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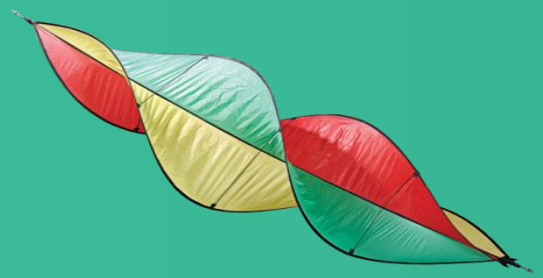
TECHNOLOGIECAMPUS GENT



Android in Industrial Settings

Jan Vossaert & Vincent Raes

Veilige industriële netwerken

https://msec.be/verboten/

22/12/2016

Overview

- Secure Mobile Access to the Local ICS Network
  - General purpose devices
  - Mixed OT and IT functionality

- Secure Services on Embedded Android in Industrial Settings
  - Embedded devices
  - Dedicated OT functionality

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Secure Mobile Access to the Local ICS Network

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Introduction

- Use mobile devices in ICS environments
  - Hardware platform
  - Multi-purpose device
  - Built-in security & management technologies

Introduction

*"…**monitor** any area of production—packaging status, cook temperature or frying capacity—from the palm of their hands..."*
(Hillshire Brands)

*"We use the app to **monitor** our gas detection devices, but we also use a few controls in the app that allow us to **remotely silence the alarms**…"* (Bayer Corp. in Pittsburgh)

*"The main advantage of a mobile device in an industrial setting is the **real-time access to all information independent** of the workers **location**"*

*"We have a few in-house mobile applications for **handling work orders and purchase orders**, as well as preventative maintenance and inventory."*

*"troubleshoot **without** the help from the **control room**"*

*"A mobile HMI **reduces communication errors** between people by allowing the **field operator** to access the same data as the **control room** operator."*

*"…anytime **access to real-time and historical production data** and trends, operators can see where there are problems, where problems might potentially arise, or where additional capacity exists to increase production or run an alternative product."*
(Hillshire Brands)

http://www.automationworld.com/mobility/industrial-mobile-apps-whos-using-them-and-why

https://library.e.abb.com/public/c6c714440006c741c1257ad200492e1b/46-51%204m213_EN_72dpi.pdf

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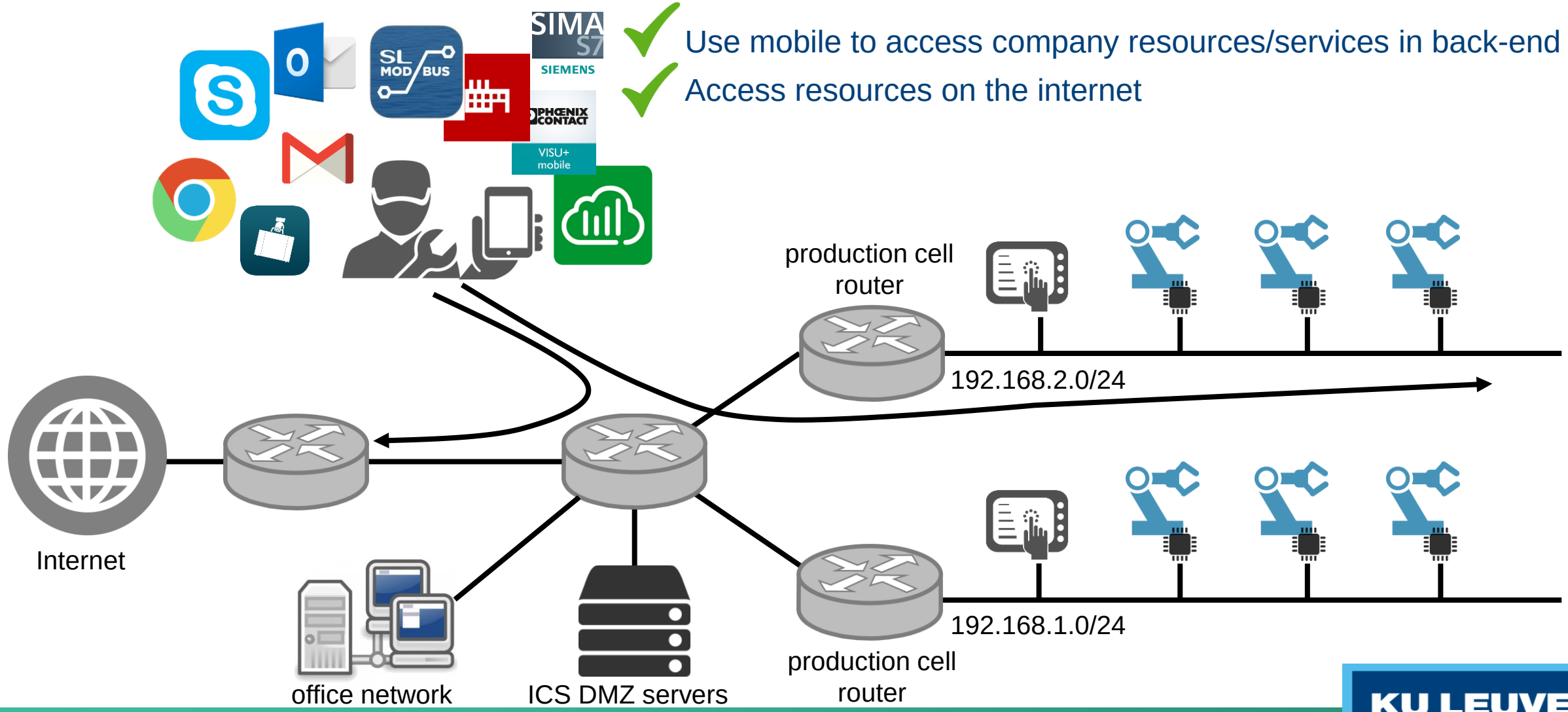
Goals

- ✓ Use mobile to interact with ICS equipment
- ✓ Use mobile to access company resources/services in back-end
- ✓ Access resources on the internet



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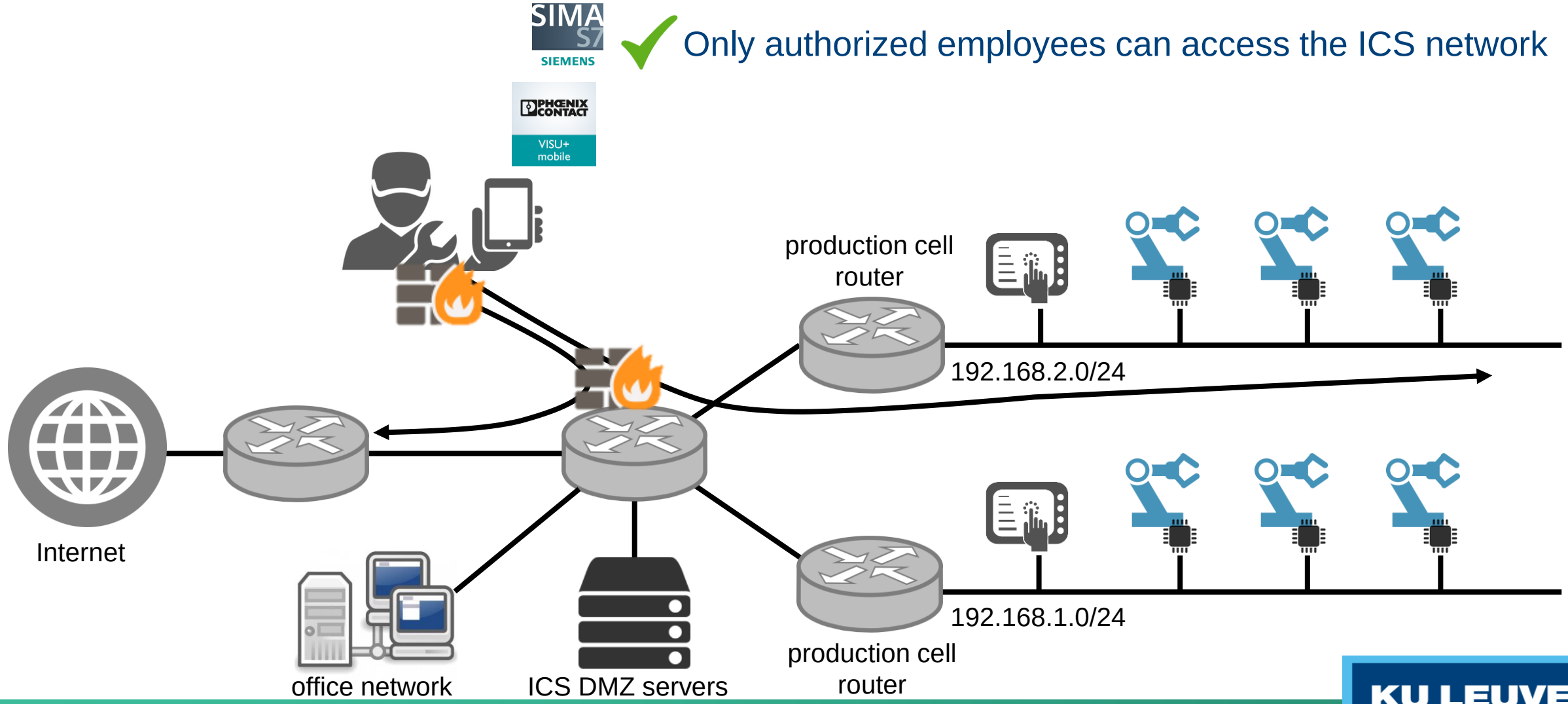
Goals

- ✓ Only traffic from specified ICS apps can reach the ICS network
- ✓ Only authorized employees can access the ICS network



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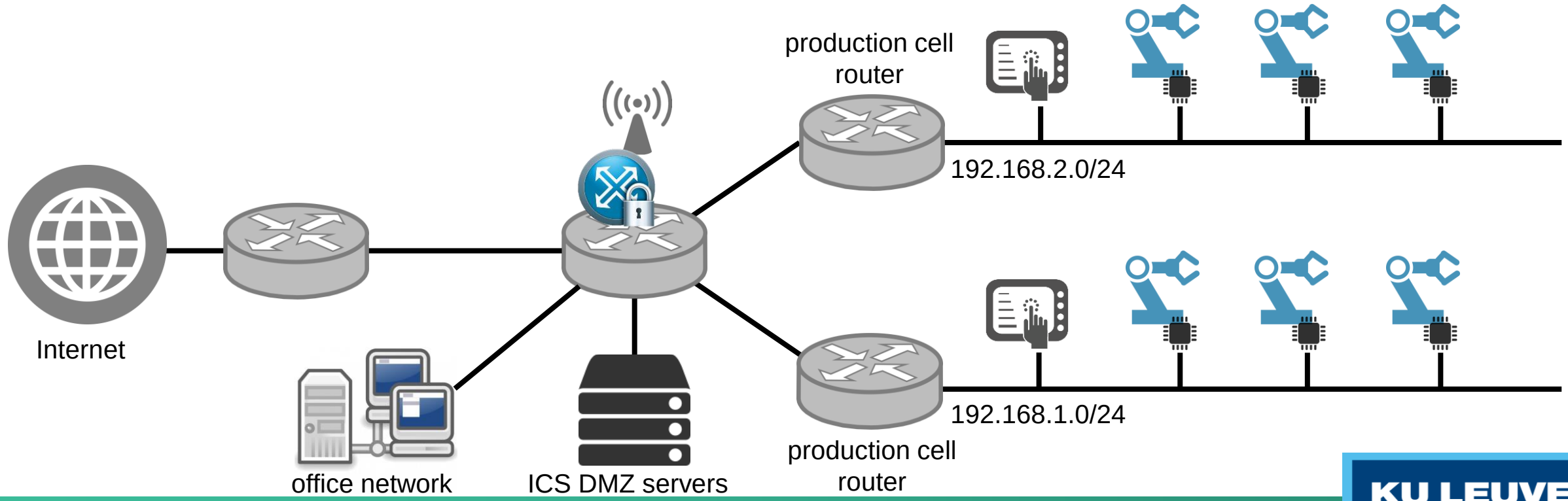
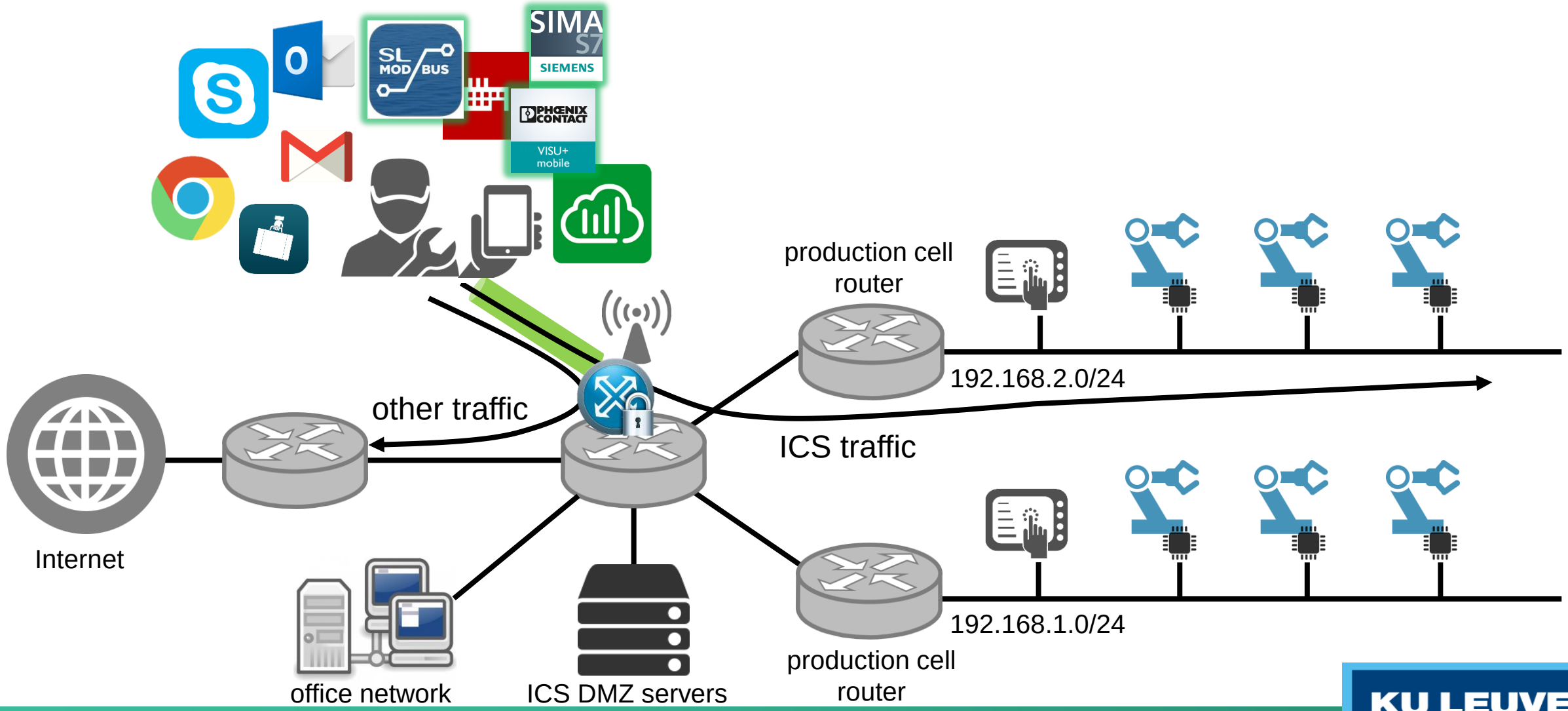
Setup

1. Wireless VPN gateway provides authenticated access to ICS network

2. MDM restricts apps that can access VPN interface on mobile device



Setup



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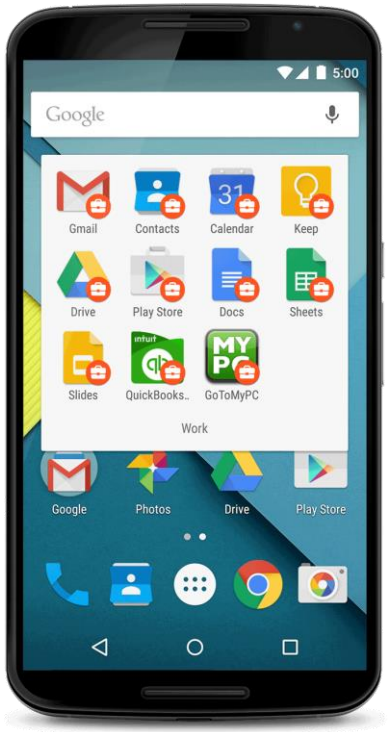
Realisation

- Uses the Android for Work platform
  - Improve Android usability, security, and flexibility in work environments
  - Built-into recent Android devices (5 and higher)



  - Supports two virtual profiles on Android device
    - Person profile managed by user
    - Work profile managed by employer
    - General security policies set by employer
  - User has both work and personal apps installed
    - Users can have the same app installed in both the work and personal profile
    - Sandboxing between both profiles

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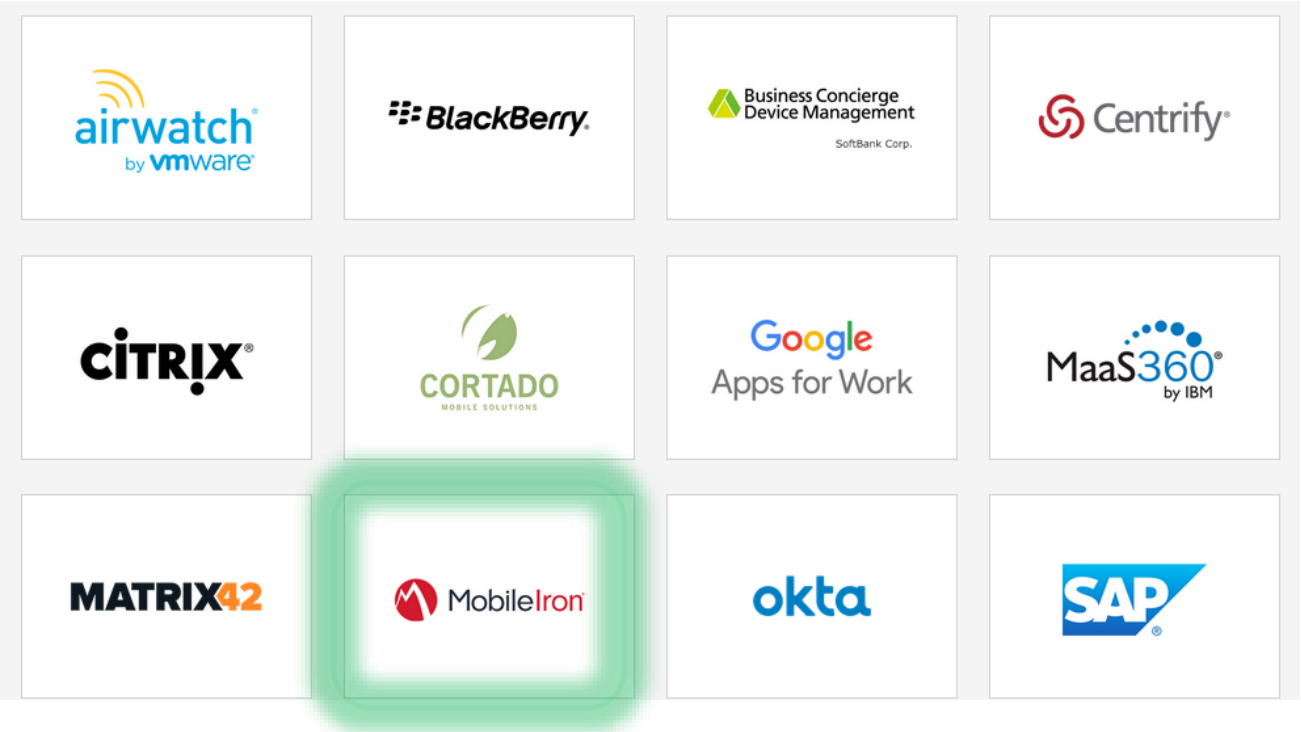
Realisation

- Enterprise mobility management (EMM) providers provide the interface to manage devices using the AfW framework



Realisation

policies

MobileIron

policies

- VPN configuration
  - Crypto parameters
  - Endpoint address
  - CA certificate
  - Client certificate
  - Client key
- Selected ICS apps
- Platform security policies

Conclusion

- More in-depth analysis can be found on project website
  - https://msec.be/verboten/
- Fully supported by commercial MDM providers
- Similar possibilities for iOS
- Prototype demo during break

Secure Services on Embedded Android in Industrial Settings

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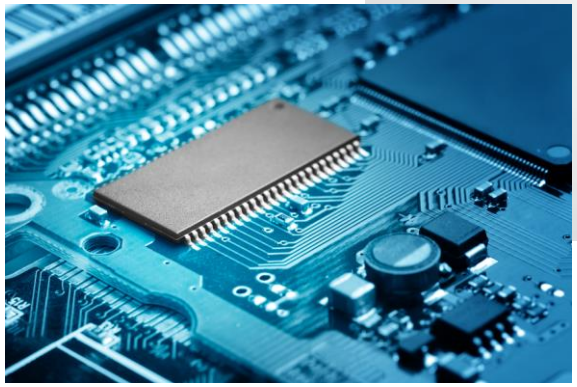
Introduction

INTERNET OF THINGS

Plattform INDUSTRIE 4.0



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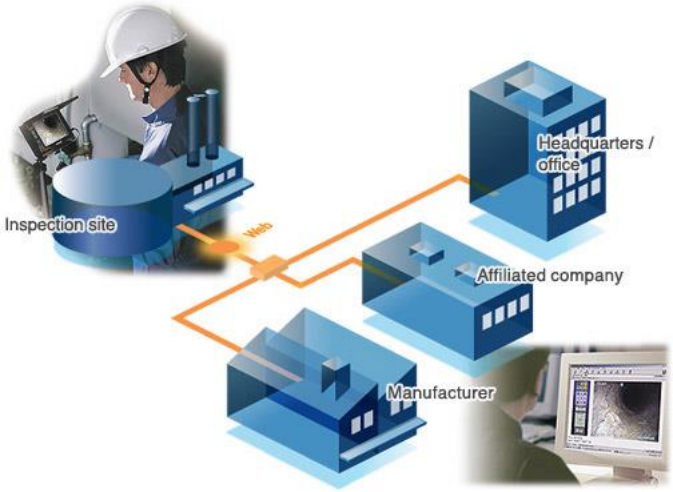
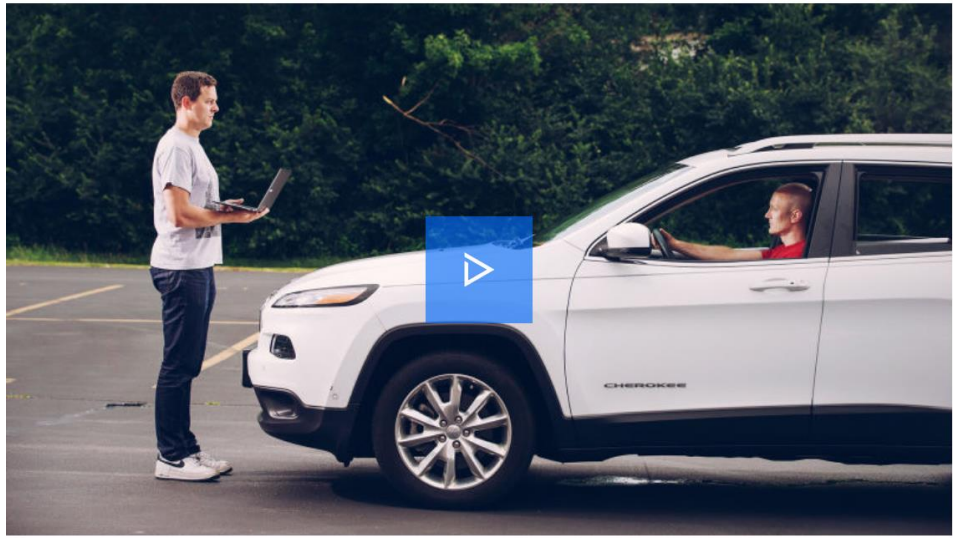
Introduction



HACKERS REMOTELY KILL A JEEP ON THE HIGHWAY—WITH ME IN IT



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Our approach

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Secure Service Example

- Robot arm workspace secured with laser sensor

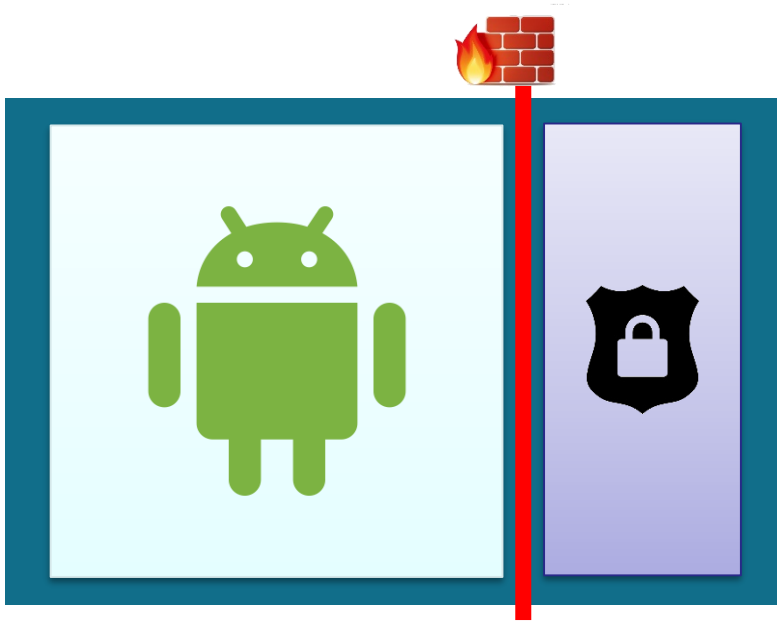
- Secure service: Disable robot arm as soon as laser is broken

How does it work?

- Isolate part of the platform from Android
- Isolated section has higher security guarantees
- Uses ARM TrustZone technology

TrustZone®
Security Foundation by ARM®

- Prototype developed on SabreLITE board



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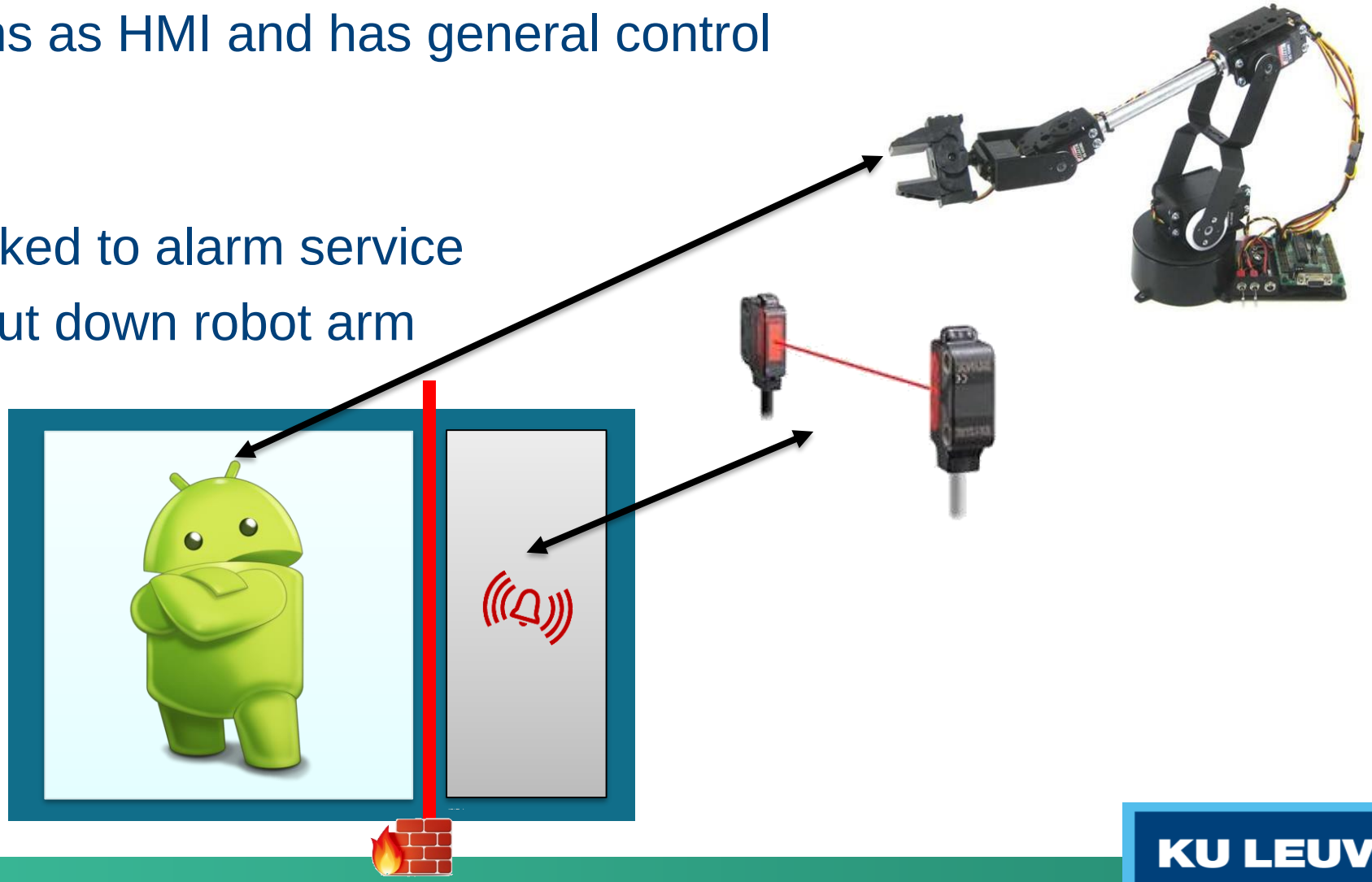
Robot Arm

- Android functions as HMI and has general control over robot arm

- Laser sensor linked to alarm service
  - Alarm can shut down robot arm



Proprietary Software

- Company specialised in production floor analysis
- Offers the analysis as service to its clients
- Production floor can be optimized based on the results

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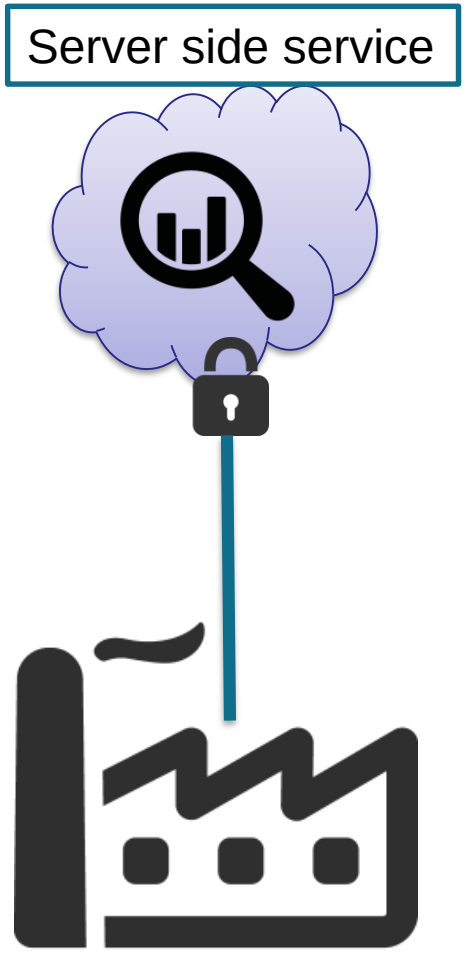
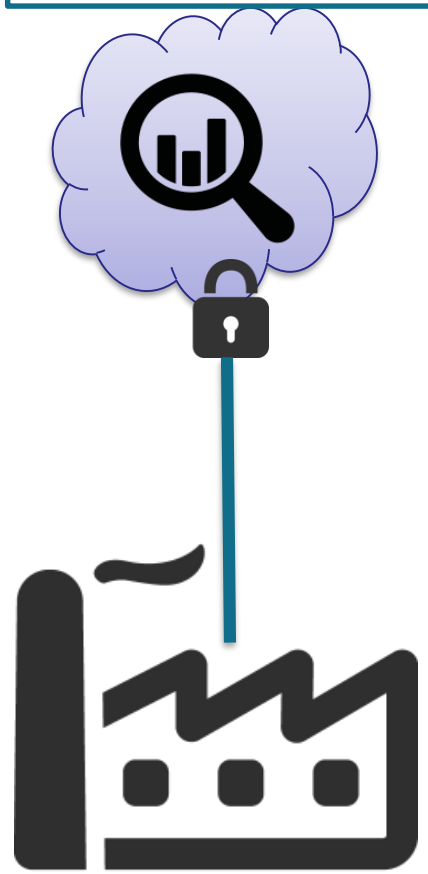
Proprietary software

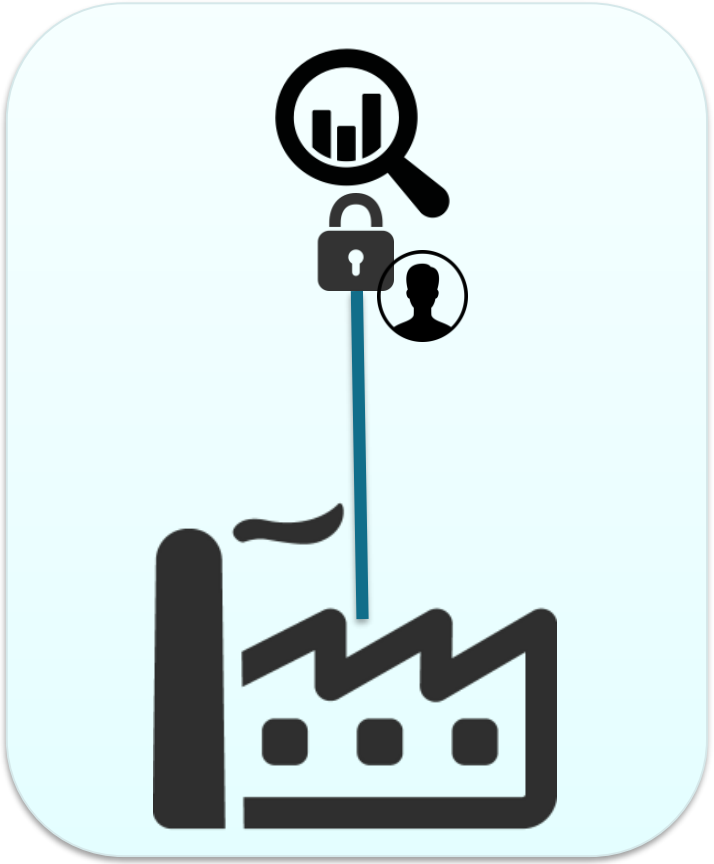


Proprietary software

Server side service



Dedicated device



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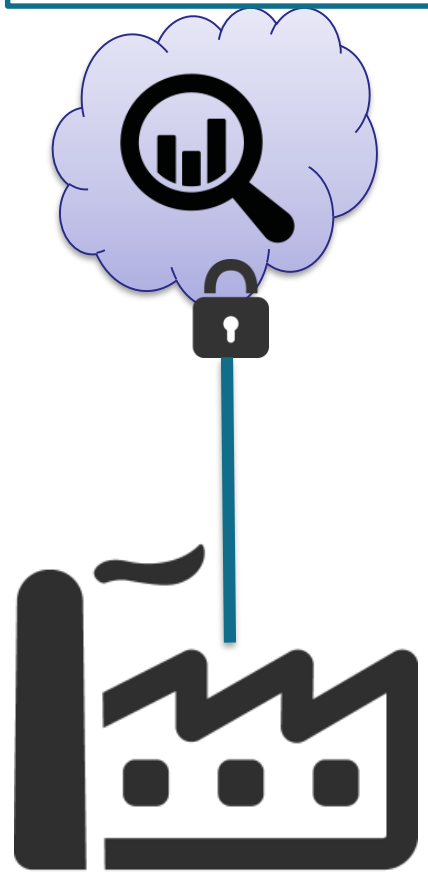
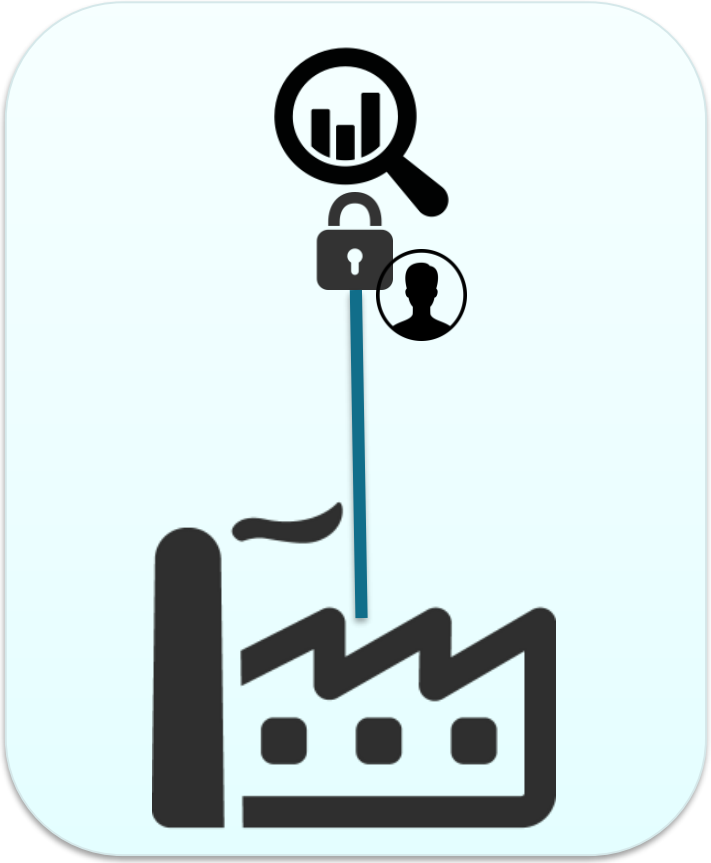
Proprietary software

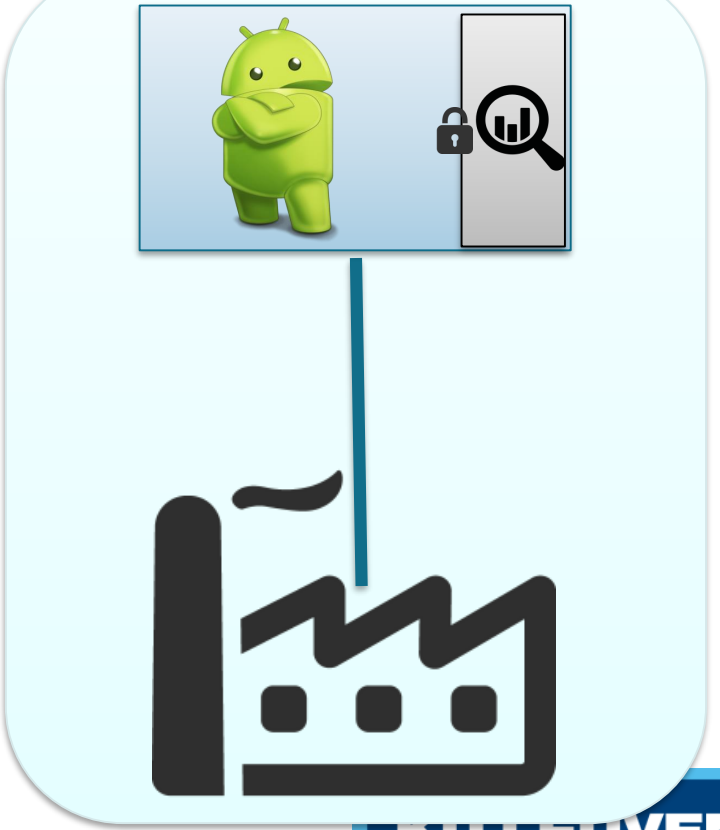
Server side service



Dedicated device



Our approach



Leasing Machines

- Company leases machines to clients
- Price based on usage
- Android used as HMI and control
- Isolated partition creates authenticated logs

Conclusion

- Android platform can be used to provide secure services
  - Data confidentiality and authenticity
  - Critical services can run unimpeded

- These services can enable new business cases or amplify existing work

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