



**SAAB**

# Technical Collaboration Day @ Saab

Base Test Equipment a Modular Test Platform

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OEOGIT Test Infrastructure



# AGENDA

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- Introduction/Background (Test Development @ Surveillance in Gothenburg)
- Base Test Equipment Concept
- DEMO - running a TPS in “Mock/Simulated mode” ...
- Generic Control Function with NI products
- Generic Super Vision Function with NI products
- Questions ...

# EXAMPEL RADAR PRODUCTS

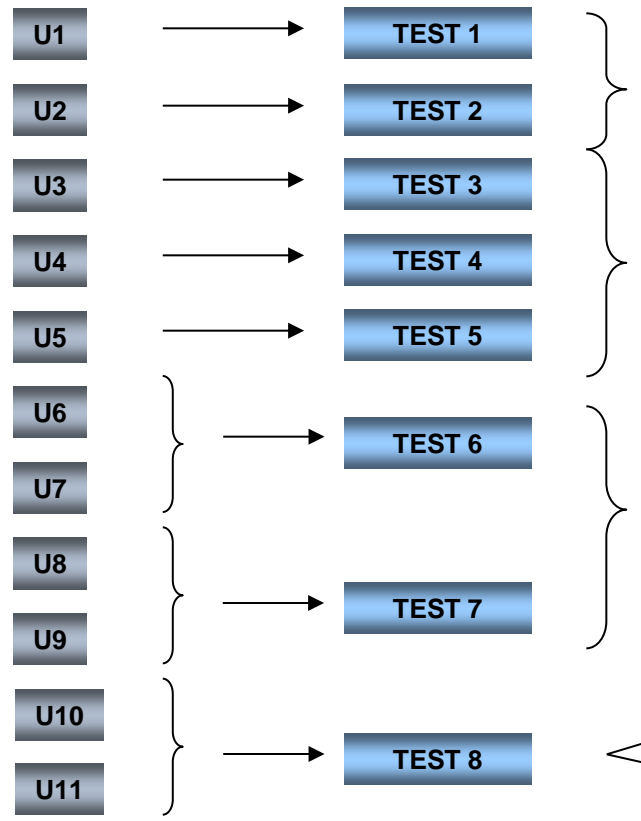
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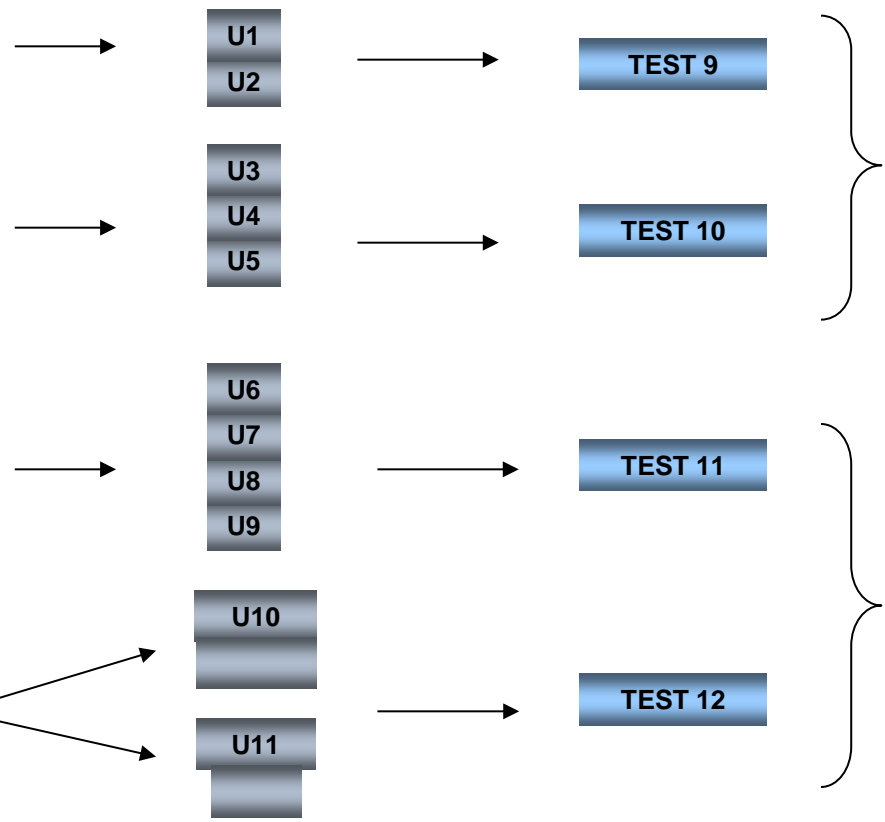
# HISTORICAL STRATEGY

Develop a unique test system for each product !

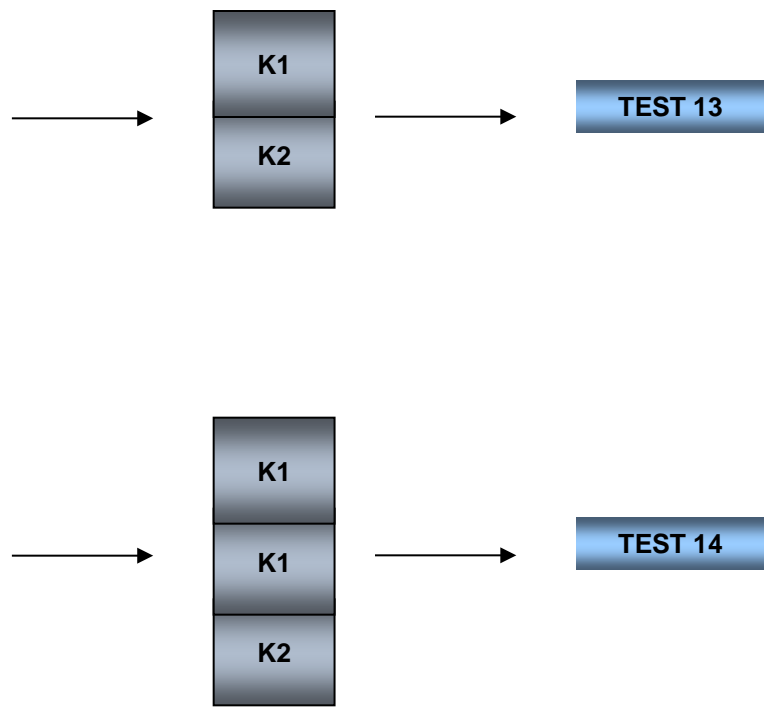
## COMPONENT



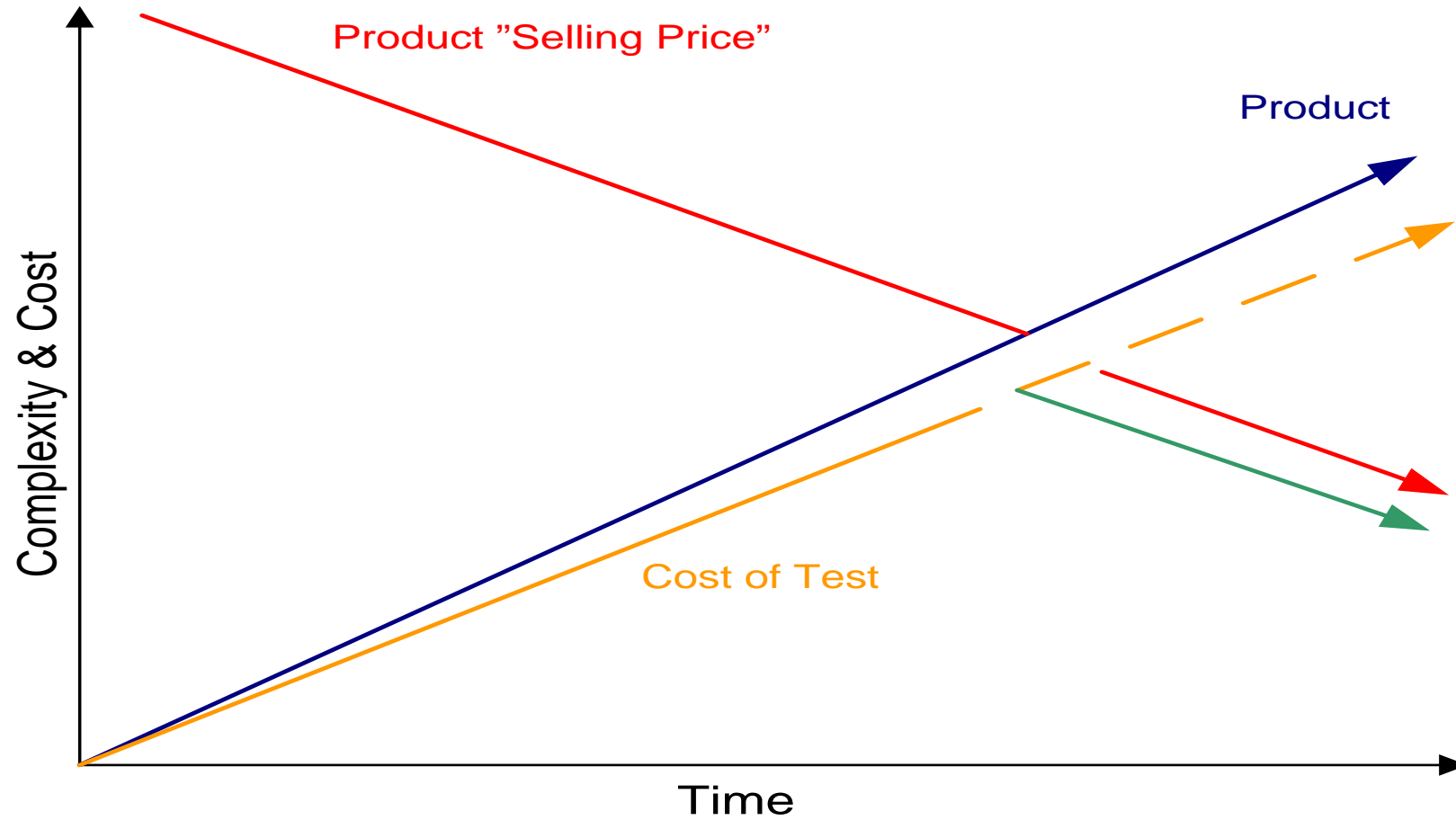
## SUB UNITS



## SUB SYSTEM

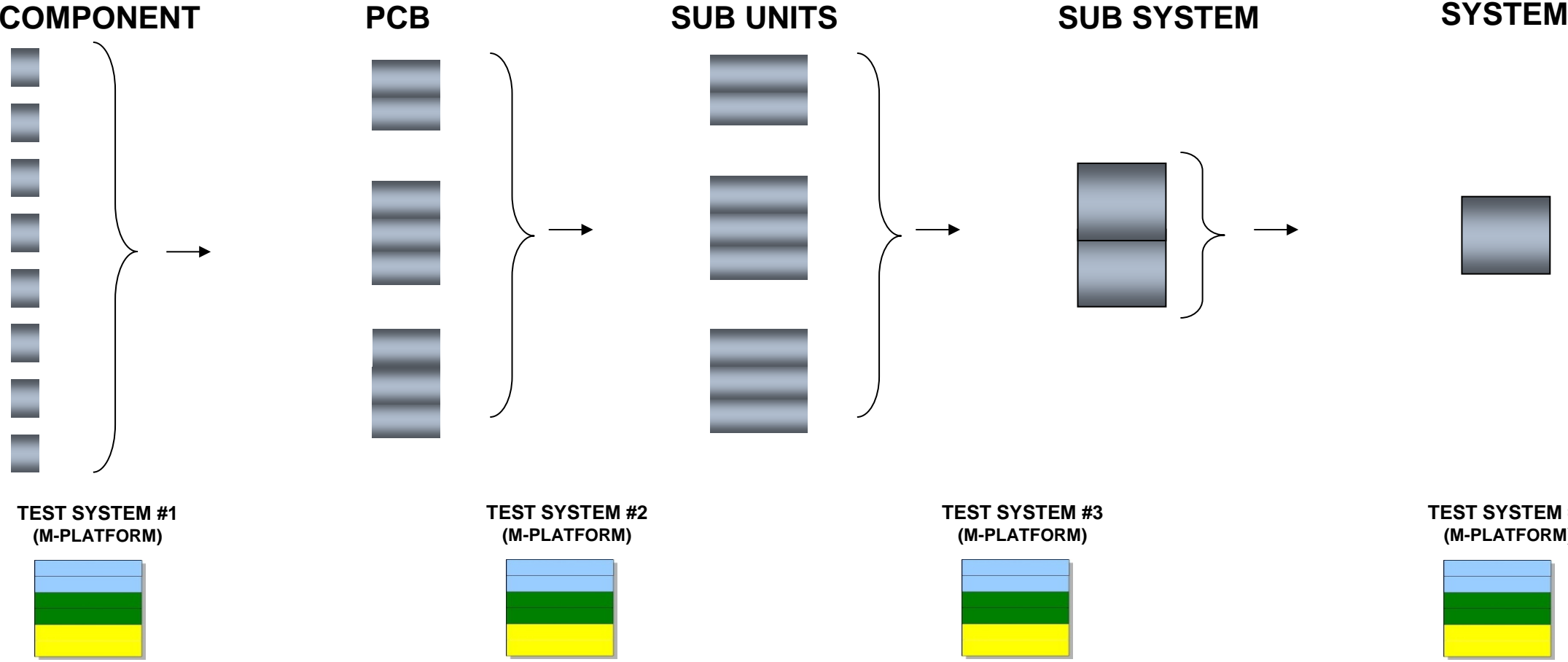


# TREND



# VISION STRATEGY

Which test system is available for the new product?



# CUSTOMER REQUIREMENTS

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The customers need...

- to **minimise cost** for verification and production test
- to **reduce time** for test
- to **minimise** the **investments** in test equipment > ROI (Return Of Investment)
- to **match** increasing or decreasing **production volumes**
- to **ensure mobility** of production between production units & sites
- to **maximise** the **life cycle** of test equipment

# TESTSYSTEM REQUIREMENTS

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## Shorter Development Time

- Use Well Defined Interfaces
- Use Standard Components
- Develop For Reusability
- Scalable
- Uniform Develop Environment

## ▶ Less Maintenance Cost

- Standard Components
- Well Defined Interfaces
- Well Documented
- Clearly-Defined Test Hierarchy

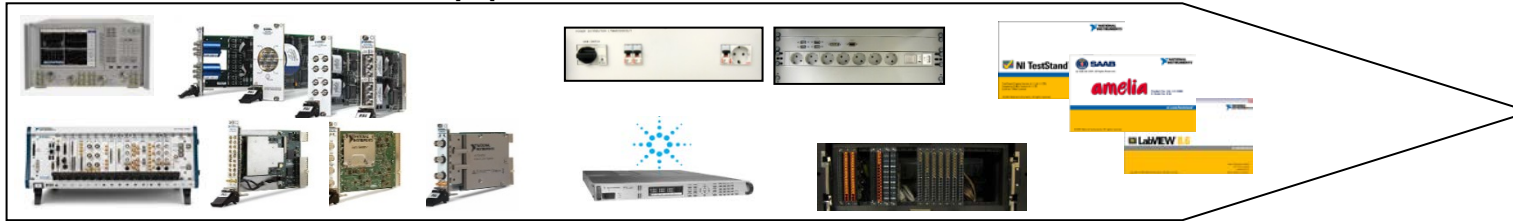
## Longer Lifecycle

- Upgradeable
- Modular
- Variation Durability
- Standard Components

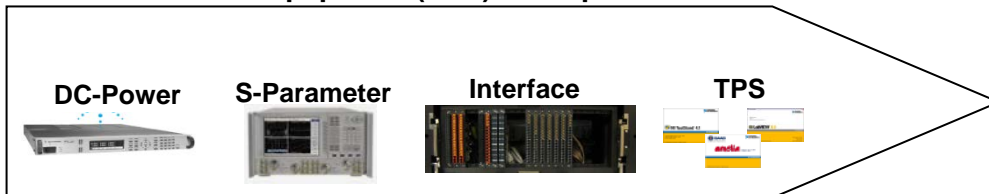


# BASE TEST EQUIPMENT PROGRAM (BTEP)

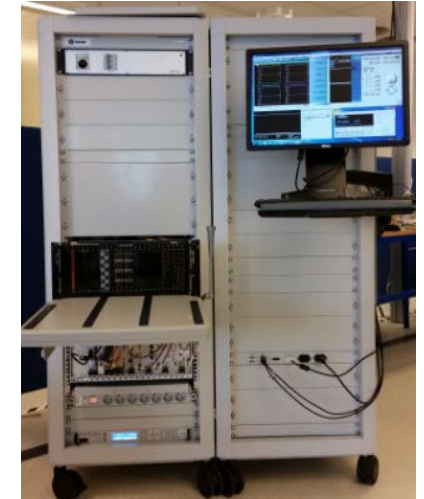
## CSLM1170007/1 Base Test Equipment



## Automated Test Equipment (ATE) AD & $\mu$ W - LPAM1092012

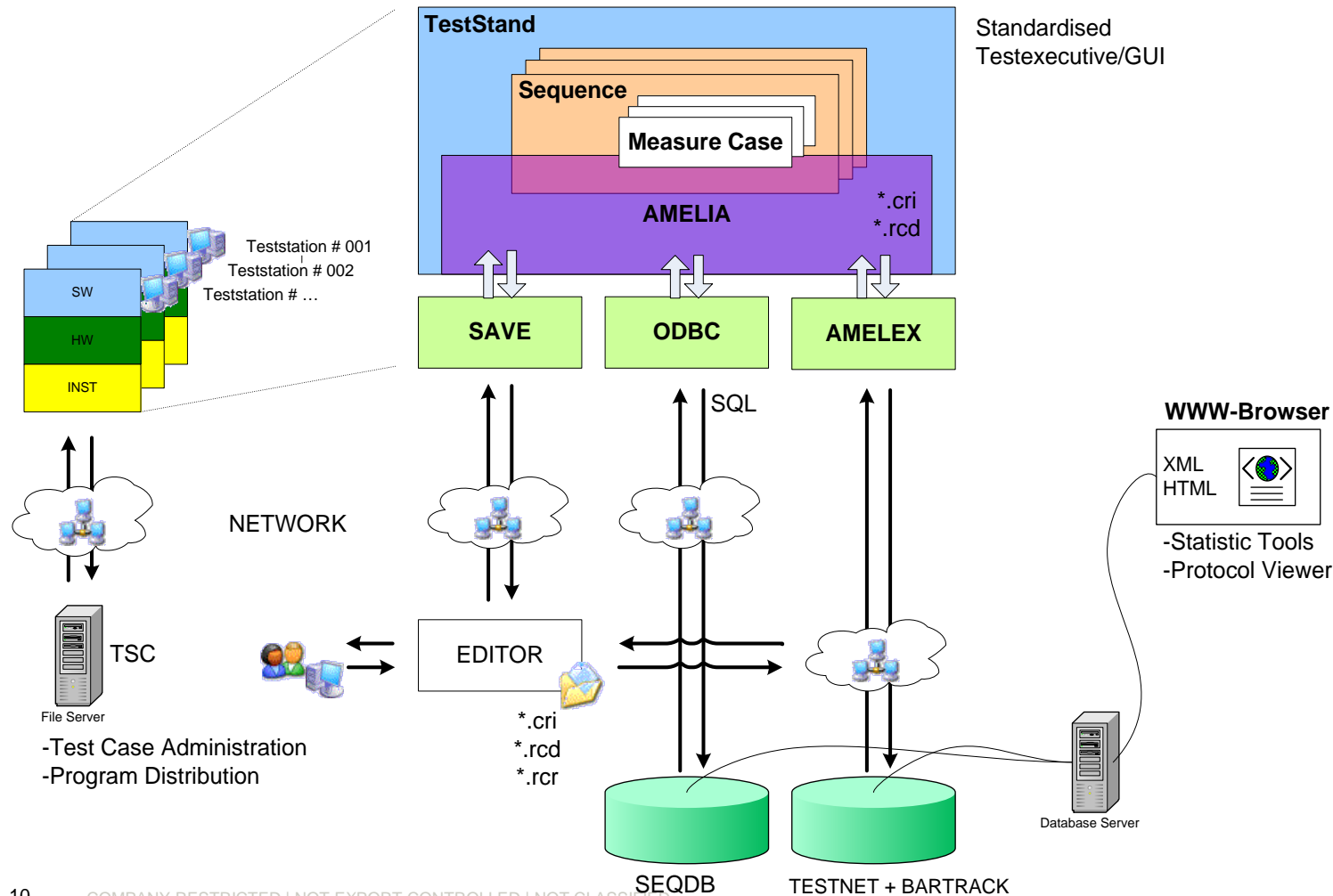


## n/LPAM1092012

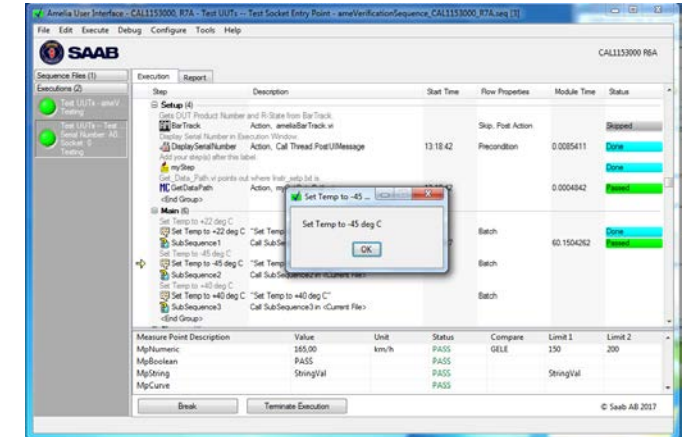


- 200/LPAM1092012 – DLM (MICA & Meteor RAS)
- 201/LPAM1092012 – EXR (ERIN, Mk4)
- 202/LPAM1092012 – DLM (MICA & Meteor RAS)
- 203/LPAM1092012 – DLM (MICA & Meteor RAS)
- 204/LPAM1092012 – Used for integration in lab..
- 205/LPAM1092012 – EXR (ERIN, Mk4)
- 206/LPAM1092012 – GREW (PLB, TRO, TRH ..)
- 207/LPAM1092012 – Circuit Boards
- ..
- LPAM1092012/800 – DCU @ SGD in South Africa

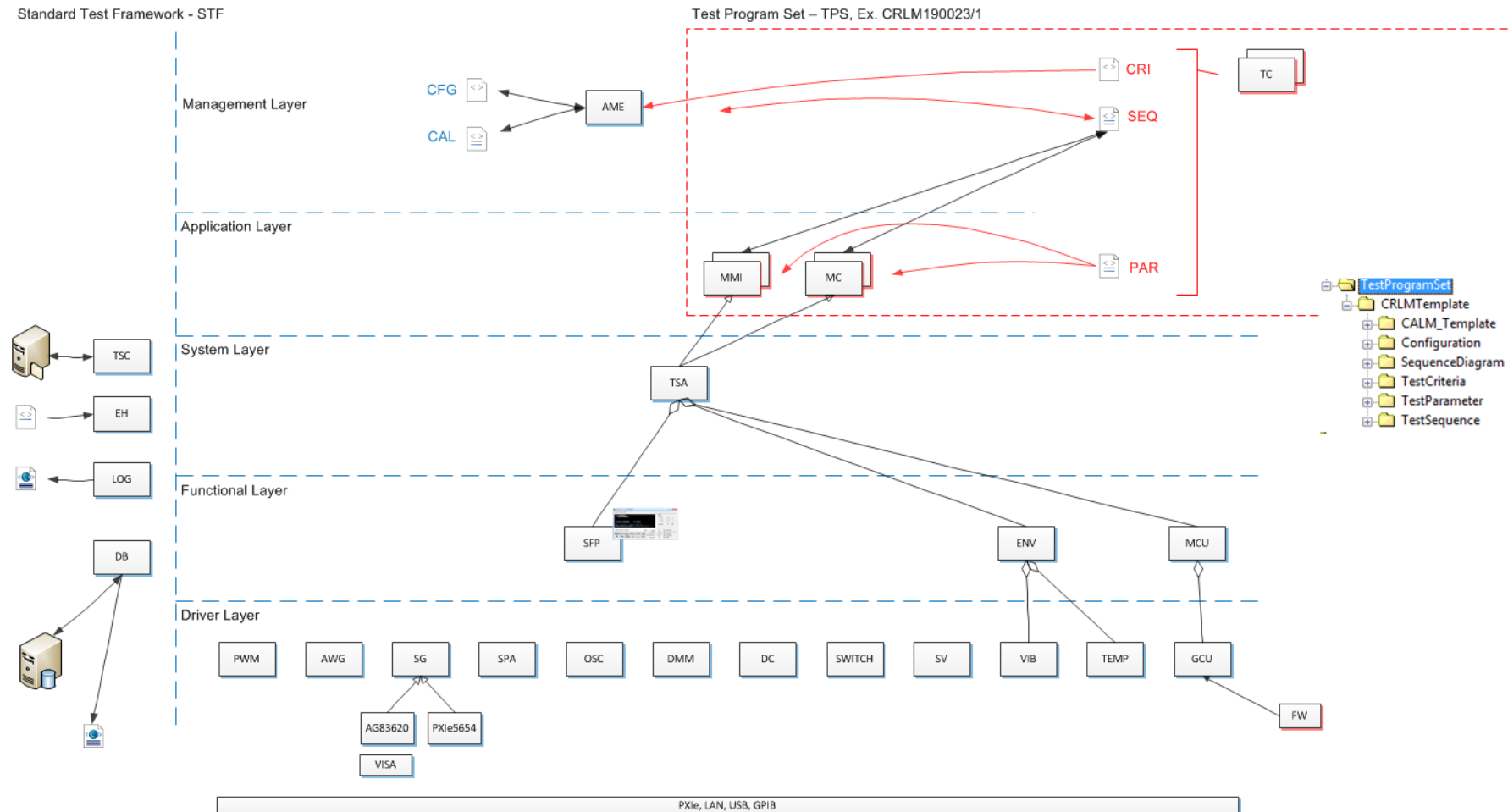
# STANDARD TEST ENVIRONMENT



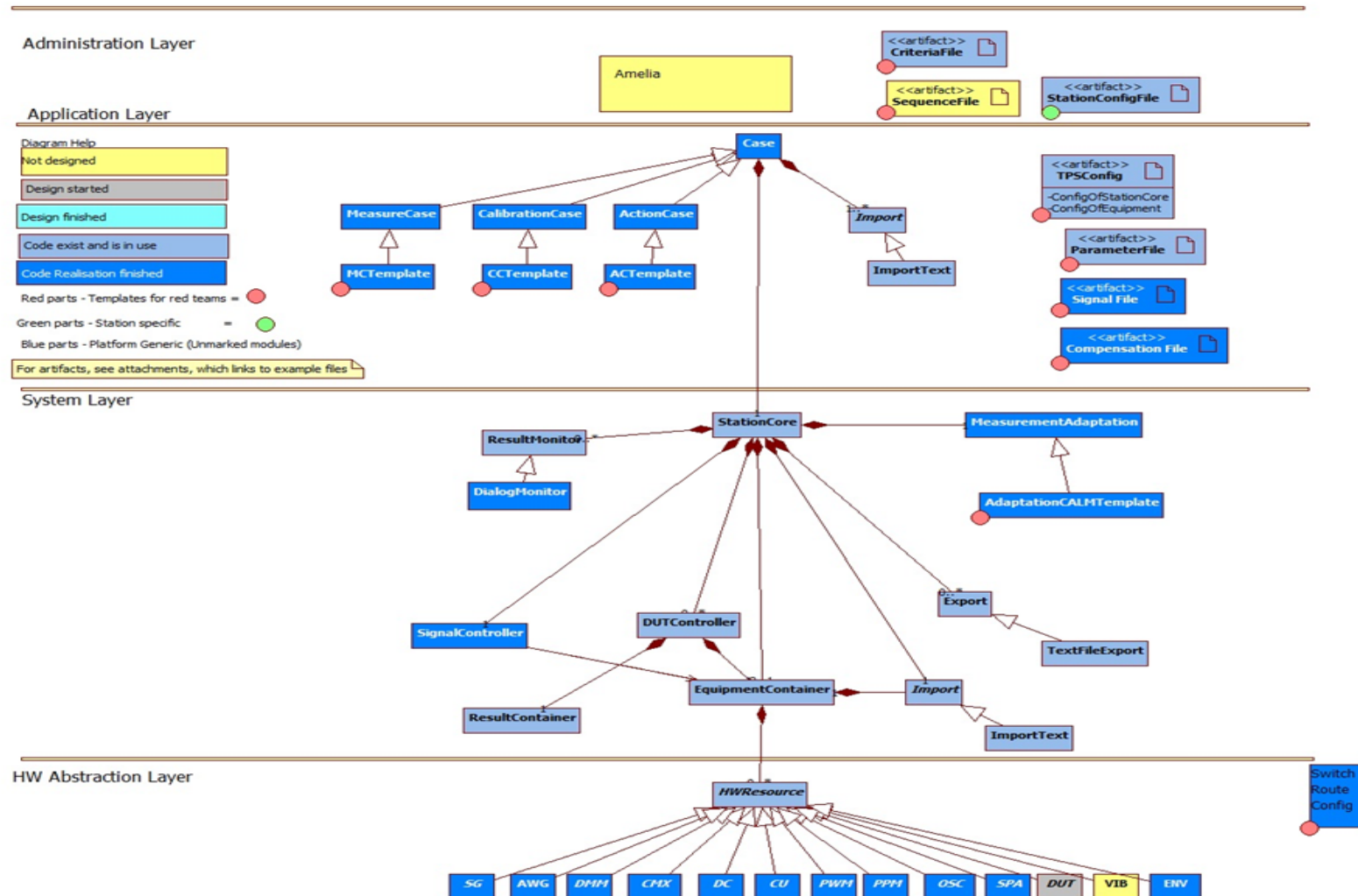
Standardised  
Testexecutive/GUI



# BLOCK DIAGRAM (STF)

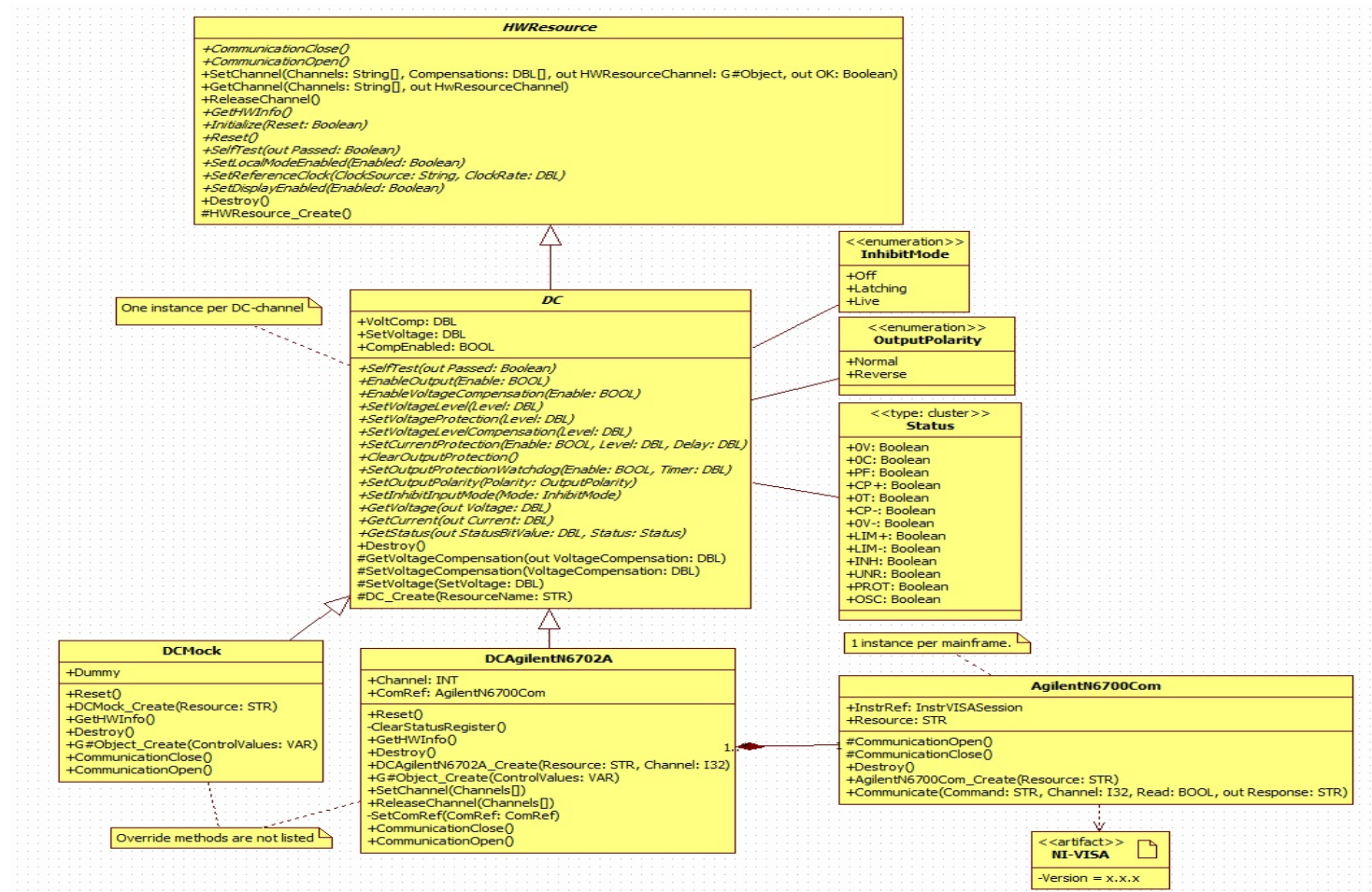


# STANDARD TEST FRAMEWORK (STF) - UML



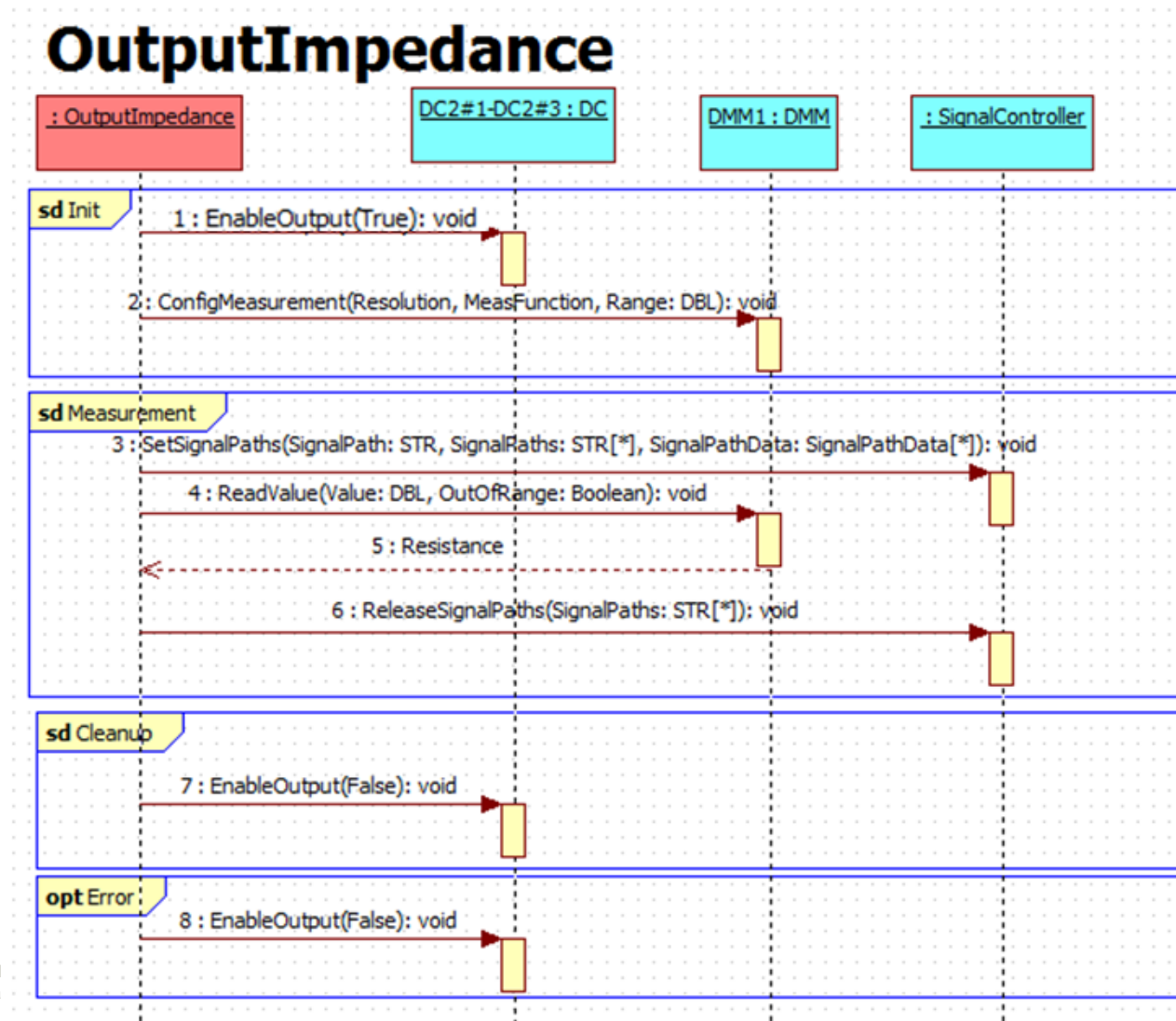
# STANDARD TEST FRAMEWORK (STF) - UML

## Conceptual overview of resource "DC"



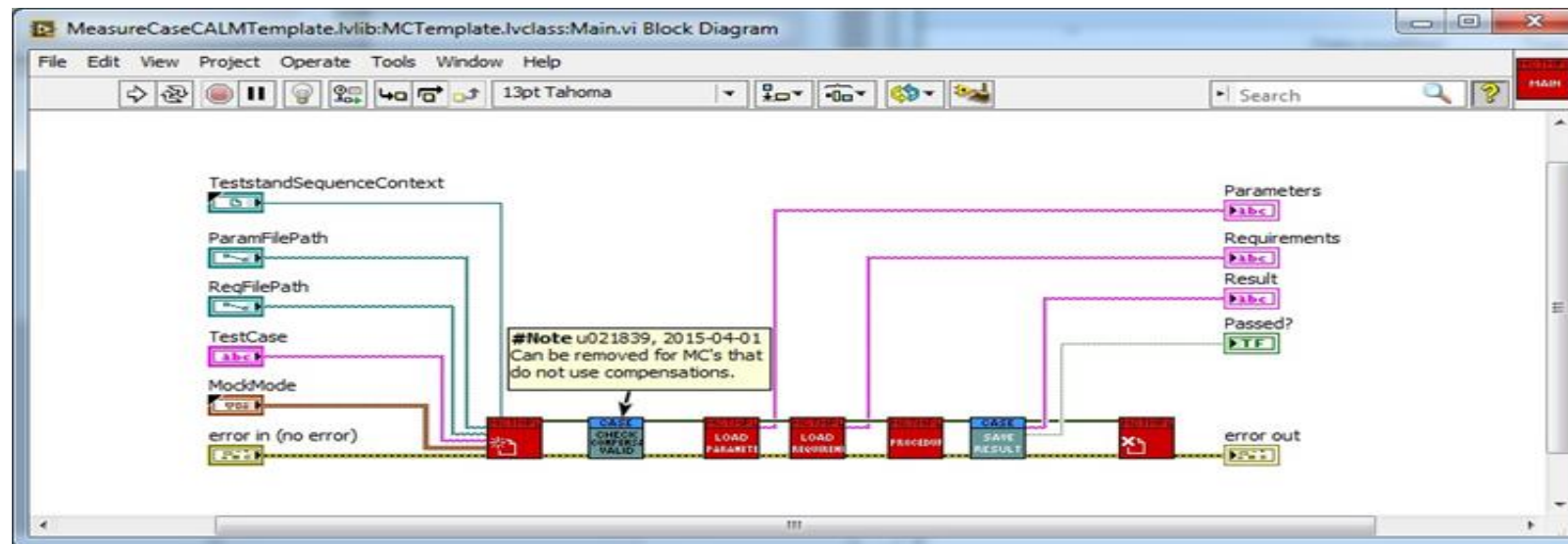


# EXAMPLE OF SEQUENCE DIAGRAM - UML



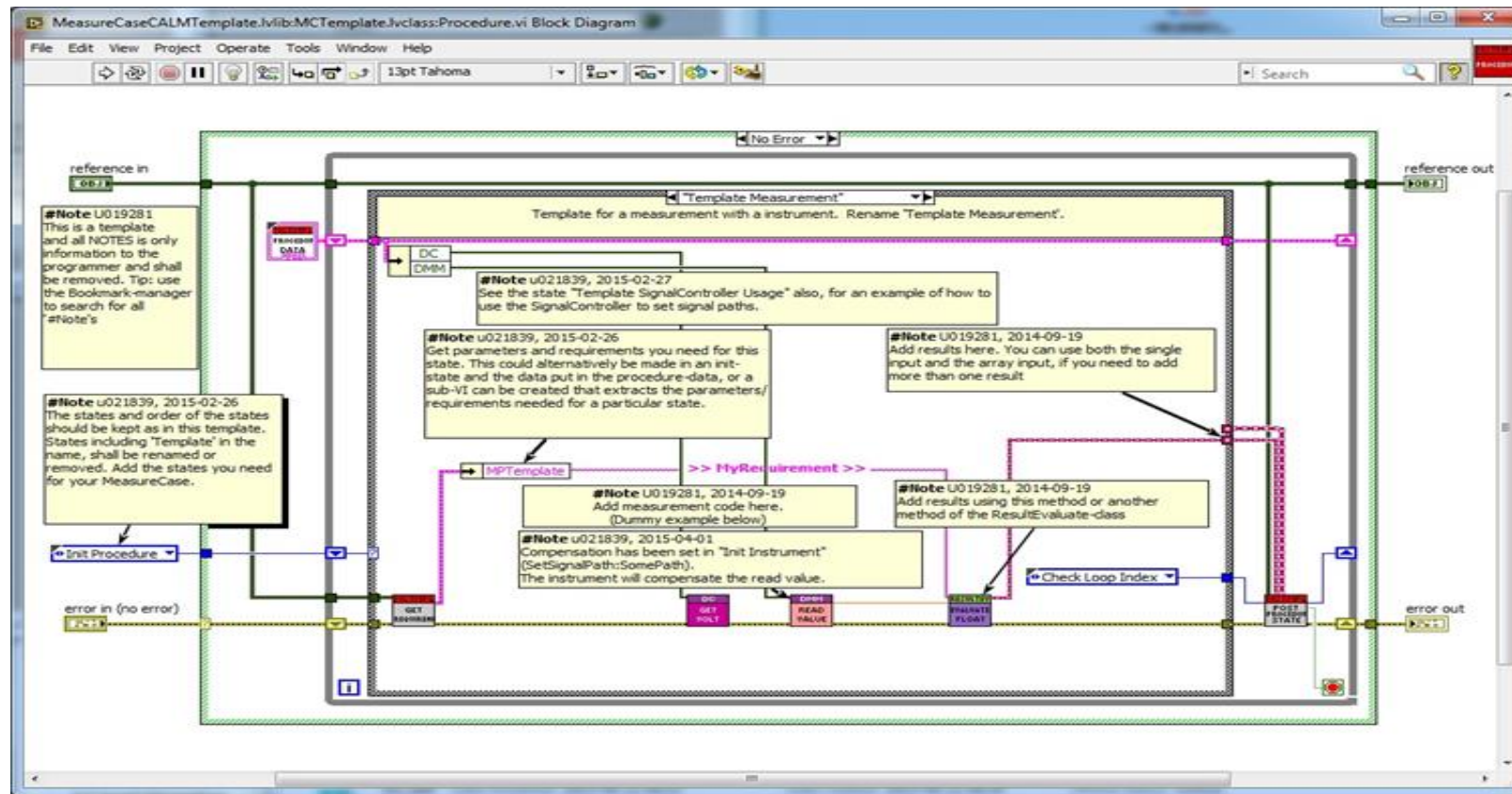
# STANDARD TEST FRAMEWORK - LabVIEW

Ex. Measure Case Template (a Measure Case is called from a Test Plan)



# STANDARD TEST FRAMEWORK - LabVIEW

## Ex Template "Procedure Case Measure"





# DESIGN RULES AND IN HOUSE COURSES

1/LXEM1040007 - R.1A - Verksamhet - ORGANIZAT OPERATION

Documents

-- 21/10260-1/LXEM1040007 - 1 - A - LabVIEW Development Guidelines

-- 2/10260-1/LXEM1040007 - 1 - H - Design Rules for Test Software Development at "devtest\_base"

-- 22/10260-1/LXEM1040007 - 1 - A - LabVIEW FPGA Development Guidelines

-- 3/10260-1/LXEM1040007 - 1 - A - Guidelines for Test Software Development at "production\_test\_testprograms"

LXUM1101001 - R.1A - Education Test Development - EDUCATION

LZUM113500/1 - R.2A - G# System Development - COURSE

LZMM1125000/1 - R.2A - G# System Development - Fundamentals - COURSE MODULE

LZMM1125000/2 - R.2A - G# System Development - Advanced - COURSE MODULE

LZMM1125000/3 - R.2A - G# System Development - UML and LabVIEW - COURSE MODULE

Documents

LZUM1135001/1 - R.1C - UML Sequence diagram Course - COURSE

LZMM1125001/1 - R.1C - UML Sequence diagram - Understand and review diagrams - COURSE MODULE

LZMM1125001/2 - R.1C - UML Sequence Diagram - Design and create diagrams - COURSE MODULE

Documents

LZUM1135002/1 - R.2A - Test Cases with STF - COURSE

LZMM1125002/1 - R.2A - Test Cases with STF - Design and Create - COURSE MODULE

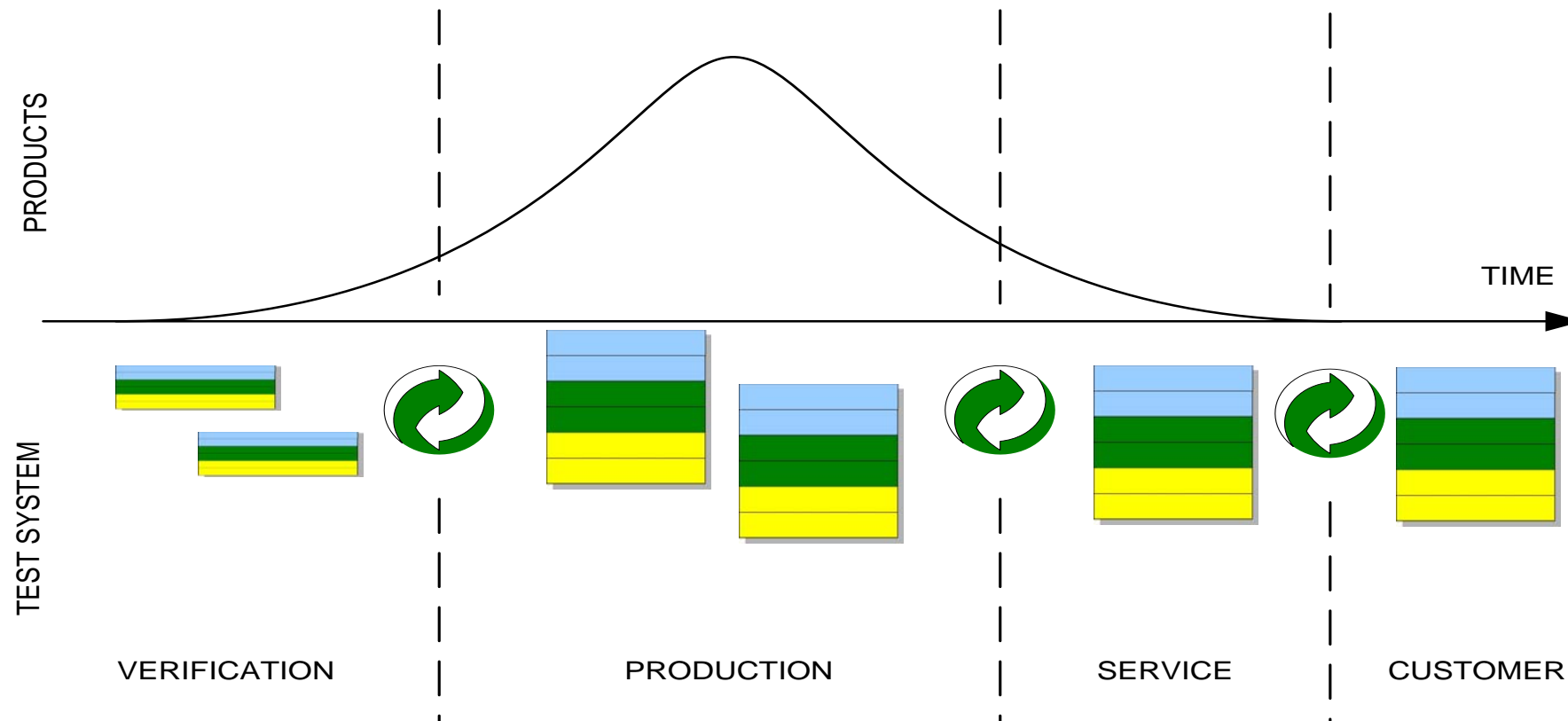
Documents

-- 03819-LZUM1135002/1 - 1 - A - Test Cases with STF Platform, Course Description

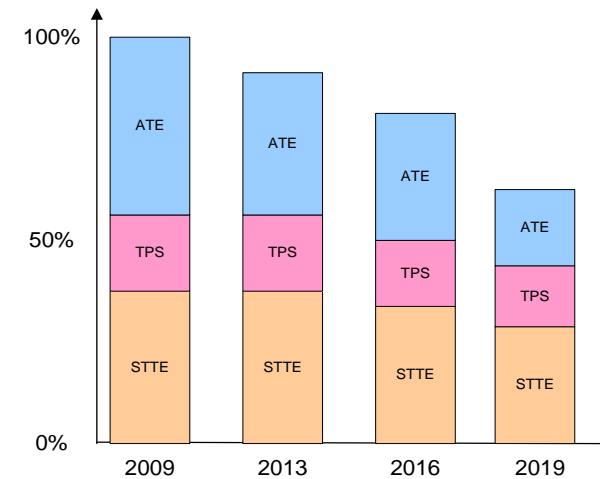
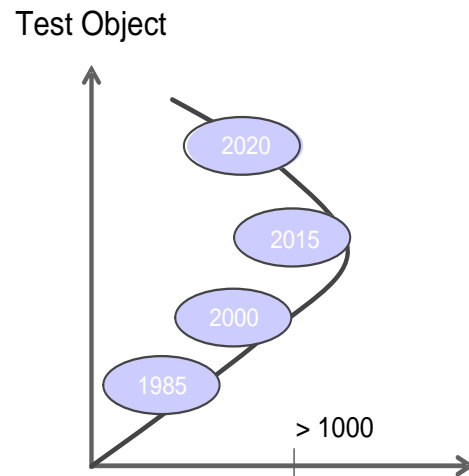
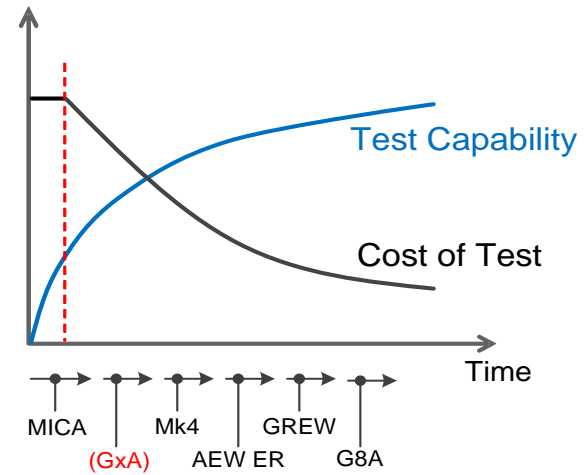
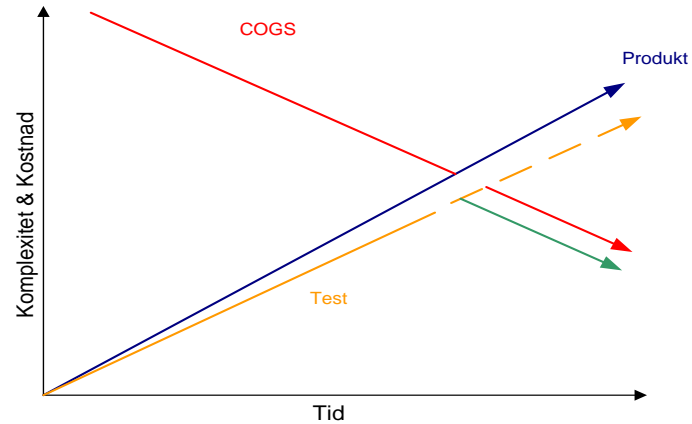
-- 03812-LZUM1135002/1 - 1 - A - Test Cases with STF Platform, Teachers Guidance

# DURABILITY OF A TEST SYSTEM

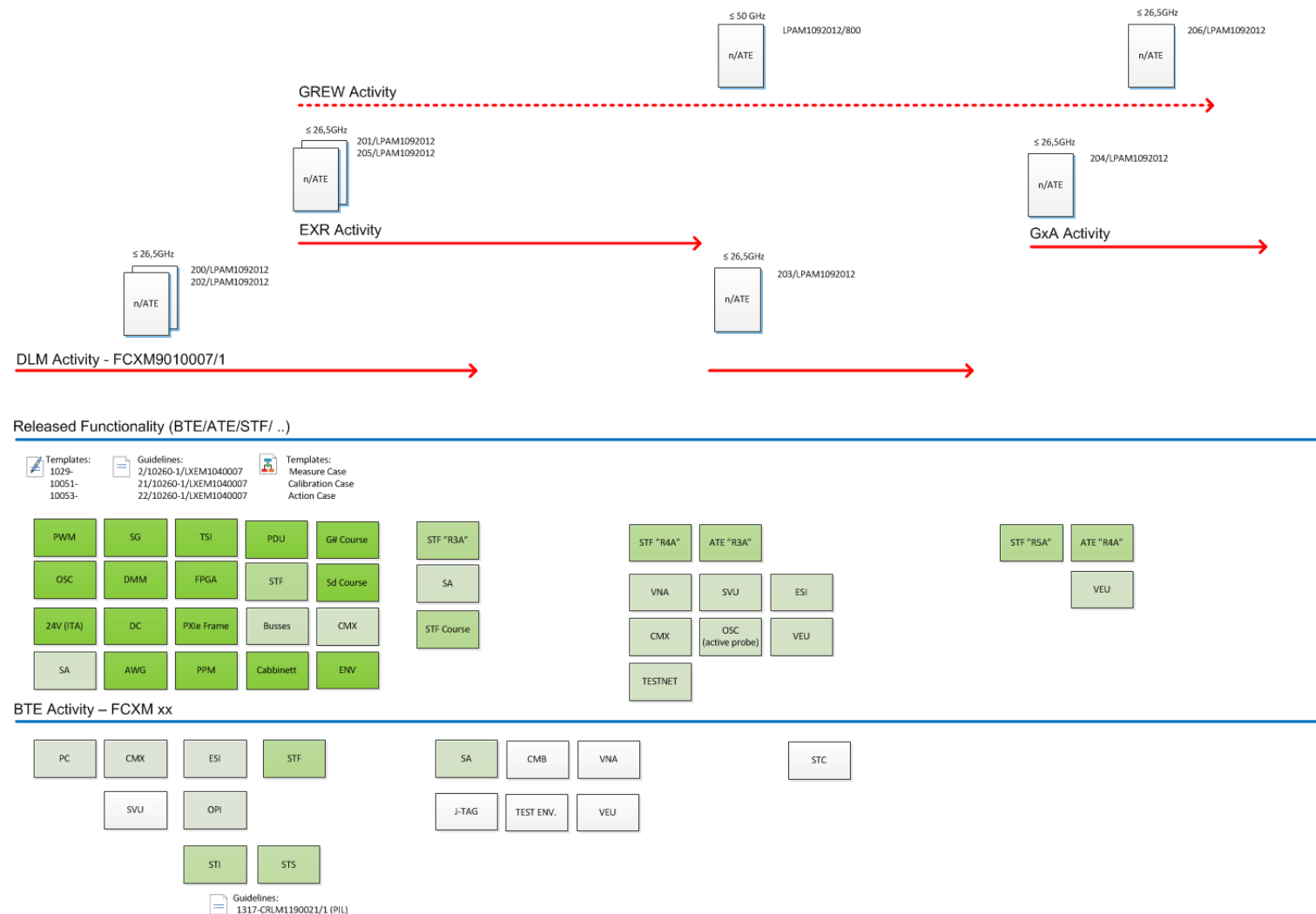
By way of “platform thinking” and with a standardised “WoW” we can establish a lasting test strategy that matches the products life cycle



# EXPECTED IMPACT



# ENABEL PROACTIVITY



# DEMO ...

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# GENERIC CONTROL FUNCTION - GPIO/HSIO

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## Background:

- Unique Hardware solutions for control of test objects
- Insufficiency in documentation of equipment
- Older equipment in need of upgrade / redesign
- Secure future maintenance and updates.

## Requirements:

- Standardize control of UUT ...
  - Statically signals
  - Time synchronized signals
  - "Serial bus" communication
- General hardware solution with a defined interface to simplify adaptation to the UUT

# CONCEPT

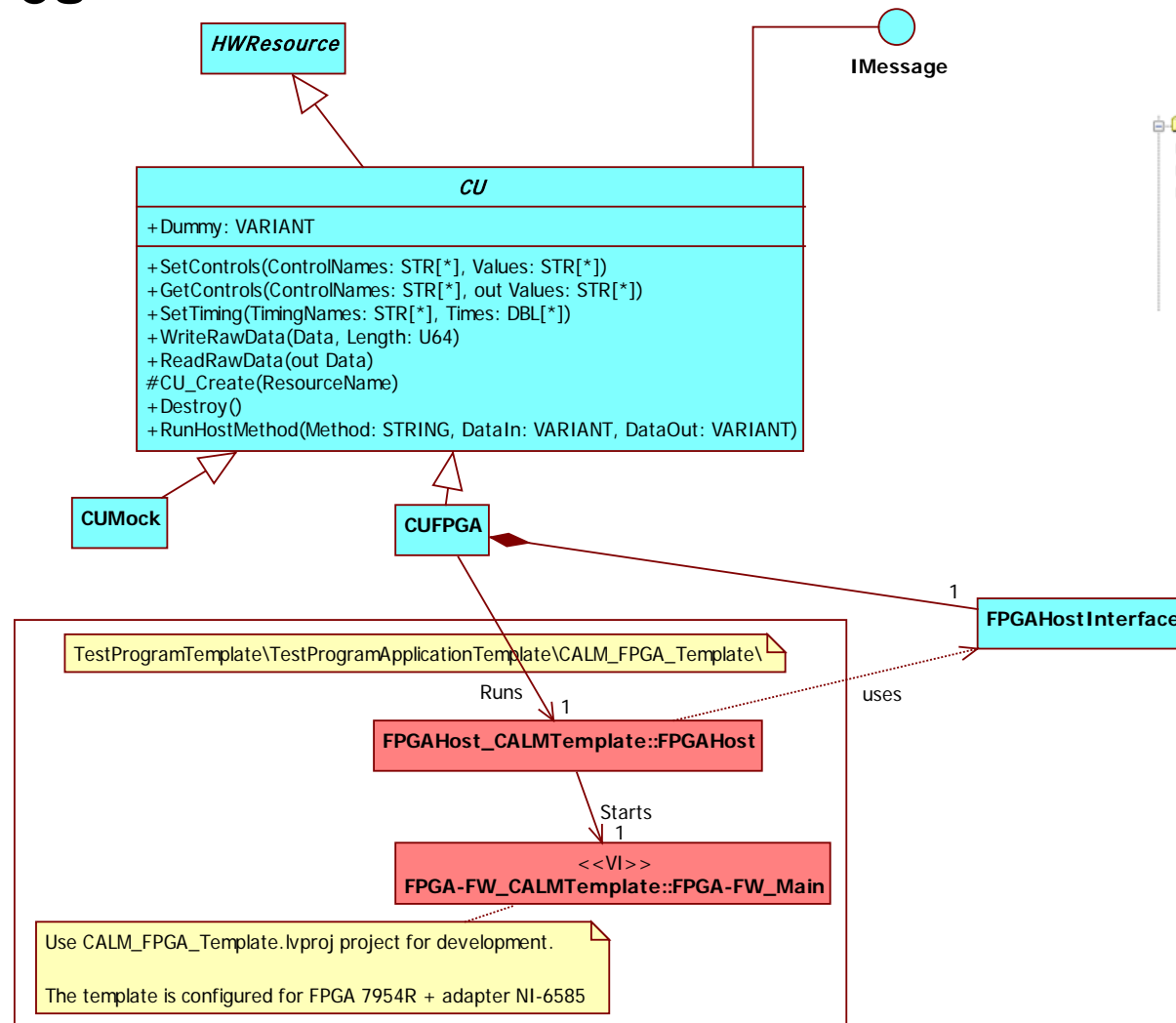
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- Future solutions should be based on a "Generic" hardware platform
- Standardize the electrical interface to test fixtures
- Standardize the software design for control of the test object
- Standardize message description for "serial bus"

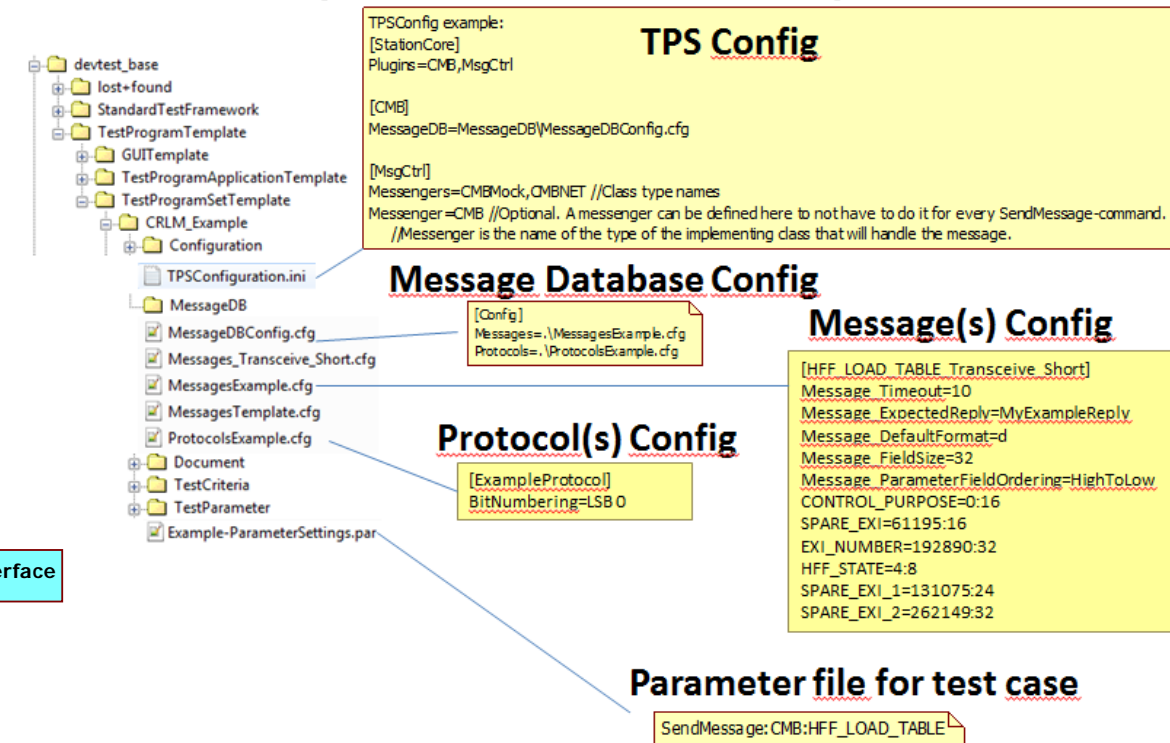


# CONTROL UNIT (CU)

## CU



## Message Controller Configuration





# EXAMPEL APPLICATIONS

GxA, Global Eye (SRU):	TRM (2010)
METEOR/MICA (LRU):	DLM (2013)
Gripen & Global Eye (LRU):	EXR (2014)
GREW (SRU):	DCU (2016)
GxA (LRU):	MRM (2018)
GxA (SRU):	AIU, DPU, MWOU, ... (2018)
GREW (SRU):	TRO, TRH, PLB, ... (2018)
GREW (LRU):	AESA (2019)



# CompactRIO IN ÖSA

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ÖSA = ÖvervakningsSystem Antenna Range Test System

Background:

- Development of new surveillance system for antenna measurement range
- Need of new hardware solution because of NI FieldPoint being phased out

Requirements:

- Handling of personal security
- Guaranteed signal configuration at unwanted shut-down
- Independent from the operator interface

# CONCEPT

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- General hardware solution with changeable module configuration
- Large similarity with development on Windows



# EXAMPEL APPLICATIONS

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A12  
A15  
M2  
M3 (2019)

A = Antenna test system  
M = Measurement system



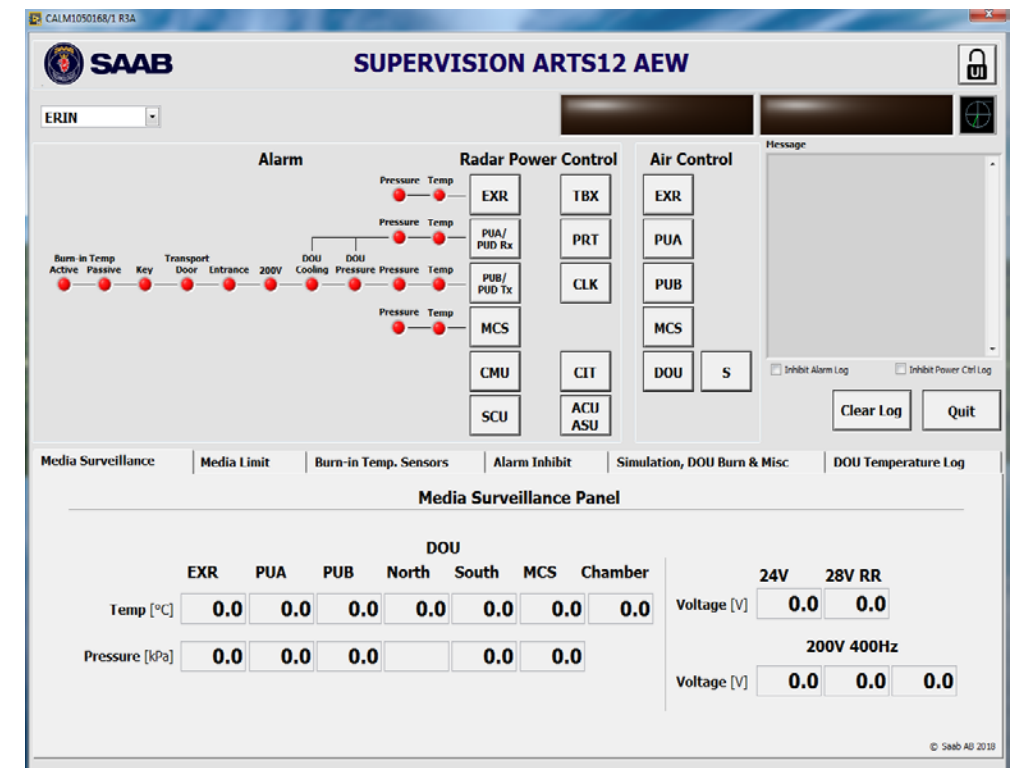
A12, two views from the  
ÖSA cabinet

# EXAMPEL APPLICATION SOFTWARE

- High recognize factor in both software and UI
- Re-use of modules from our PC platform
- Shared Variables for data interchange between cRIO and Win UI
- Handles multiple types of antenna products

## Improvemets:

- A more intelligent data interchange, e.g. Network Streams or TCP/IP-protokoll
- One software product per antenna product
- Remove unnessary logic in Windows UI



# QUESTIONS ...

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