Vision in IoT, why It's a Security Minefield and How to Navigate It

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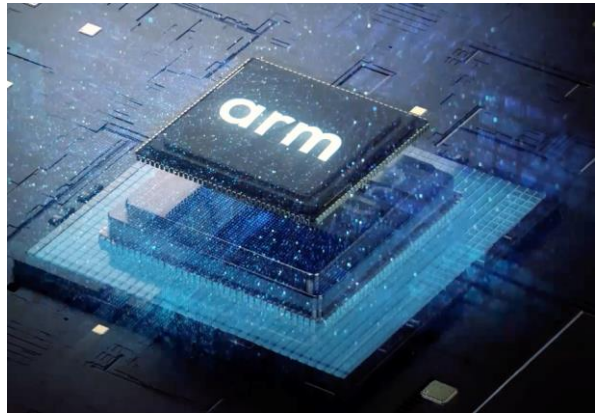

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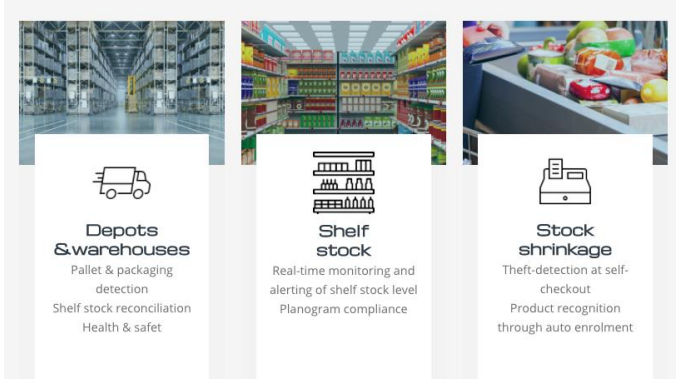

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About this talk

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Intended audience & Objectives

Audience:

- Business decision makers (for vision in IoT)

Objectives

- Threat landscape of deploying vision in IoT
- The state of the art in guidance around security
- Recommendations for hardening

What this talk **is not**:

- A replacement for dedicated security professionals
- Holistic capture of security for your business

Vision in IoT

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Embedded vision use cases

Vision in critical systems:

- Autonomous cars
- Smart streets
  - CCTV
  - Water levels
- Industry 4.0
- Autonomous delivery
- Smart Homes

Critical systems

Sensitive data

93% See security as a key differentiator

Threat Landscape

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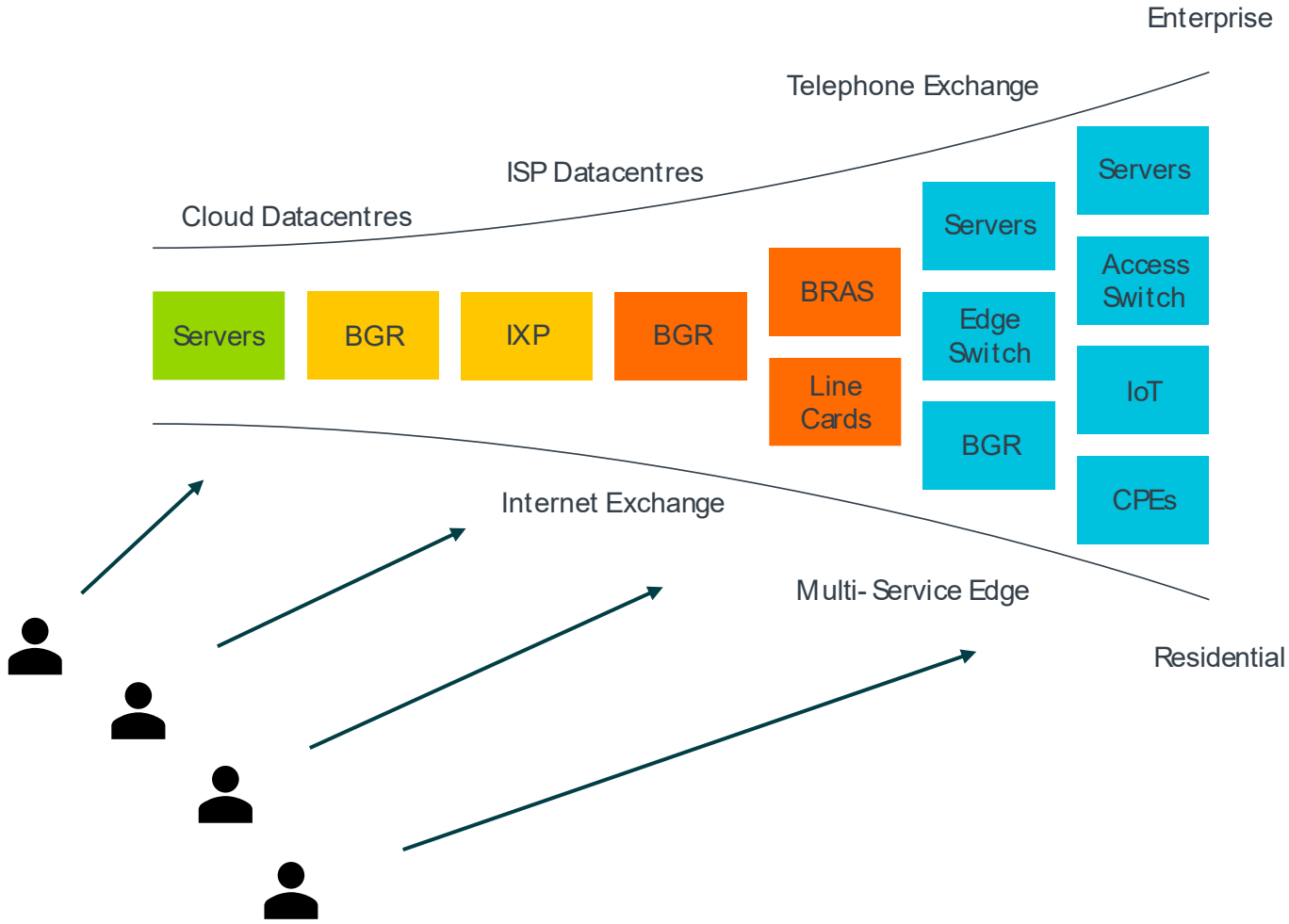
Cloud to edge deployment continuum

Threat modeling

- Actors
- Context
- Heterogeneity



Vision/ML specific threats

- Adversarial attacks in computer vision
  - Sign manipulation example
  - Lane manipulation example
- Typographic attacks
  - https://openai.com/blog/multimodal-neurons/
- Knowledge distillation attacks
  - https://arxiv.org/pdf/1906.06046.pdf
  - Loss of IP

IoT threats

- Webcam/CCTV incidents
  - Smart home cameras with weak passwords
  - CCTV breach
- General IoT incidents (still applicable to vision)
  - Malicious control of car driver aids
  - Mirai Botnet

- https://www.bloomberg.com/news/articles/2021-03-09/hackers-expose-tesla-jails-in-breach-of-150-000-security-cams
- https://www.bbc.co.uk/news/technology-33650491
- https://en.wikipedia.org/wiki/Mirai_(malware)
- https://www.iotsecurityfoundation.org/iot-botnets-might-be-the-cybersecurity-industrys-next-big-worry/

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Navigating the minefield

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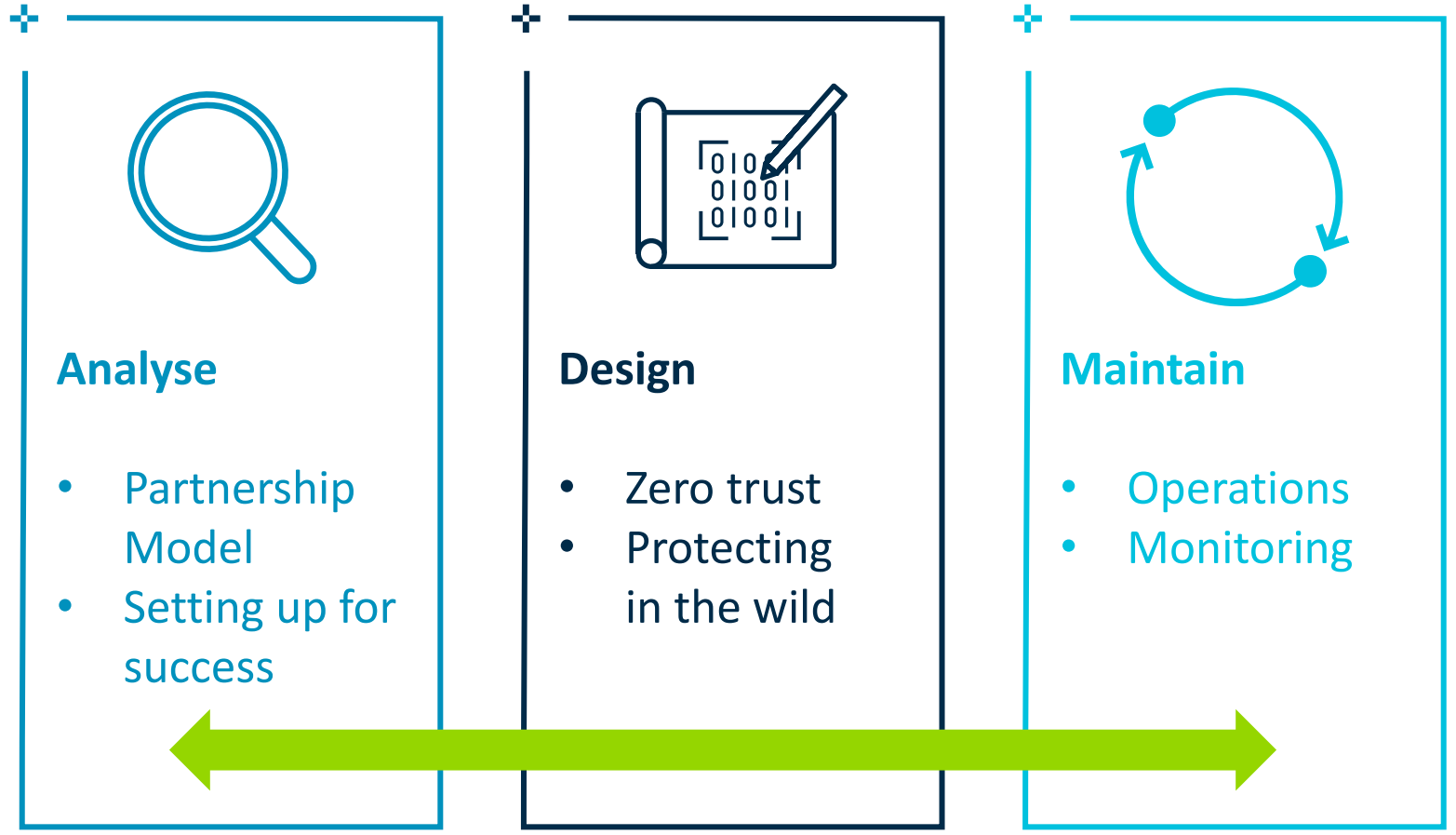
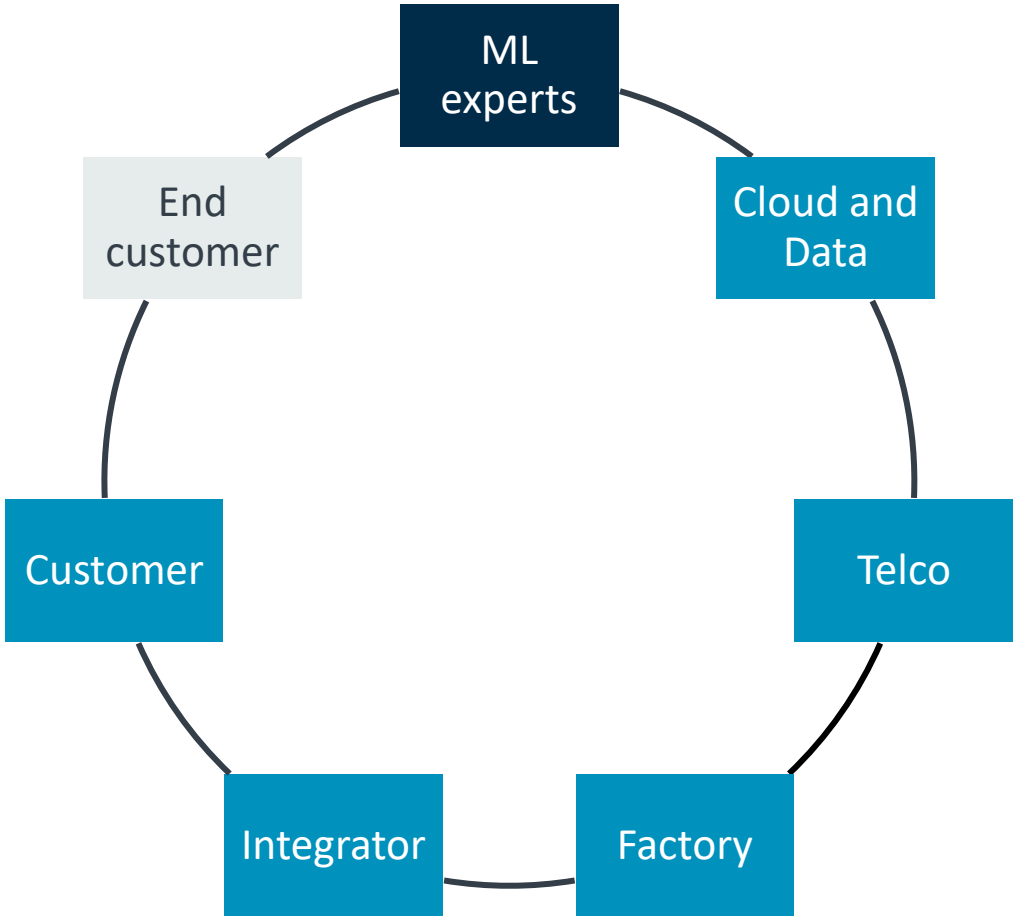
Navigating the minefield: Overview



Analyse: Partner model to IoT

- Producing end solutions in Vision & IoT is difficult!
- How many components do you do in this circle?
- How many components do you directly rely on?



Analyse: setting up for success

- Perform risk analysis & threat modelling for all parts of your remit
- Understand what frameworks and standards you need to follow
  - NIST Cyber Security Framework
  - IoT Security Framework
- Validate your partners stance and implementation of security
  - Field specific standards and guidelines
    - Road vehicles -- Cyber security (**ISO/SAE FDIS 21434**)
    - IoT Security and Privacy (**ISO/IEC CD 27400.3**)
  - Pen-tests
- Selling security
  - Calculating your ROI

Design: Zero-Trust Security

- Follow and implement a ***Zero-Trust*** approach to security

Authentication & Identity

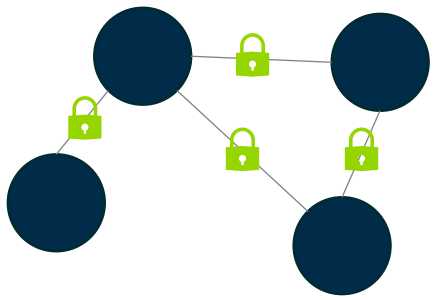
End2End Encryption

Observability & Monitoring

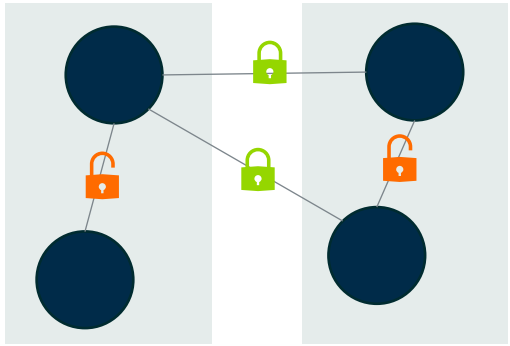
Data driven protection

Perimeter security

Zero-Trust Security



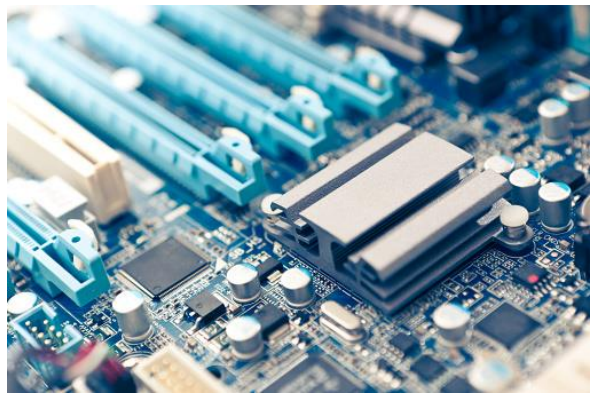
Perimeter Security



Design: Protecting IoT in the wild

Implementing security at the hardware layer

- Not using dev boards in production!
- RoT, Encrypted Storage, Secure Boot



- Tamper proofing
  - Fuses
- Device hardening
  - Removing access

- Minimizing risk potential
  - Limiting data
  - Limiting function

Maintain

- Getting certified for your field
- Operational security
  - Login detection, endpoint protection
- Using Multi-factor authentication (MFA)
- Pen-testing
- Fast Zero Day remediation

Summary & Questions

- Vision in IoT and the threat landscape
  - Vision use cases and critical systems
  - Adversarial attacks
  - IoT threats
- Navigating the minefield
  - Understanding the partnership model
  - Scoping your security
  - Standards and best practices

Parts not included

Appendix

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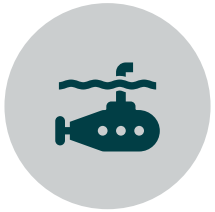
Warning: Parts not included!

SECURITY DEVELOPMENT LIFECYCLE (SDL)

INFLUENCING YOUR TEAM THAT SECURITY IS IMPORTANT



DEFENSE IN DEPTH

RELEASE CHECKPOINTS

AND MORE....

Frameworks & Specifications

- Threat Management
- Tooling & Automation
- E2E Security Process
- Operational Security

Still interested? Further reading:

Related content reading

- https://seechange.ai/privacy-and-security/
- https://seechange.ai/from-cloud-to-iot-securing-the-continuum/

General security reading

- https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.pdf
- https://www.cisco.com/c/dam/en/us/products/collateral/security/2020-outcomes-study-main-report.pdf
- https://www.nist.gov/programs-projects/nist-cybersecurity-iot-program