

G+D
Currency Technology

How CRA changed the way how we develop Software at G+D CTCS

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G+D Currency Technology
TAV #53, Munich, 29.10.2026

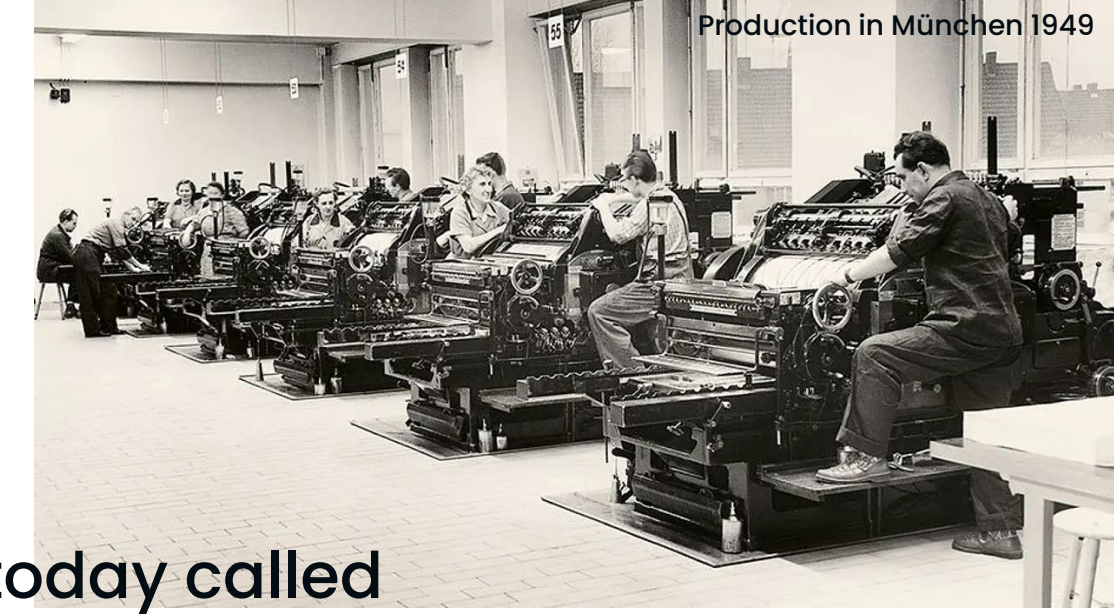
G+D Currency Technology

Outline

- Where we come from & what we test
- How CRA came to G+D CTCS Software

- How did CRA manage “to change everything”?
- Example CRA E2E SW (test automation) topics
- Our Challenges: Responsibility, E2E, Organization
- Lessons Learned & Looking a bit Beyond
- Conclusions

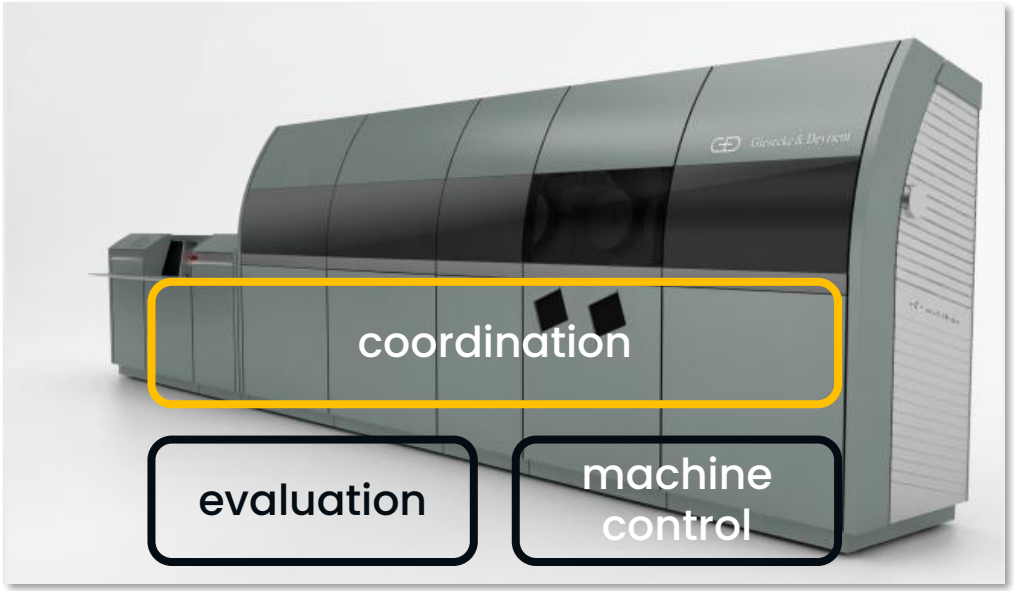
Where does G+D come from?


Production in München 1949

- Today G+D is a company as selling a variety of security products
- Its roots are in banknote processing – today called Currency Technology / High Performance Systems (HPS)
- Products are considered **system critical** (!)
- Products are operated under video surveillance in a factory floor setting by screened operators
- No connection nor dependence on the internet from the machine
- A product developed, setup & maintained by experts only

Fertile ground for a “classic” R&D culture of “feature before SW security”

What we test at G+D Currency Technology

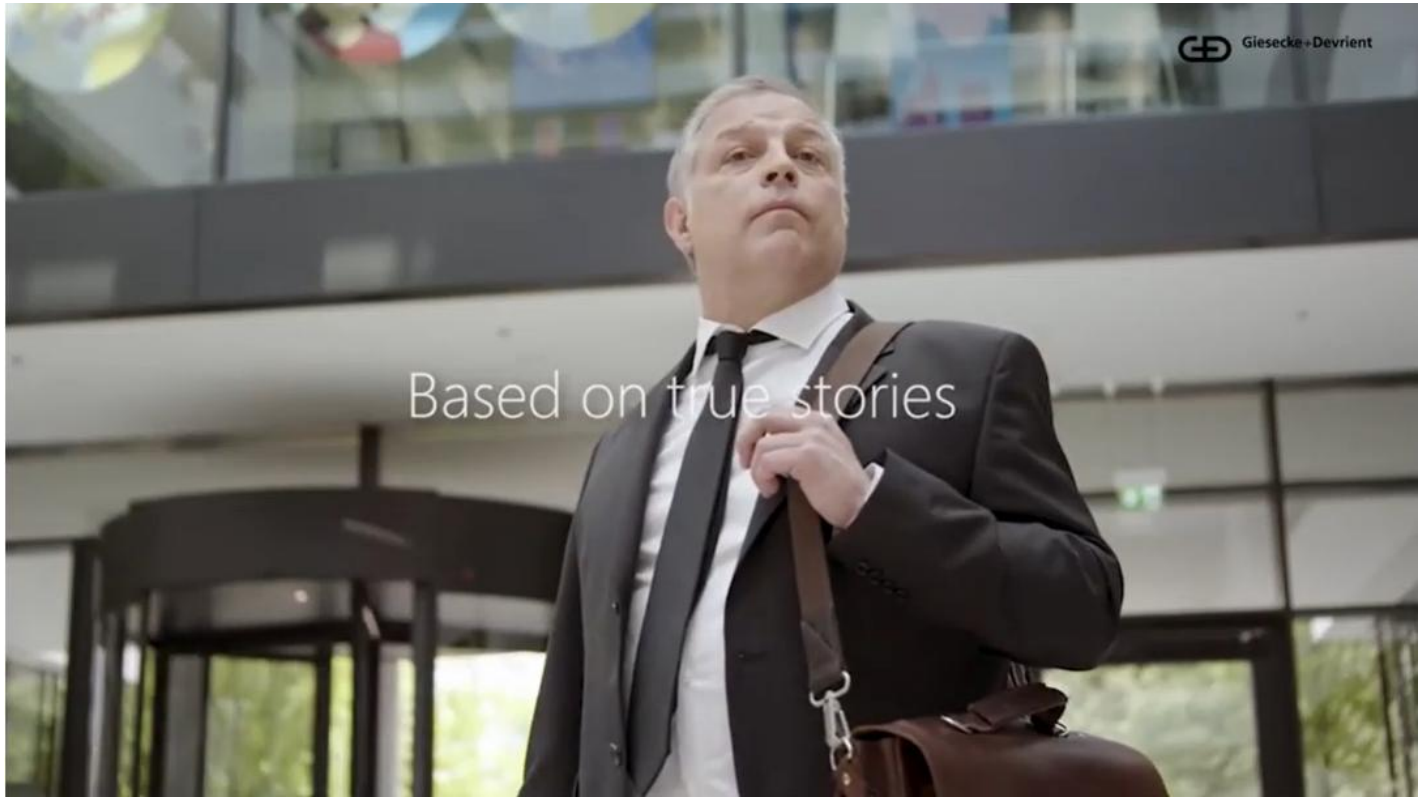


- Multiple products based on common product platform that are deployed worldwide in banknote printing, central banks, cash-in-transit centers, casinos, etc
- Each processes millions of banknotes/day **24h/7d** & is configurable for any currency
- Complex mixed HW/SW system including real-time SW, image processing, embedded control SW, highly concurrent processes, databases, etc.


Some moments in life ...
... you will always remember
7.8.2010
13:36

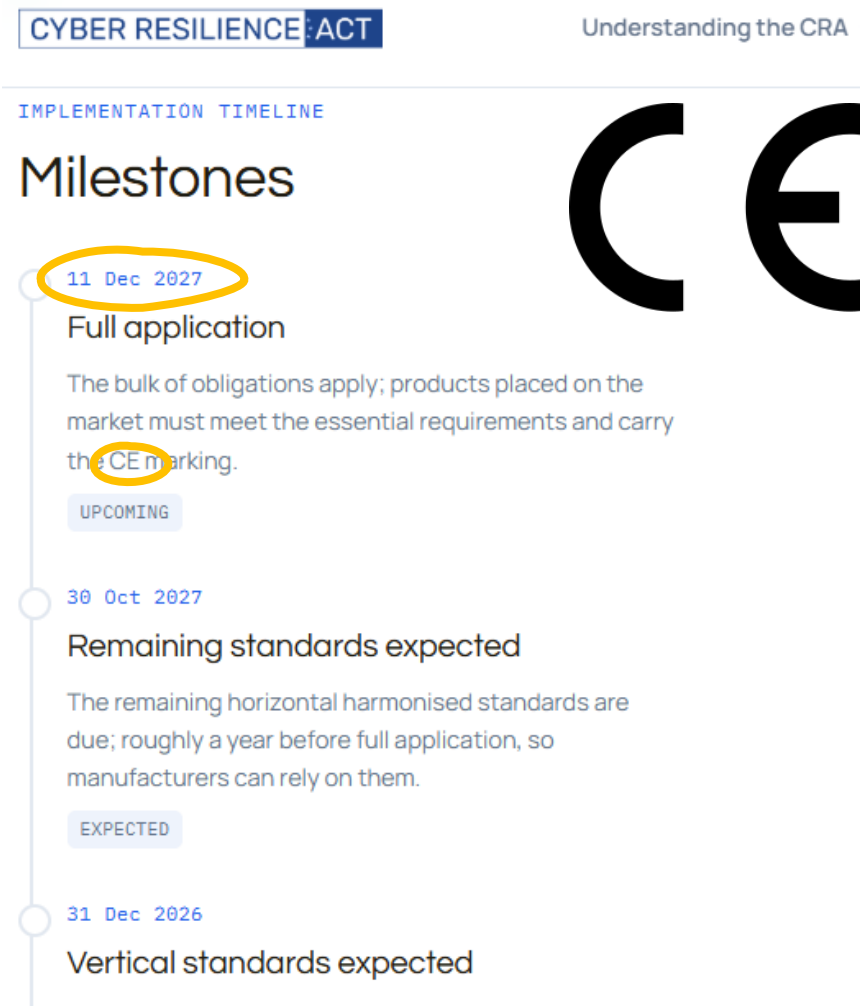
Cyber security has been around for ages – WHY NOW?!

- *Technological advances* (form factors etc) & increased connectivity have made it „easier“ to intrude „anywhere“



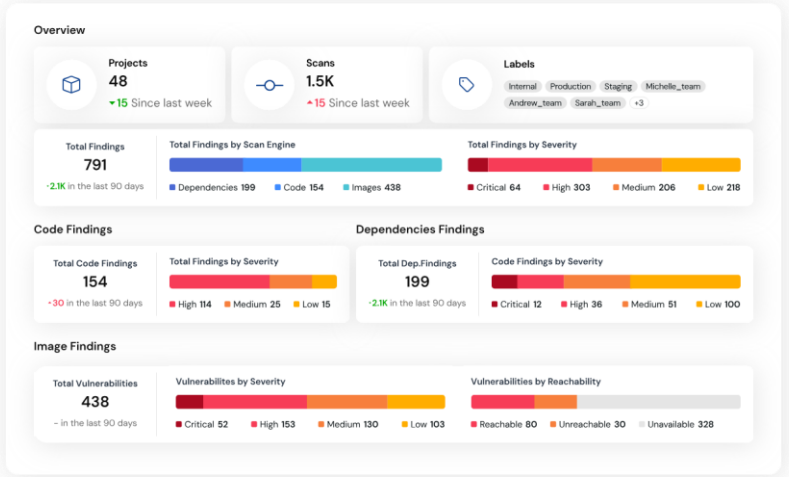
How did CRA manage “to change everything”?

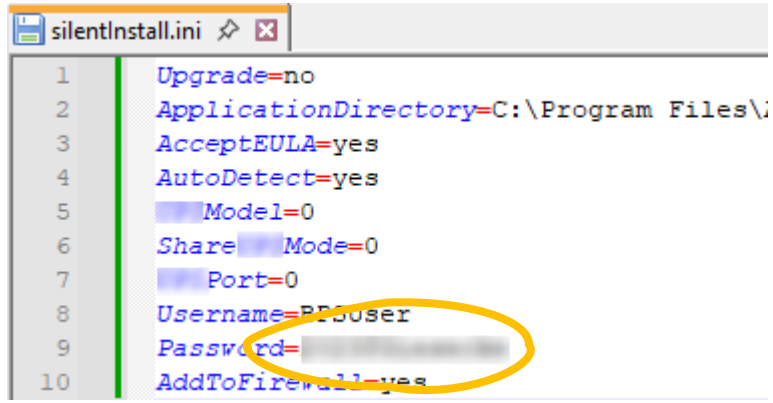
- An *EU regulation* that will touch the *ability to deliver products*
  - Well understood in G+D already from HW availability context!
- Significant potential financial impact for companies with products where “really every product sold counts”



Example CRA E2E SW (test automation) topics

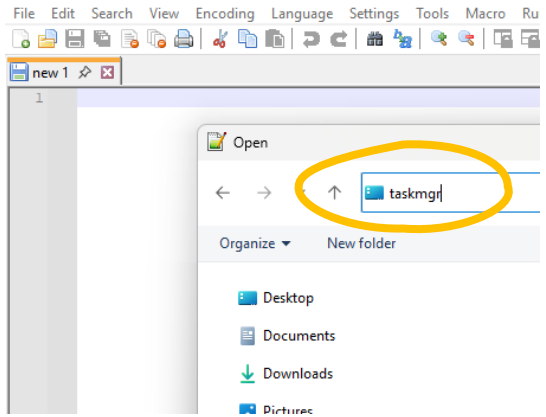
- (Continuous!) fixing of findings reported by vulnerability scanners in 3rd party (open source) software
  - Extend regression tests to also include packaging aspects
- Secure communication & improve (a lot of) password handling
  - Not only test but also to cope with new designs in test automation infrastructure

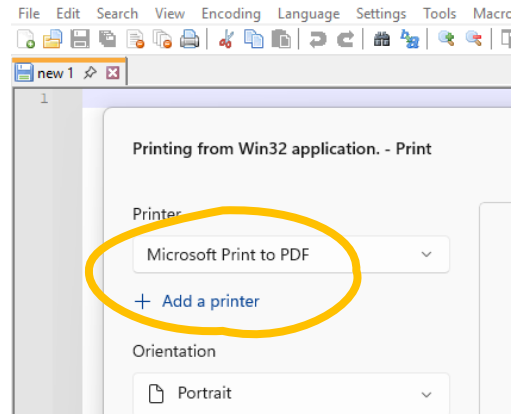




Example CRA E2E SW (test automation) topics

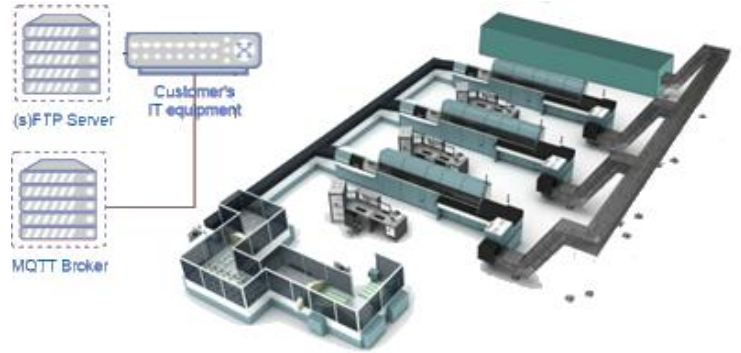
- Harden user interfaces
  - We need to include UI interactions in our tests!!!
  - It turns out in SW we have an implementation choice!





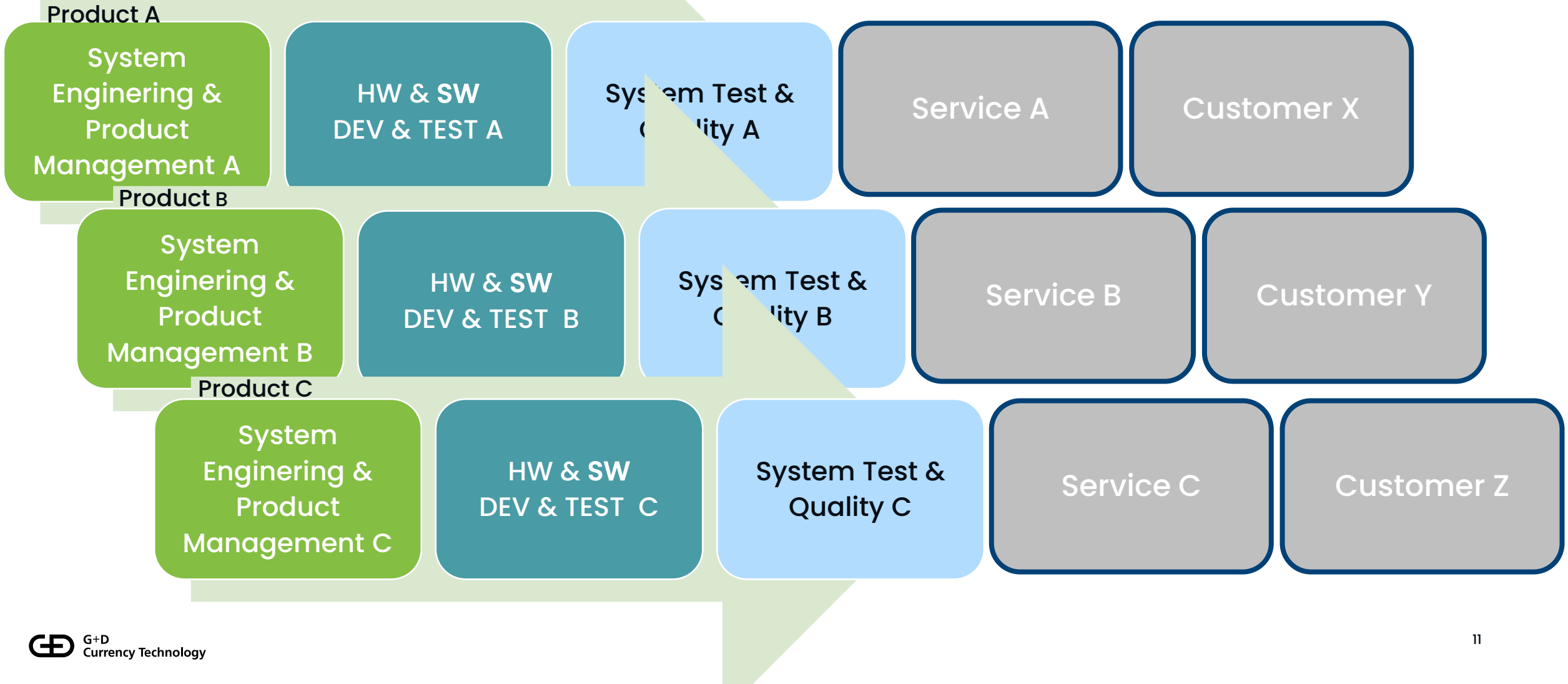
- Harden network interfaces
  - Integrations with customer network & other machines



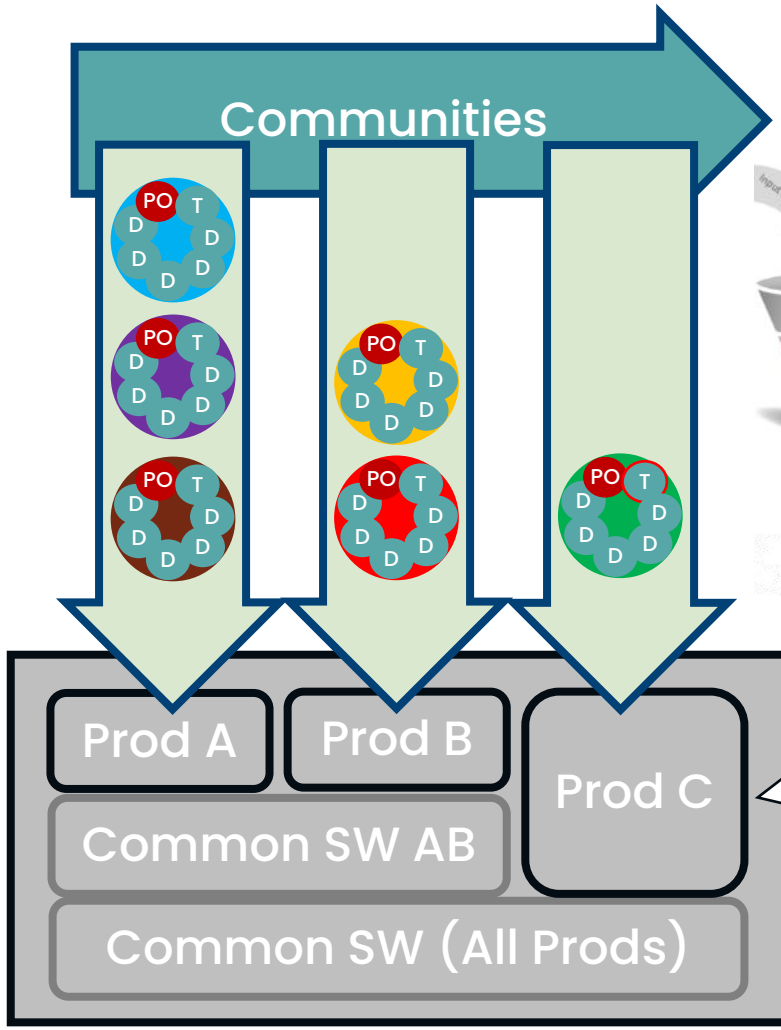


- User management on the machine
  - Generally always within G+D user management BUT in some places we fall back to Win user rights

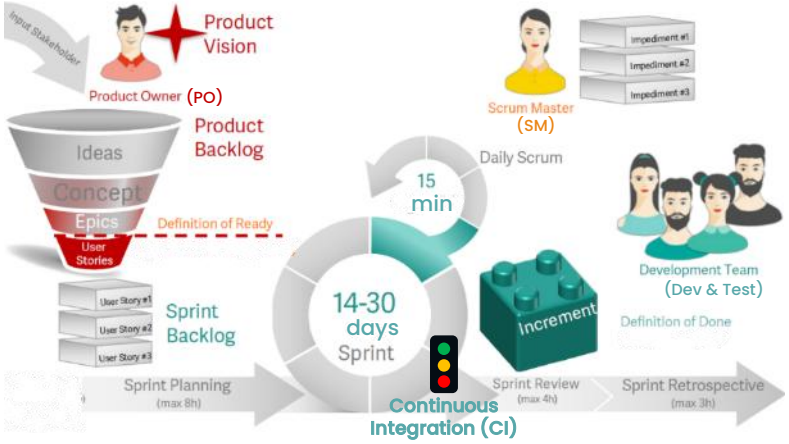
Challenges: From CTCS R&D to Customer Deployment

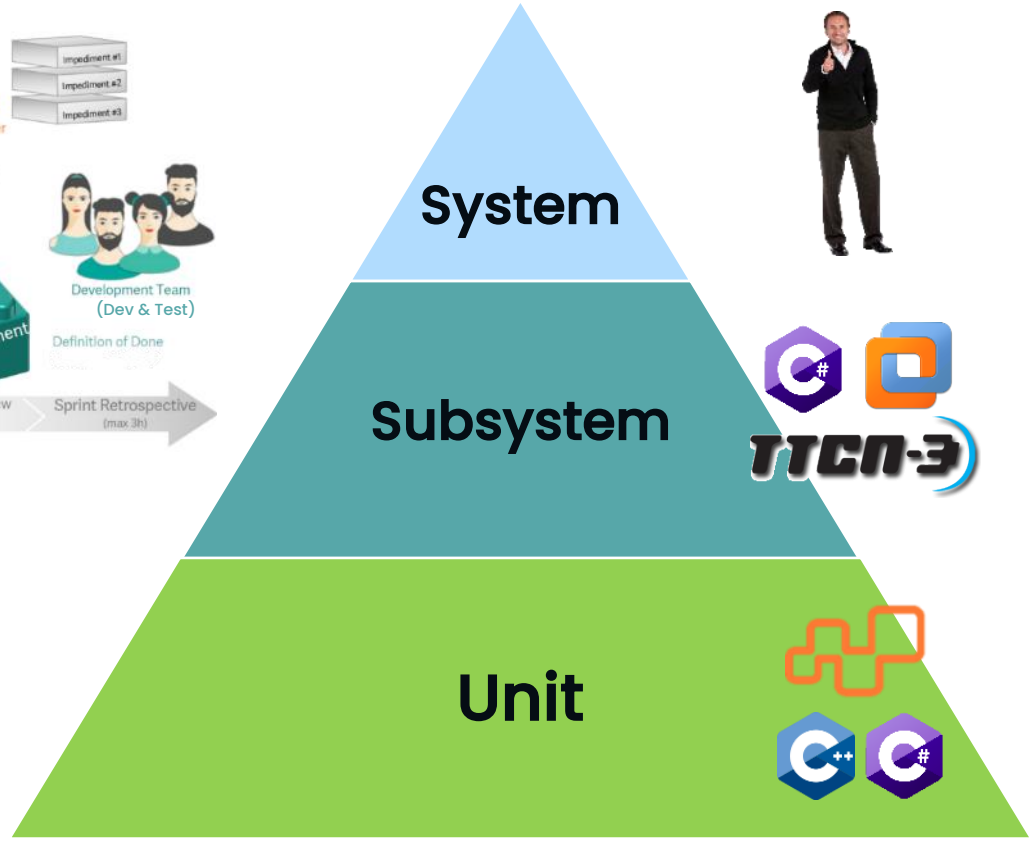


How we develop & test our software (SW DEV & TEST)



code base of millions LoC (incl legacy)





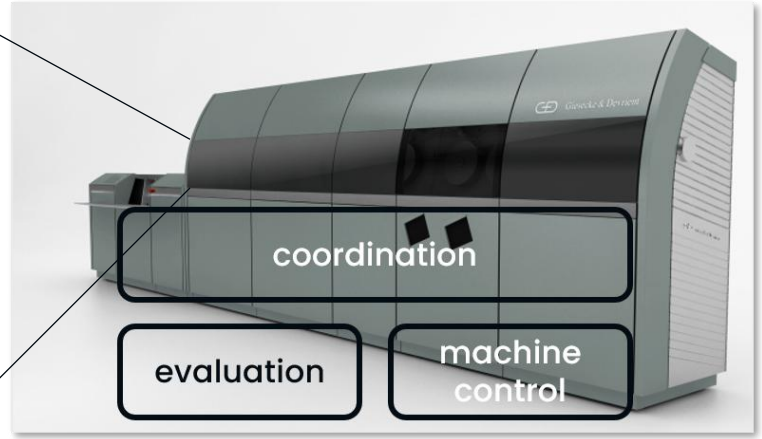
Challenges we face(d): Responsibility



- Design & implementation *across multiple domains*
  - CRA is often not just a software DEV topic (!)







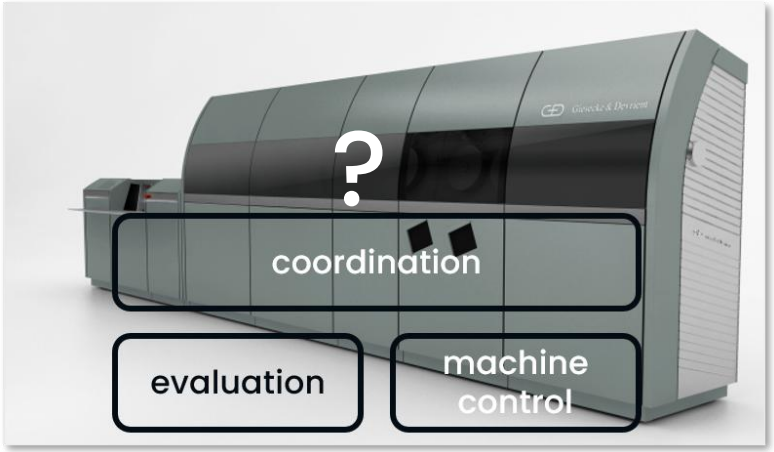
  - Who “feels” responsible for “software” ?
- Still (!) an issue: Features competing against security!
  - DEV team vs CRA team

Challenges we face(d): E2E competence

- Missing feeling for impact of DEV changes on overall E2E functionality across *all* products





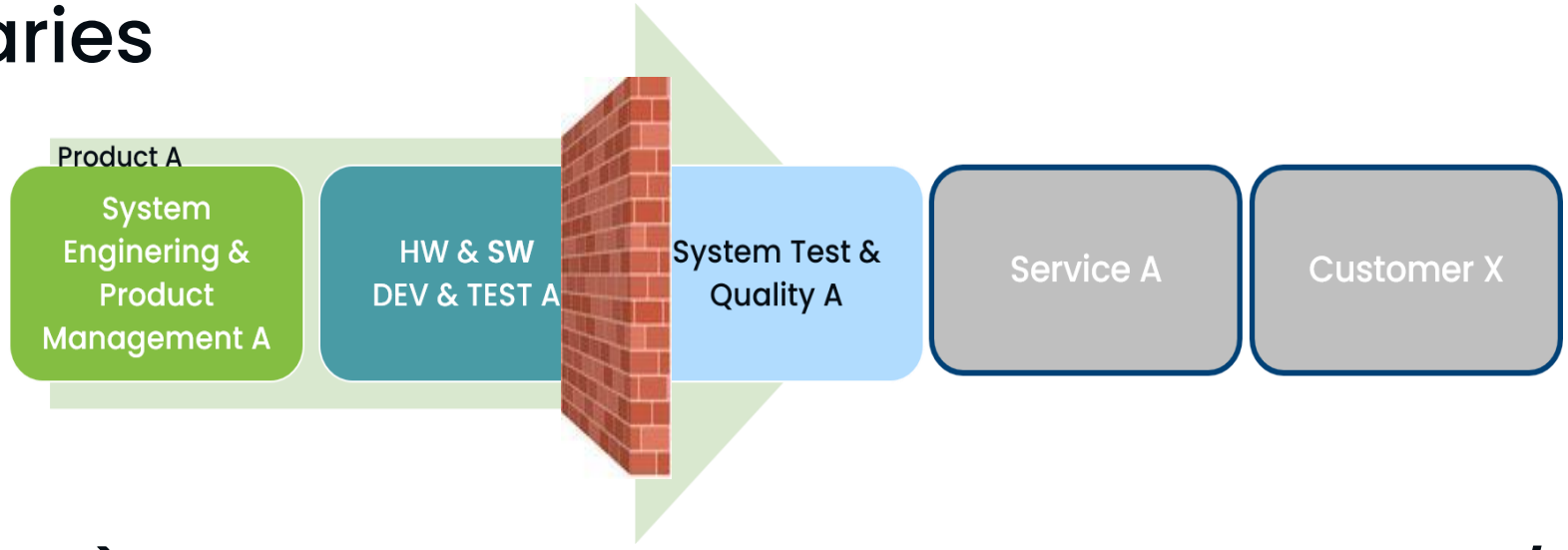


- … combined with some OOBE use of AI for DEV
- … leading us at times back to ricochet bugs

“Everything should run as before”

Challenges we face(d): different Organizations

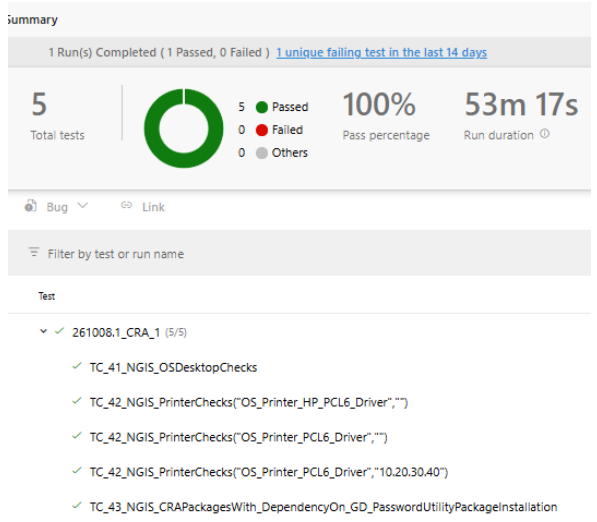
- Communication & working across organizational boundaries



- (Frequent) SW updates for products that run 24/7
  - Customers that ***love*** to stay on old releases

Some Lessons Learned

- Task force felt better than agile team dedicated to CRA
  - Easier to get experienced people part time than full time
  - “My team vs that team” thinking with agile teams
- Work on CRA requires lots of E2E competence across ALL products in a product line
- Create more CRA transparency with separate dedicated nightly test stages !
- Treat OS as new interface in E2E testing
- We MUST automate user interactions!



In the meantime … elsewhere …

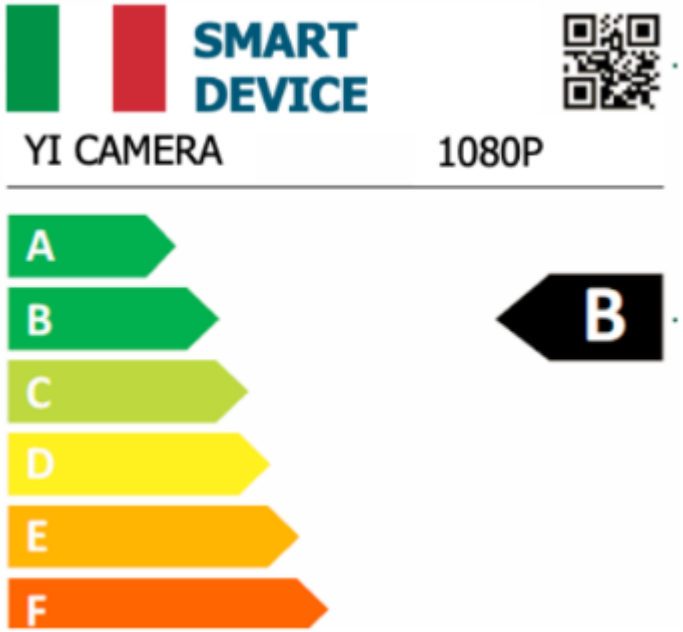
- ETSI TC Cyber creates the free standards that drive this EU regulation – read & participate!

13 Aug 2026

ETSI vertical drafts under Public Enquiry

ETSI opened the formal approval procedure on 17 vertical final draft standards (the EN 304 xxx series, covering Annex III products from routers to connected toys). Comment windows close between mid-September and mid-November 2026, depending on the vertical. The drafts are publicly readable.

IN PROGRESS



ETSI TC Cyber EUSR Mode 2	*EN IEC 62443-4-1:2018/prAA*	Security for industrial automation and control systems - Part 4-1: Secure product development lifecycle requirements
ETSI TC Cyber EUSR Mode 2	*EN IEC 62443-4-2:2019/prAA*	Security for industrial automation and control systems - Part 4-2: Technical security requirements for IACS components
ETSI TC Cyber EUSR Mode 2	*EN IEC 62443-3-3:2019/prAA*	Industrial communication networks - Network and system security - Part 3-3: System security requirements and security levels

- Good UCAAT 2026 presentation "Automating IoT Regulation Compliance on the Smart Home Gateway" by A. Mandalari (mulini)

Conclusions

- At the end CRA is a classic problem of integrating ***non-functional testing*** in industrial product development
- Effective work across all organizational boundaries & products is the key to success - break silo thinking!
- We need to adapt & extend our approach to (black box) test automation to support CRA activities!
- Special role and responsibility for ***testers*** as the ***guardians of E2E functionality***!
- **View CRA as an opportunity** instead of a burden!

