

TEST FORUM 2017

Nov 28-29, 2017, Helsinki, Finland

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electronic
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Automotive
Test Solutions

Embedded
JTAG Solutions

Industrial
Function Test

Inspection Solutions
AOI · AXI · SPI · IVS

Unified EoL Test and Programming via Automotive Bus

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NTF
NORDIC TEST FORUM

Content



Development motivation
Programming strategies
End of Line (EoL) Test
Mix of Test and EFP
Function principle
Bus-Controller
Integration
Practical example
Summary



Fundamentals for advanced EoL Solutions



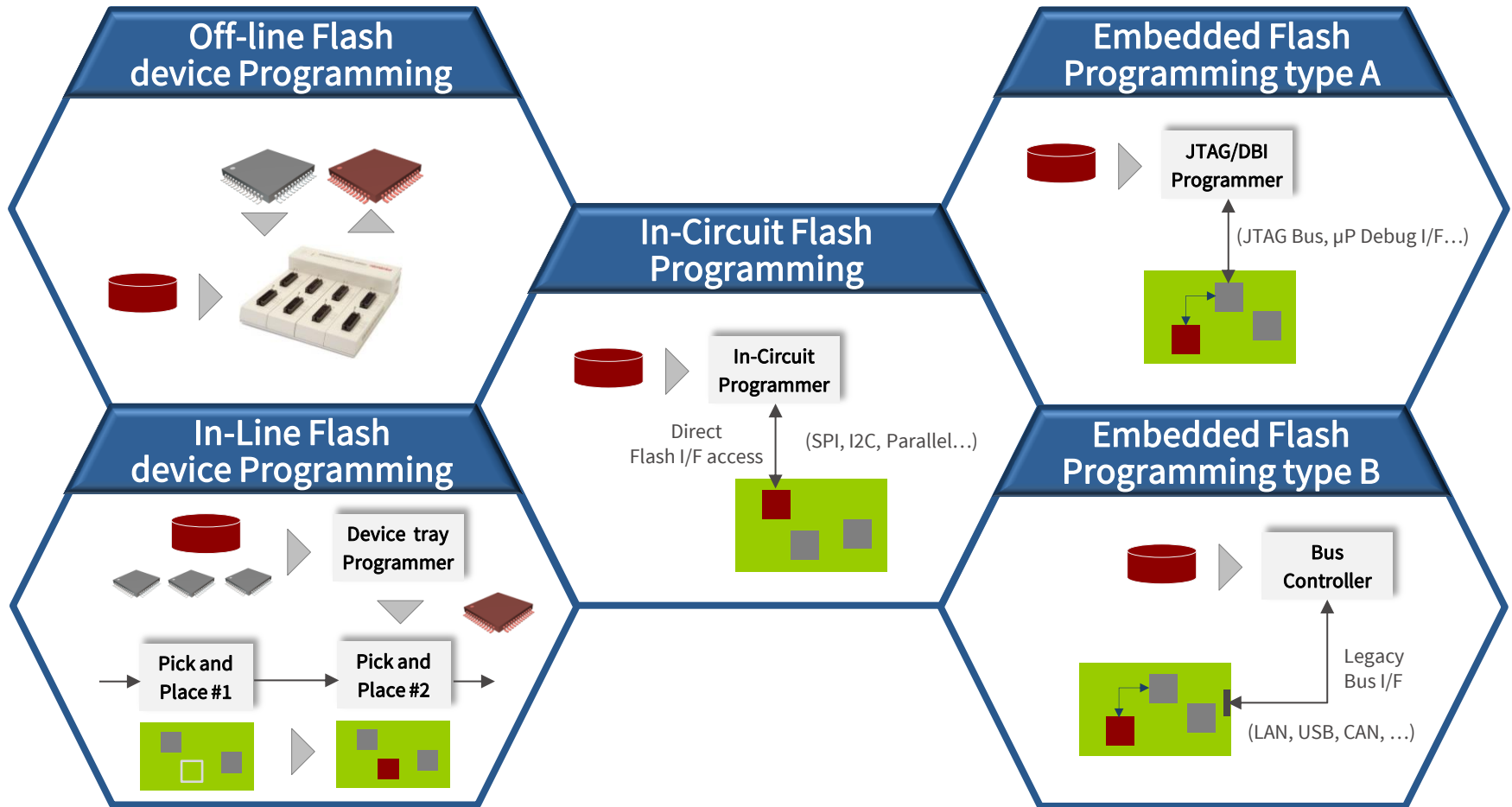
Higher efficiency by synergies...

Why advanced End of Line (EoL) Solutions?



- ➡ End of Line test represents a mandatory process step to assure the necessary production quality
- ➡ Beyond the EoL test exist the demand for a flexible final configuration of the unit on the same station
- ➡ To achieve this level, embedded Flash devices have to be programmed over the native unit interfaces
- ➡ Uniform multi-functional platform solutions for test and programming are able to raise production efficiency significant
- ➡ Synergies enabling remarkable cost reductions

Different ways – one target



 Embedded methods using On-Board resources

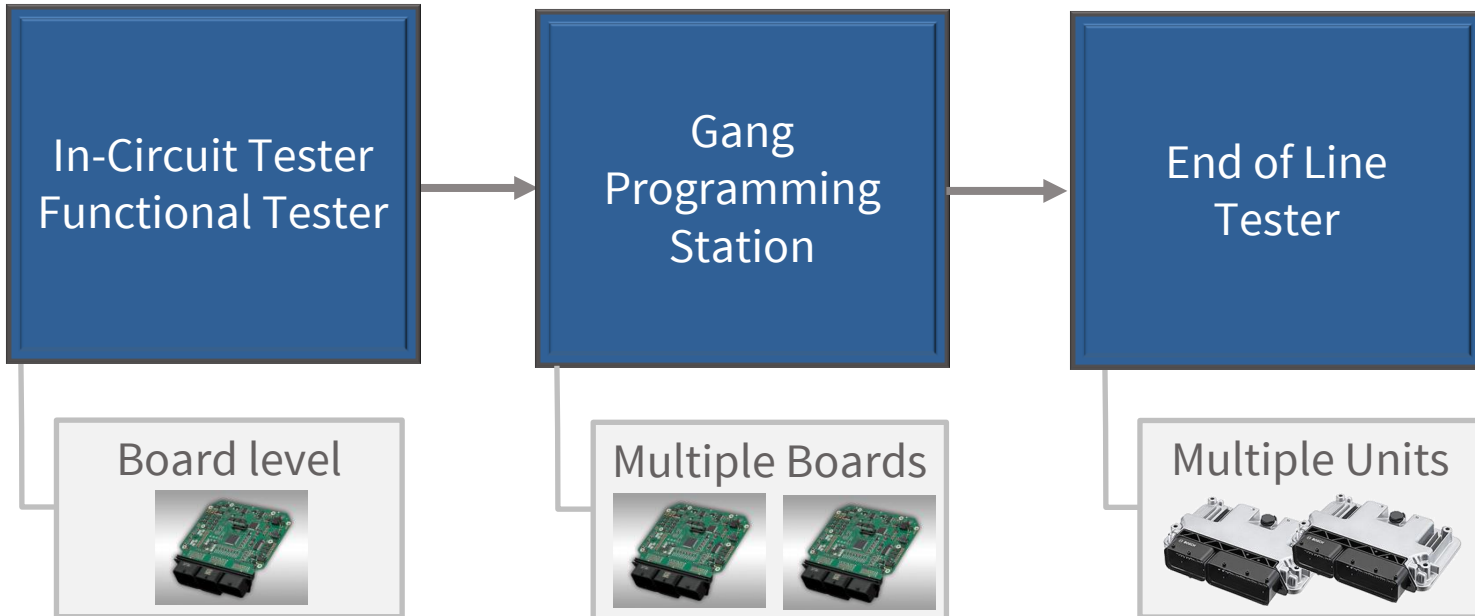
Programming on the test floor



Test + Firmware
Programming
(Low/medium size)

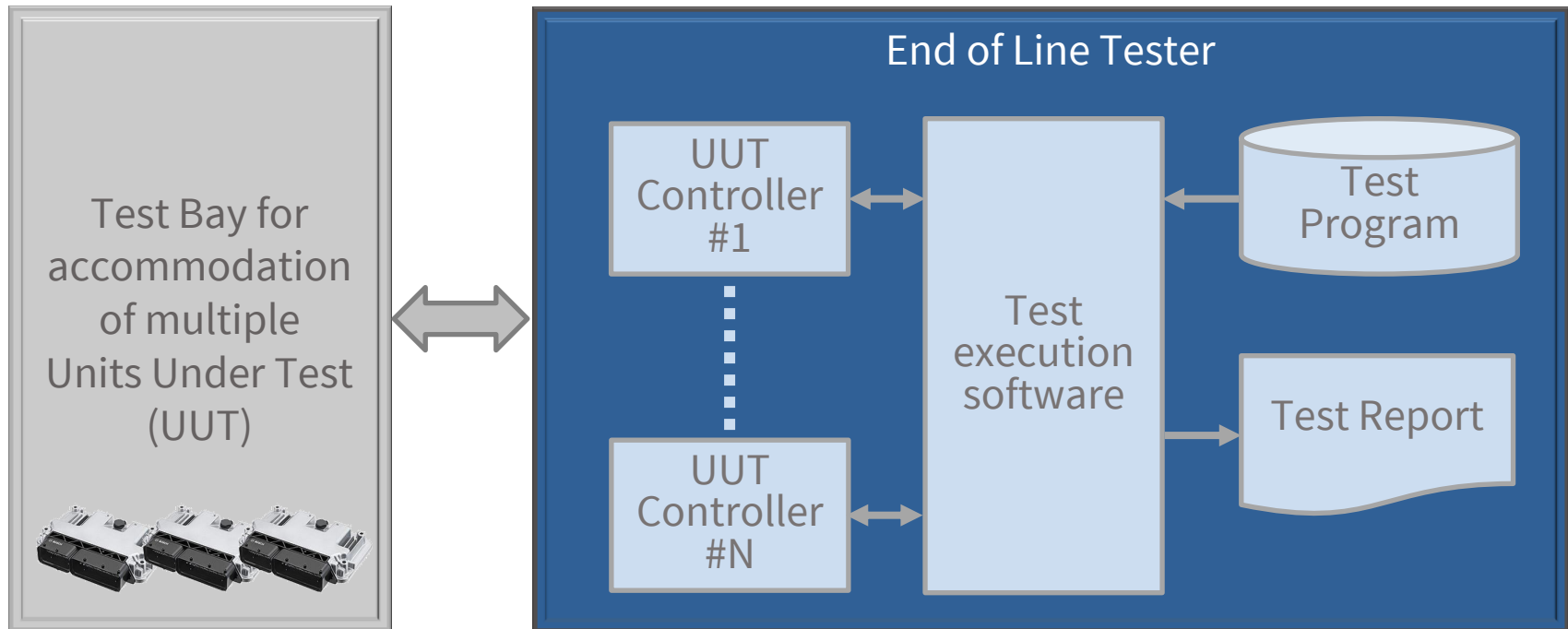
OS Programming +
Firmware
Programming
(Medium/high size)

Test + **Firmware
Programming +
Unit configuration**
(Low/medium size)



 **EoL-Programming complements existent solutions**

Basic architecture of an EoL Testers



- ➡ EoL-Test exists to prove final functionality of the units
- ➡ Execution of limited function tests (Bus-control)
- ➡ Test of multiple Units concurrent is a typical case

Requirements for advanced EoL solutions

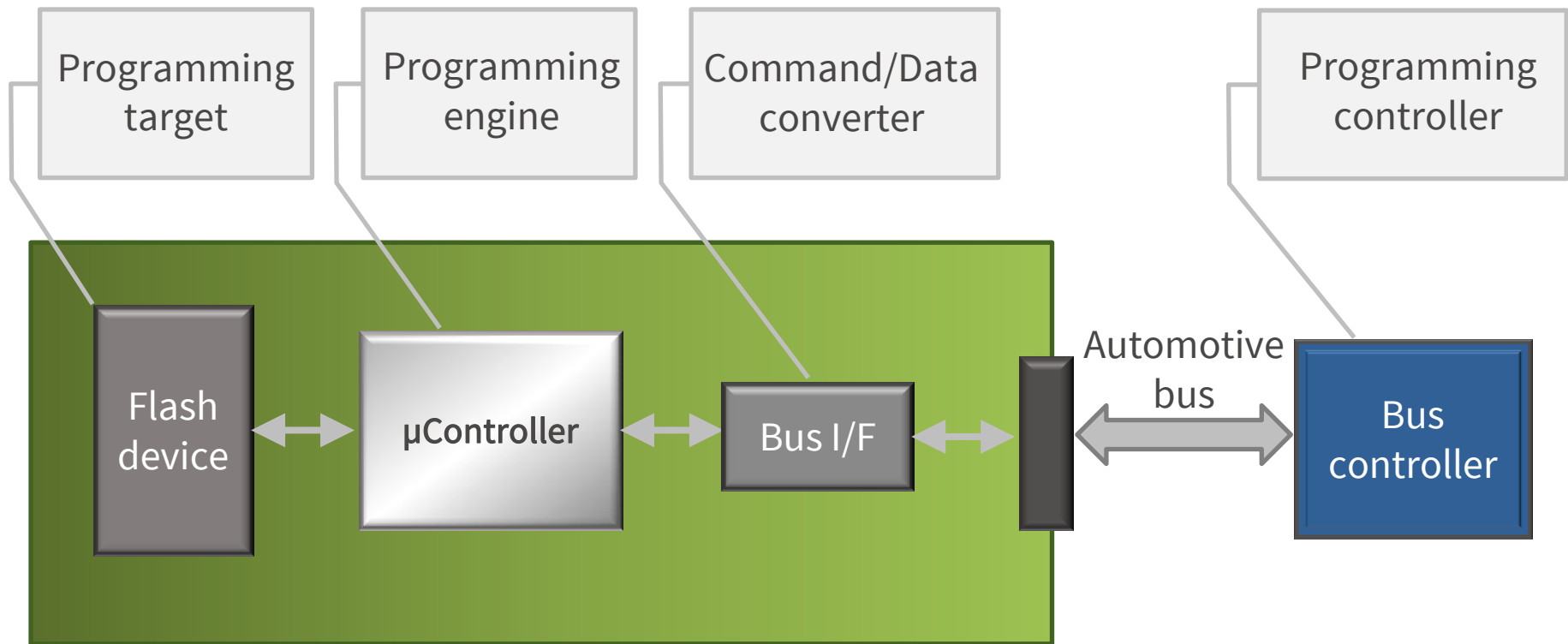


- ➔ no multiplexing of different system techniques
- ➔ Powerful controllers, equal usable for test and programming
- ➔ Support of all important automotive bus standards (CAN; CAN-FD; LIN; BroadR-Reach; FlexRay...)
- ➔ Easy integration (Plug-Ins) into commercial test-execution software (TestStand, LabVIEW CVI, etc.)
- ➔ Support of massive Gang applications
- ➔ Comprehensive and comfortable set of commands for test and programming, incl. failure diagnostics



Platform solutions with highest productivity...

Flash programming via automotive bus

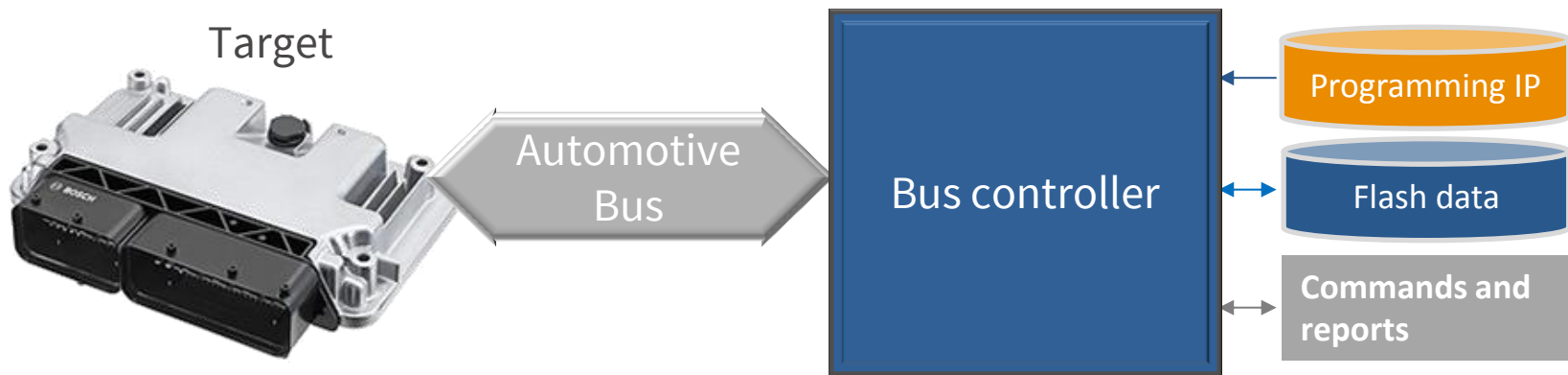


➡ In the programming flow 4 elements are involved

Programming methodology



- ➡ Download of a target specific Flash-Programming IP* over the native bus protocol
- ➡ Start of the IP in the target
- ➡ Data transfer from controller to the IP
- ➡ Programming of the Flash by the IP
- ➡ Status information returned from IP to controller



IP* Intellectual Property

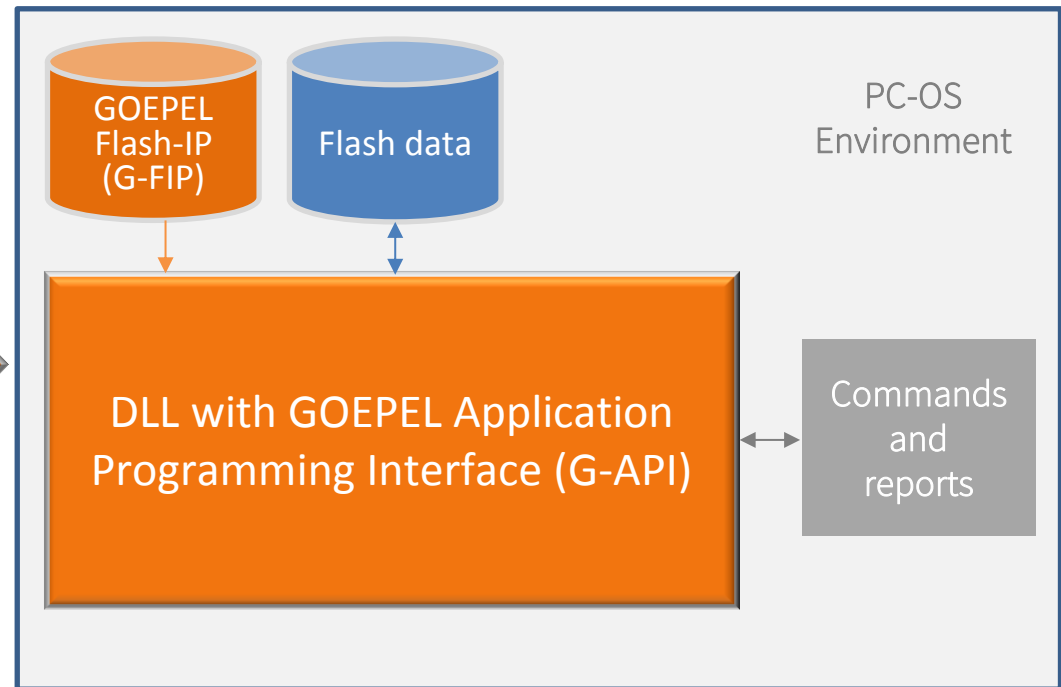
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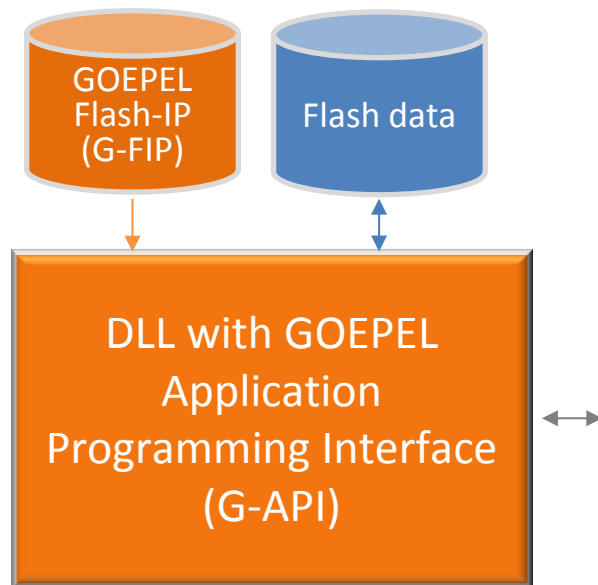
Implemented setup



- ➡ Generic API includes all commands
- ➡ Use of a so called G-FIP (GOEPEL Flash-IP)
- ➡ Count of different Flash projects is not limited



Application Programming Interface (API)



Available commands

- System functions
- Security functions
- Test functions for CAN
- Test functions for LIN
- Test functions for FlexRay
- Test functions for LVDS
-
- Diagnostics functions
- Programming functions
 - Erase sectors
 - Blank Check sectors
 - Program data
 - Verify CRC
 - Read data
 - ...

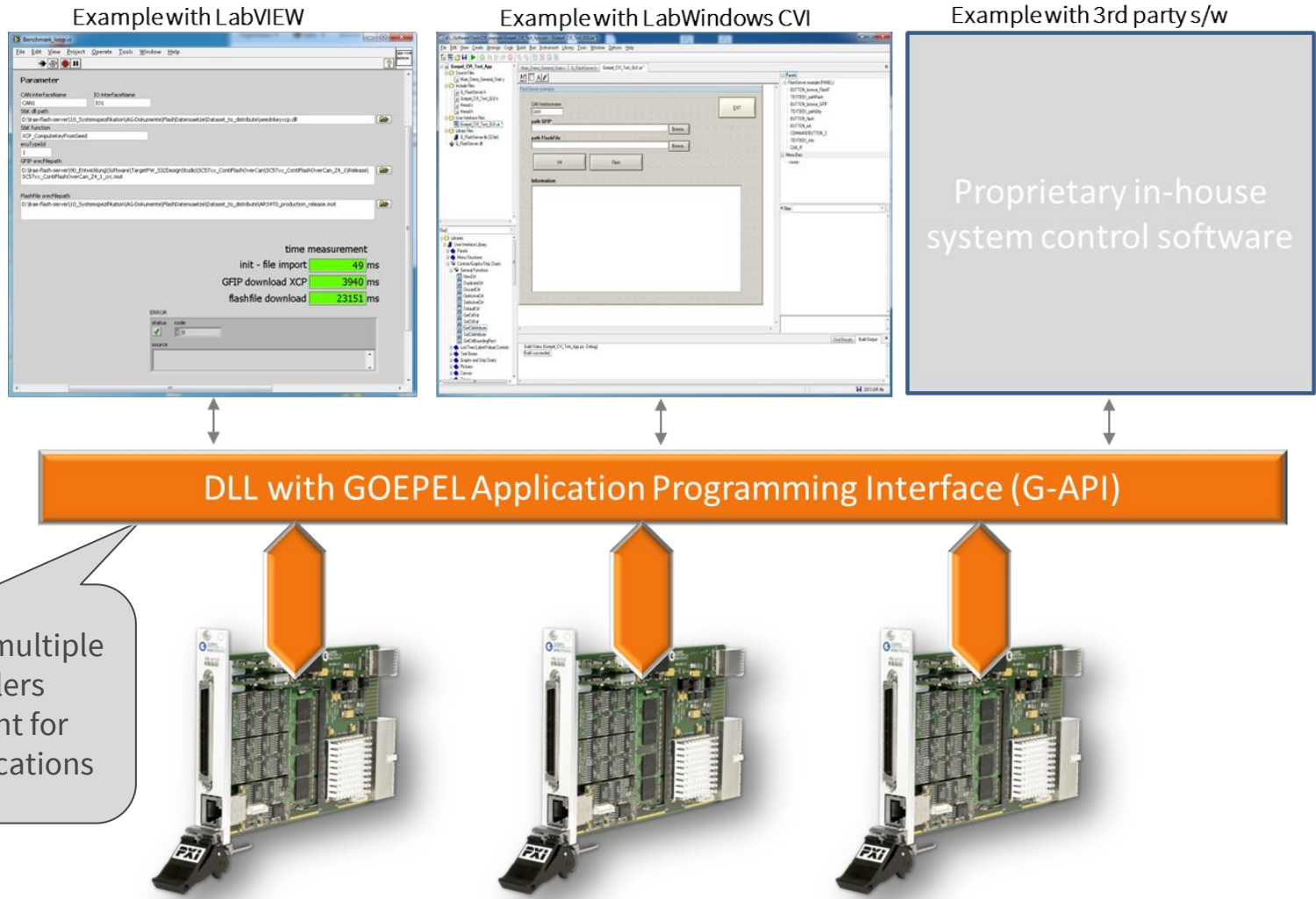
 In total the API offers over 1000 commands

Vast Bus-Controller portfolio

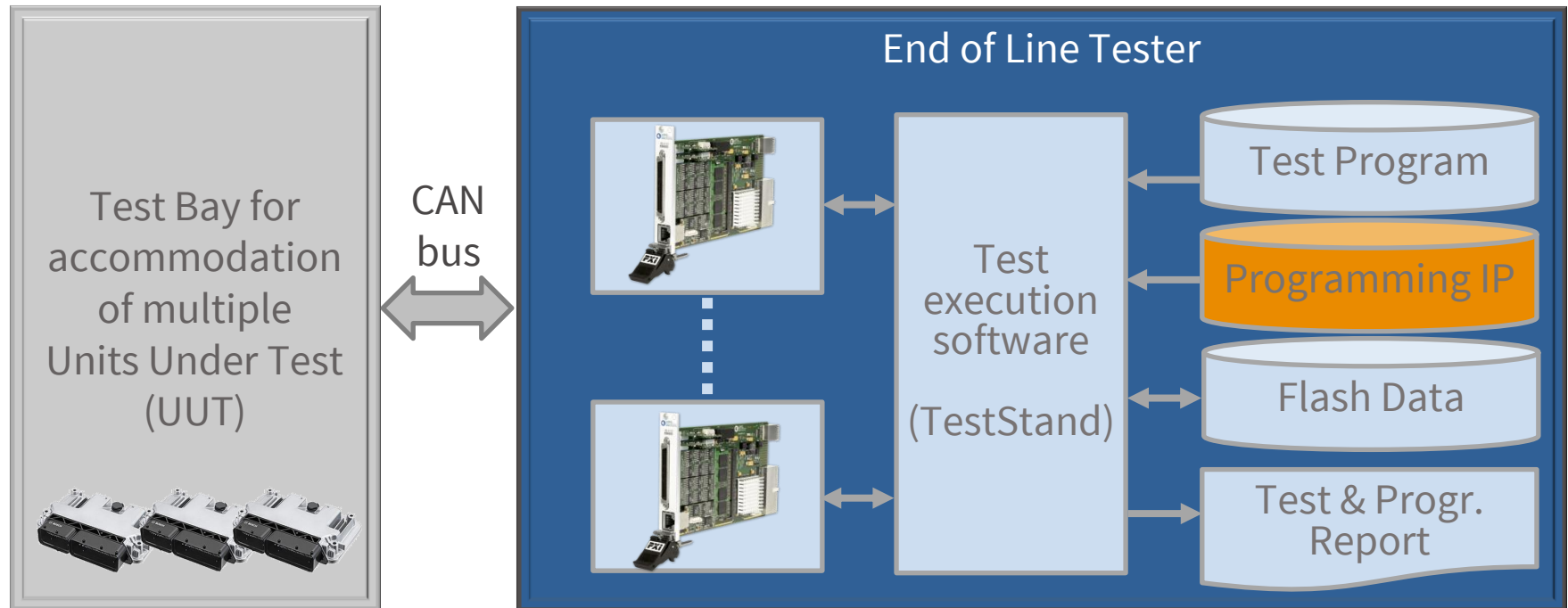


➔ Series 61 comprises over 10 different models

Integration possibilities



Example of a practical EoL system implementation



- ➡ PXI based EoL Platform with Series61 + TestStand
- ➡ UUT control via CAN Interface
- ➡ Application of XCP-protocol for communication

Achieved results



Procedure	Size/Time	Remark
Image size	1,31MB	1,31MB -> 10,48MBit
Flash-IP download	3,49s	CAN download via XCP Commands
Erase	5,37s	
Blank check	0,18s	
Programming	18,05s	
Verify	0,78s	CRC based
Total Run Time	27,85s	IP download + Erase + Blank check + Program + Verify

 μ Controller in the target is a MPC577x derivate

Summary



Excellent outlooks...

Summary → Teamwork



- ➡ Combination of test and programming within EoL is an excellent option to increase production flexibility and a valuable complement to other strategies
- ➡ Powerful Bus controllers like the Series 61 enable performant platform solutions with scalable throughput via GANG applications
- ➡ Complexity of programming requires optimal interaction of software, hardware and IP in conjunction with special automotive expert knowledge



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Thanks for your attention!

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