NIDays 08

Building a project with NI TestStand

Architectures and methodologies illustrated by case studies

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Summary

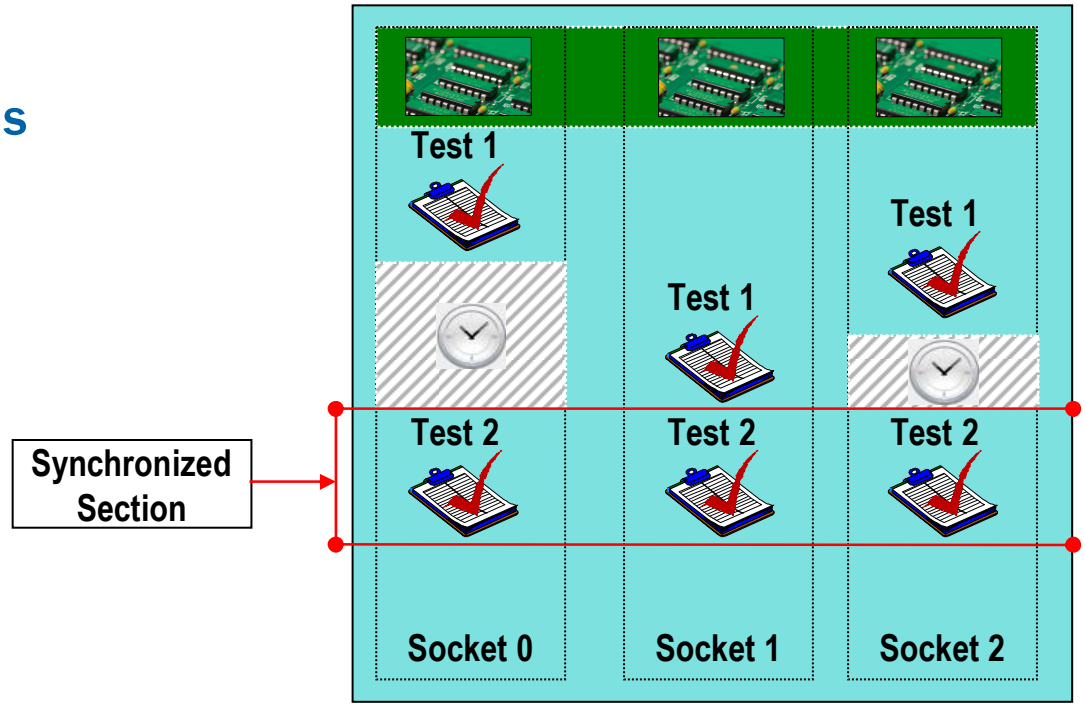
- TestStand : reminders
- TestStand : selection criteria
- Case studies
- Architectures
- Methodologies
- Conclusion

TestStand : reminders (1)

- **Definition**
  - « NI TestStand is ready-to-run test management software designed to help you develop automated test and validation systems faster ».
- **Standard as a fact**
  - TestStand establishes itself as a test bench development platform since version 3.0 *(2004)*
  - 14 of the top 15 electronics manufacturers use NI TestStand *(Electronic Business, 2004)*

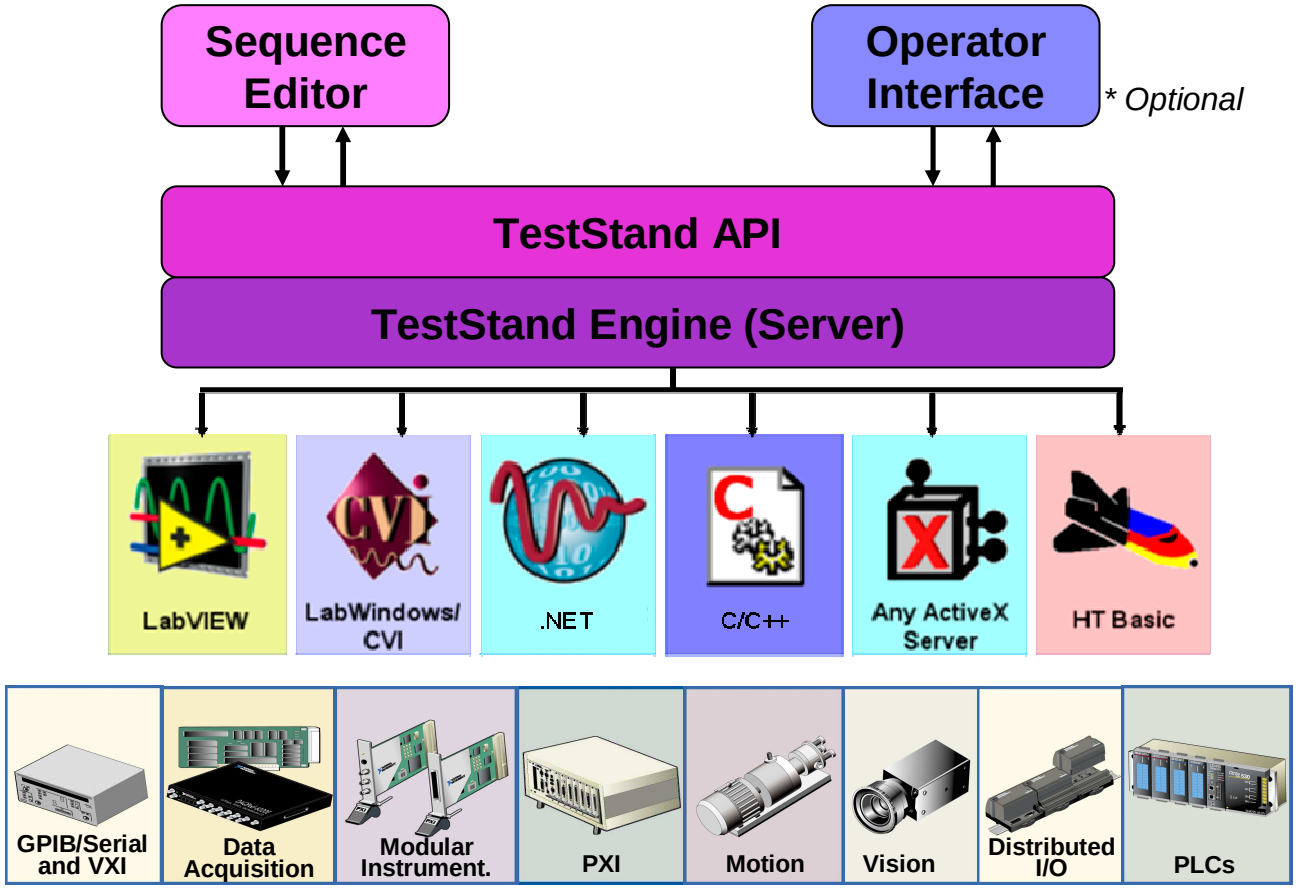
TestStand : reminders (2)

- **Customization**
  - Callbacks
  - Operator interface
  - Database Schemas
- **Process models**
  - Sequential
  - Parallel
  - Batch



TestStand : reminders (3)

General architecture



TestStand : selection criteria (1)

- A test sequencer is recommended:
  - if the test sequence depends on product under test
  - if the test sequence has to be modified
- TestStand advantages
  - Modularity which facilitates « re-use »
  - Scalable et durable
  - Forma structure, error management
  - « Core » robust et customizable
  - Parallelism, multi-thread, multi-execution
  - Login, user management, UUTs management
  - Execution report, database results logging
  - Multi-languages resources files

TestStand : selection criteria (2)

- TestStand disadvantages
  - Requires Microsoft Windows
  - Run-time license at least on each station
  - « Insufficient » native Step Types palette
  - Complexity
- Carrying out TestStand
  - Training essential
  - NI partner assistance

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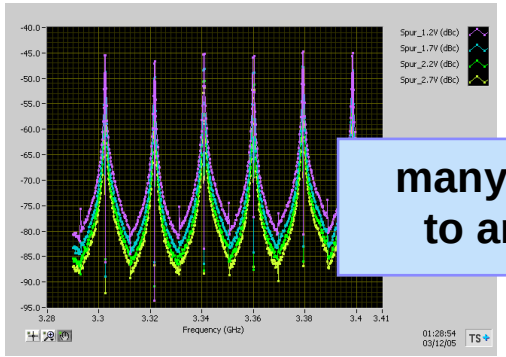
Certified TestStand™ Developer

Using TestStand

- In laboratory
  - Characterization bench
  - Validation bench



many results to analyze

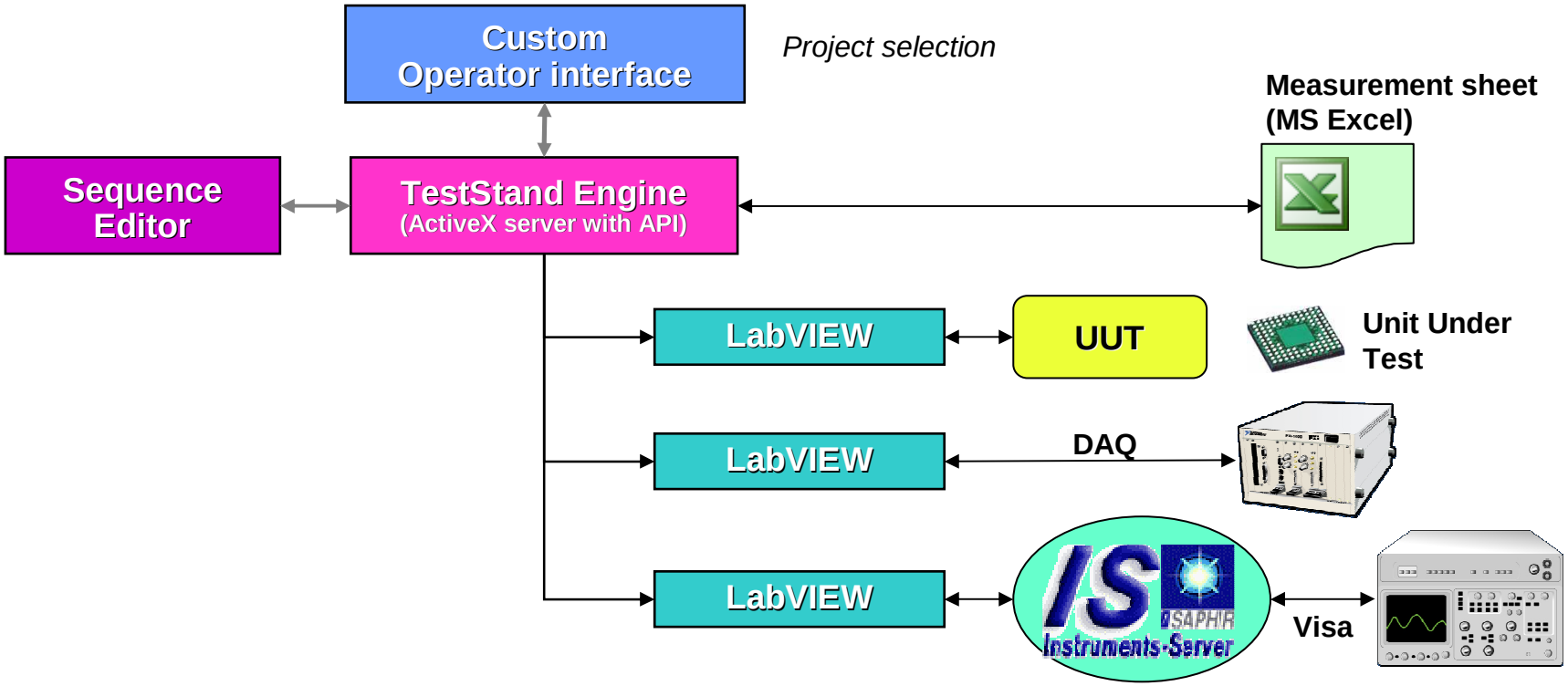
- In production
  - Input control bench
  - Assembly bench
  - Functional test bench

FAIL

PASS

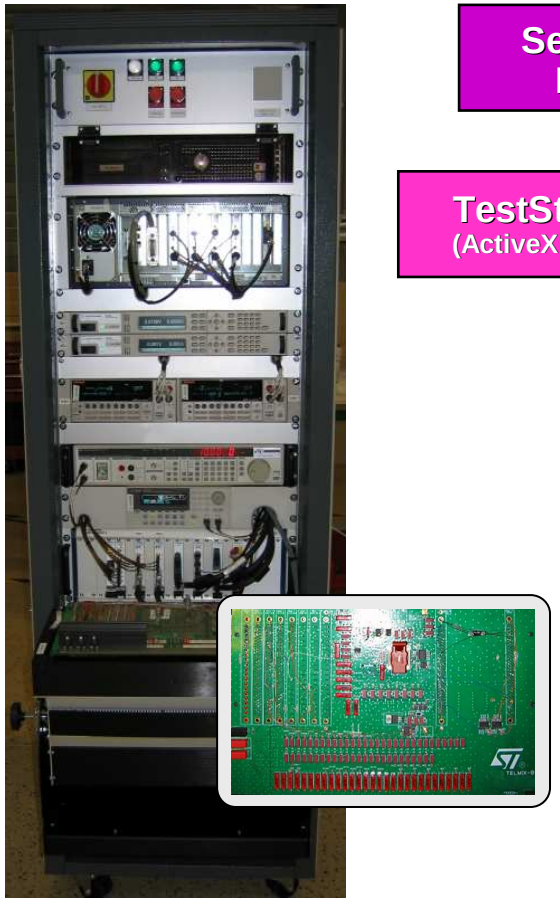
Case studies (1)

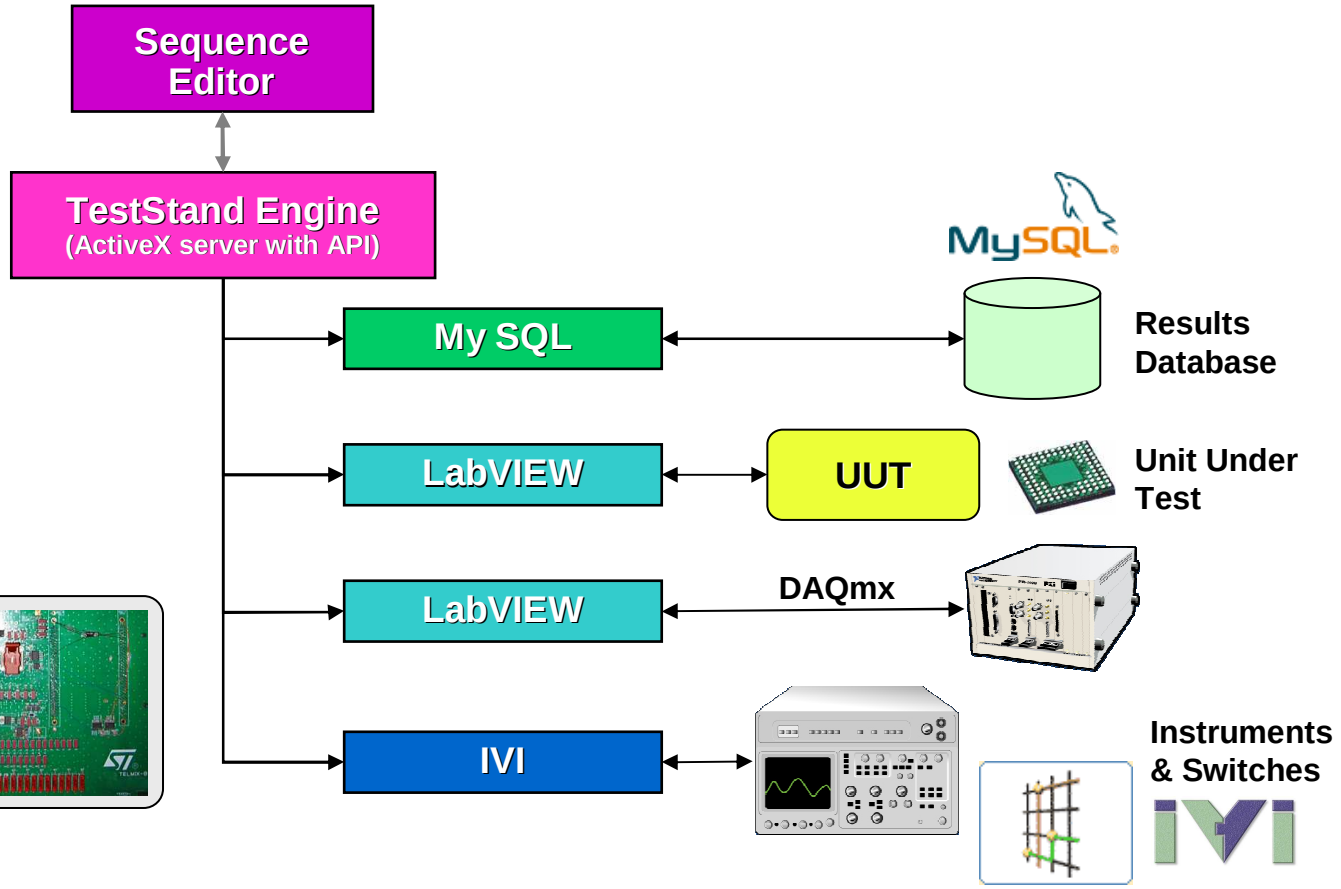
ATMEL : IC characterization bench



Case studies (2)

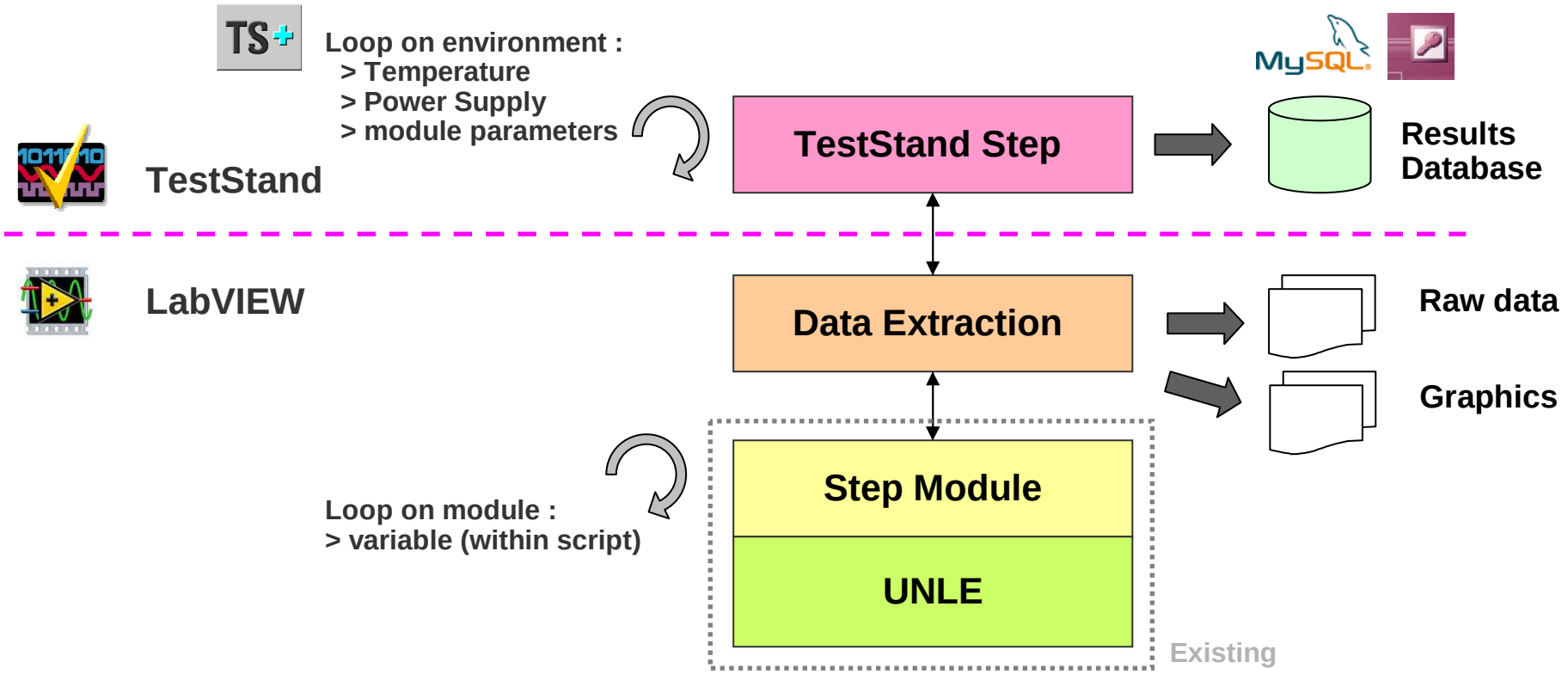
STMicroelectronics : TELMIX bench





Case studies (3)

STMicroelectronics : RFTS characterization bench



Case studies (4)

AREVA T&D : Sensor input control bench

- Impossible challenge: five days delay

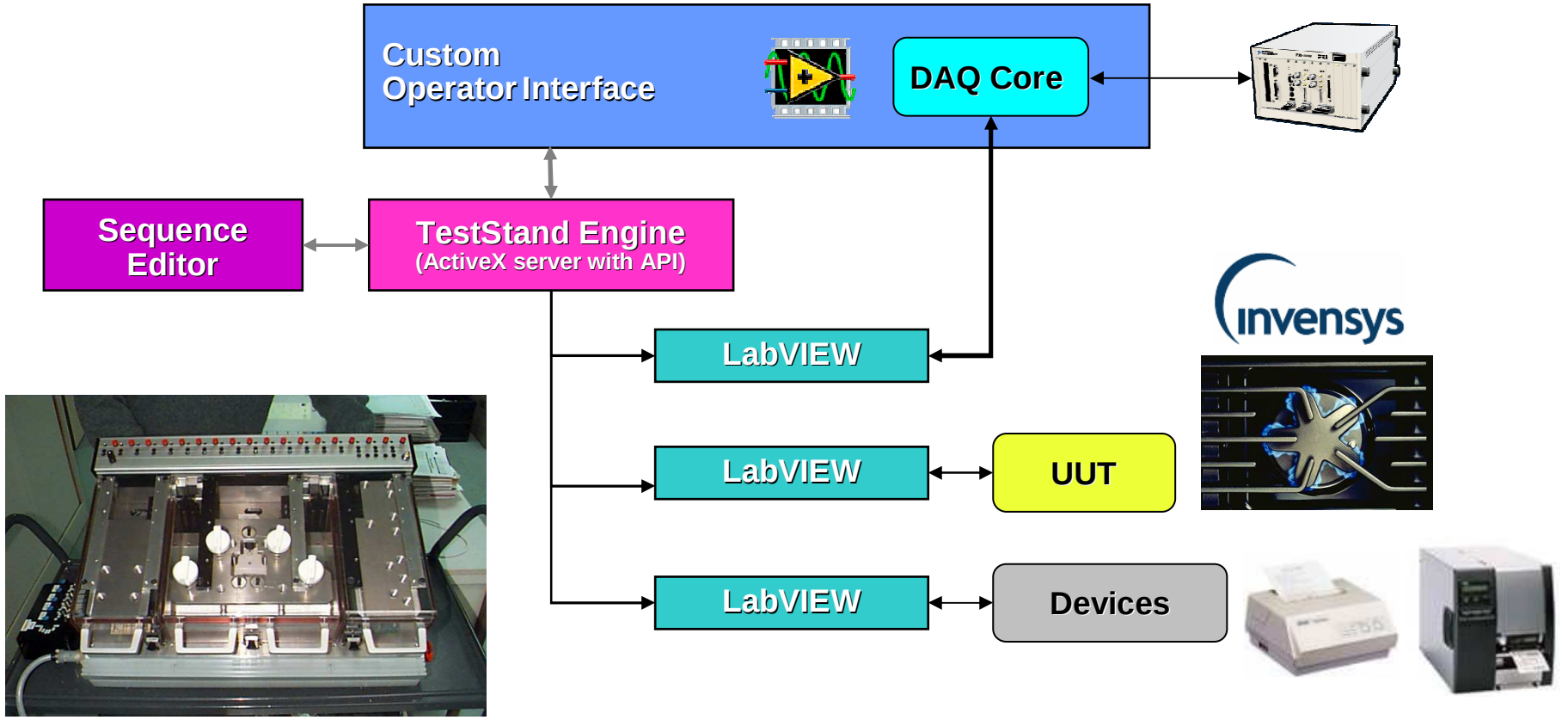
- Use of generic configurable steps

TS+

- Saving sensor lot results into ASCII file then results analysis with MS Excel

Case studies (5)

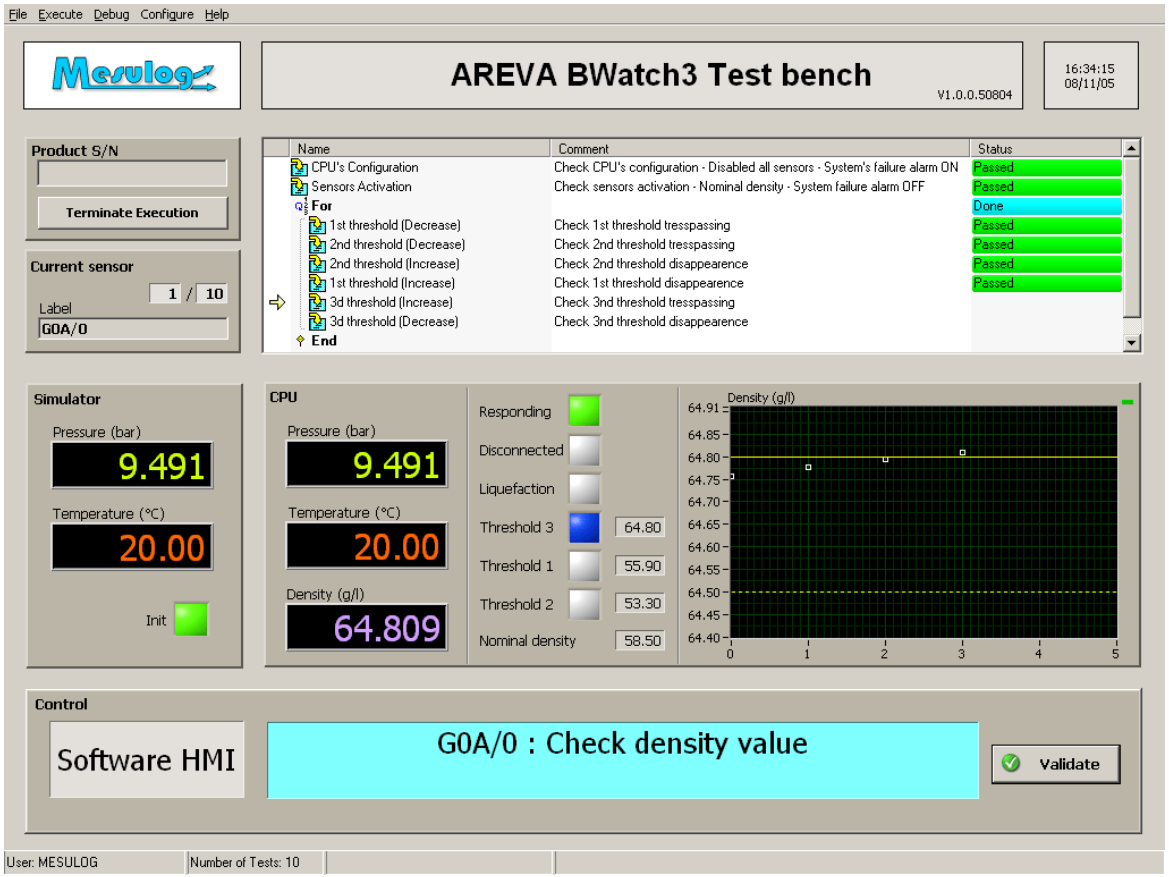
- INVENSYS : Gas products functional test bench



Case studies (6)

AREVA T&D : PLC monitoring

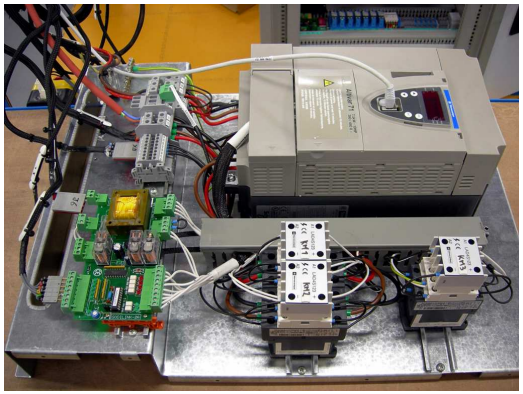
- Semi-auto
- Validation by operator

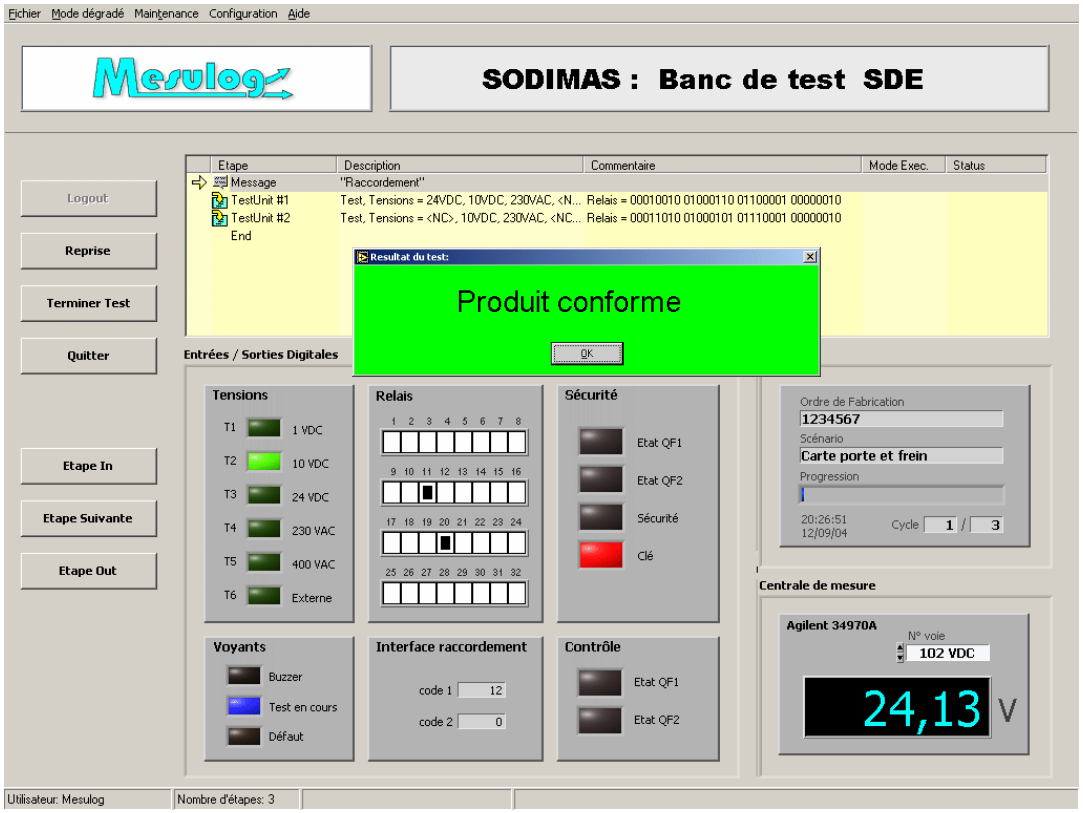


Case studies (7)

SODIMAS : Lift electrical control box

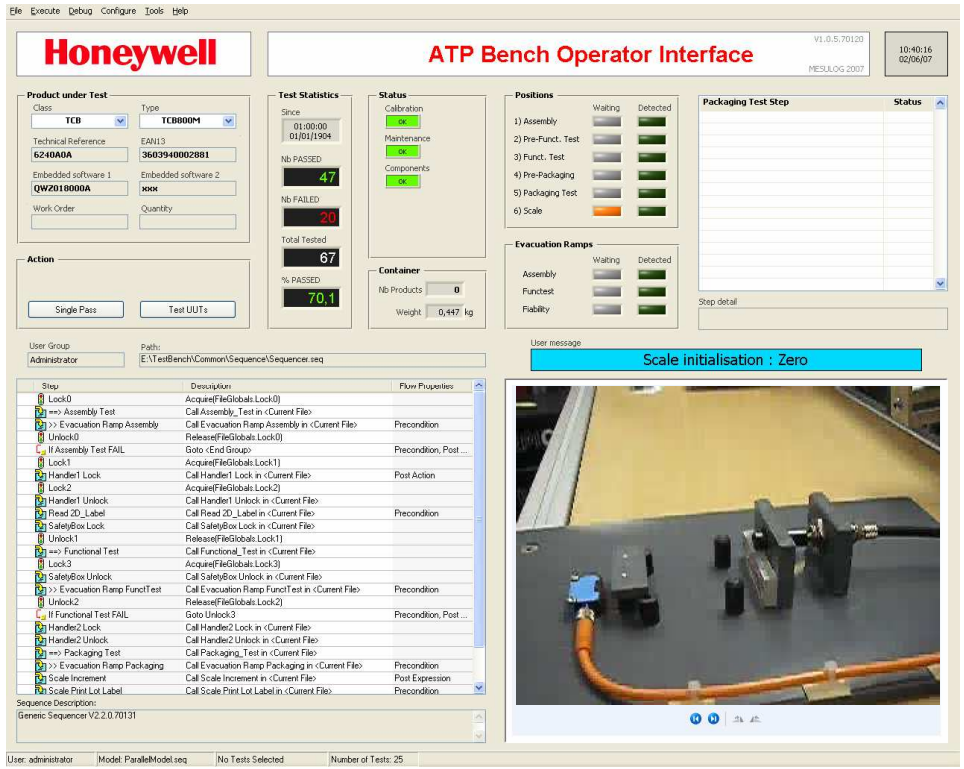
- Initially intended in LabVIEW
- Only one generic Step Type
- Sequences easily written by a technician





Case studies (8)

- **HONEYWELL : Assembly and functional sub-assemblies test bench**
  - PLC and tester
  - 3 UUTs in parallel
    - Assembly
    - Functional test
    - Packaging vision test
  - Videos display for novice operator



Case studies (9)

- **VALEO : Assembly and functional test bench**
  - Different sequences launched in parallel
  - Components control, picking indication for the operator
  - Replacement of three PLC
  - Monitoring of vision station and acoustic station

Architecture (1)

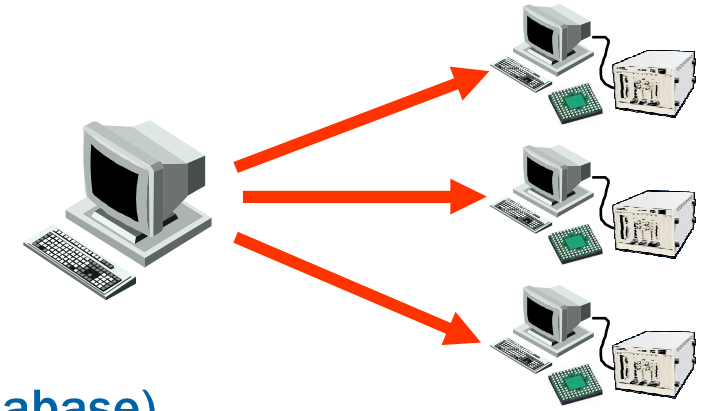
- **Instruments driving**
  - Interchangeability (IVI, IS, others) ?
  - Switch Executive ?
- **Database**
  - Tests parameters (configuration)
  - Tests limits (specifications)
  - Tests results (→ report)
- **Additional servers**
  - NI Shared Variable Engine
  - OPC

Direct link to ERP ?

Operator interface indicators automatically updated

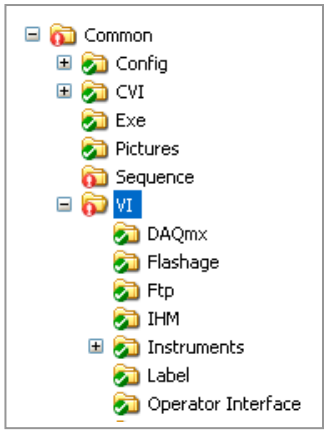
Architecture (2)

- **Stations**
  - Single station
  - Deployment on many PC



- **Network**
  - LAN : server connection (file or database)
  - WAN : remote control, database

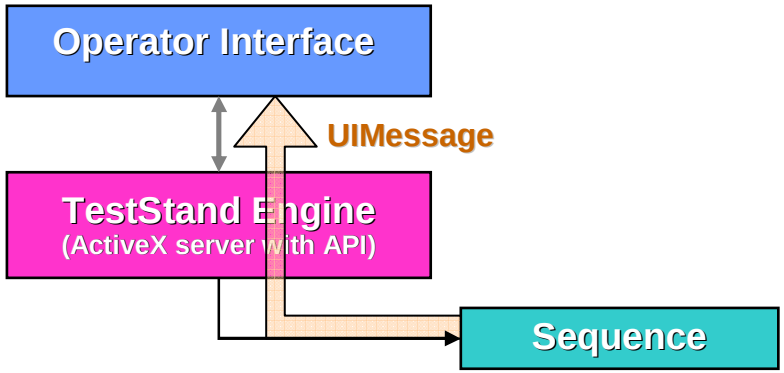
- **Source Code Control**
  - Tortoise SVN
  - Synchronicity
  - Others…



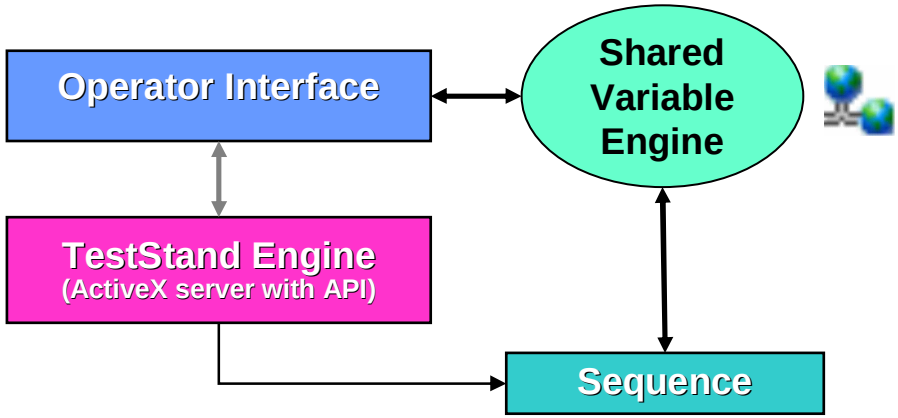
Architecture (3)

Operator interface

- TS : UIMessage



- Additional Server



Methodology (1)

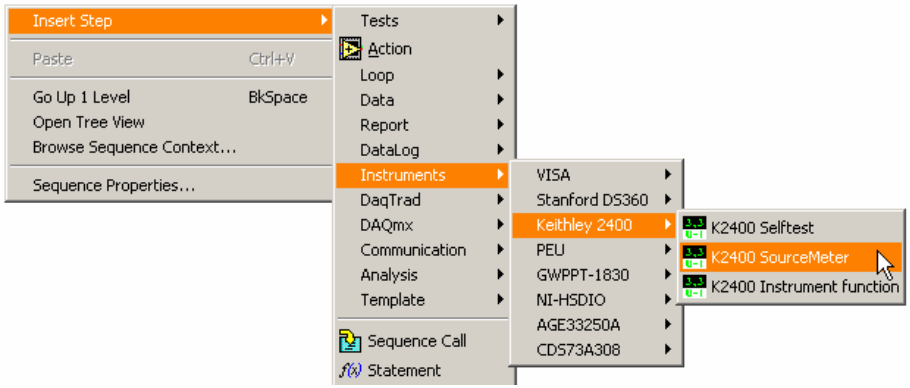
Recommendations

- Modularity
  - Use containers (= LabVIEW cluster)
  - Create sub-sequences
- Data zones
  - Sequence « Parameters » and « Locals »
  - « File Globals », « Stations Globals »
- Setup and Cleanup
- Documentation
  - Use labels
  - Use comments

Methodology (2)

Step Types libraries

- Generic modules creation
  - Configuration dialog box
  - Execution Module (PostStep)
- Use of validated independent modules
  - Different Step Types versions can coexist
  - Different Run Time Engine versions can coexist
- Version management



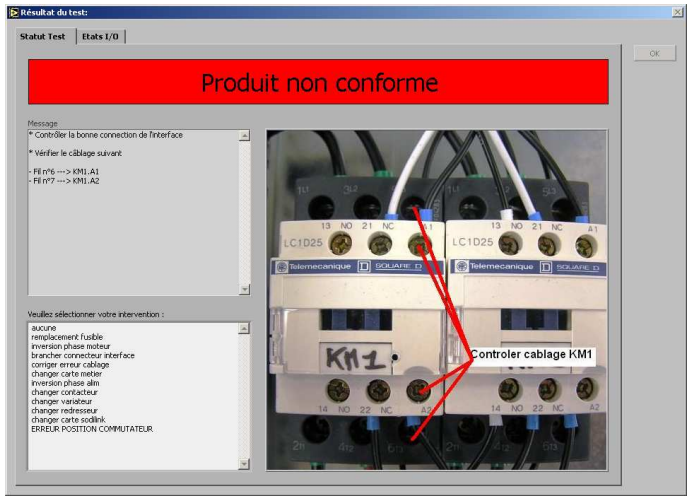
Step Type	Version
Frequency_Count	1.2.4.0
Frequency_PowerInBand_1_2	1.2.4.0
Frequency_Measurement_1_2	1.2.4.0
EditSubstep	3.5.0.725
PostSubstep	3.5.0.725

Methodology (3)

- Project tree
  - Search directories
    - By default
    - Be careful when adding new search branches
  - Folder organization
    - Generic
    - Specific to a bay
    - Specific to a product
  - Types
    - Sequences (process model, callbacks, test sequences)
    - Code modules
    - Executables
    - Data

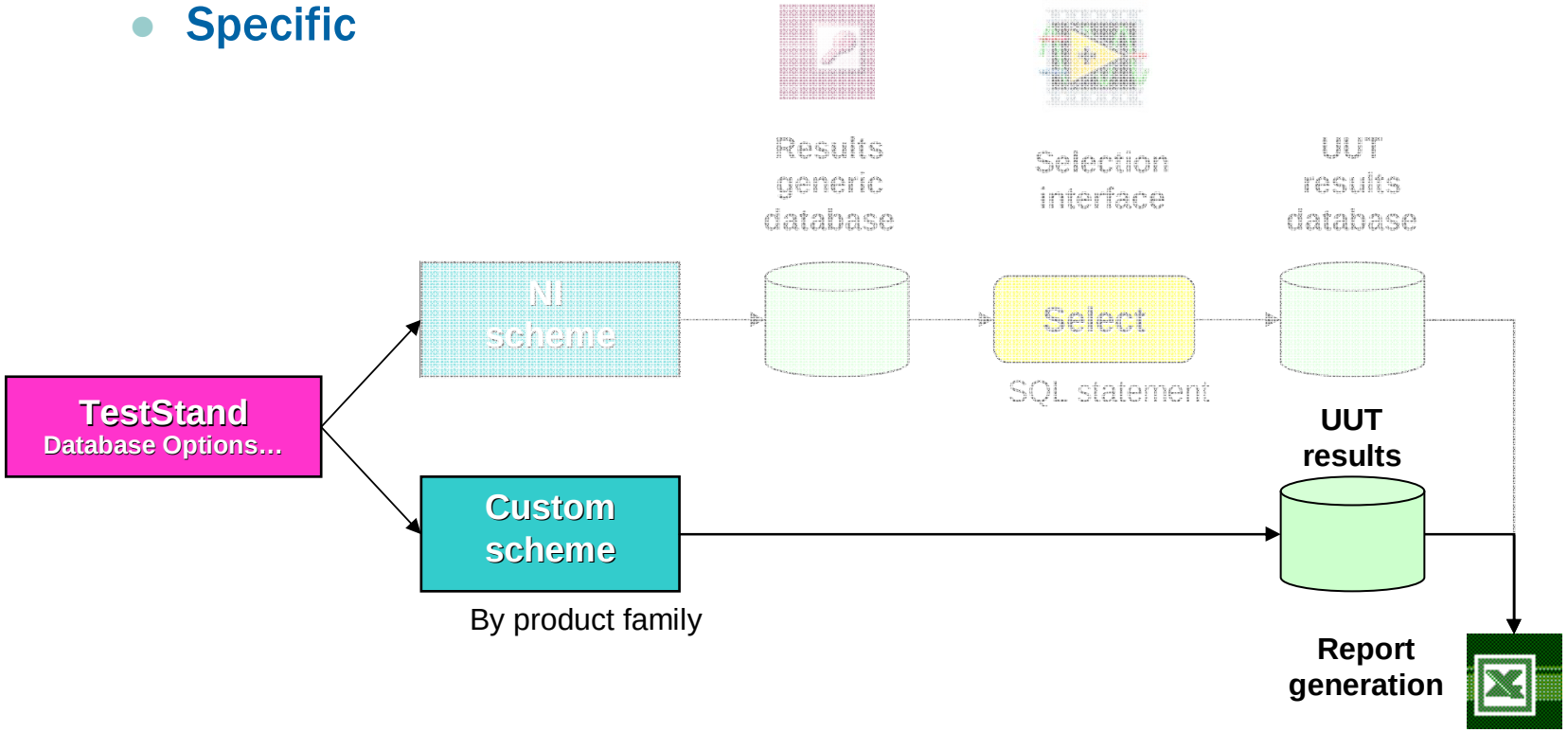
Methodology (4)

- Execution status
  - PASS
  - FAIL
  - ERROR
  - TERMINATED
- Status management
  - Post Step
  - Post UUT
- Error management
  - Resume after operator action
  - Stop test execution



Methodology (5)

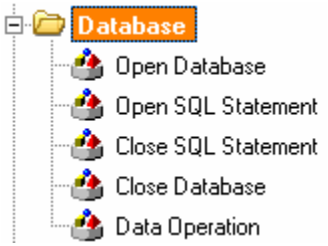
- Database – Automatic logging
  - Generic
  - Specific

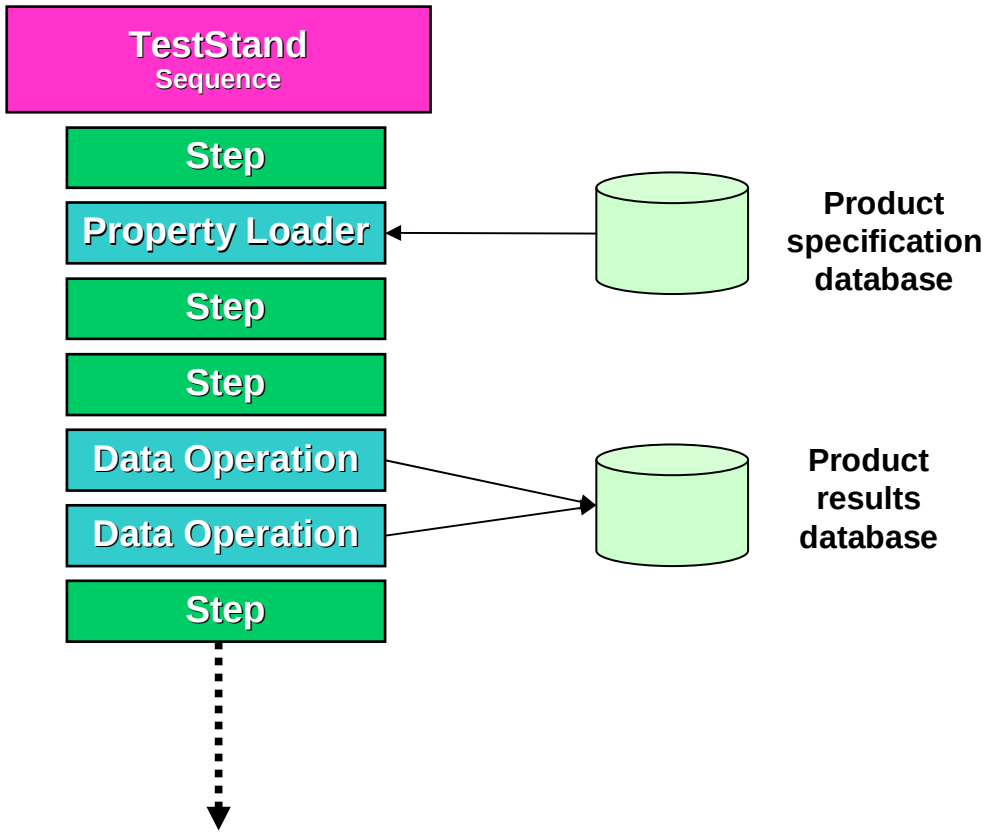


Methodology (6)

Database – Occasional access

- Database steps





Methodology (7)

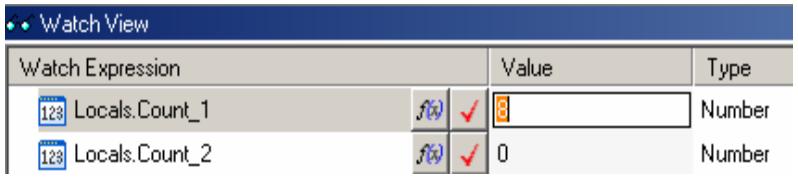
- Test report
  - ☑ Enable ⇔ Disable
  - Automatic report generation = execution trace
    - ASCII
    - HTML
    - XML → ATML ?
  - Custom report generation
- Printing
  - Default label
  - Tested product label
  - Lot packaging label

Methodology (8)

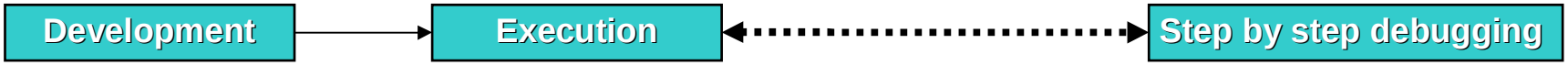
Debug and maintenance tools

- Tools

  - Breakpoint ⇔ Step Into / Step Over / Step Out / Terminate
  - Watch Expression ➔ « Online » variables modification
  - Skip / Passed / Failed
  - Interactive Loop
  - Next step



- Using Sequence Editor



- Using Operator Interface

si implémenté

Conclusion

- TestStand is a powerful but complex tool
- There is no universal architecture
- Not ONE programming method, but…
  … use methodology !

- With a suitable architecture and a good methodology, NI TestStand is always a good choice.

Questions

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