

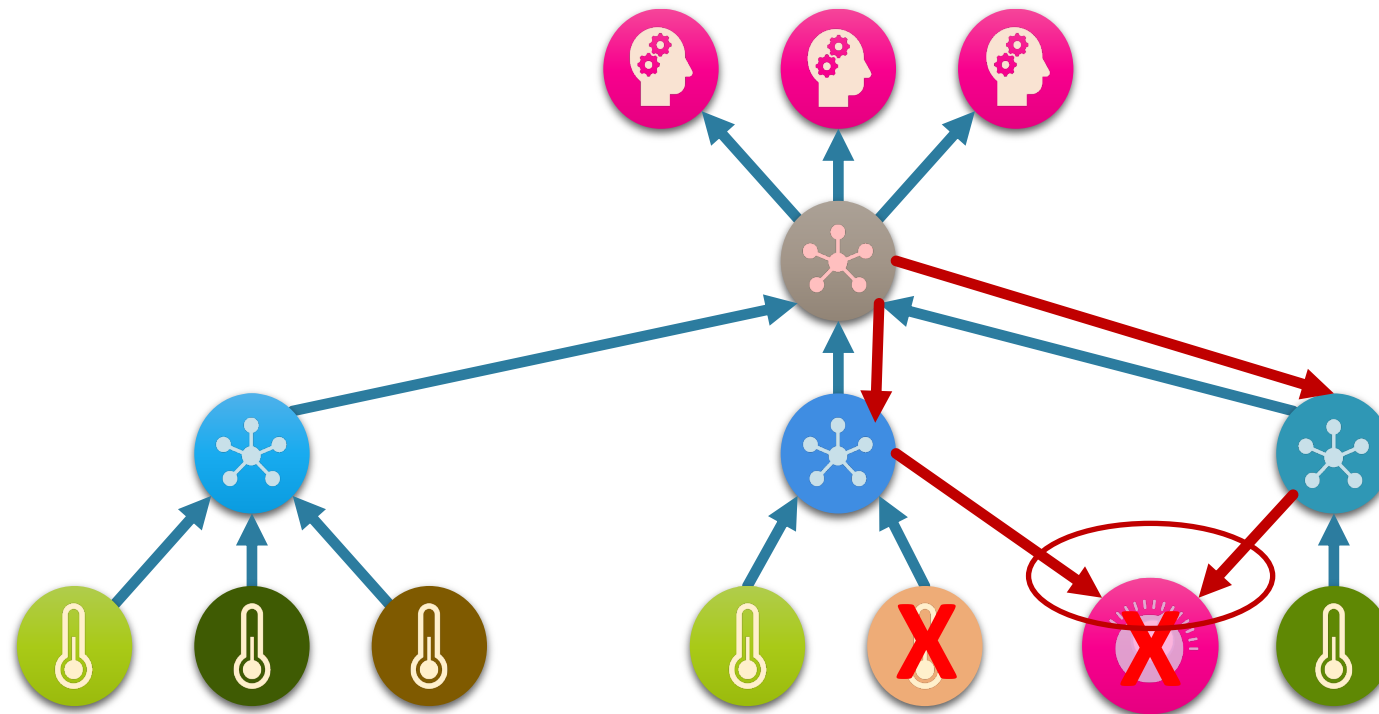
Supporting the Development and Operation of IoT systems with the ENACT Framework

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(SINTEF)
22nd October 2020

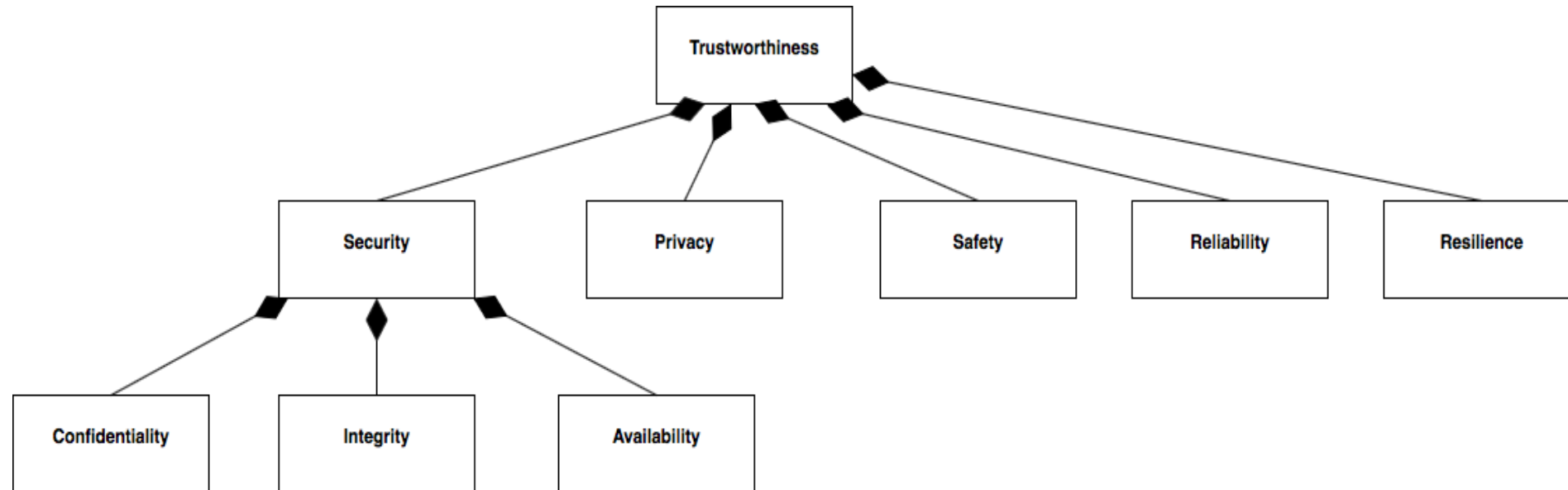
Towards Smart IoT Systems

- The next generation of **Smart IoT Systems** needs to:
 - manage the closed loop **from sensing to actuation**,
 - be distributed accross **IoT, edge and cloud** infrastructures,
 - and operate in an **unpredictable physical world**.

} **Trustworthiness**



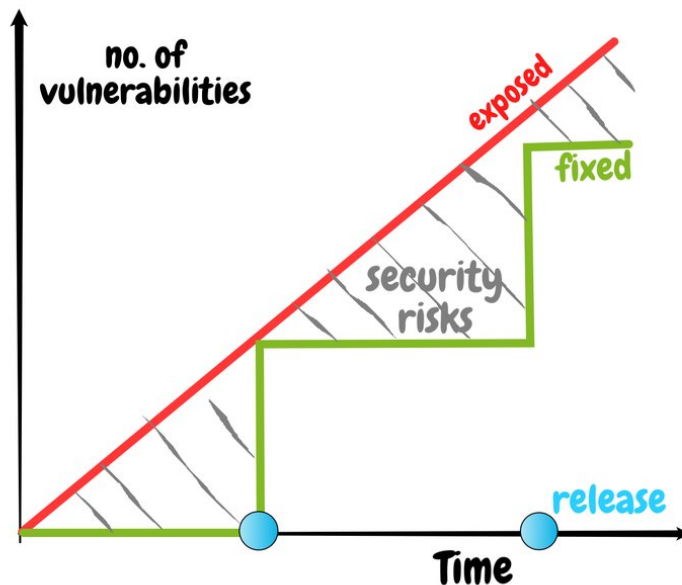
Trustworthiness



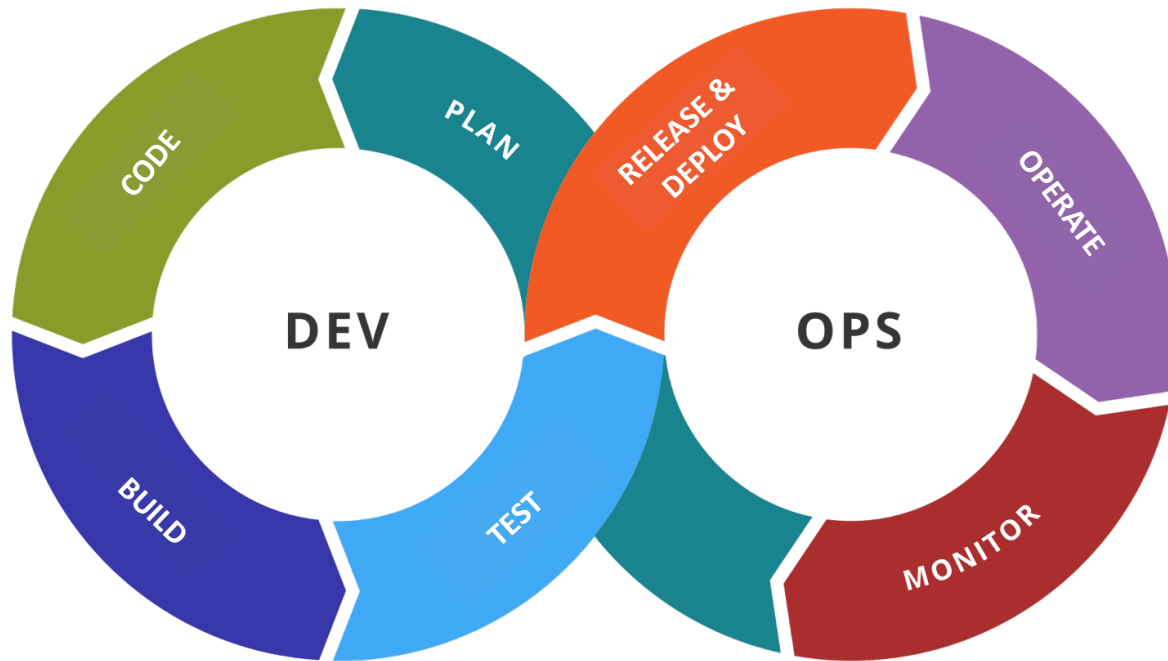
*“**Trustworthiness** refers to the preservation of security, privacy, safety, reliability, and resilience*”*

Continuous Evolution & Trustworthiness

- SIS Infrastructure, requirements, context, might **frequently change** thus **introducing** new internal/external **threats to trustworthiness**
- The ability of these systems to **continuously evolve** to their environment is decisive to ensure and increase their **trustworthiness and quality**.



DevOps in a nutshell



- **DevOps core values:**

- **Culture:** Practice of operation and development engineers participating together in the entire system lifecycle
- **Automation:** Infrastructure as Code, Continuous Delivery
- **Feedback:** Measure everything, feedback from Ops to Dev

Why IoT is challenging DevOps?

Diversity

- Heterogeneous and unstable devices, software, stacks, etc.

Multi-context & scalability

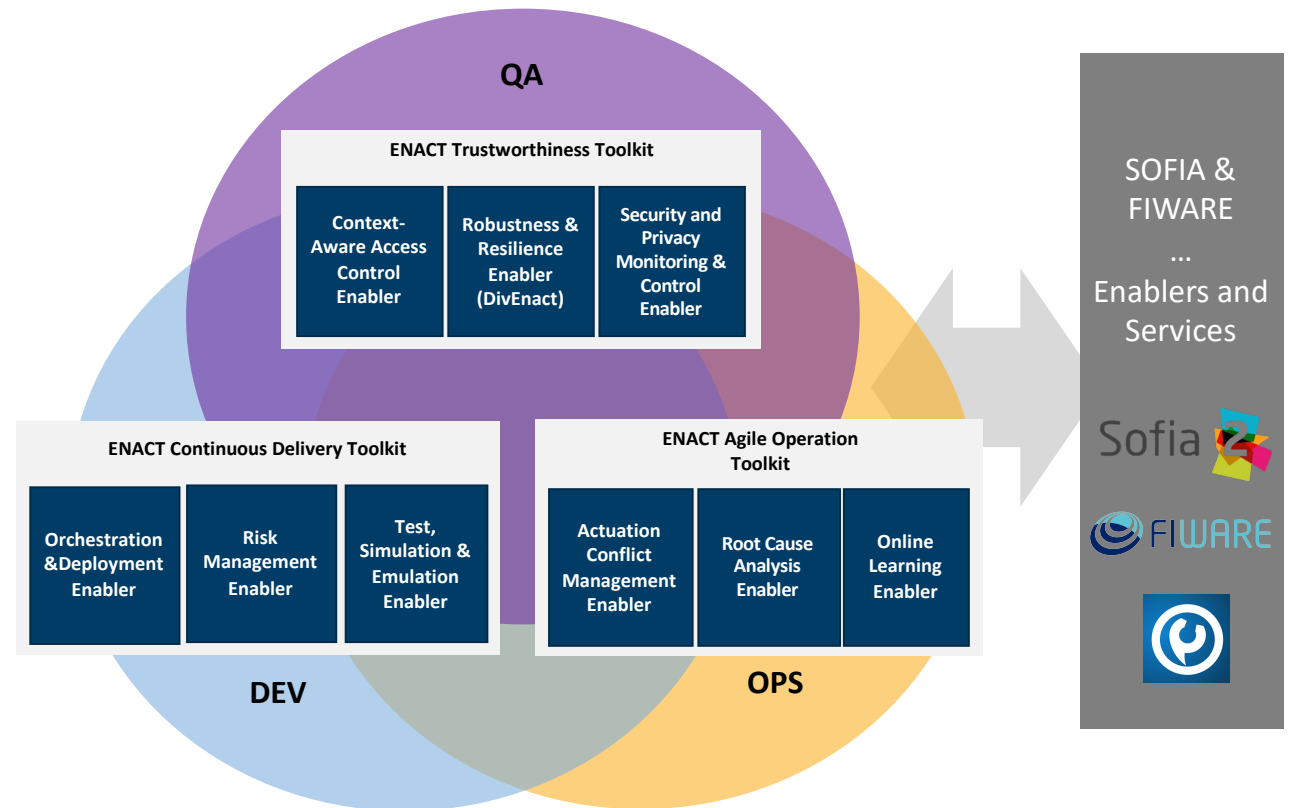
- Distributed components running in different context.
- More context means higher exposure to **trustworthiness** treats.

Actuators

- Impact on the physical world!

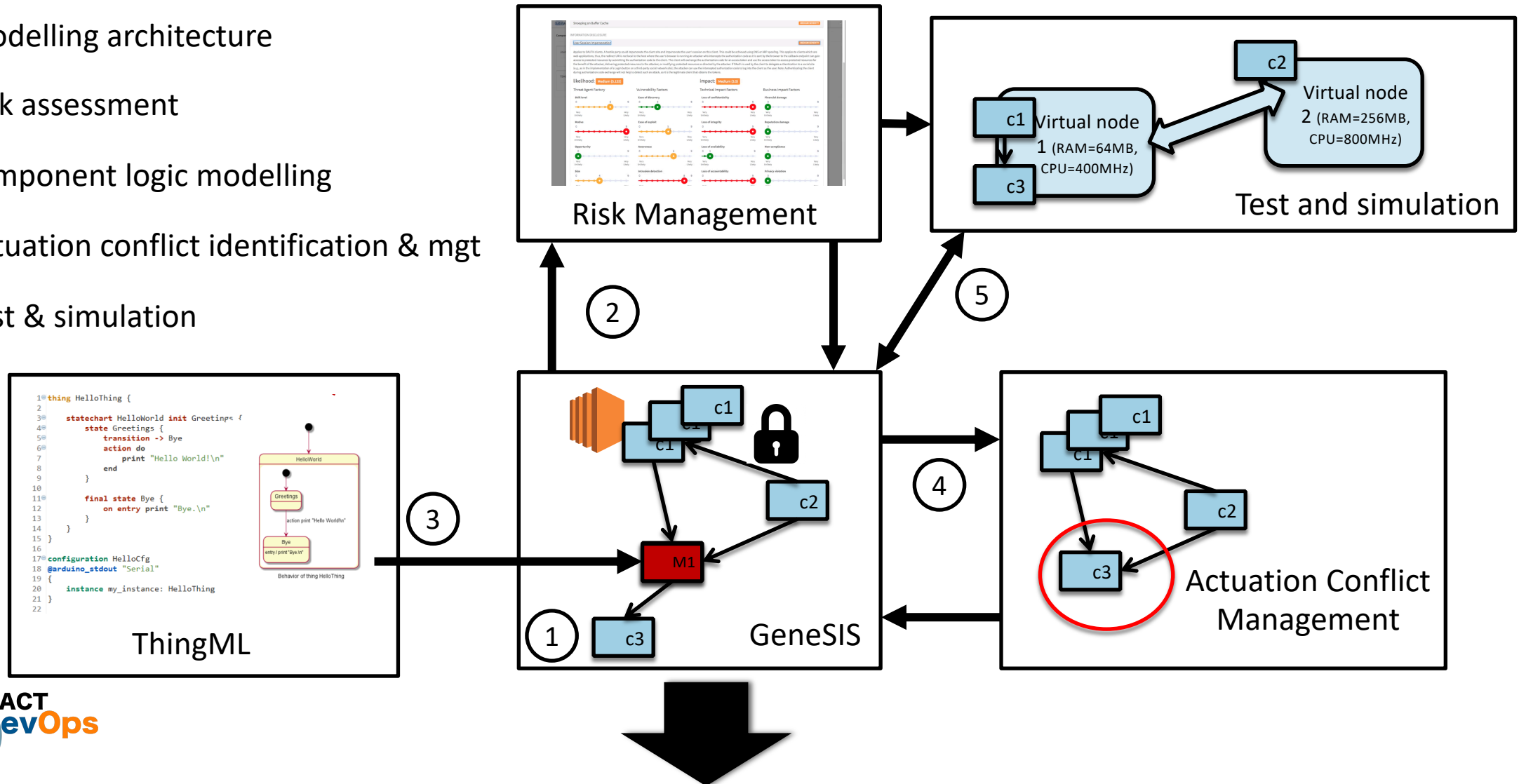
ENACT Objective

“**ENACT** will deliver a set of **loosely coupled enablers** to support the continuous **development and operation of trustworthy Smart IoT Systems**”




A more complete pipeline

- 1 Modelling architecture
- 2 Risk assessment
- 3 Component logic modelling
- 4 Actuation conflict identification & mgt
- 5 Test & simulation



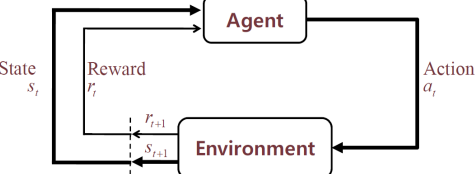
An example



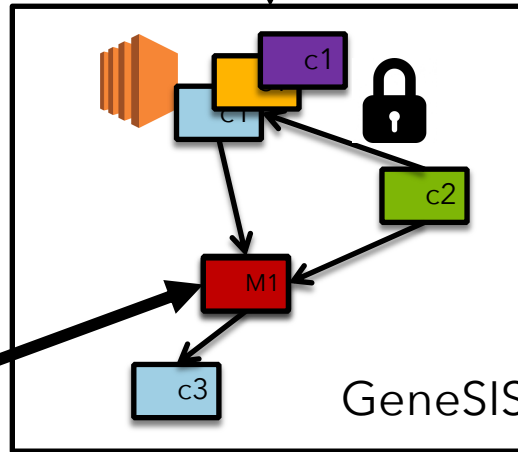
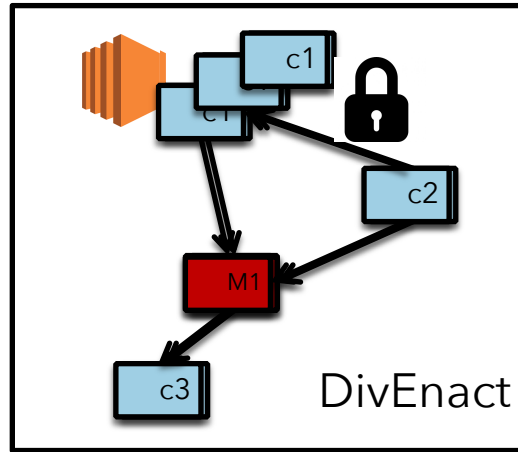
Security & privacy Control



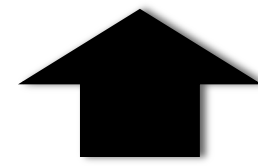
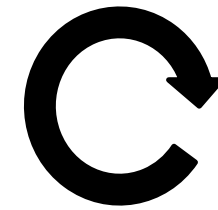
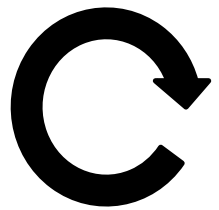
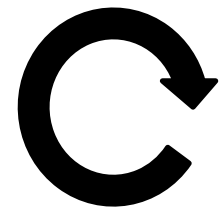
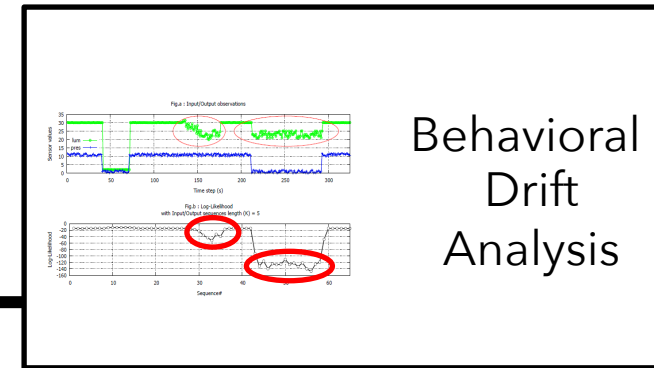
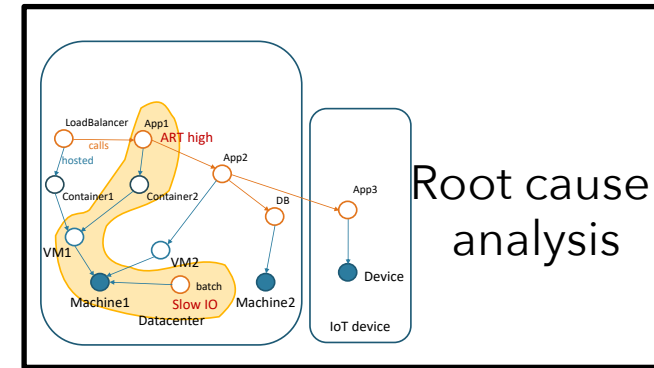
Access control



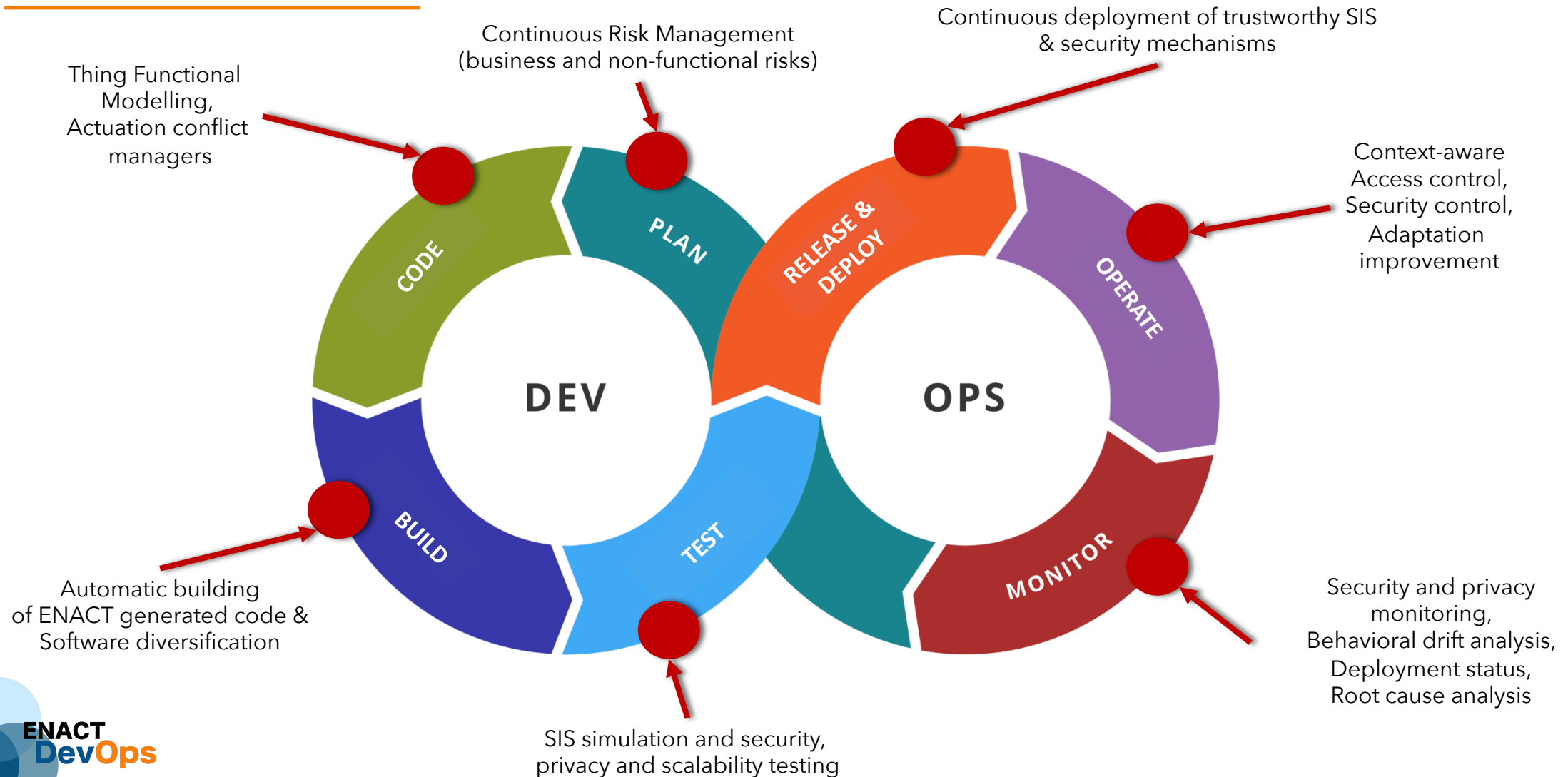
Online learning




Security & privacy Monitoring

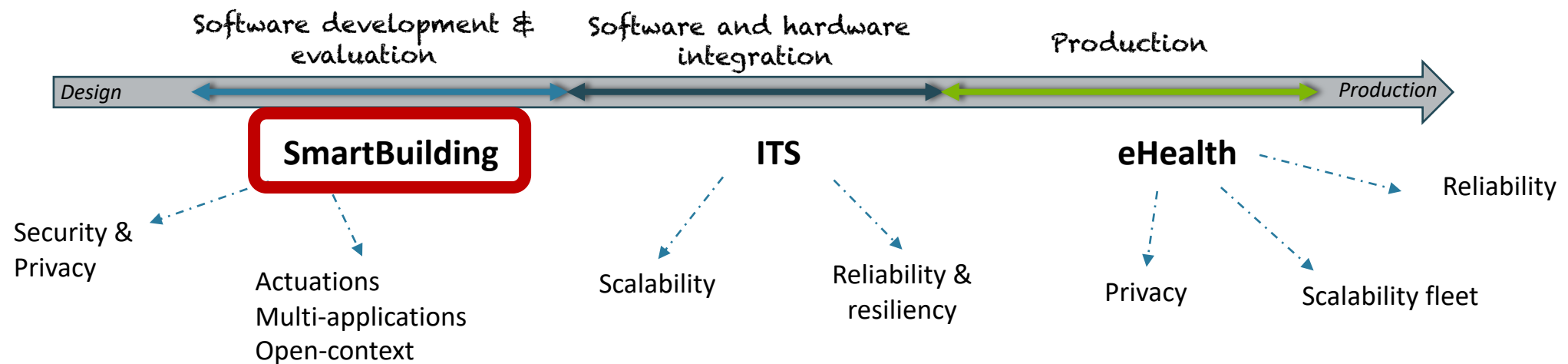


ENACT DevOps for Smart IoT Systems

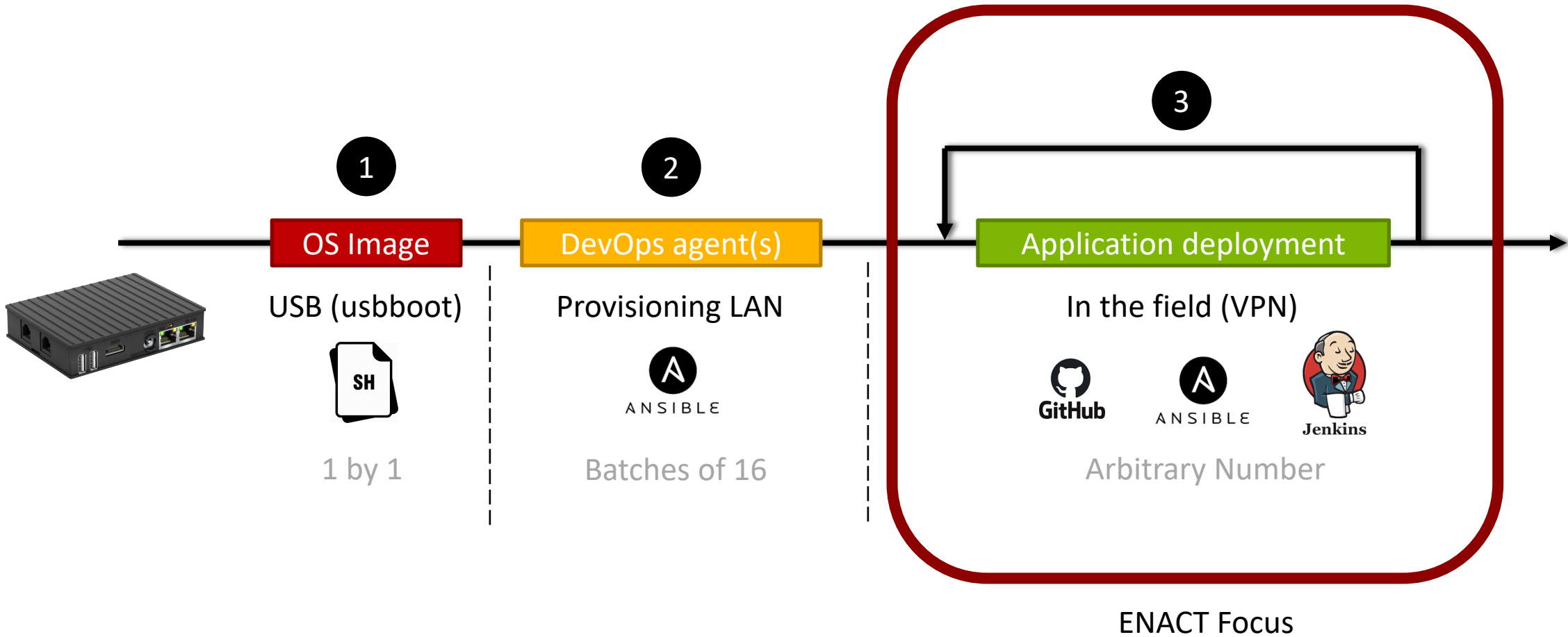


Three use cases illustrating ...

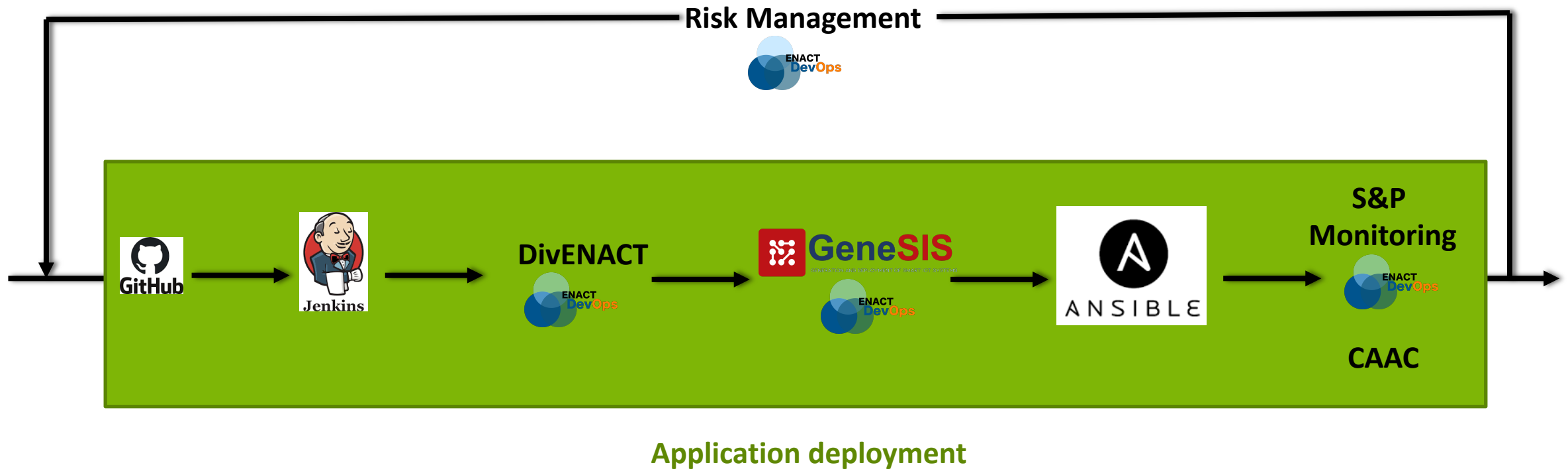
- **Three vertical domains:** eHealth, ITS, Smart building.
- **Three levels of maturity** in the SIS lifecycle.



Build your pipeline with the ENACT enablers: the TellU example



New DevOps pipeline



3



Continuous Risk Management **beawre**

- **Start-up created** in January 2019 in **ENACT** in collaboration with H2020 **PDP4E** project (focused on GDPR and privacy aspects)
- **Offers:** Easy-to-use solution to **continuously control risks** in complex digital systems and **collect evidence of risk control efficiency**



Continuous and real-time analysis and automation for risk assessment



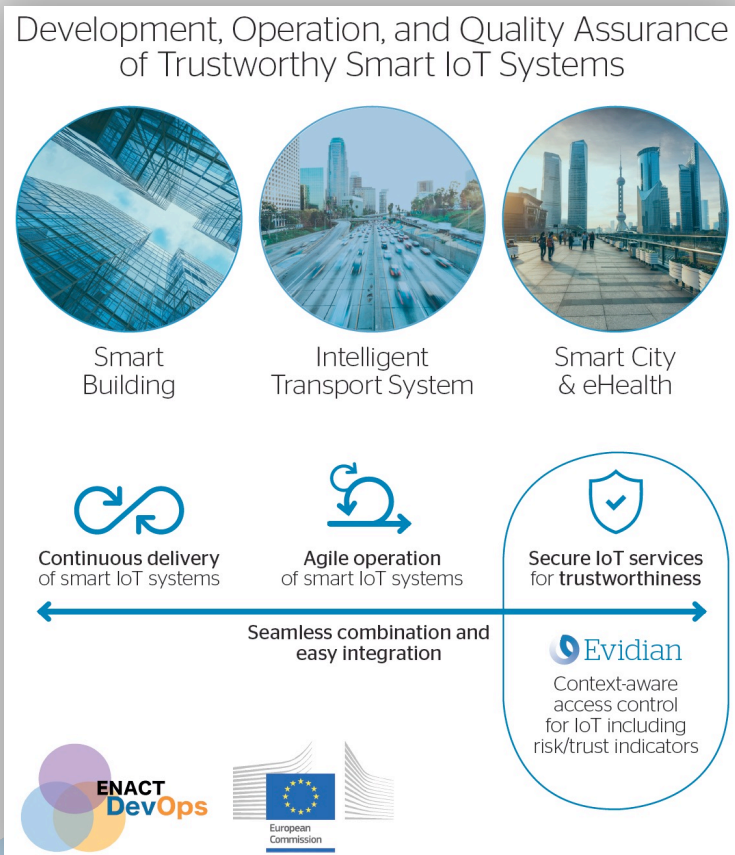
Measure mitigation effectiveness through evidence collection



Support for legal regulation compliance with multiple stakeholders

- **Early Adopters:** eHealth and construction (internal & external to ENACT)

Context-aware access control



Fulfill the *IT-OT continuity* principle for what concerns access control



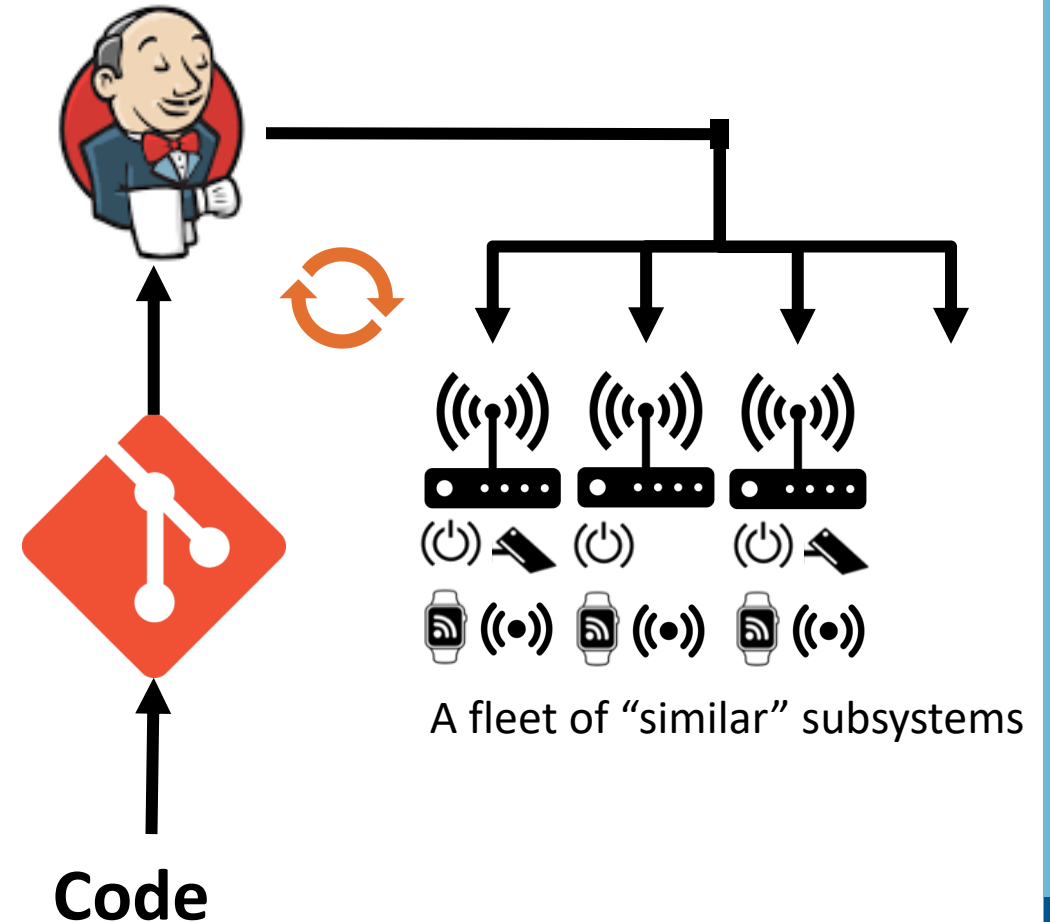
Deliver -as the cornerstone component- a situation-aware dynamic authorization module



Control access for: users → services, services → services, objects → services

In the core of DevOps: Continuous Deployment for IoT

- **Deployment of subsystems**
 - Device with no direct access to internet
 - Technology agnostic
- **Deployment of security mechanisms**
 - Security monitoring developed in ENACT
 - Security control in IoT platform developed in ENACT
- **Deployment of Actuation Conflict Managers**
 - Automatic identification of conflicts
 - Support for dynamic resolution
- **Deployment of Fleet of subsystems**
 - Define multiple diverse deployments
 - Deployments of large fleets, in Production, Preview, safemode, etc.



Demo

- A long demo here:
<https://www.youtube.com/watch?v=hxExx-eqEhk&t=203s>
- A short one for today 😊:
https://www.youtube.com/watch?v=9S58MEgbk_s



Development, Operation, and Quality Assurance of Trustworthy Smart IoT Systems.

