



LabVIEW Based Displays

Online Visualization of Telemetry Data during a Rocket Flight using OPC UA and LabVIEW

A·M·S SOFTWARE GMBH

Erfolg durch nachhaltige Lösungen

Airbus Defence and Space

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ni.com

Companies Introduction

- A.M.S. Software GmbH
 - Alliance Partner of NI for 20+ years

AIRBUS

- Software and Hardware Systems
- LabVIEW Engineers (CLA, CLD)

- Airbus Defence and Space
 - Program Line: Space Systems
 - Sounding Rocket Program



The Sounding Rocket Program – TEXUS/MAXUS

- Civil research under µg conditions
- Is operational since 1977
- Scientists are responsible for the experiments
- Airbus is responsible for the system
- In total 64 launches have been performed







The Sounding Rocket Program – TEXUS/MAXUS

	TEXUS	MAXUS
Total Length Payload Length	13 m 5,3 m	17 m 6,6 m
Total Mass Payload Mass	2,65 t 400 kg	12,3 t 800 kg
Apogeum (max Altitude)	250 km	700 km
ug Time	~ 360 sec	~ 720 sec

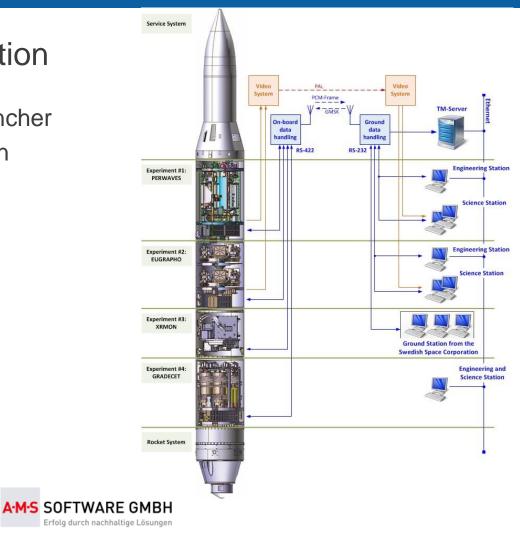


Typical Launcher Configuration

- Four scientific experiments per launcher

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- In focus is the experiment execution
 - Experiment H/W and S/W
 - Science stations
- The back-bone
 - On-board data handling
 - Data transmission
 - Ground data handling
 - Engineering stations





Challenge

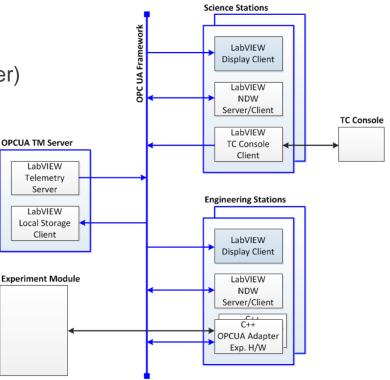
- Modern payload center for the scientists (Mission Control)
- Customized Displays without Programming



OPC UA – Decentralised Framework

- OPC UA supports the modular approach
 - Data can be provided by different sources (server)
 - Data can be directly access by different consumers (clients)
 - Single modules can be exchanged
 - No central entity that needs to be updated/maintained

Ground System







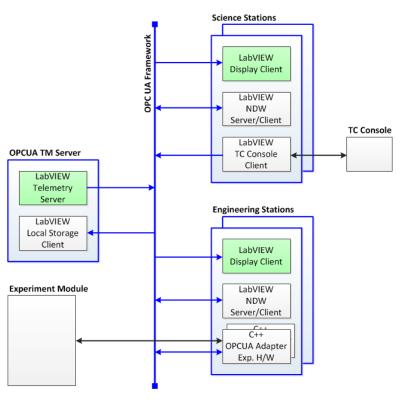
Roadmap

- Step 1
 - Implementation of LabVIEW Based Displays
 - One server for multiple display clients
 - Used for the MX9 Flight in April 2017
- Step 2
 - Roll-out of the Prototype in 2017
 - Multiple servers for multiple clients
 - Used for the TX54/55 flight in May 2018
 - Parallel operation to the existing system

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Ground System





What is OPC UA?

- Open Platform Communication Unified Architecture
- High level data transport on TCP/IP Networks
- New OPC UA Stack in LabVIEW 2017
- Replacement of OPC

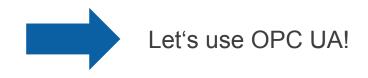
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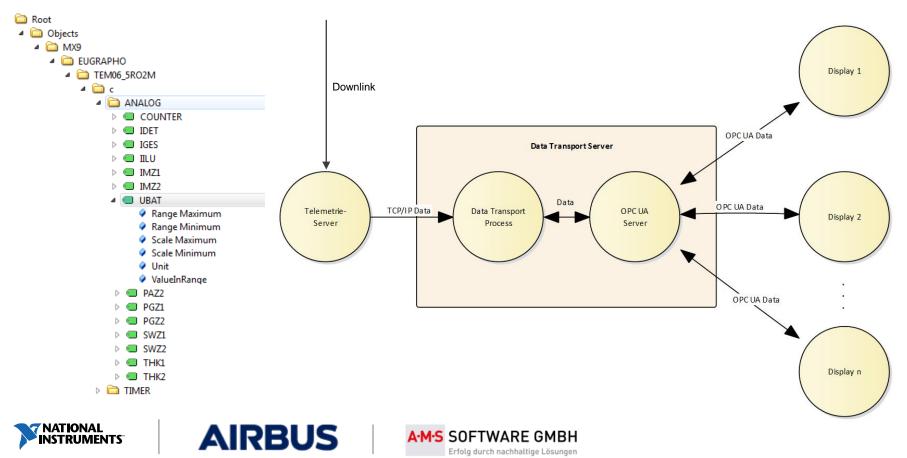
Why do we use OPC UA?

- Standardized and Modern, in focus of Industry 4.0!
- Structured data (Variables in a named tree)
- Open and transparent, platform independent
- TCP/IP packets optimized for high bandwidth





OPC UA Data Transport Server (OPC UA Adapter)

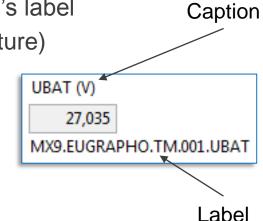


How does the OPC UA to Display coupling work?

- Connect to OPC UA servers using LabVIEW 2017 API
- Generic background multi server processes
- Subscribe items (controls) for monitoring
- Bind a control to a OPC UA variable by using the control's label

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- Get OPC UA data change events (LabVIEW event structure)
- Visualize data on user interface
- No LabVIEW coding needed, as required



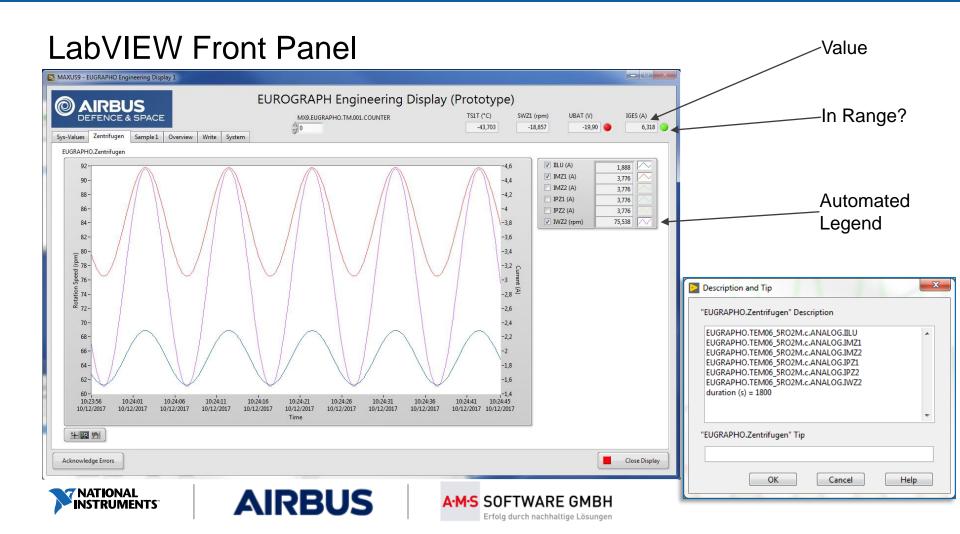


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LabVIEW Block Diagram

MAXUS9 - EUGRAPHO Engineering Display 1 [CUSTOMDISPLA	AY EUGRAPHO Engine] Block Diagram o	n CustomDisplay.lvproj/My Computer		
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Supporting Tools – Item Browser

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Erfolg durch nachhaltige Lösungen



Next Steps

- Continue usage of OPC UA Decentralized Network for coming launches
 - Switch off the old system (now parallel)
 - Continue progress on developing of OPC UA servers, clients and data binding (tools)
- OPC UA also for science data (Kohn Experiment)
 - Use cRIO based OPC UA Server for easy laboratory operation or parabolic flights
 - CompactRIO with NI-DAQmx (cRIO 9046)
 - CompactRIO in Space (2019)

