Microsoft

IoT in Action

#IoTinActionMS

Microsoft

Developing an IoT security practice for durable innovation

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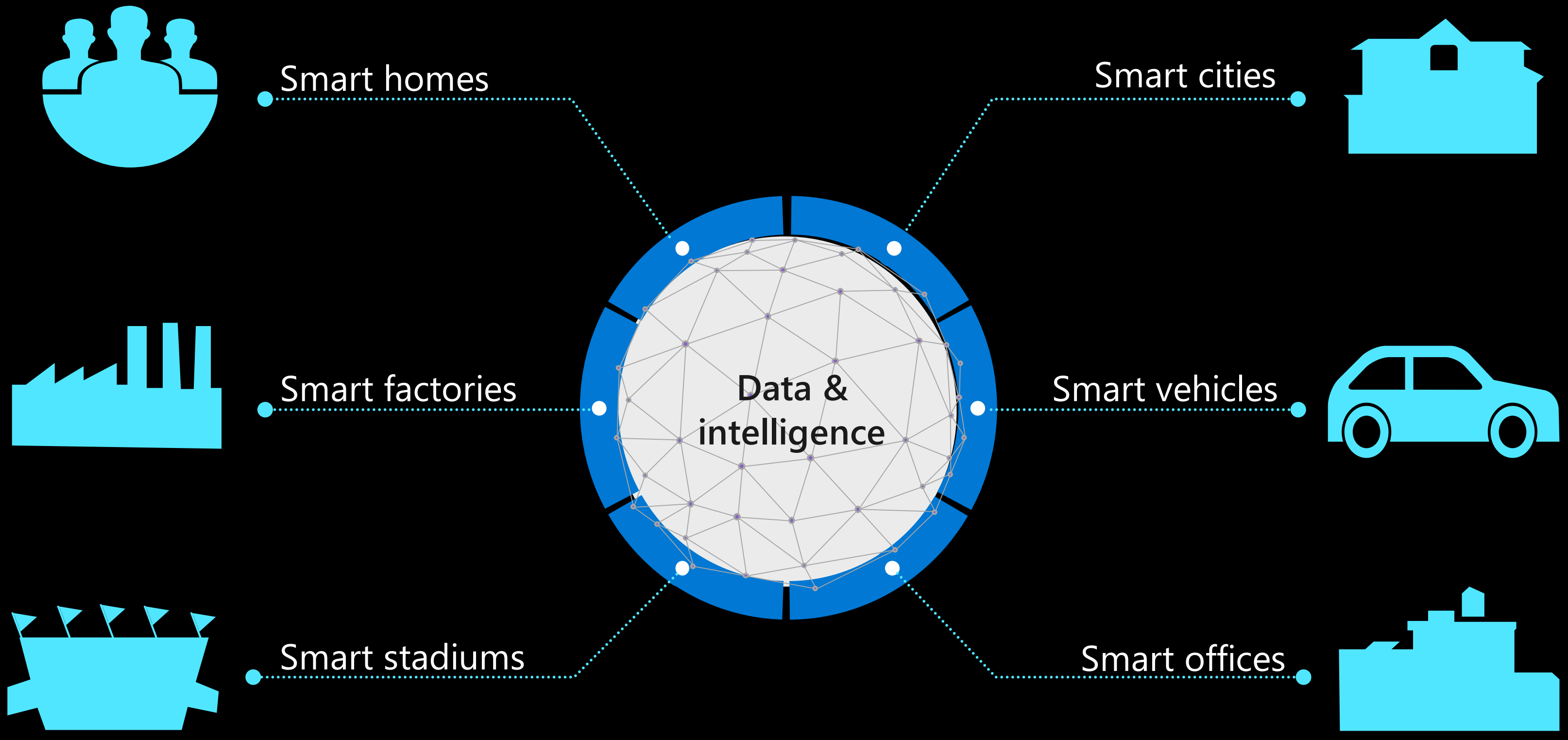
IoT in Action

IoT is fueling digital transformation



Smart homes

Smart factories

Smart stadiums

Data & intelligence

Smart cities

Smart vehicles

Smart offices

20 billion connected devices by 2020

—Gartner

41.6B

Connected “things” by 2025 generating 180ZB of data

$130B

New monetization avenues due to IoT-related services

80%

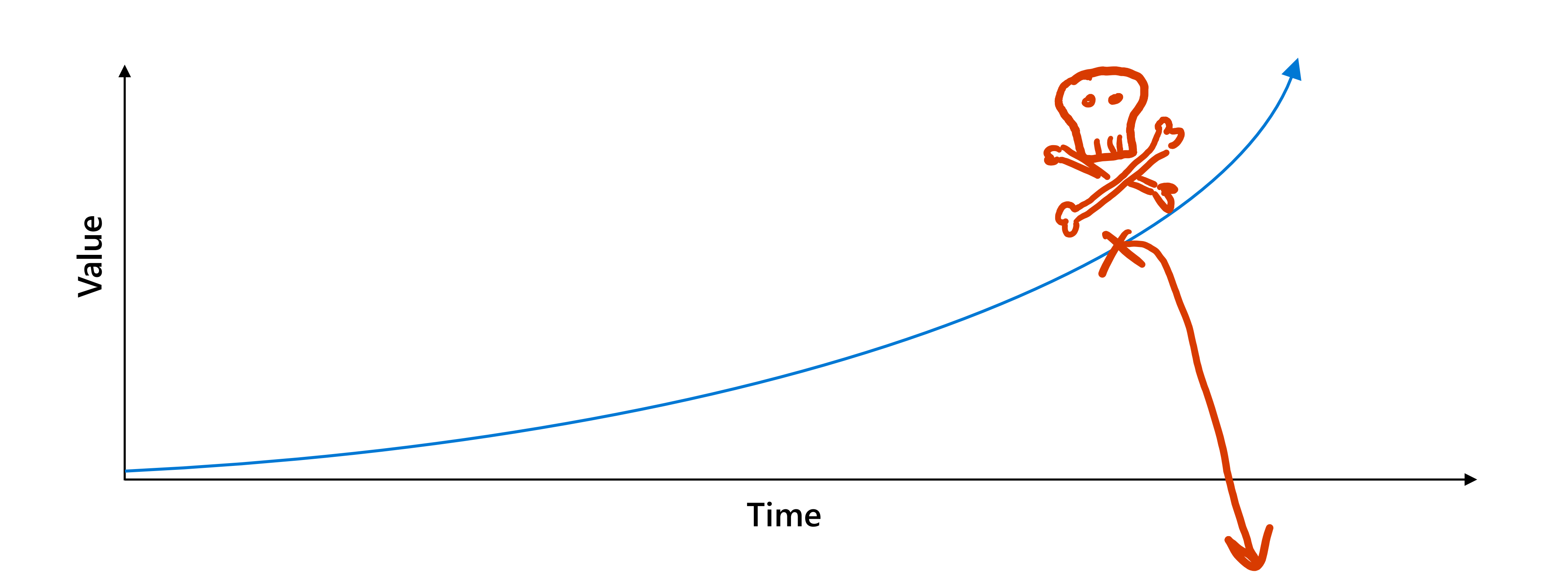
Companies that increased revenue as a result of IoT implementation

$100M

Average increase in operating income (avg. 8%) among the most digitally transformed enterprises

- Reduce costs
- Delight customers
- Streamline operations
- Create new business models

Planning your IoT deployment



PoC stage
slow climb in value

Production deployment
delivering real business value

~~**Iteration**~~
~~accelerating value through digital feedback loop~~

“Protecting Your Family: The Internet of Things Gives Hackers Creepy New Options”

“Security experts warn of dangers of connected home devices”

Cyberattacks On IOT Devices Surge 300% In 2019, ‘Measured In Billions’, Report Claims

“Industrial IoT to equip new era of corporate intruders coming in through devices”

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“The IoT ransomware threat is more serious than you think”

“When smart gadgets spy on you: Your home life is less private than you think”

“Industrial IoT to equip new era of corporate intruders coming in through devices”

“Webcam firm recalls hackable devices after mighty Mirai botnet attack”

“The Lurking Danger of Medical Device Hackers”

“Hackers exploit casino’s smart thermometer to steal database info”

“Hacking critical infrastructure via a vending machine? The IOT reality”

74%

of consumers would pay more for a smart device that had additional security

65%

of consumers wouldn’t purchase a smart device from a brand that has experienced a security breach

93%

of consumers believe that manufacturers need to do more to secure smart devices

97%

of enterprises call out security as a concern when adopting IoT

22%

enterprise customers are willing to pay 22% more for IoT cybersecurity

70%

and they would buy 70% more devices if security concerns were mitigated

Governments taking action

USA

- State legislation passed (CA, OR, NY, IL, MD)
- Several bills introduced to Congress
- NIST mandated to define multiple baselines

Europe/UK

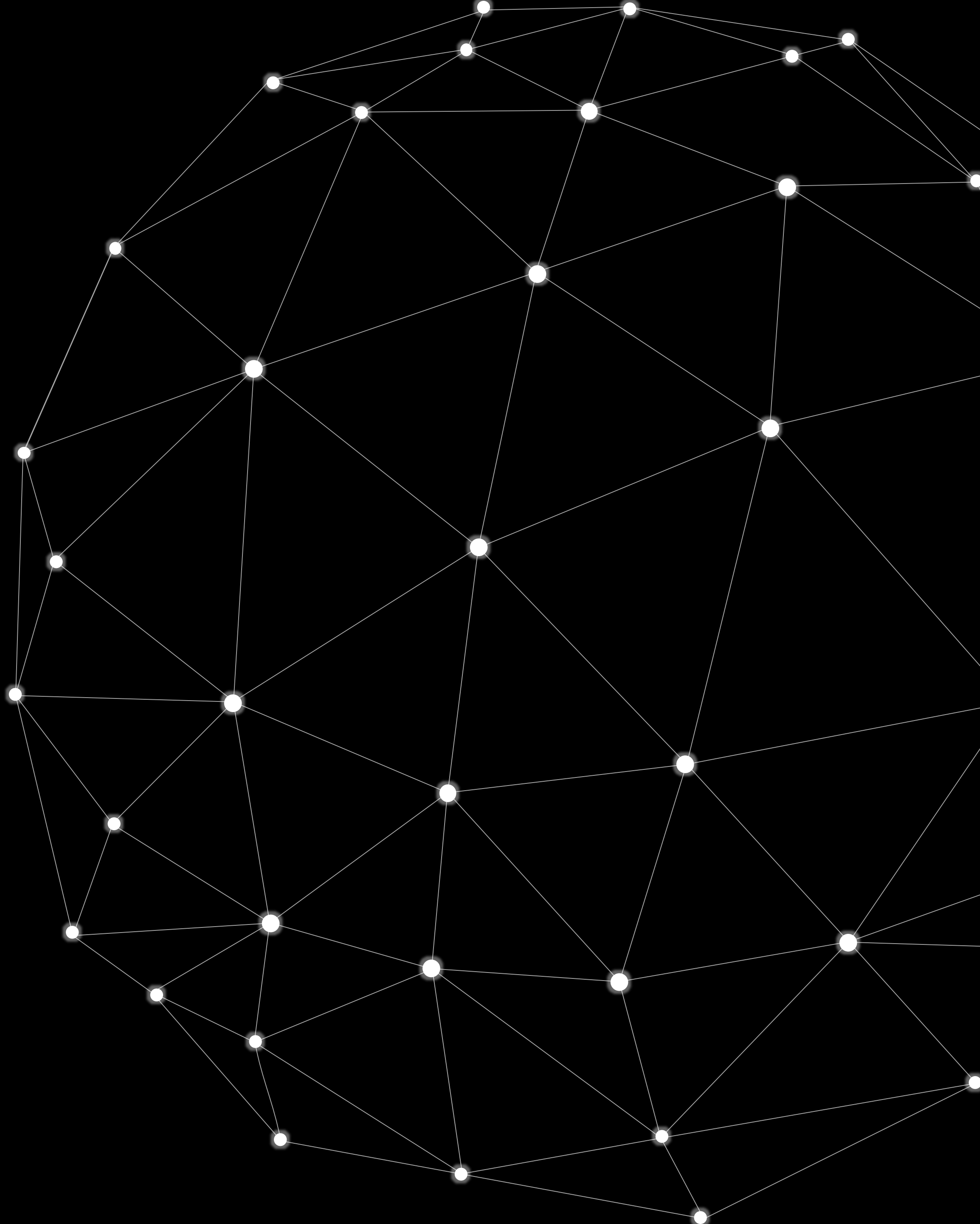
- Security certifications under the EU Cybersecurity Act
- UK Code of Conduct informed ETSI Standard
- UK testing different consumer labels

APAC

- Singapore aims to define security guidelines
- Japanese campaign to hack consumer devices

Cybercrime is big business for bad actors

- Nation-states
- Organized criminal groups
- Corporate competitors
- Opportunists
- Hacktivists
- Company insiders



A look at device-level attack surfaces

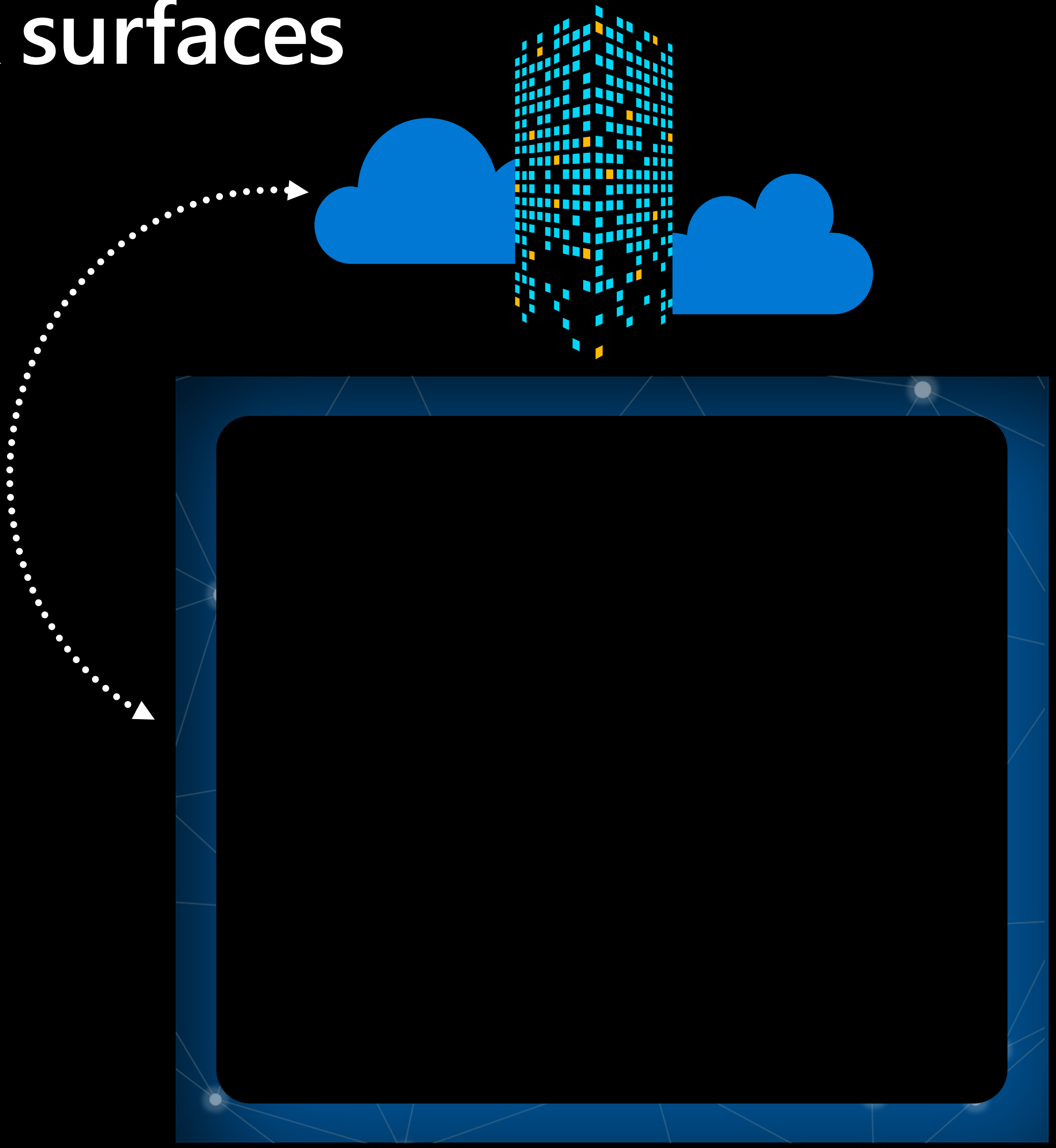
Applications

Network communications

Network stack

OS/Platform

Hardware



IoT attacks put businesses at risk

Devices bricked or held for ransom

Devices are used for malicious purposes

Data & IP theft

Data polluted & compromised

Devices used to attack networks

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The cost of IoT Attacks

Stolen IP & other highly valuable data

Compromised regulatory status or certifications

Brand impact (loss of trust)

Recovery costs

Financial and legal responsibility

Downtime

Security forensics

Devices bricked or held for ransom

Your devices or mission critical equipment are rendered useless. The only possible recovery options require you to roll a truck or to pay ransom to your attacker.

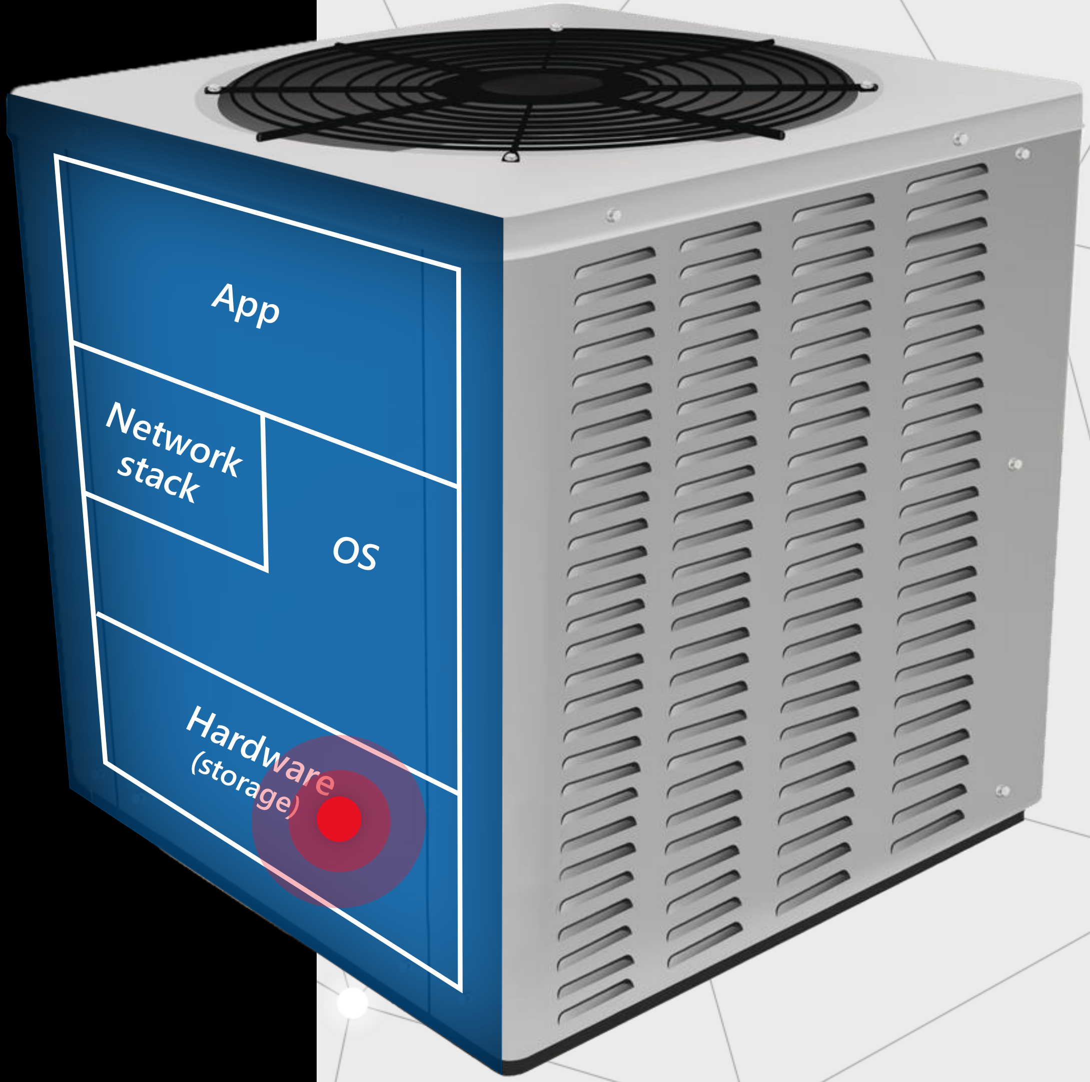
Assessing the risk:

- Would device/equipment downtime hurt revenue?
- Would there be out of pocket costs related to downtime?
- Does the device/equipment perform a critical task that people depend on for health and safety?

Devices bricked or held for ransom

Access to the HW and storage is typically the goal for attackers in attacks like this

Methods of achieving this include malicious or unauthorized code execution that escalates privileges and gives them access to the deepest parts of the platform where they can modify the storage.



Devices bricked or held for ransom

Strategies and capabilities for mitigation

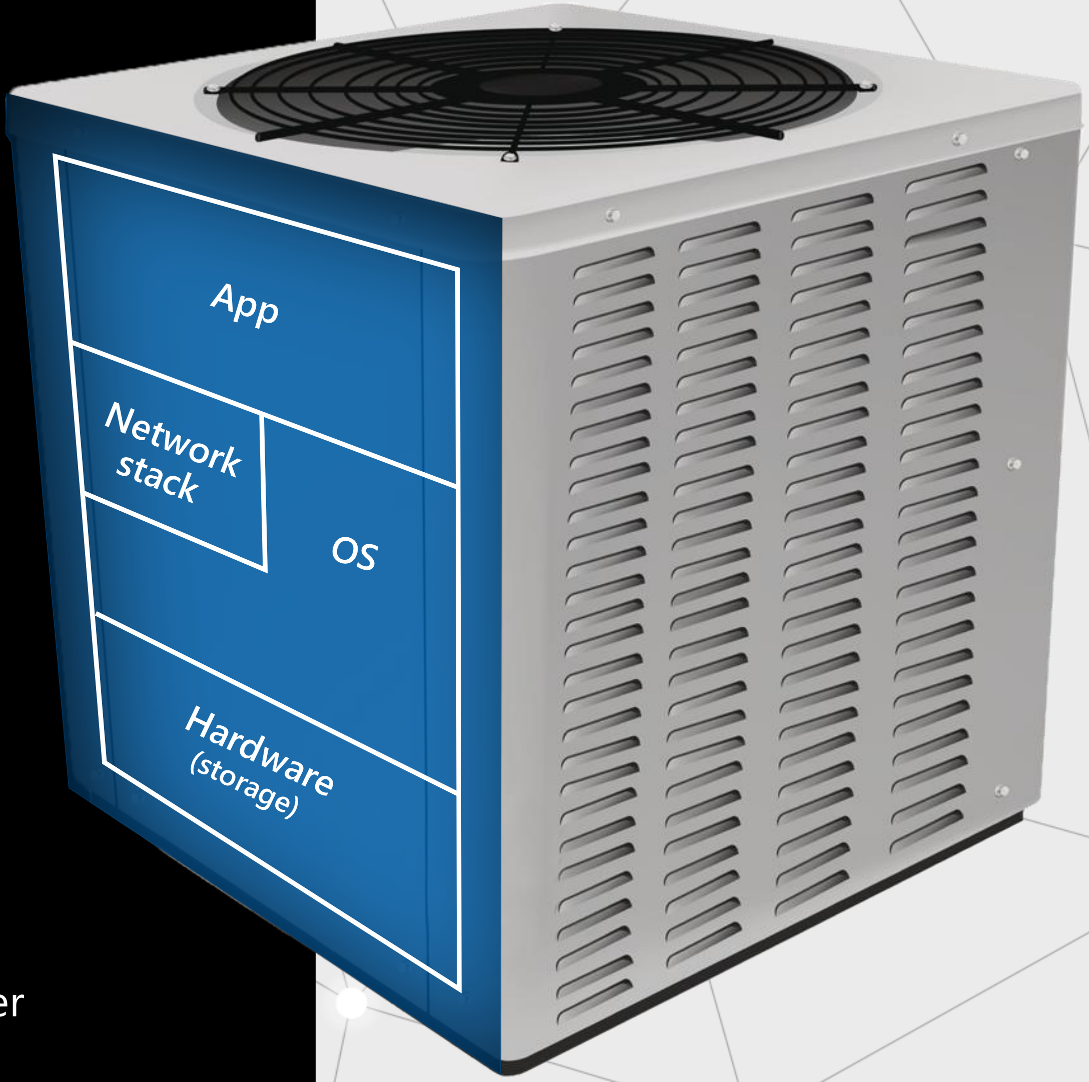
Defense in depth; multiple layers of defense that control access to storage

Compartmentalization; to limit access to various aspects of the OS

Hardware barriers; such as MMU to manage the flow of communication on the chip

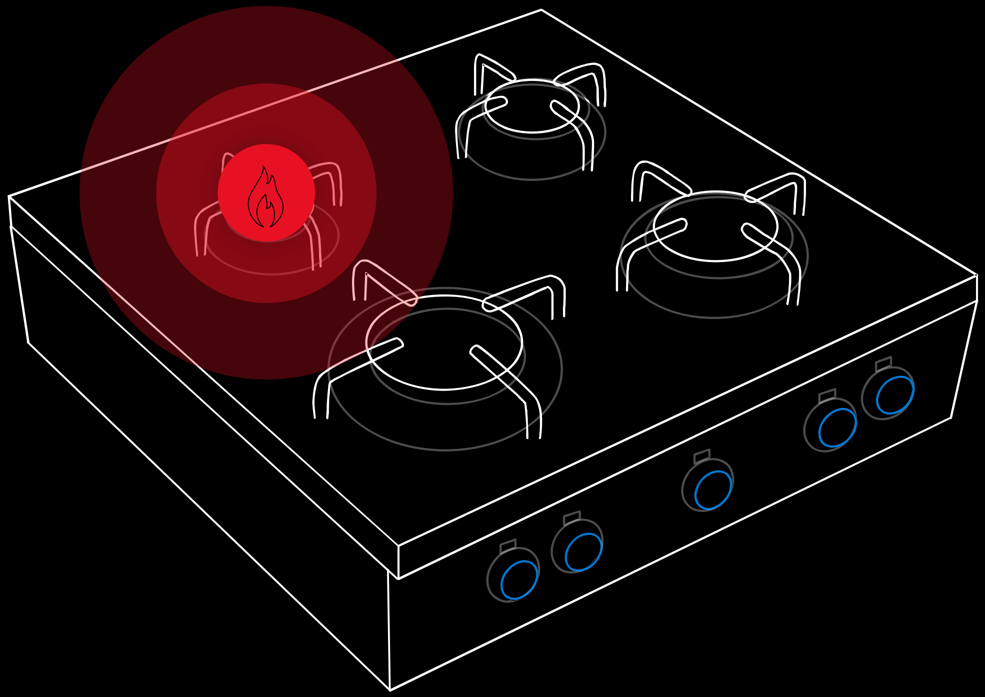
Over-the-air (OTA) updates; to renew security on devices limiting the opportunity for success

Best practice: Vertically integrated system where all these capabilities interlock and comprehensively refreshed together



Devices are used for malicious purposes

Your devices are used to do harm in the environments they operate in. This could lead to privacy breaches, physical damage and injury, brand degradation and legal liability



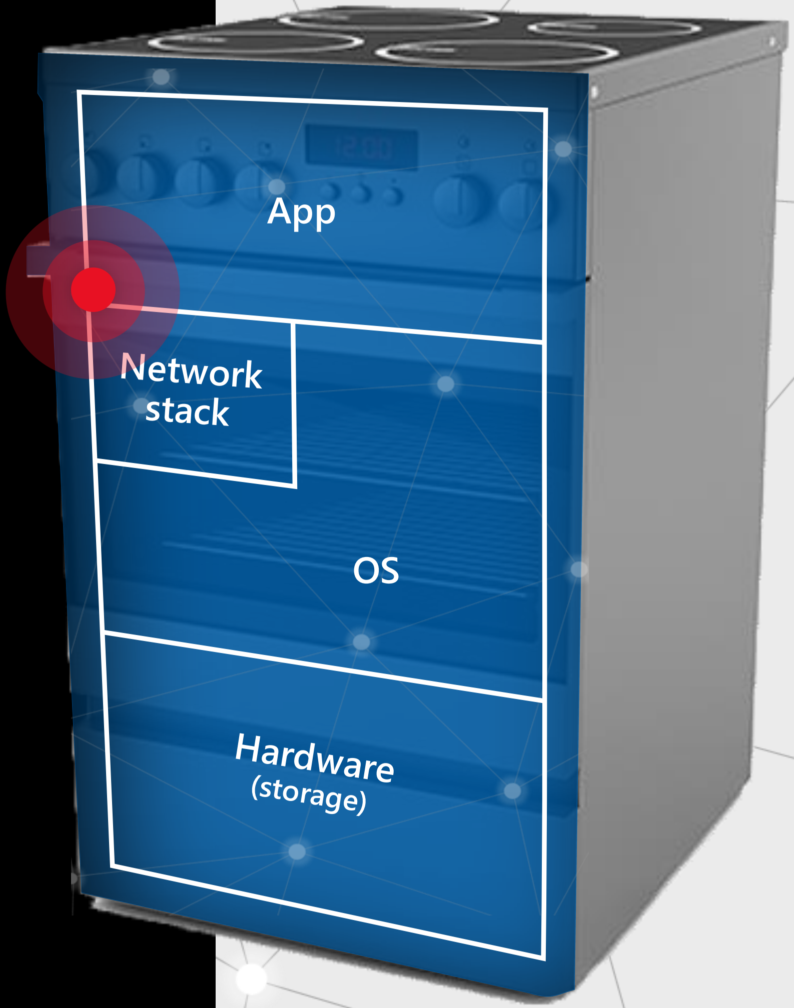
Assessing the risk:

- Do your devices access heating elements, gas or water lines, or operate in a potentially dangerous context?
- Could your devices cause physical harm to the people that operate them?
- Can your devices cause a privacy breach in their environment?

Devices are used for malicious purposes

Attackers trick your devices into doing something they weren’t intended for

Methods of achieving this include attack that imitate your command and control through network tampering. Attackers may also trick a device into running malicious code, giving them access to a device’s physical controls.



Devices are used for malicious purposes

Strategies and capabilities for mitigation

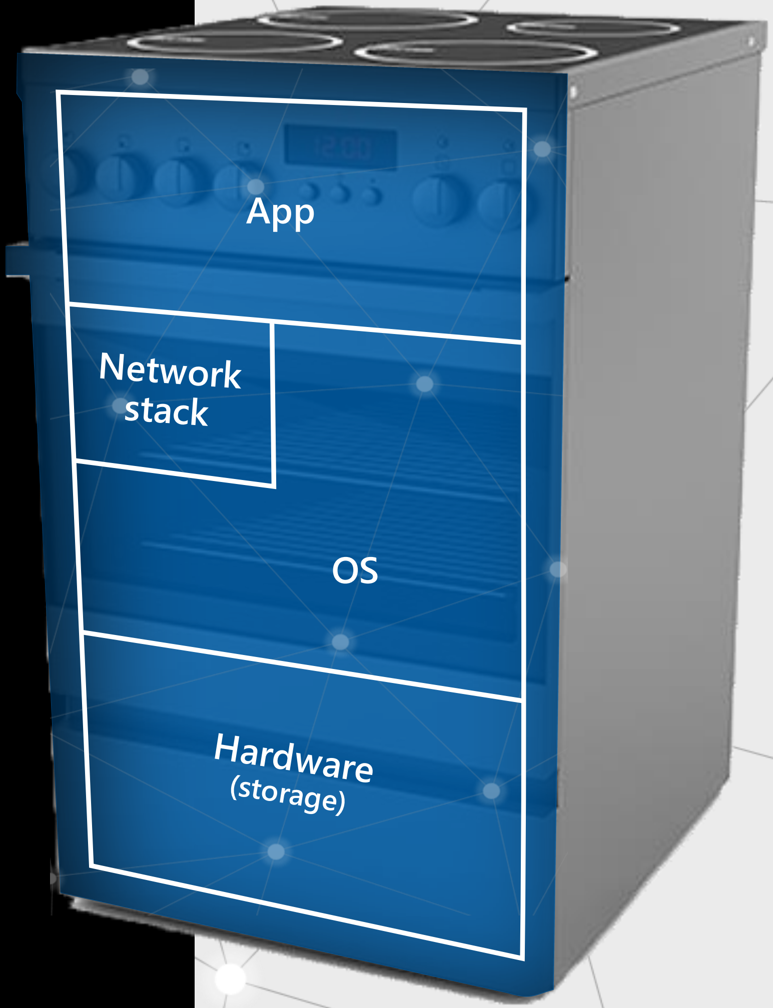
Private/public key pairings with trusted crypto and protocols; to ensure trusted communication

Secure boot; to ensure that devices only run authentic and current software

App containers and privilege restrictions; to limit access to physical controls

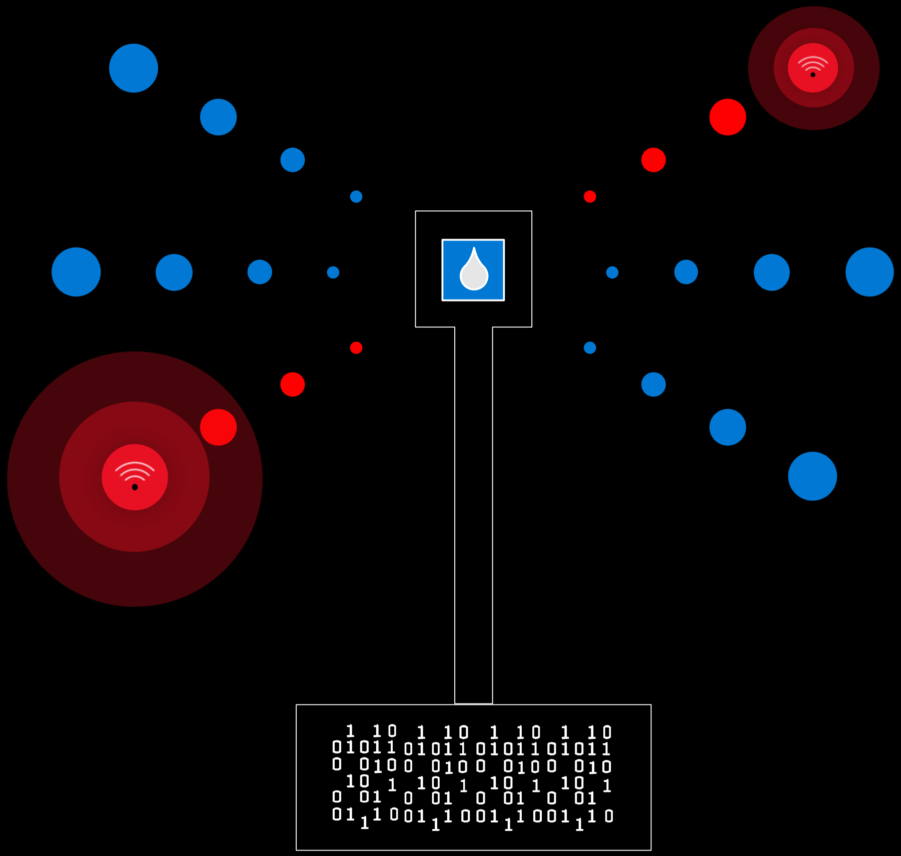
Stack canaries to defend against ROP attacks and some forms of overflows

OS-based app manifest; that defines what is appropriate and governs app behavior



Data pollution & compromised business insights

The data and insights coming from your devices can’t be trusted. You may have no way of identifying the issue until something severe goes wrong.



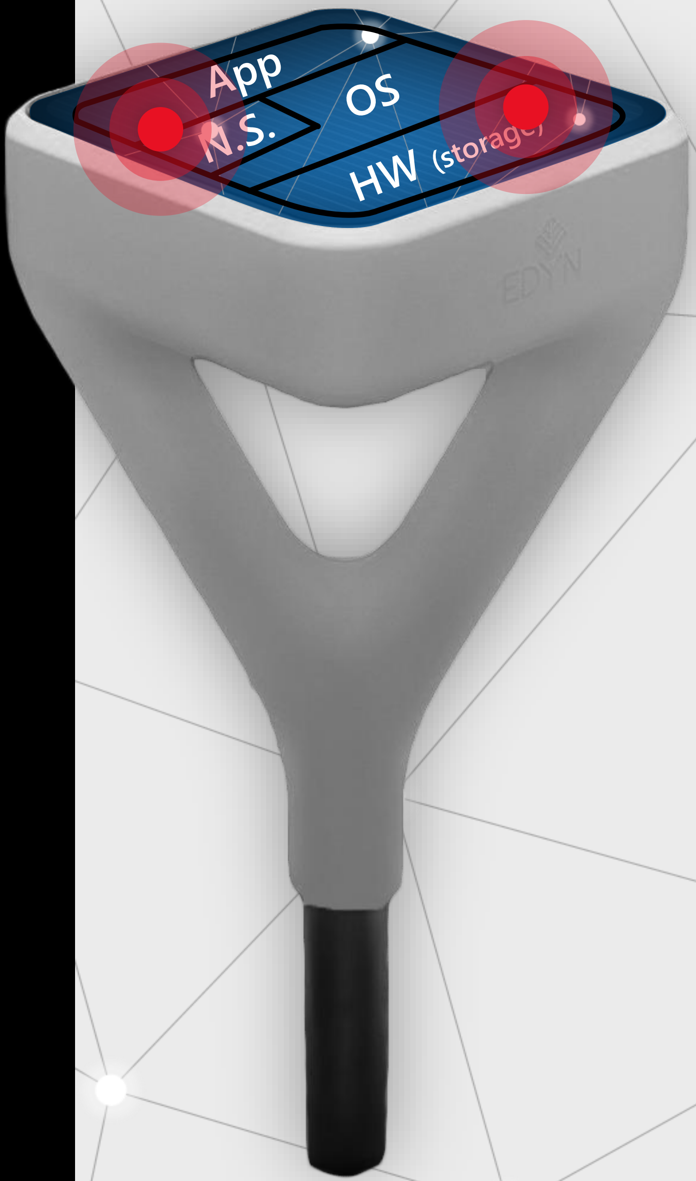
Assessing the risk:

- Are you using the data to make critical decisions about your business?
- Does the data from your devices inform machine learning (ML) or artificial intelligence (AI) models?
- Are you generating revenue or billing customers based on the data coming from your devices?

Data pollution and compromised business insights

Attackers manipulate data or impersonate your devices with a counterfeit/stolen identity

Methods of achieving this include man-in-the-middle type attacks where outbound data/packets are manipulated. Devices may also be impersonated by exploiting identity weakness including shared passwords and keys and certificates that are not protected properly.



Data pollution and compromised business insights

Strategies and capabilities for mitigation

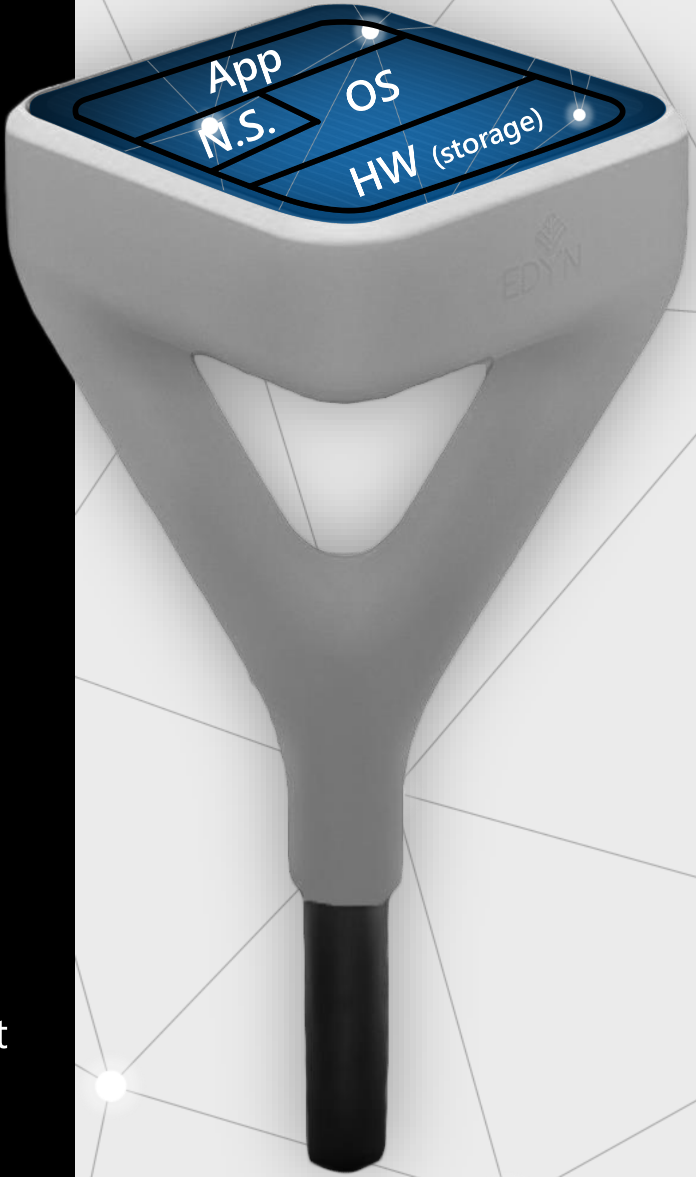
A unique unforgeable identity in the silicon

Mutual authentication; ensures the server and client are authenticated.

Attestation; to ensure only authentic devices, running trusted software, connect to your service

Signed, encrypted communications; to ensure data and packets in motion are not compromised

Best Practice: private keys generated by device in a secured environment and stored in a key vault that is only accessible by the HW root of trust.



OUR DEFENSE IN DEPTH APPROACH
INCLUDES EXTENSIVE MONITORING AND CONTROLS.
NETWORK PROTECTION.
DATA ENCRYPTION

This is your security team.

The 7 properties of highly secured devices

Hardware
Root of Trust

Defense
in Depth

Small Trusted
Computing Base

Dynamic
Compartments

Certificate-Based
Authentication

Failure
Reporting

Renewable
Security

https://aka.ms/7properties

Some properties depend only on hardware support

Hardware
Root of Trust

Hardware Root of Trust

Unforgeable cryptographic keys generated and protected by hardware

- Hardware to protect **Device Identity**
- Hardware to **Secure Boot**
- Hardware to attest **System Integrity**

Some properties depend on hardware and software

Defense in Depth

Dynamic Compartments

Small Trusted Computing Base

Dynamic Compartments

Internal barriers limit the reach of any single failure

- Hardware to **Create Barriers**
- Software to **Create Compartments**

Some properties depend on hardware, software and cloud

Certificate-Based Authentication

Failure Reporting

Renewable Security

Renewable Security

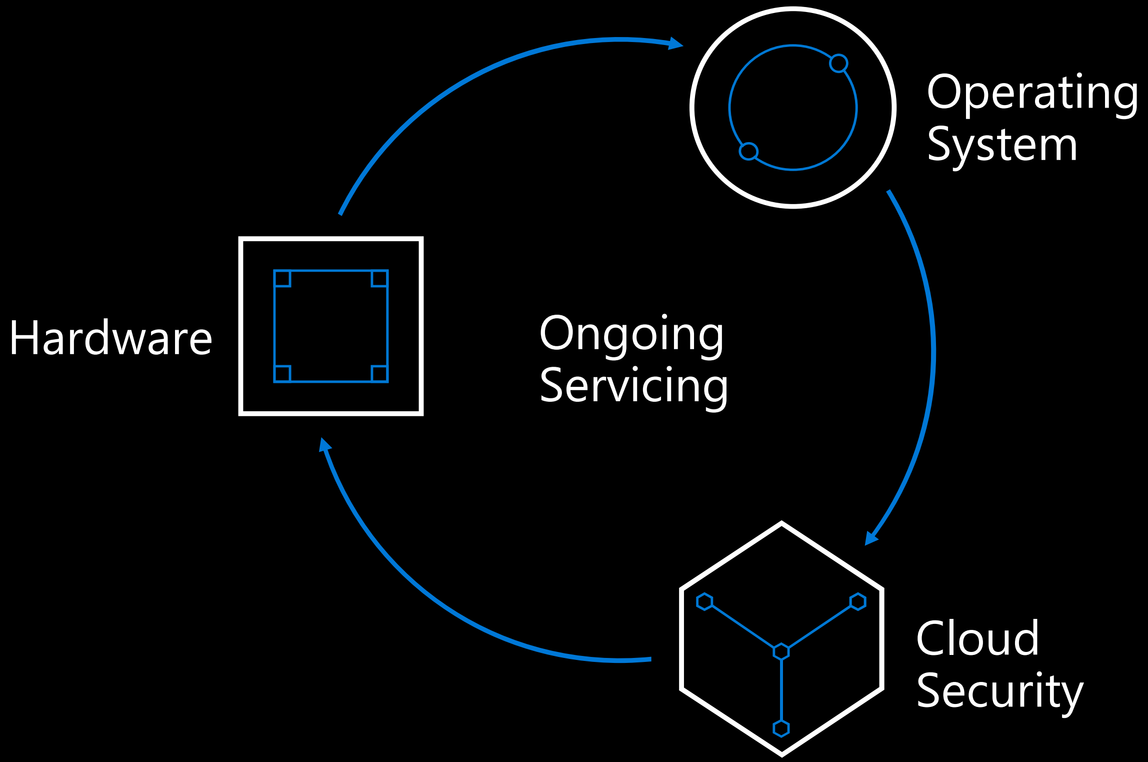
Device security renewed to overcome evolving threats

- Cloud to **Provide Updates**
- Software to **Apply Updates**
- Hardware to **Prevent Rollbacks**

Azure Sphere

An end-to-end solution for securely connecting existing equipment and to create new IoT devices with built-in security. Put the power of Microsoft's expertise to work for you everyday.

- Azure Sphere certified chips
- The Azure Sphere Operating System
- The Azure Sphere Security Service
- Azure Sphere Ongoing Servicing



Over 10 years of security and OS updates delivered directly to each device by Microsoft

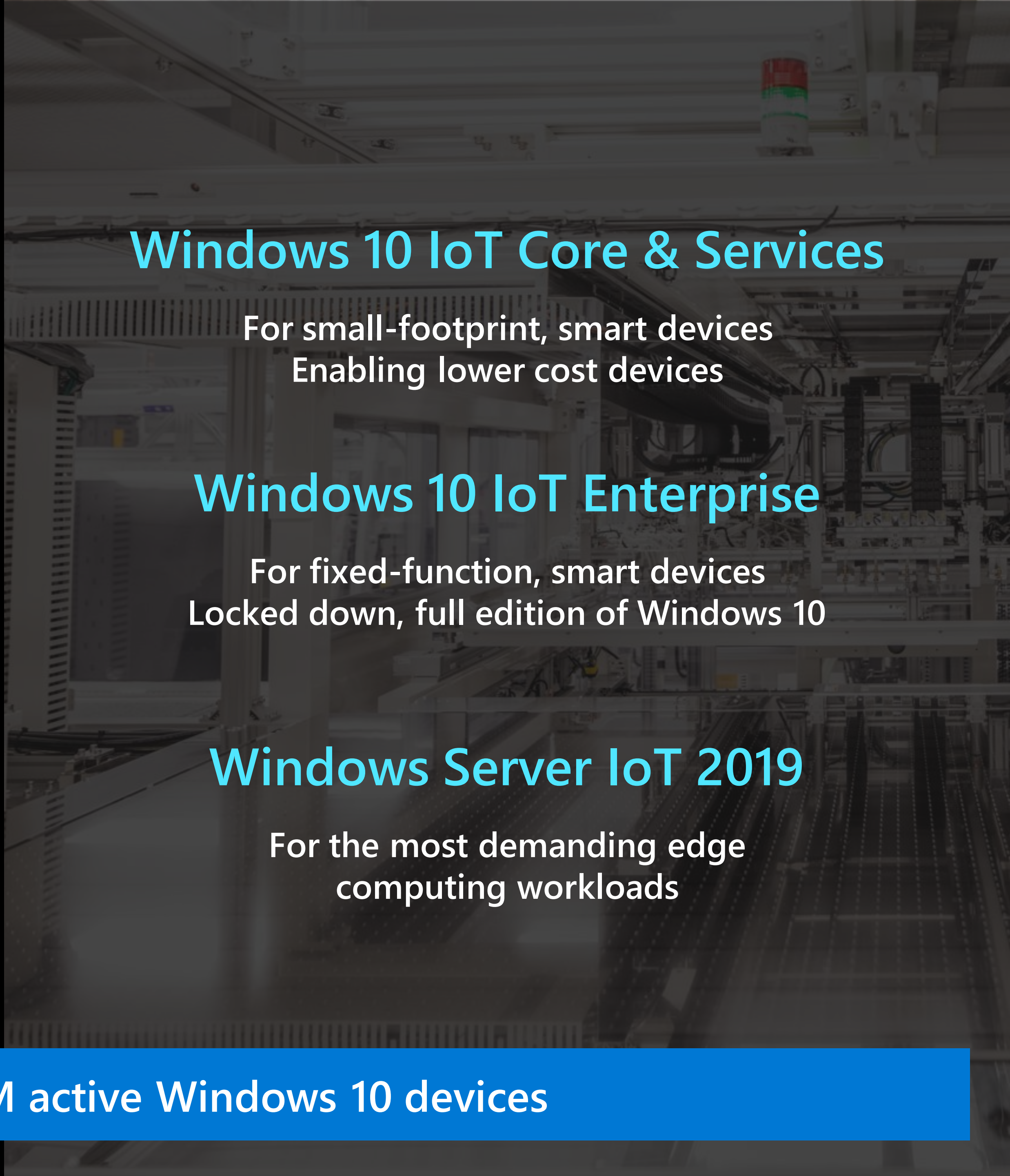
Windows for IoT

Windows for IoT has the features and manageability you expect from Windows 10

Built-in Windows 10 security that's always up-to-date and supported for 10 years with security patches

Protects your IoT solutions from device to cloud with the latest security advances in Windows 10

A team of security and privacy experts focused on the platform



Windows 10 IoT Core & Services

For small-footprint, smart devices
Enabling lower cost devices

Windows 10 IoT Enterprise

For fixed-function, smart devices
Locked down, full edition of Windows 10

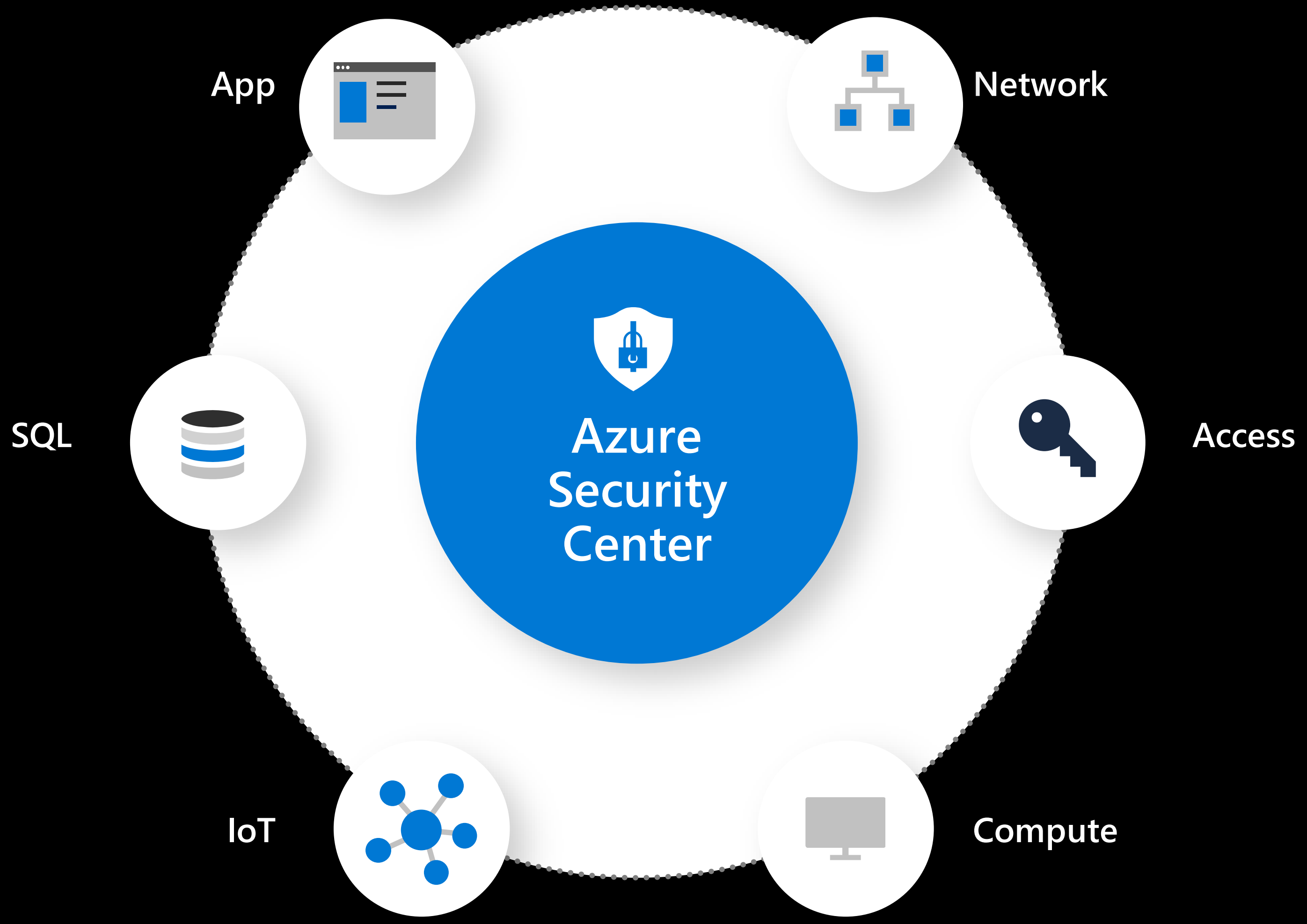
Windows Server IoT 2019

For the most demanding edge
computing workloads

Built on the foundation of 900M active Windows 10 devices

Azure Security Center

Azure Security Center provides threat protection and security posture management capabilities for your cross-cloud and IoT resources, including Microsoft and 3rd party devices. Azure Security Center is the first end-to-end IoT security service from a major cloud provider that enables organizations to prevent, detect, and help remediate potential attacks on all the different components that make up an IoT deployment.



The time is now

Talk to your Microsoft representative today