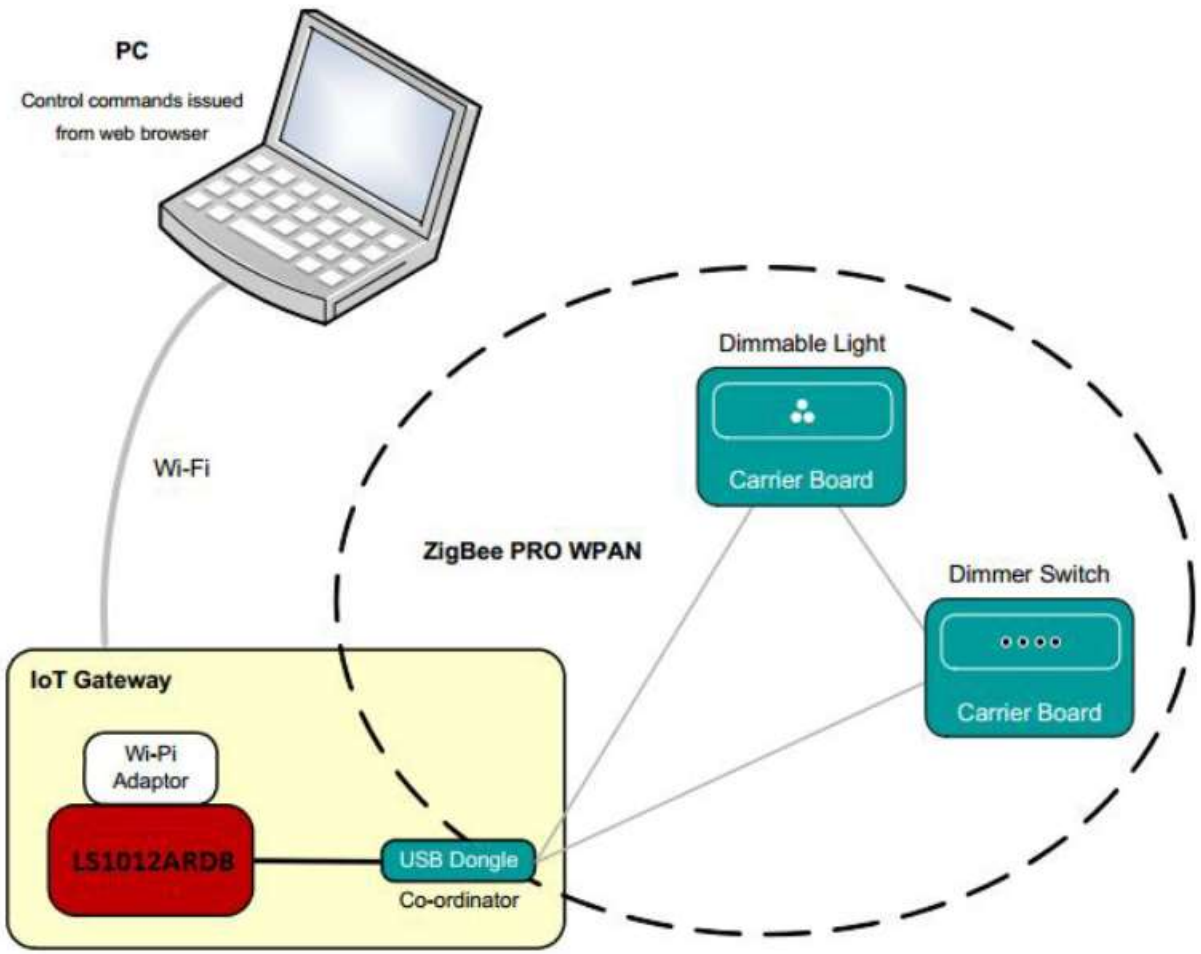
LS1043ARDB

LS1046ARDB

BLE, Thread, ZigBee, and NFC

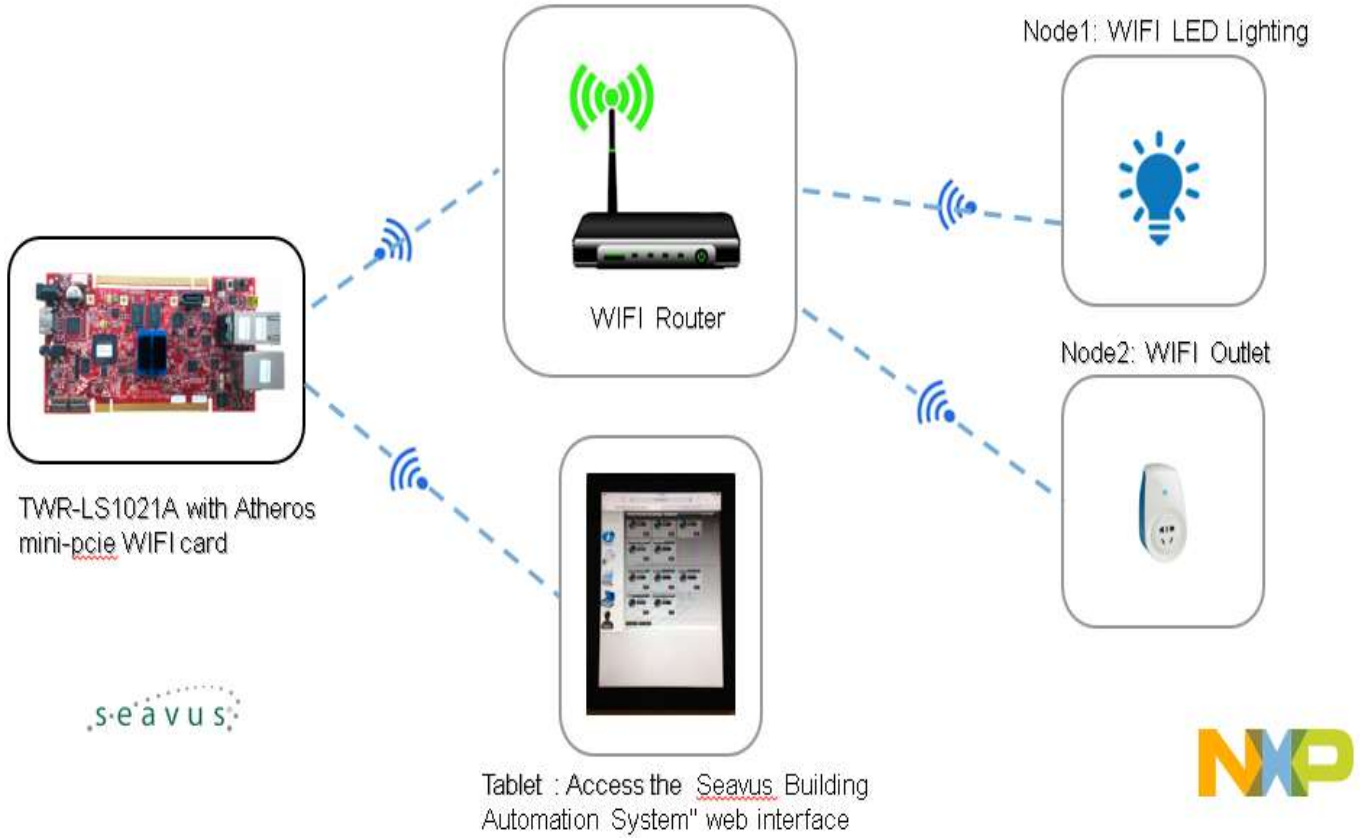
- BLE
  - supported through KW41Z modules
    - FRDM-KW41Z board or integrated on the reference design (LS1012ARDB)
    - bluez utilities – HCI
- Thread
  - supported through KW41Z modules
    - FRDM-KW41Z board or integrated on the reference design (LS1012ARDB)
    - TUN/TAP kernel modules with FSCI encapsulated IPv6
- ZigBee
  - JN516x-EK004 Evaluation Kit
- NFC
  - OM5578 Arduino Shield Interface Board

ZigBee Smart Home Gateway



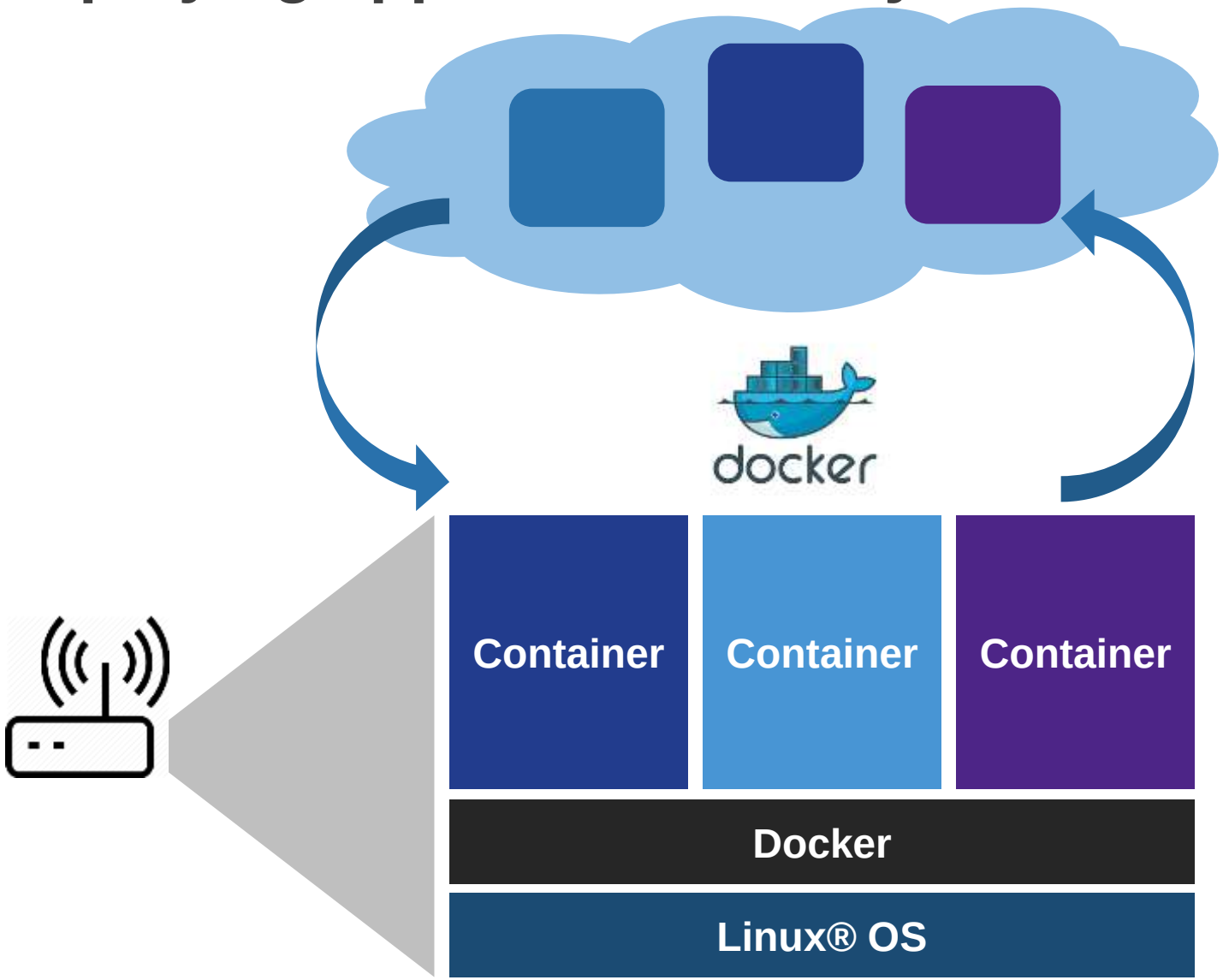
- NFC commissioning of each device on ZigBee network

Wi-Fi Building Automation Gateway



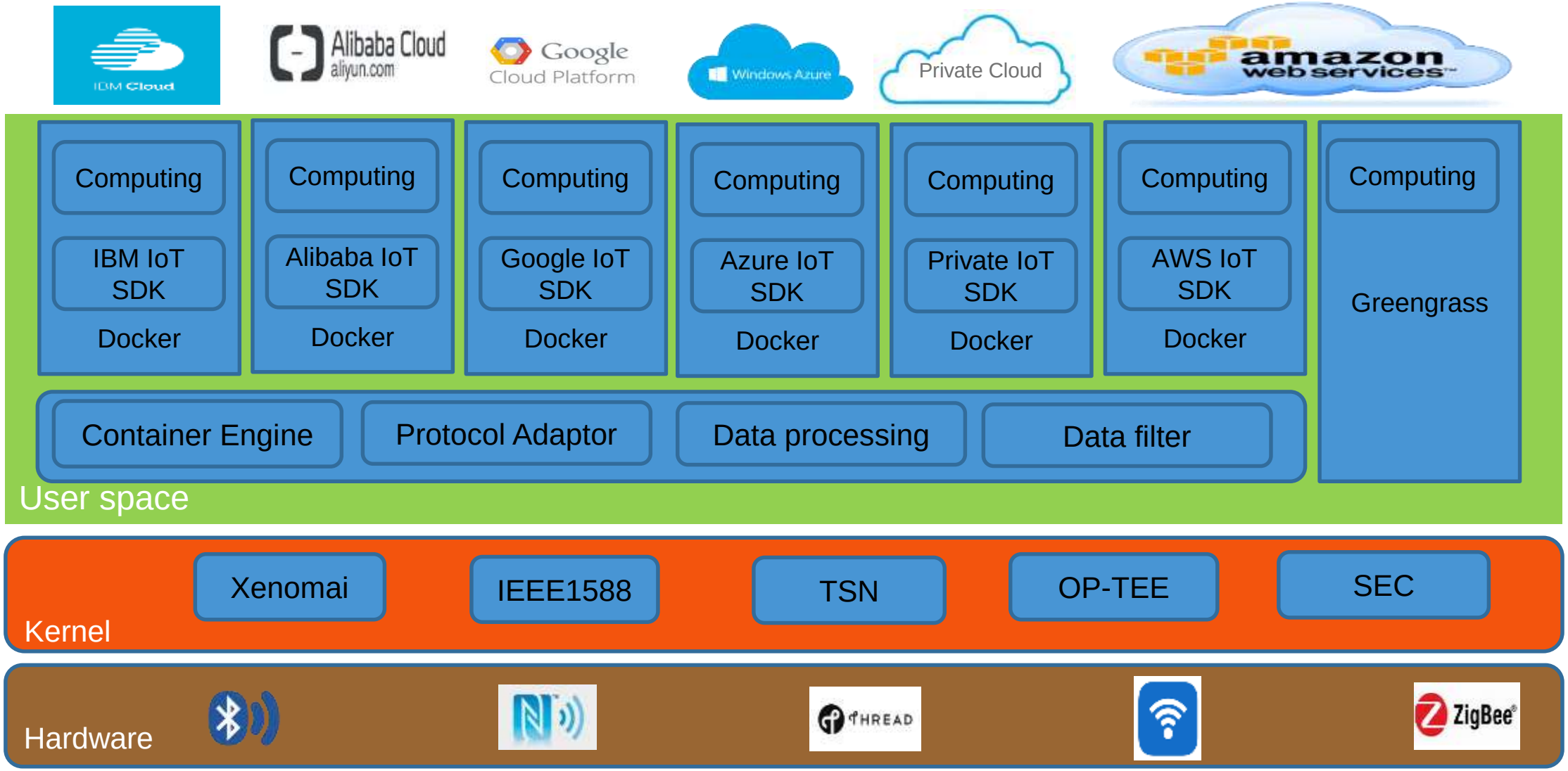
02.
Cloud Connectivity

Deploying applications easily with Docker



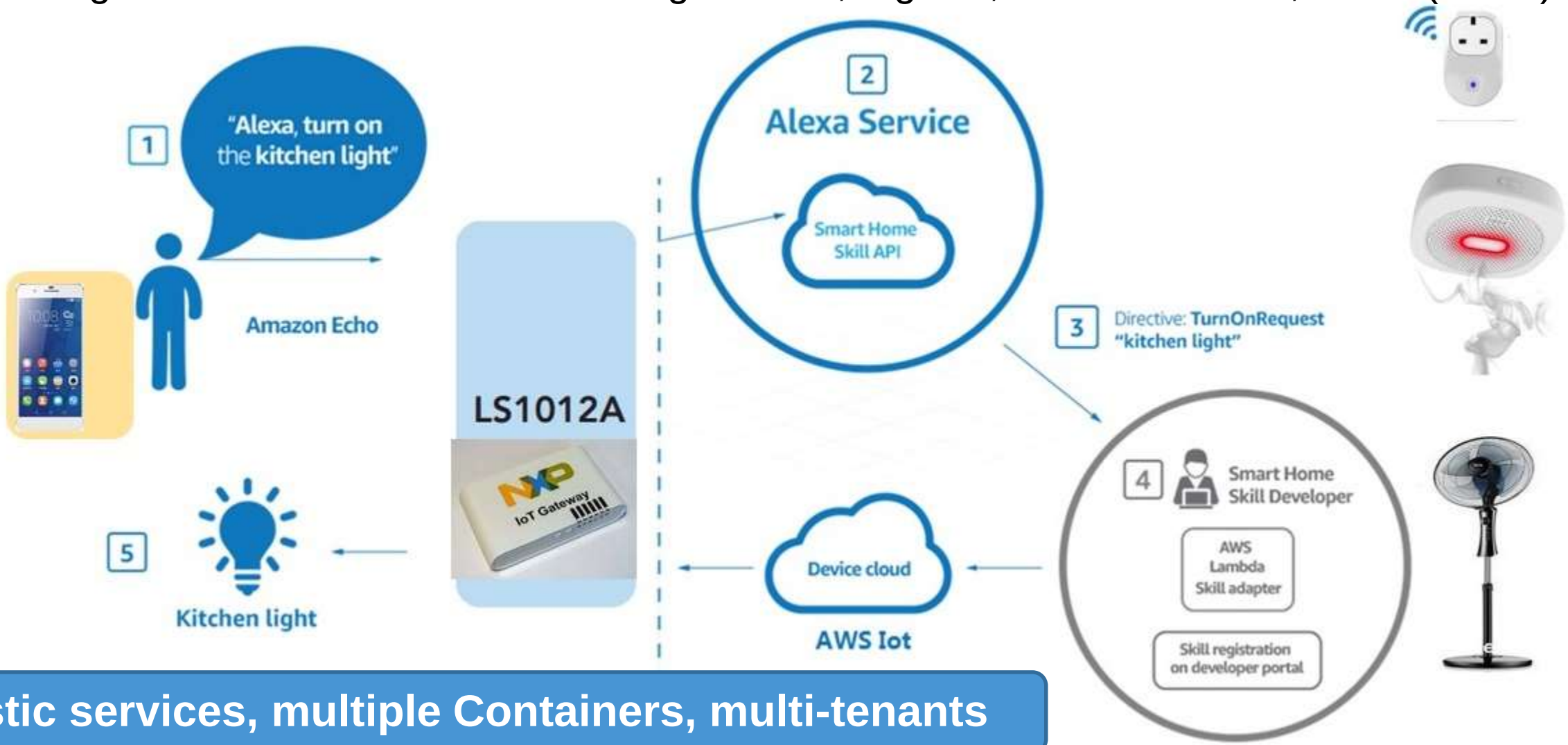
- Uses Linux Containers to partition different applications and allocate resources
- Easily move applications between the cloud and the edge
- Move applications between different gateways
- Connect to the cloud with docker containers

IoT Gateway Platform



Advanced, Multi-Cloud Virtualized IoT Platform (Home, Enterprise IoT)

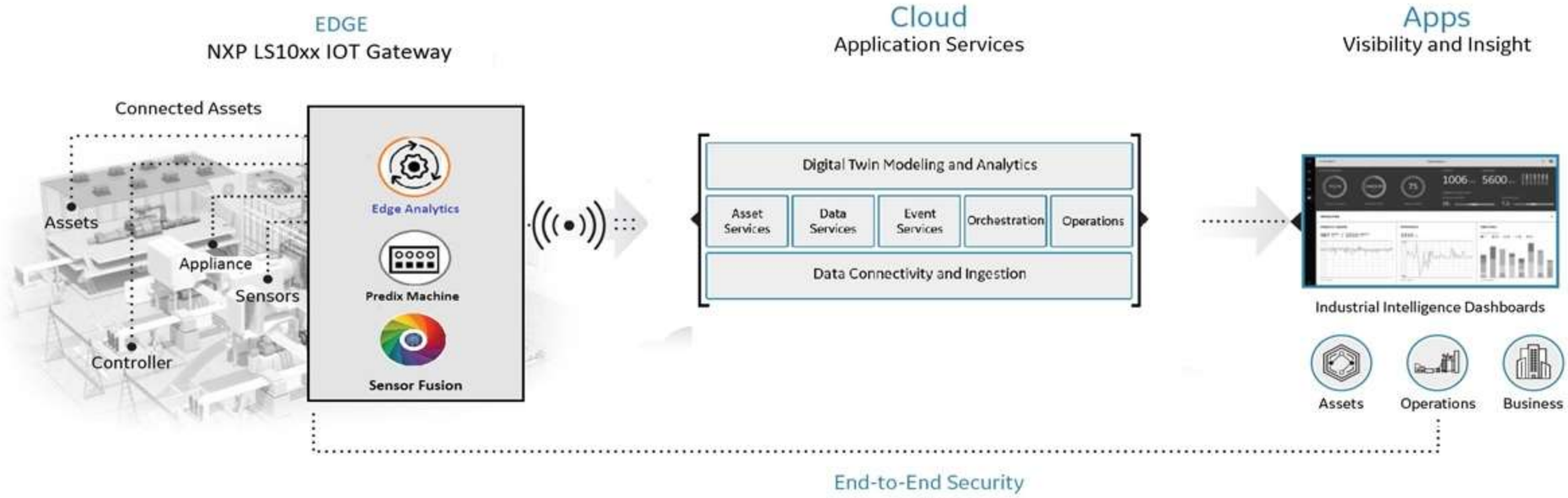
- Running in Docker Container connecting with BT, ZigBee, Wi-Fi and AWS, Alexa (Voice)



Elastic services, multiple Containers, multi-tenants

Advanced, Multi-Cloud Virtualized IoT Platform (Industrial IoT Gateway)

- GE-Predix Industrial IoT Gateway running in 2nd Container connecting to Industrial Cloud



Elastic services, multiple Containers, multi-tenants

03.

Secure IoT Devices

1990s – 2016

An Era of Security/Trust Breaches

As computer systems have grown more capable, complex...so have the **attacks**!

9 CERTIFICATES
Stolen across 7 different domains
COMODO Certification Authority Hack

4 MILLION
Employee federal records hacked
Department of Defense Hack

77 MILLION
Compromised accounts
Playstation Network Outage

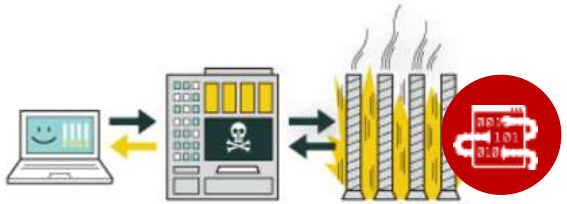
45.7 MILLION
Credit cards stolen
TJX Hack – Albert Gonzalez

900,000
Deutsche Telekom customers affected in Germany

2,400
TalkTalk routers affected in the UK

Operation Shady Rat

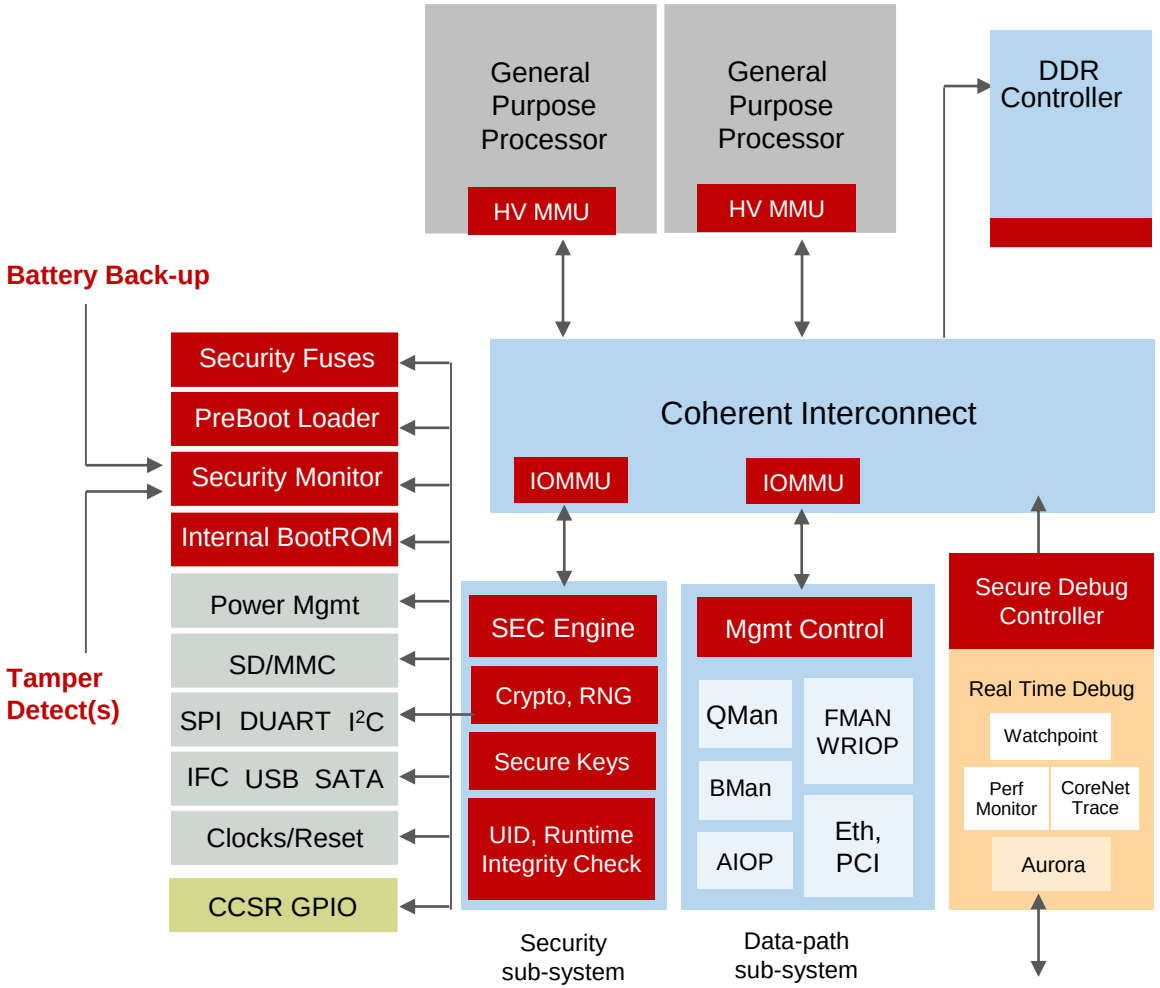
85%
Share of infected computers – Iran, Indonesia, India
Stuxnet Worm (Targeting Industrial Systems)



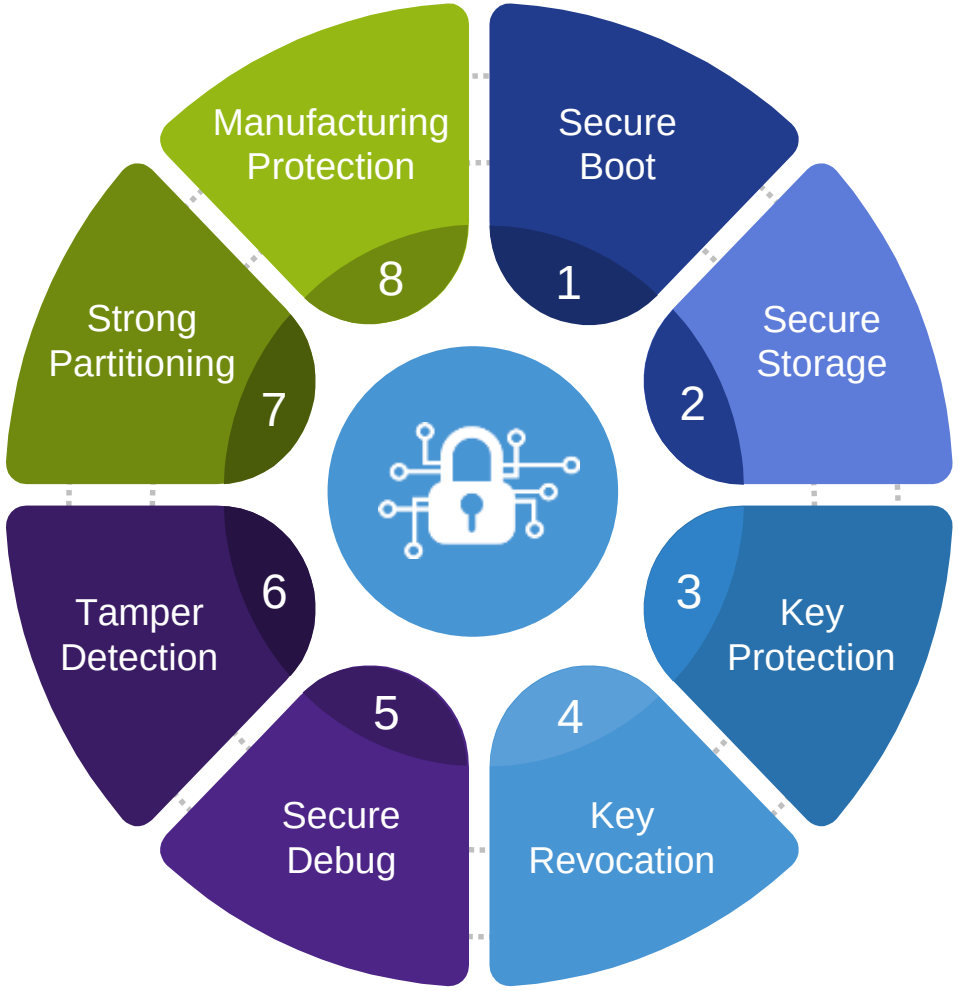
71+ ORGANIZATIONS HIT
Defense contractors, United Nations, The Olympic Committee
Mirai Botnet Malware

Trust Architecture

Hardware based security features to ease the development of trustworthy systems

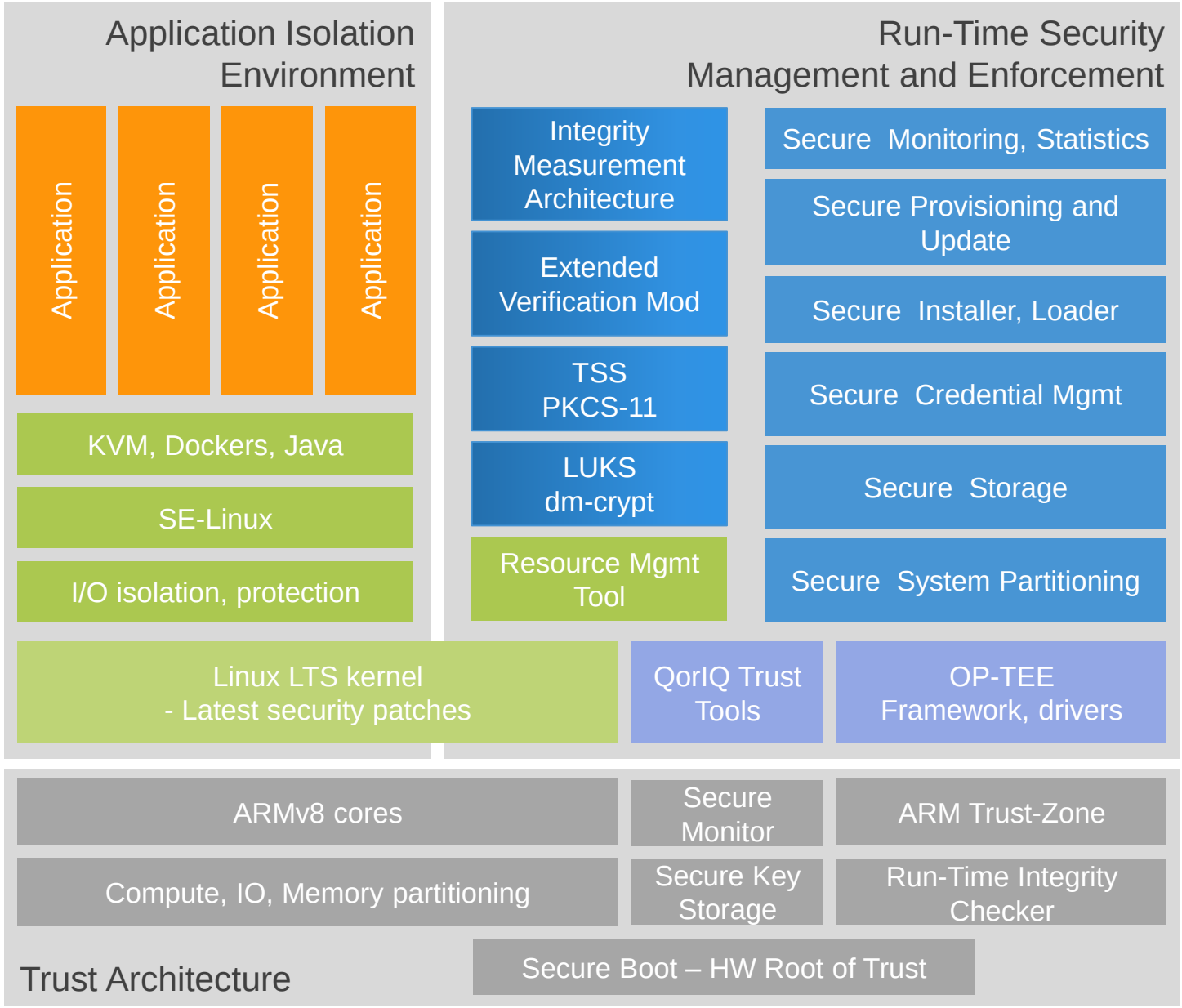


All QorIQ SoCs support Trust Architecture

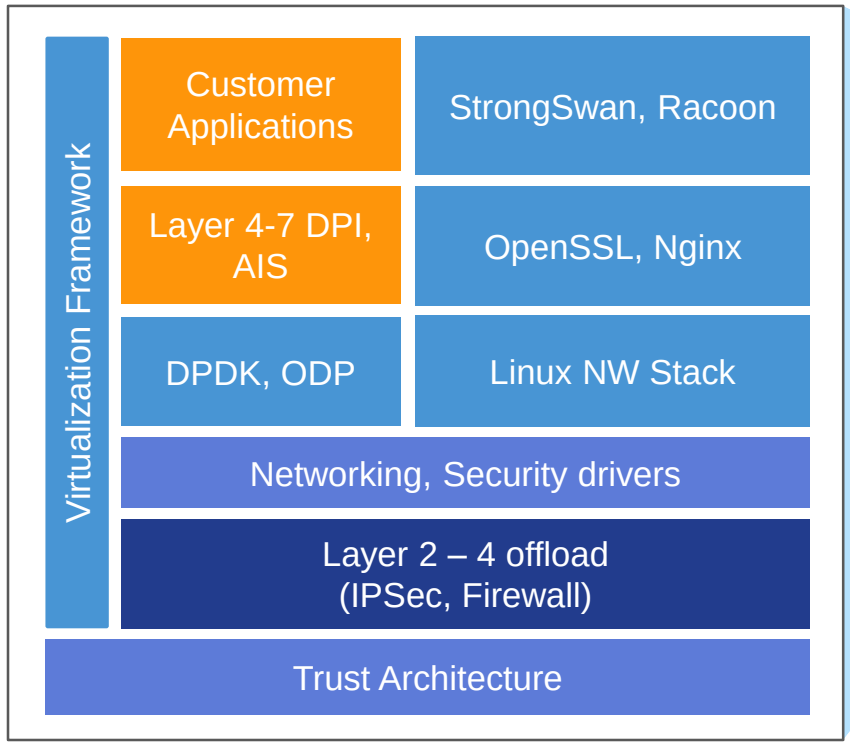


Trust Linux

- Enhances standard off-the-shelf Linux
- Ensures Trusted Applications
  - Isolation of resources
  - Verified installation
  - Controlled launch
- Ensures Trusted Data
  - Isolated, encrypted user data.
  - Isolated, secure credentials
  - Controlled access
- Ensures Trusted System
  - Run-time monitoring and statistics
  - Firmware update, commissioning
- HW Assist by Trust Arch
  - HW root of trust during boot process
  - Run-time integrity check for kernel, TEE
  - Secure monitor, tamper detect



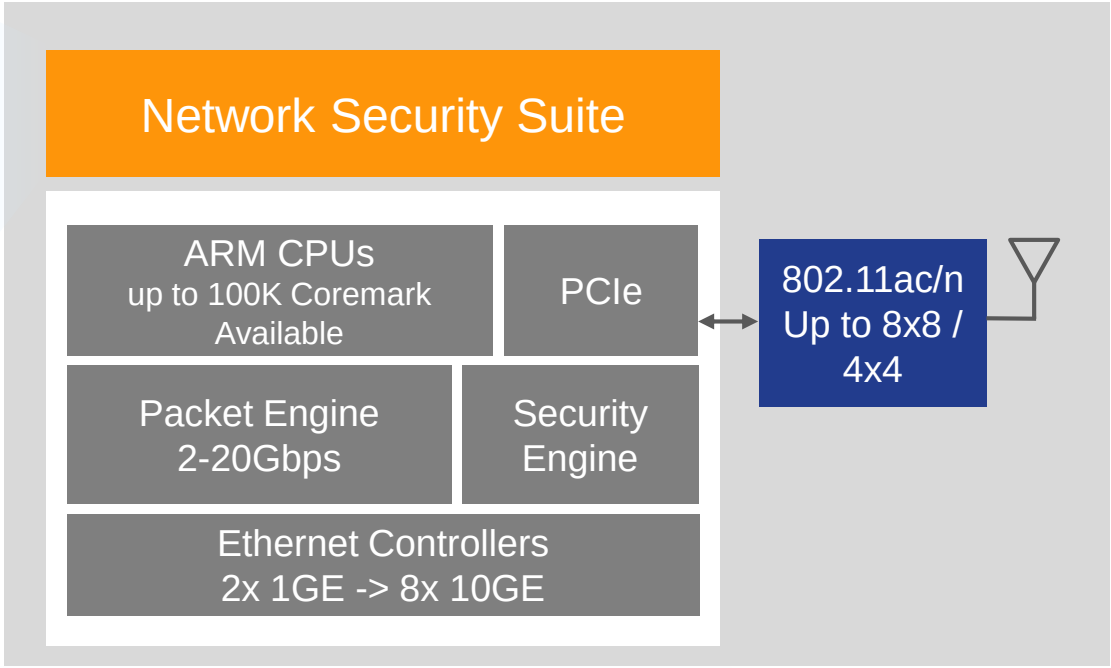
Network Security Suite

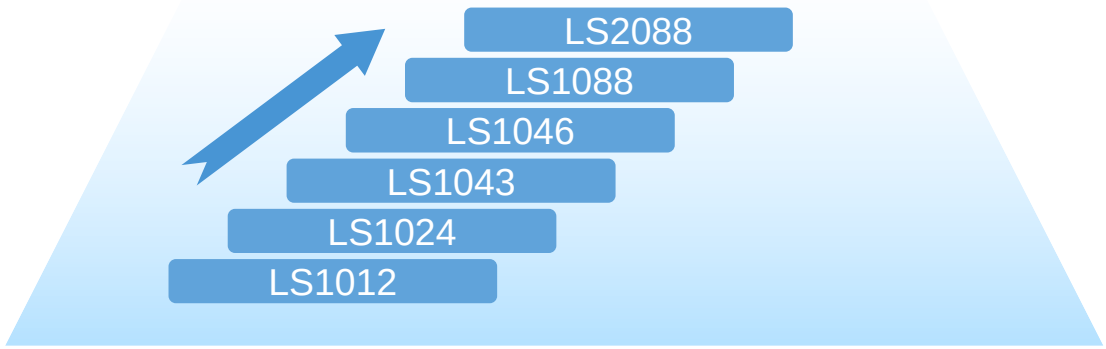


Low-end
Complete solution

Mid-range
optimized components

Scalable Hardware





Summary

- **Gateways require flexible hardware and software for changing connectivity options**
- **Docker enables easy enablement of different cloud services**
- **Gateways are the first line of defense against security threats**

SECURE CONNECTIONS
FOR A SMARTER WORLD