Functional Safety Digitalisation – Reduce the Burden

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Introduction

Chris Parr BEng CEng MIET FS-Expert (#260/15)

Chief Technical Officer
30 years' experience in Safety Critical systems design, commissioning verification and assessment.

Ian Dolan MSc CEng MIET MInstMC FS-Expert (#318/24)

Principal Functional Safety Consultant
25 years' experience in Safety Instrumented system design, assessment and consultancy.

Agenda

Functional Safety Digitalisation – Reduce the burden

1. Defining Digitalisation
2. The Challenges in Functional Safety
3. Example – Automated Proof Testing
4. Taking it further - Safety Lifecycle Digitalisation
5. Summary

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Defining Digitalisation

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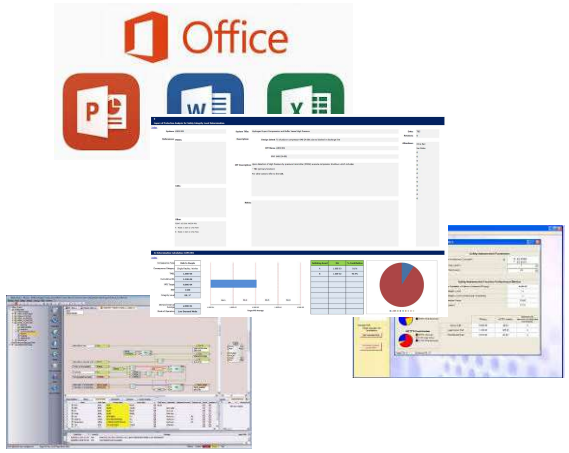
Defining Digitalisation

Our Definition - The use of digital technologies to fundamentally change work processes in the functional safety lifecycle and provide added value.

Digital Tools



Digitalisation

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Current Challenges in Functional Safety

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Current Challenges

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Macroeconomic pressure
→ Downtime for Testing, labour requirements

It is not always possible to test devices in operation

Skills shortage
→ Reduced quality and effici

The test is influenced by human fa

Long-term conformity
→ Proof that the requirement
specification are met

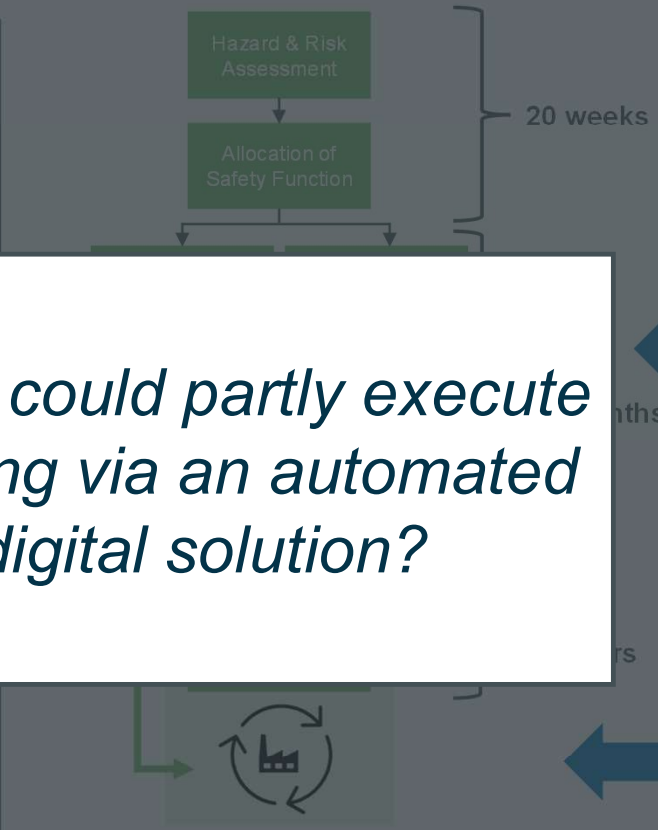
Repeatability of the test is hard to

Document and data ma
→ Cross-departmental and cross-platform
storage of data from different resources

Data collection and reporting not always organized

Monitoring of safety performances
→ Based on actual field data

Difficult creation of statistical failure rate



What if we could partly execute proof testing via an automated and digital solution?

Widely available digital tools and digitalisation process

Current challenges lie here. Lots of tools but lack of integrated digitisation

Use case in operation:
Proof Testing – How is it impacted by those challanges?

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Automated Proof Testing

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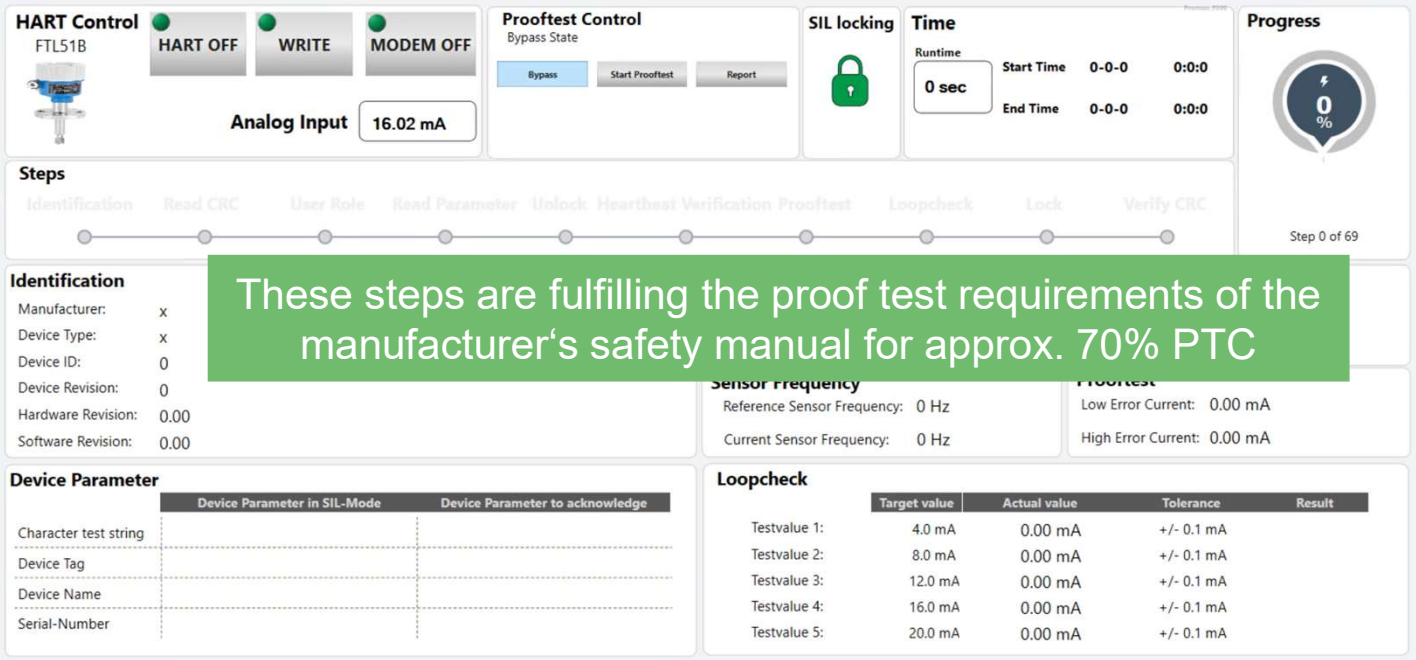
Automated Proof Testing

What is it possible to test in 80 seconds?

For sensors, the test proofs the electronic functionality of the device, and it includes plausibility to extend the test interval.



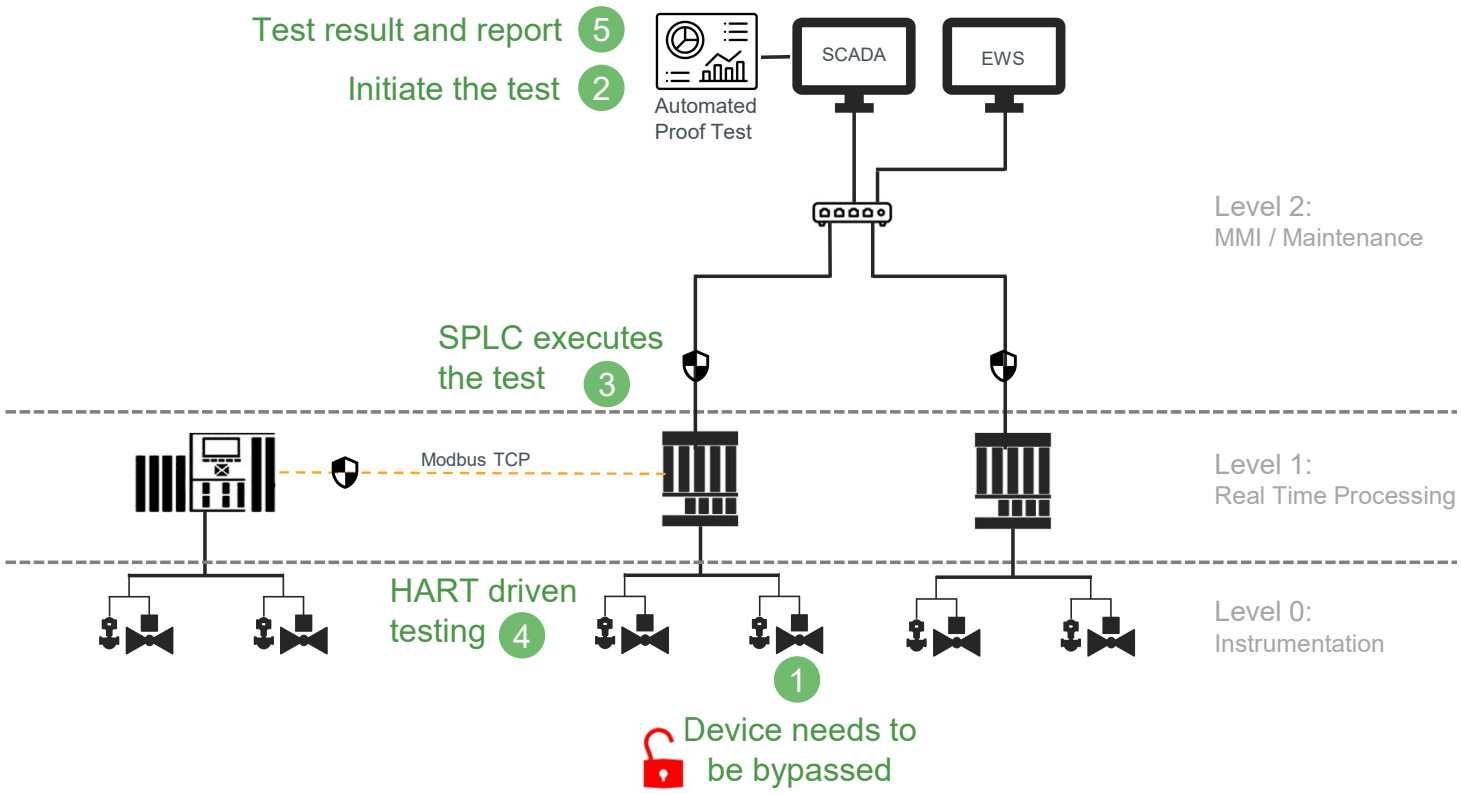
It solve several issues…

- Faster and more flexible
- Multiple steps covered
- Repeatable and compliant
- Documented
- Data available
- Independent from individual skills

… and allows user to redesign the testing and maintenance concept.

Automated Proof Testing

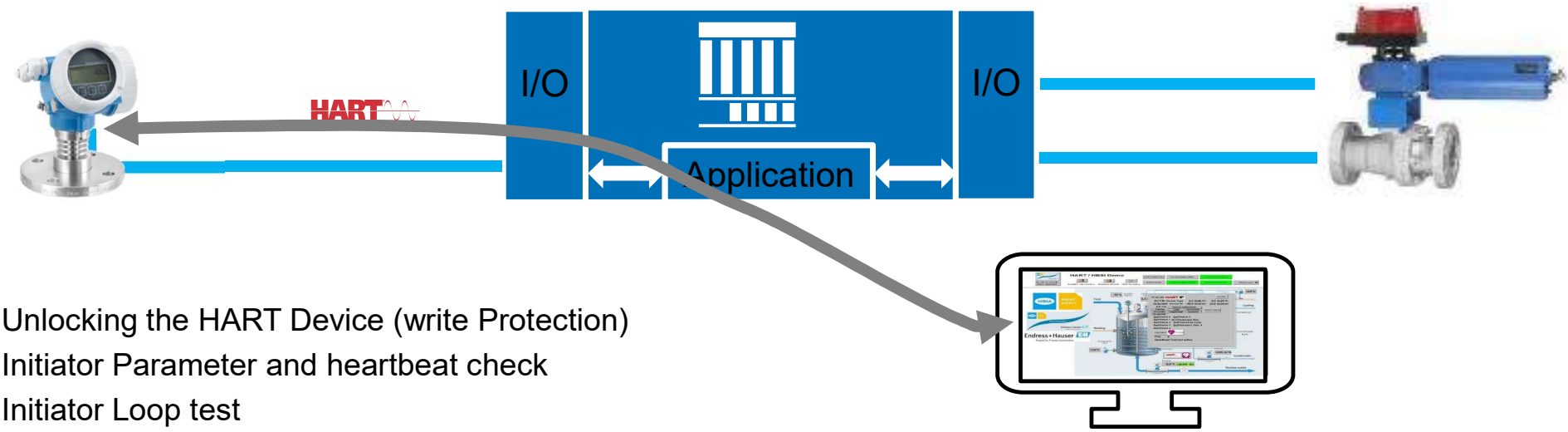
How does it work in a typical installation?



Key features

- Proof tests managed by single HMI
- Only devices that are bypassed can be tested
- Test are performed by SIL3 logic solver through standard logic blocks
- HART communication is used to drive the test
- Results are stored and can be printed in reports

Automated Offline Proof Test



1. Unlocking the HART Device (write Protection)
2. Initiator Parameter and heartbeat check
3. Initiator Loop test
   For range monitoring: simulation of 5 levels
4. Logic check
5. Valve closure and closure time check
6. Lock HART Device

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Taking it Further – Safety Lifecyle Digitalisation

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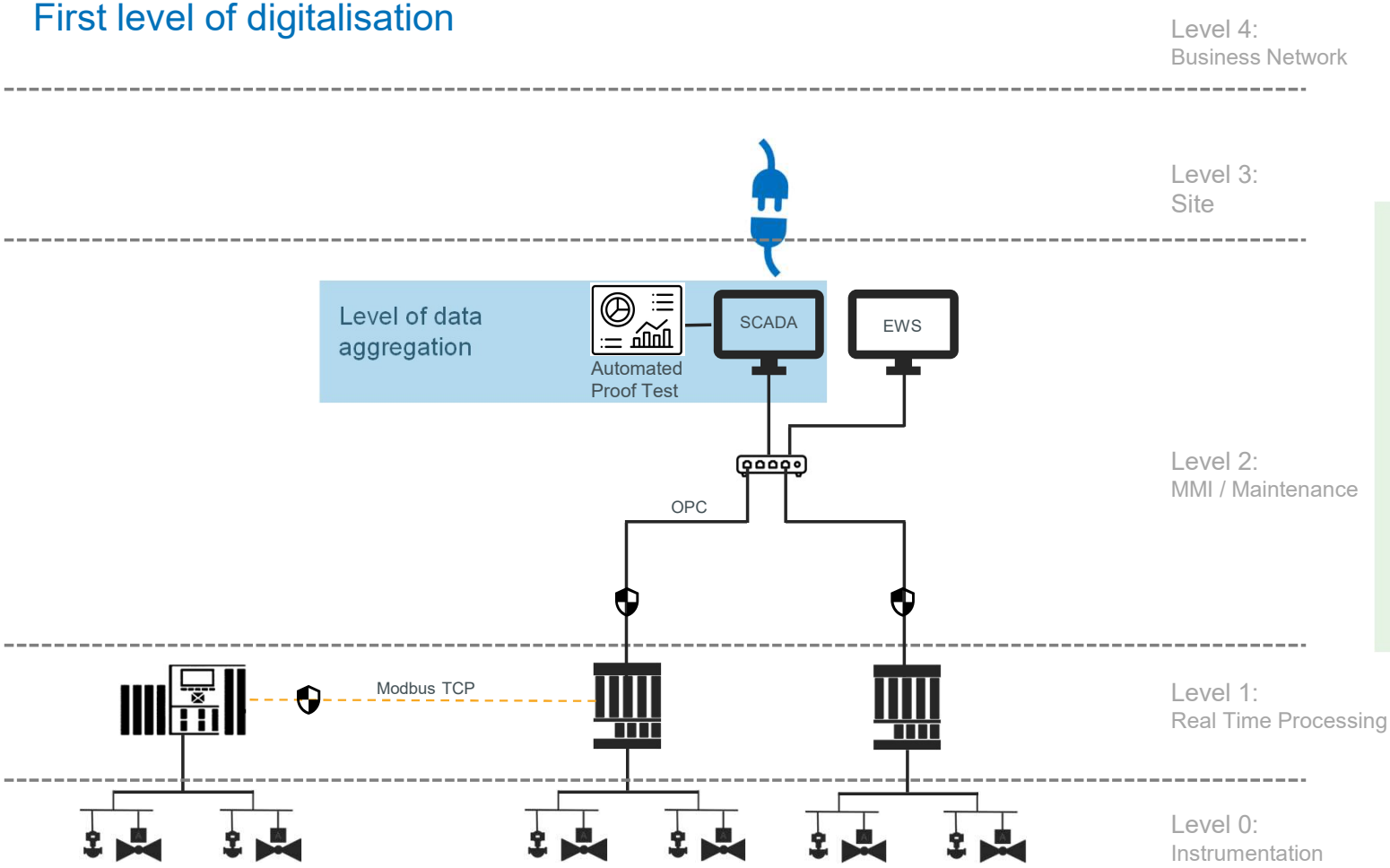
Island Level

First level of digitalisation

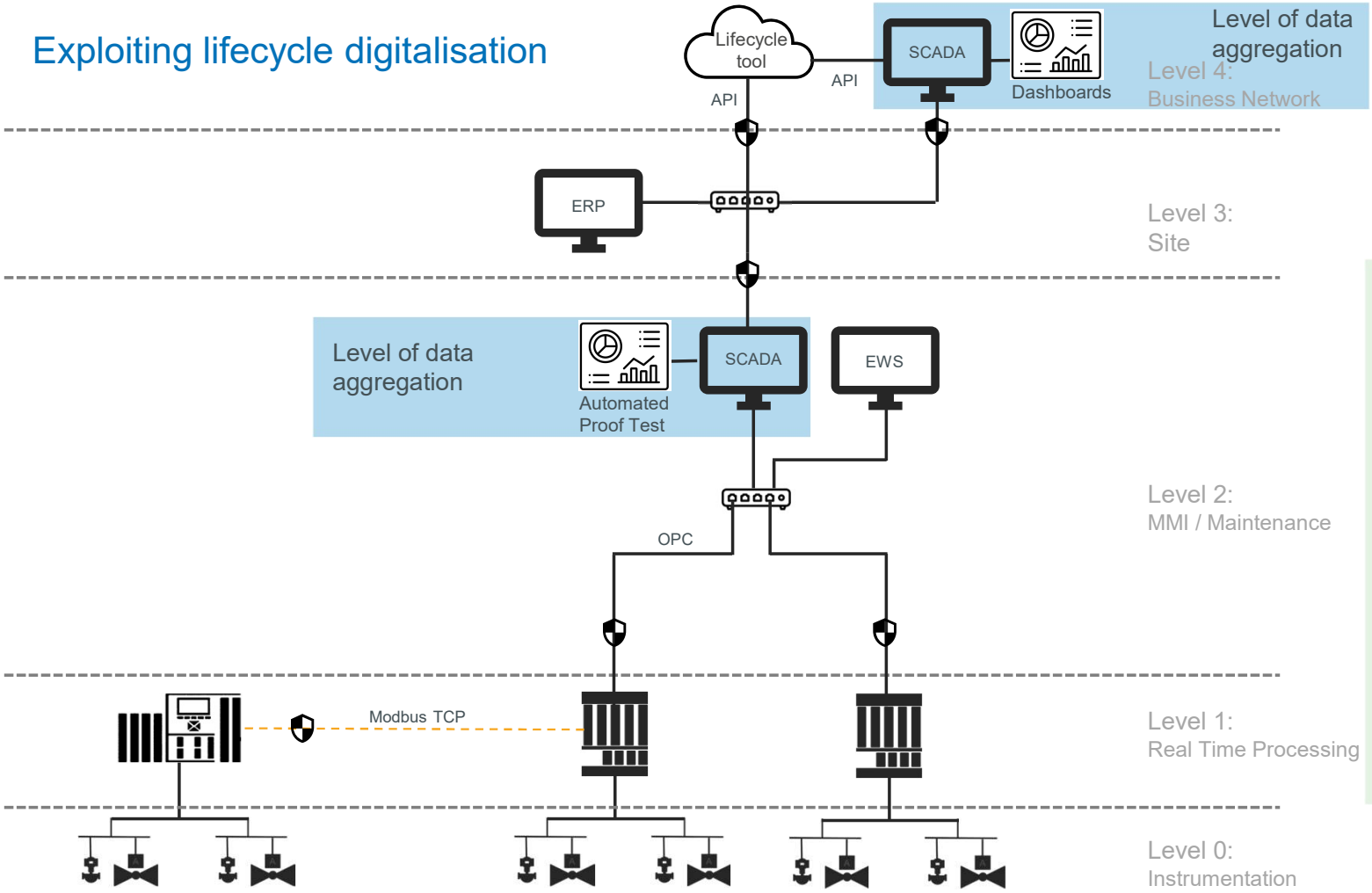


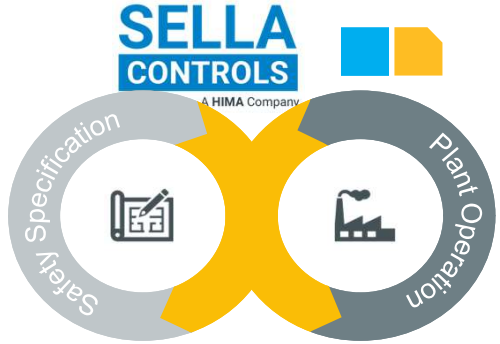
Island Level:

- Provide digitalisation of certain processes but it is limited
- Integration of SCADA system with safety PLC
- Usage of OPC
- No connection to level 3 & 4
- Ready for digital expansion

Integration / Connect Level

Exploiting lifecycle digitalisation





Integration and Connect Level:

- **Enable full Safety Lifecycle Digitalisation**
- Can be adapted to several security concepts
- Data integration can be at different levels
- Company wide integration
- Connection / sync with external systems via API

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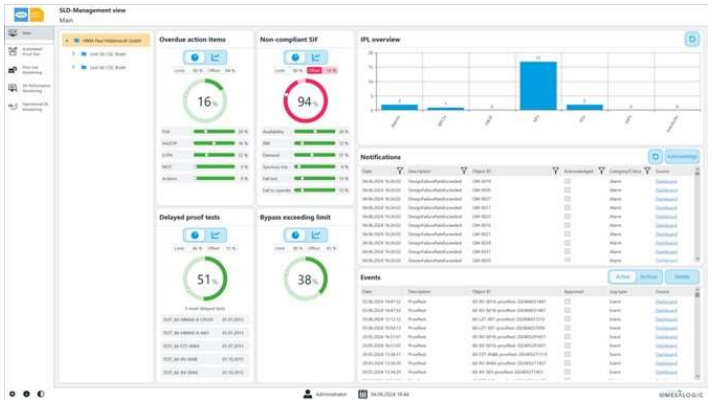
Safety Lifecycle Digitalisation

Why Integration Matters…..

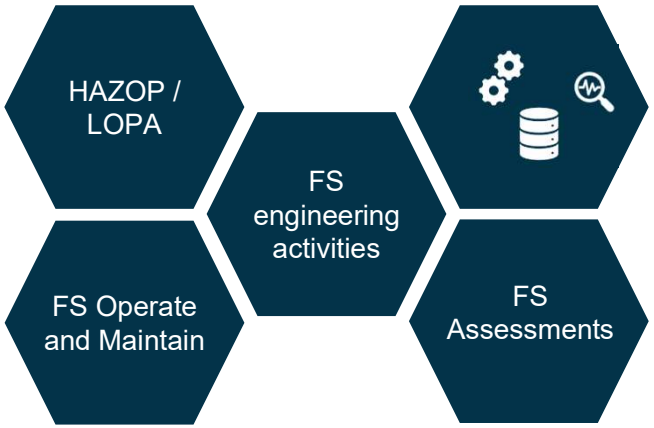
Safety Lifecycle Digitalisation

Automation Level

Collect / Integrate / Visualise



Lifecycle management platforms / tools



Synchronization and Validation of Events →
← Results of analytics and calculations

C&I Engineer

→ Specification, Installation, Commissioning, Maintenance, Troubleshooting, Improvements

Operation and Maintenance Team (Asset Engineer)

→ Monitoring overall FS KPIs and compliance of SIFs, get support for key processes like Proof Testing Management Failure Data Management, Reporting for Audit / Assessments, etc…

Functional Safety Engineer

→ Risk assessments, SIF Engineering, Validations, Assessments, setup Proof Test Procedures, etc…

This is the target group to be supported

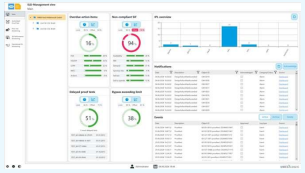
What is it possible to achieve as next step?

A cockpit for FS in Operation with embedded automated workflows

Active monitoring of compliancy | **Automated analysis of operational data** | **Optimize proof test management** | **Reach and maintain the prior use declaration** | **Automated calculation of actual PFDavg** | **Automated interpretation of process events**

How may this look like?

Overview



Define and monitor FS related KPIs / key alarms and events.

SIF Performance Monitoring

Detect events and monitor the performance of each SIF.

Failure Data Management

Support qualification of devices for safety applications, creation of statistical failure rates and use / monitor of dynamic PFD.

Automated Proof Test

Overview all executed, upcoming and overdue tests

Macroeconomic pressure
→ Avoid plant unavailability

Reduce plant shutdowns (and their duration)

Skills shortage
→ Reduced quality and efficiency

Reduce systematic issues through automated processes

Long-term conformity
→ Proof that the requirements of the specification are met

Alert on gaps against safety requirements

Document and data management
→ Cross-departmental and cross-platform storage of data from different resources

Fingertip available reports

Monitoring of safety performances
→ Based on proper data management

Easy monitor of metrics and KPIs

Summary

Safety Lifecycle Digitalisation is not somewhere in the future, but it is **now!**

Effective Safety Lifecycle Digitalisation can only be achieved through **proper integration**.

Functional Safety know-how is needed to obtain a proper outcome of the integration.

Safety and Security should always be considered.

Safety Lifecycle Digitalisation should focus on **operation and maintenance.**

Questions?

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What's next….

Slot	Start Time	Paper	Workshop	Finish Time
6	11:55	Slot A-6: Concerning Assumptions for Cyber Security and Functional Safety	Slot B-6: CASS **61508** & **62061** Workshop	12:25
Lunch 12:25 – 13:25				
7	13:25	Slot A-7: Functional Safety & Artificial Intelligence (AI)	Slot B-7: CASS **61511** Workshop	13:55 (14:30)