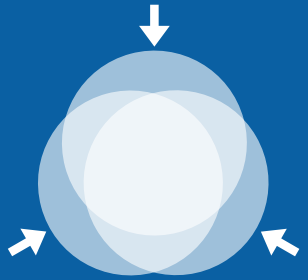

NATIONAL
INSTRUMENTS™

Addressing the Challenges of In-Vehicle Infotainment Test & Wireless Standards Test

<Name of the Presenter>
<Designation>
<Company>

Unique Test Requirements in the Automotive Industry

More I/Os, buses and wireless standards in a single unit

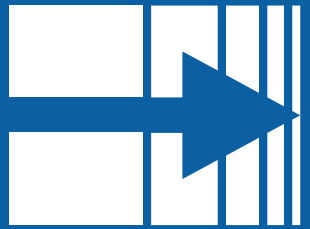


CONVERGENCE

Lowering the cost of test

LOWER PRICE

Shorter time to market with frequent changes



RAPID CHANGE

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Convergence of Wireless Standards in Infotainment

Mobile Communication
GSM, WCDMA, LTE, etc.

Connectivity
Bluetooth, WLAN, etc.

Navigation
GPS, GLONASS, Galileo, Beidou, etc.

Broadcast
AM/FM, XM, HD Radio, DVB, etc.

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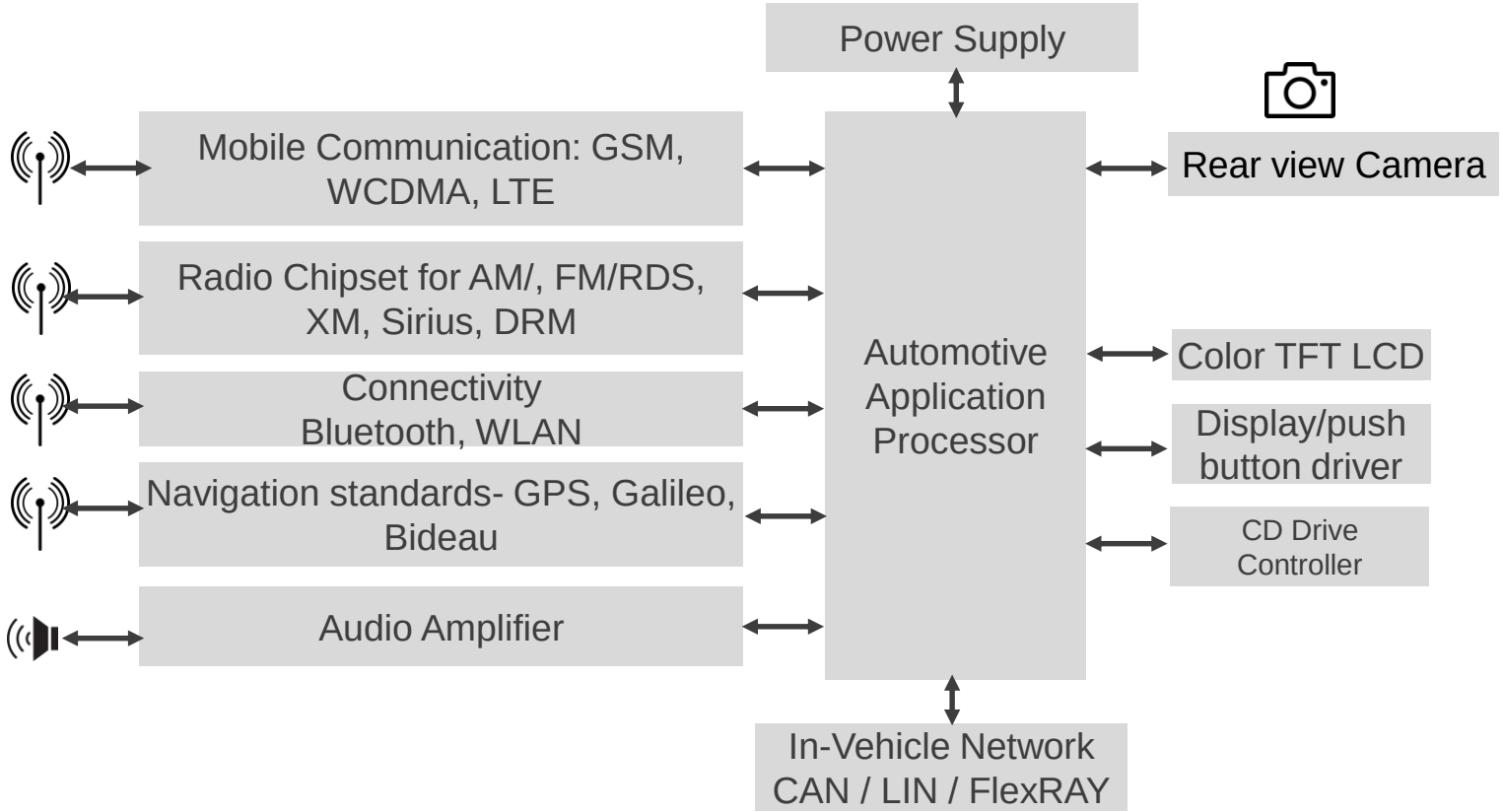
Typical Infotainment System



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More I/Os and Wireless Standards

One platform to cover fast-changing I/O requirements

DAQ and Control

- Multifunction I/O
- Counter / Timer / Clock
- Digital I/O
- Analog Input / Output
- Vision and Motion
- FPGA / Reconfigurable I/O

Instrumentation

- Oscilloscopes
- High-Speed Digital I/O
- DMM & SMU
- Signal Generators
- Switching
- RF Analyzers & Generators

Interfaces

- GPIB, USB, LAN
- RS232 / RS485
- CAN, LIN, DeviceNet
- SCSI, Ethernet
- VXI - VME
- Boundary Scan / JTAG

Wireless Test with Vector Signal Transceiver

- Cellular
- WLAN & Bluetooth
- Broadcast
- GNSS
- ZigBee, Z-Wave

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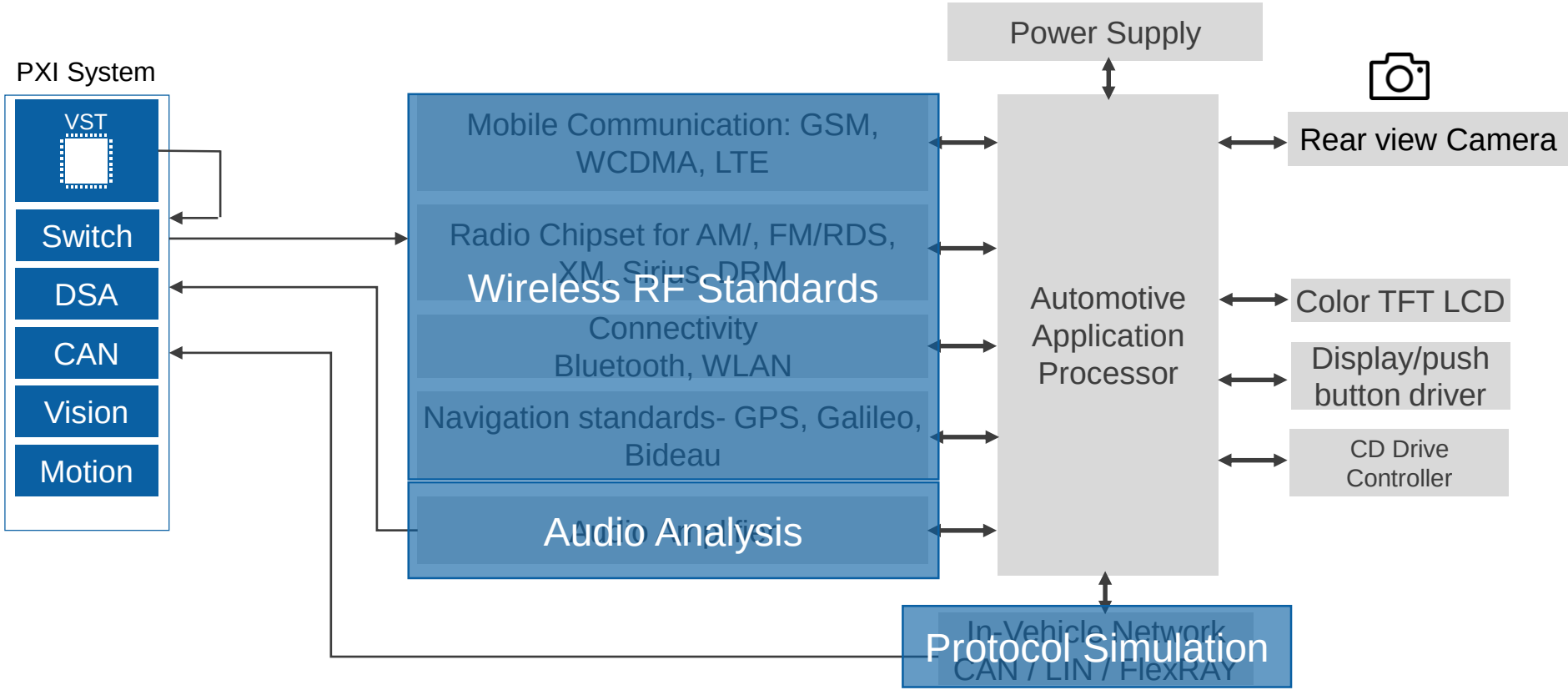
Typical Infotainment System



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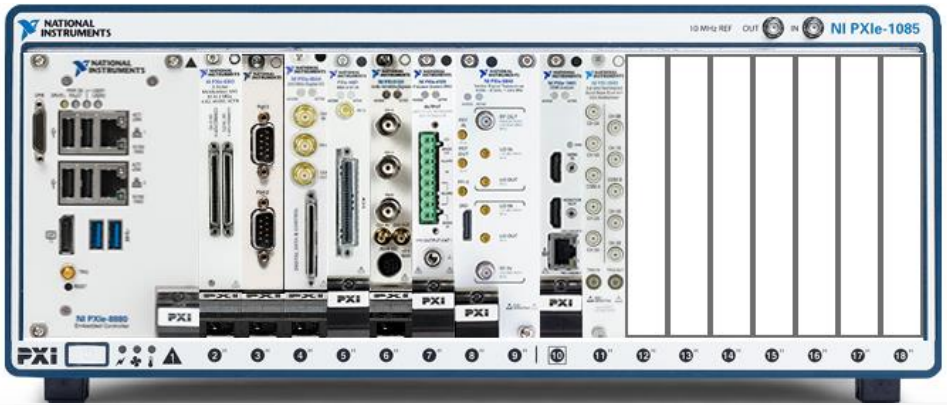
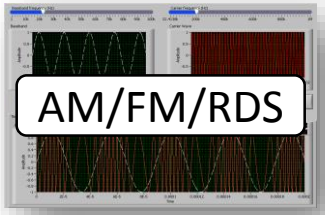
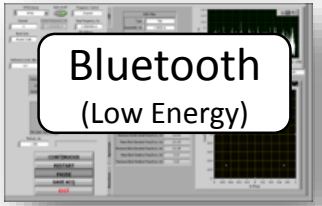
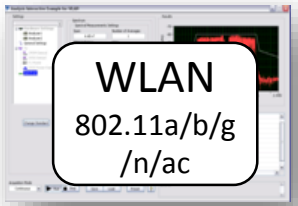
Motion cards for doing actuation using probes on the Touch Screen template inspection, etc..

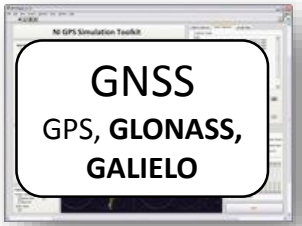
LabVIEW based High Performance Wireless Standards Test Software

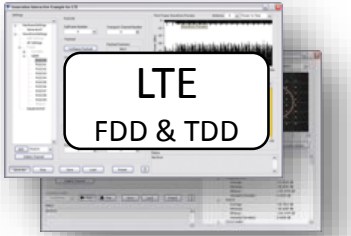



AM/FM/RDS


Bluetooth
(Low Energy)


WLAN
802.11a/b/g
/n/ac


GNSS
GPS, **GLONASS, GALIELO**


LTE
FDD & TDD

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Introduction to MaxEye Technologies

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MaxEye Technologies Logo

Typical Infotainment Test Scenarios

Test Scenario 1: Multiple User Inputs

“The infotainment system has multiple User Interfaces to access features such as HVAC, digital instrument cluster, Navigation, FM, switched using the steering wheel switches. The system control strategies should be able to resolve contradictory control inputs. The IVI system should be able to handle race conditions between the driver’s(steering), passenger and the system modules themselves.”

Test Challenges:

- Test Coverage of all possible expected use cases to validate the OEM defined priority sequence.
- Constantly change the timing and sequence of inputs to validate system robustness
- Capture & Log Test Results for future analysis

Test Scenario 2: Advanced Standards like FM-RDS

*“*The infotainment system is tuned to a channel lets say, 93.5 MHz . The Infotainment System is FM –RDS complaint, therefore, possibly the name of the FM channel is being transmitted as the RDS message – this message typically appears on the Infotainment HUD. At this instant it is also possible that the user wants to change channels or modes “

Test Challenges:

- Incase of FM – RDS systems, need to simulate both the audio signals from FM station and also relevant RDS data signal.
- Visually inspect the display to check whether the interpreted RDS signal data is displayed properly
- Simulate user input and also test for switching speed while switching between FM channels.

Test Scenario 3: Switching between various features

*"*High-end infotainment system where user is streaming video on demand via DVB, infotainment system has multiple displays & also has cellular connectivity. Assume the Infotainment unit suddenly receives a call, while the vehicle moves through different coverage zones of cellular connectivity"

Test Challenges:

- Incase of cellular connectivity, we would want to test the vast variety of cellular connectivity standards available.
- Testing for mobility – different territories may have different standards that would be supporting them
- Test for different Multimedia standard streaming quality – audio & video synchronization
- Test synchronization when multiple displays are involved.
- Testing for instantaneous switching of audio when the call is received

Test Scenario 4: Radio Station Scan

*“*Requirement to perform a scan on the FM Radio. The complete FM frequency range is swept to scan for FM stations in the region as well as audio analysis to check for the quality of reception as well as audio amplifier“

Test Challenges:

- Simulating multiple(4-5) FM stations across the FM frequency range using the same signal interface.
- Audio analysis of parameters like octave analysis, Total Harmonic Distortion(THD), SINAD etc.

One instrument for All Signal Needs and Protocols

AST-1000 developed by Averna, NI Platinum Alliance Partner

Radio

- AM/FM
- Sirius/XM
- HD Radio (AM/FM)
- DAB/DMB/ DAB+
- RDS, DARC, TPEG
- DRM

Navigation

- GPS
- GLONASS
- Galileo
- BeiDou-2 (COMPASS)
- QZSS
- S-BAS

Video

- ATSC
- DVB
- ISDB
- CMMB

Connectivity

- WiFi (802.11a/b/g/n/ac)
- WiGig (802.11ad)
- LTE / WCDMA
- Bluetooth 1.2/2.0/3.0
- Bluetooth 4.0 (Low Energy, BLE)
- DSRC

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* GNSS Simulator is powered by StellaNGC® from M3 Systems

Automotive Infotainment Test System – Harman

Multi-DUT Testing System Integrated by Noffz, NI Platinum Alliance Partner

Noffz Software
Parallel tests and database integration

NI TestStand

Noffz Software
DUT controls and APIs

NI LabVIEW

Noffz Hardware

Signal Conditioning | Adaptor | Enclosure

NI Hardware

PXI Chassis + PXI Instruments

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"We tested multiple wireless technologies ranging from Bluetooth to WiFi to GPS and cellular all with the same equipment using the NI Wireless Test System. The WTS and NOFFZ's RF test engineering expertise helped us significantly reduce test time and the time it took to get our test systems up and running.

—Markus Krauss, HARMAN/Becker Automotive Systems GmbH

HMI Testing

Thank you

Questions ?