

NIDays

THE LabVIEW CONFERENCE

How to Develop Strong Control and Monitoring Applications in LabVIEW

Espen Ringnes

National Instruments Application Engineer

Control & Monitoring Applications



Power Distribution
and Control



Turbine Control



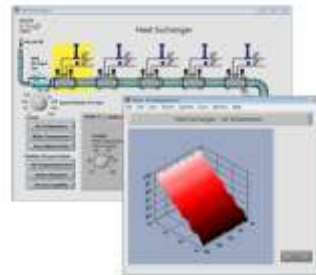
Industrial Machine
Control



Medical Device
Control



Structural
Monitoring



Process Control



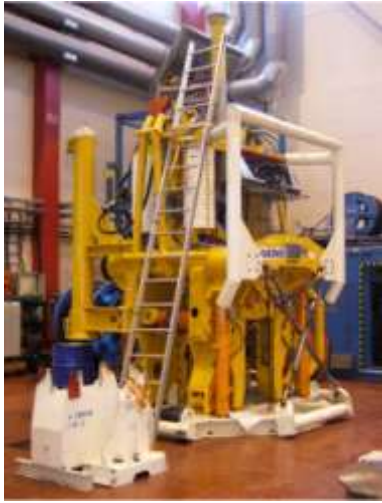
Oil and Gas
Applications



Power Monitoring
and Control

Developing a Subsea Flow Line Connection Tool

Controlled by CompactRIO



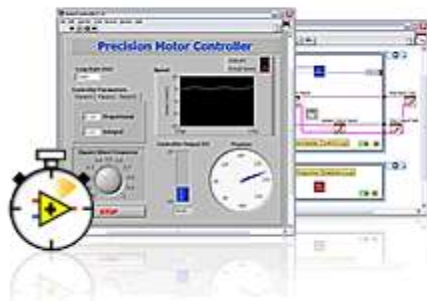
NI RIO Technology

Off-the-Shelf Platform with Custom Capabilities



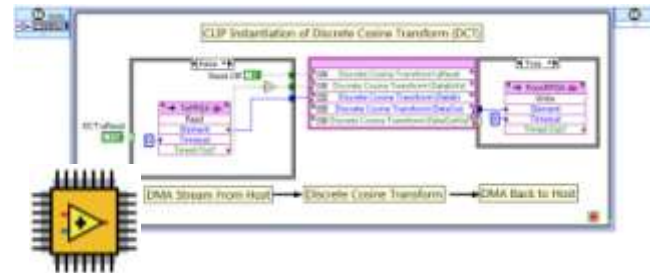
- Standard architecture through design, prototype & deploy
- Standard software tool-chain across technologies and platforms
- Integrated FPGA for custom processing, timing and control

LabVIEW Real-Time Module



Add-on for creating deterministic,
stand-alone systems

LabVIEW FPGA Module



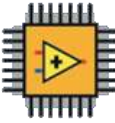
Add-on for programming
reconfigurable FPGA
hardware using graphical
programming



What is Real-Time?

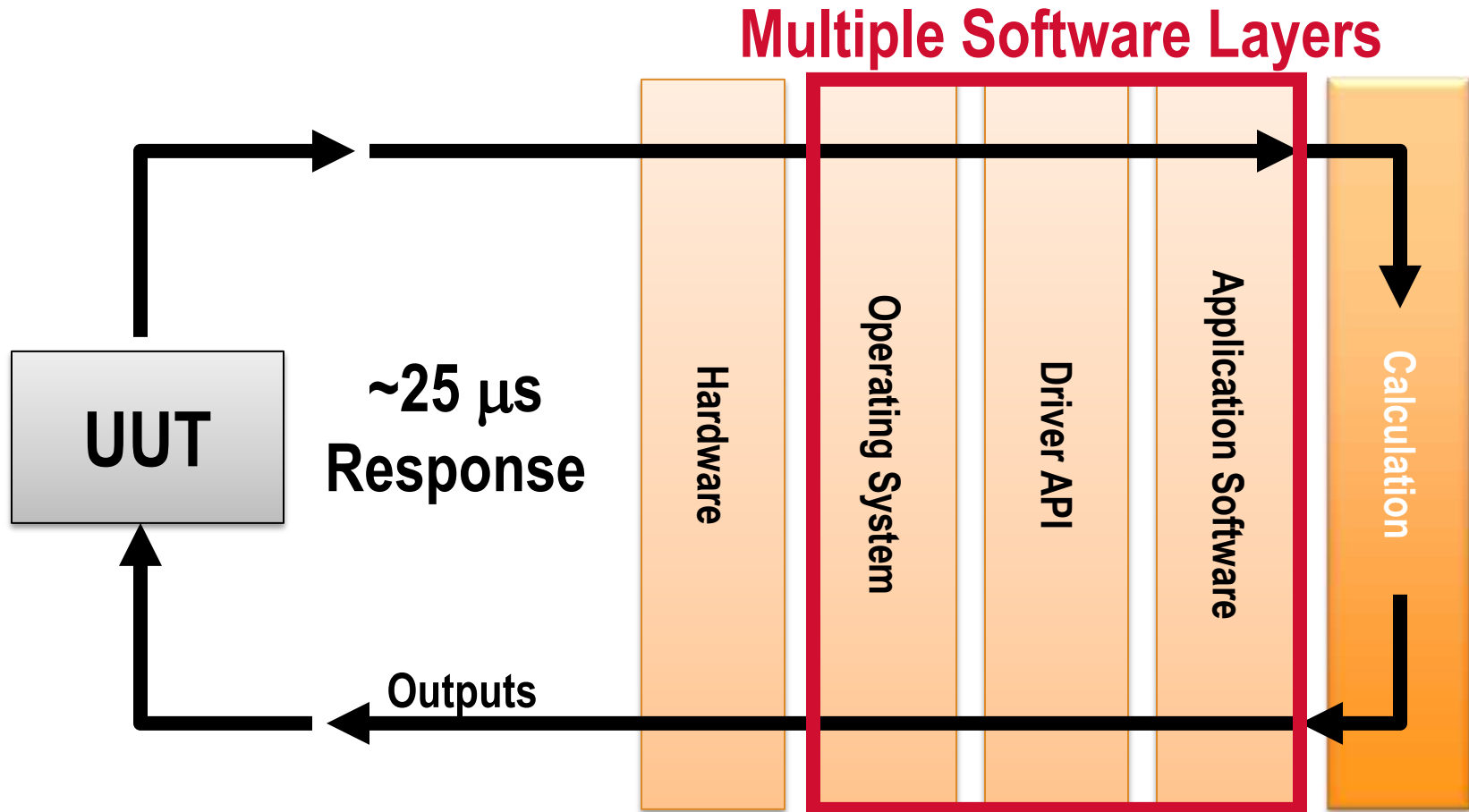
- Real-time **does not** always mean real fast
- Real-time means **absolute reliability**
- Real-time systems have timing constraints that must be met to avoid failure
- Determinism is the ability to complete a task within a fixed amount of time

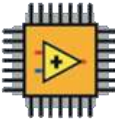




High Reliability and Determinism

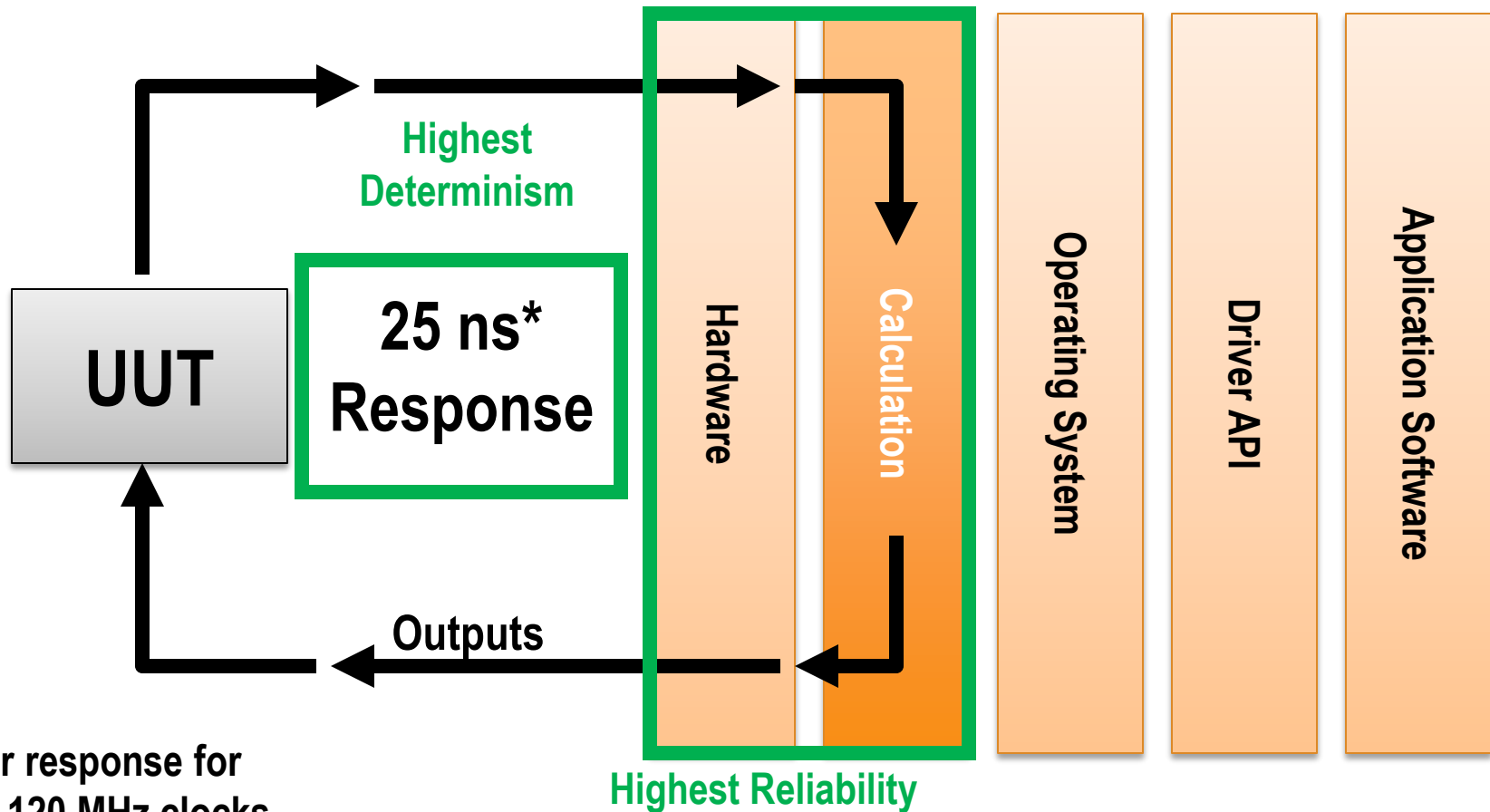
Decision Making in **Software**





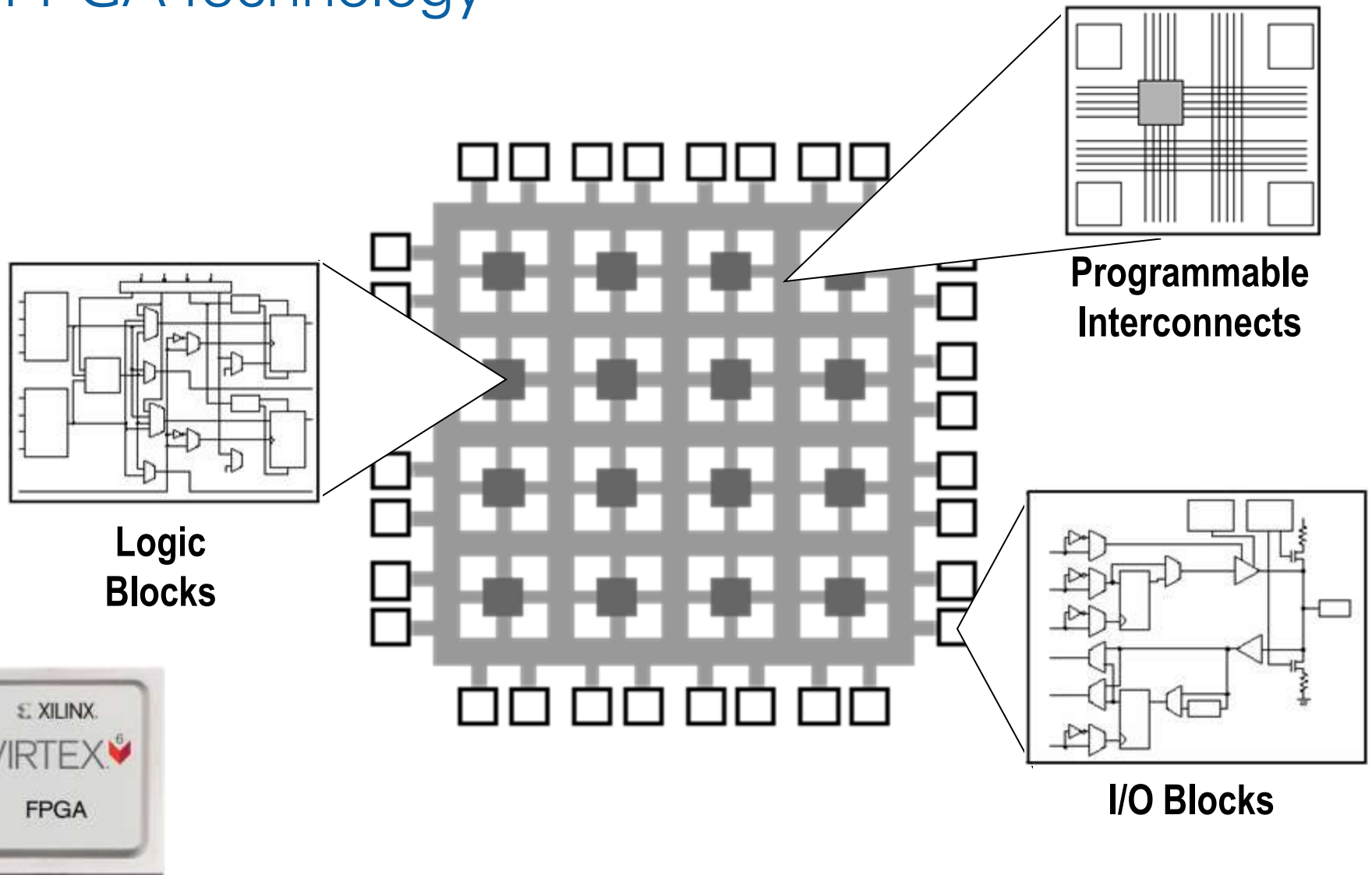
High Reliability and Determinism

Decision Making in Hardware

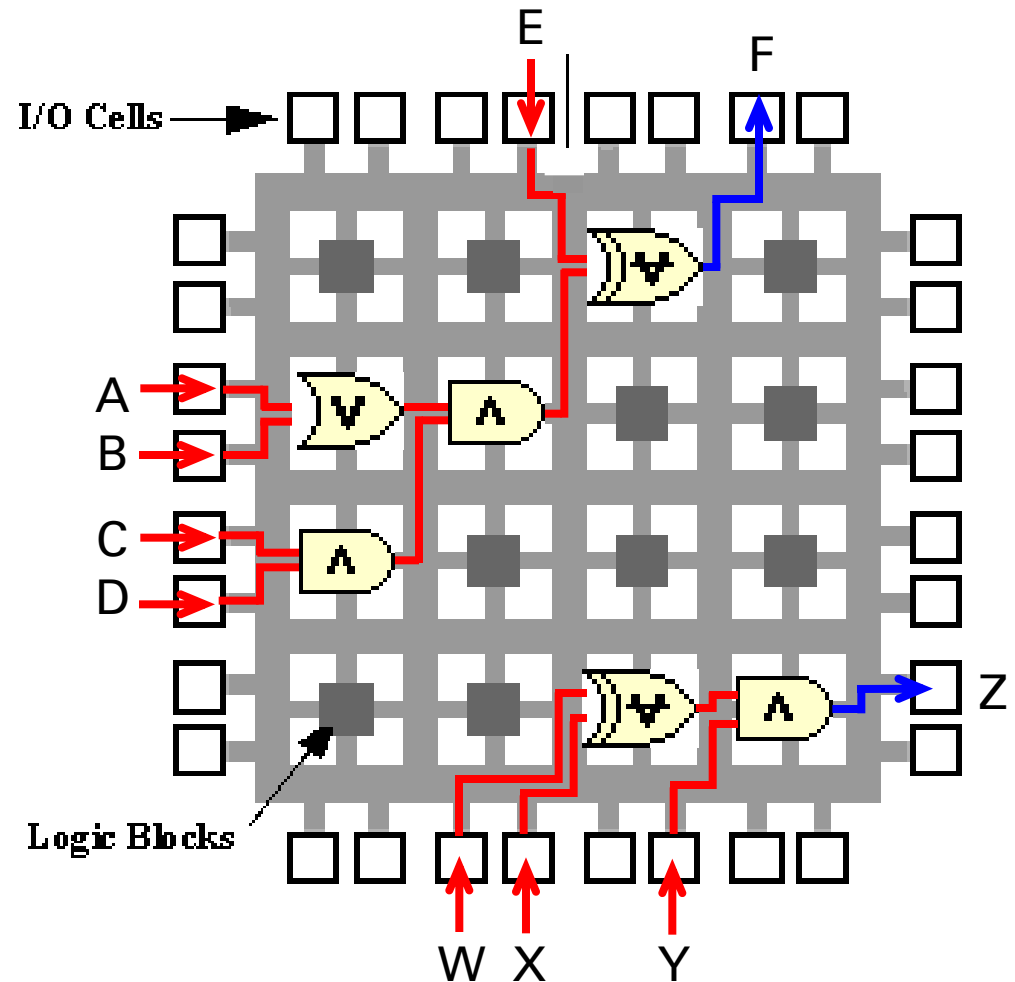
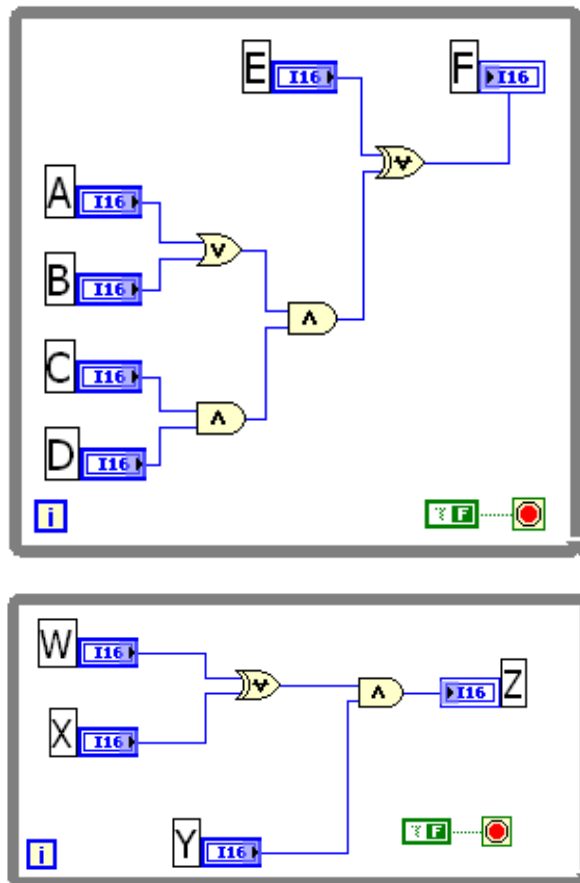


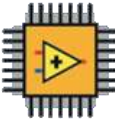
* Faster response for
80 and 120 MHz clocks

FPGA Technology



FPGAs are Parallel Dataflow Systems



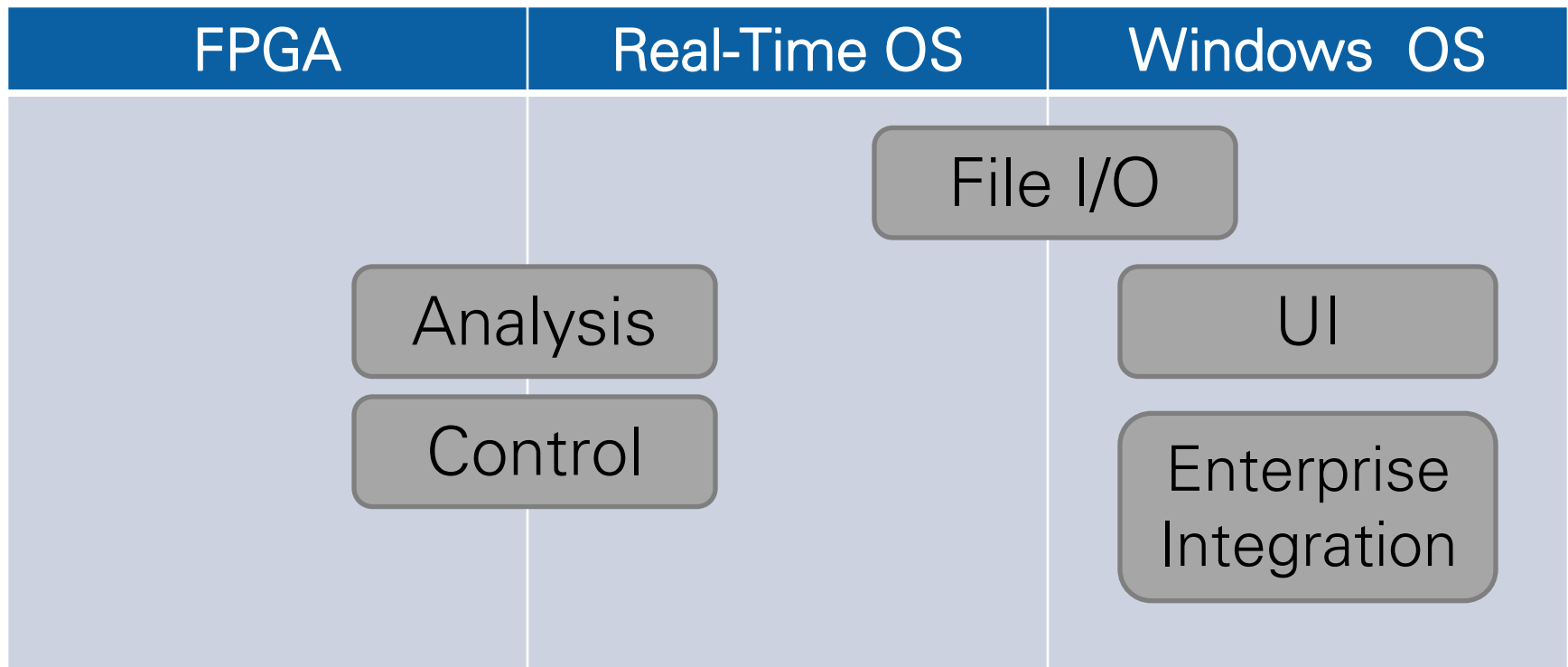


Summary FPGA benefits

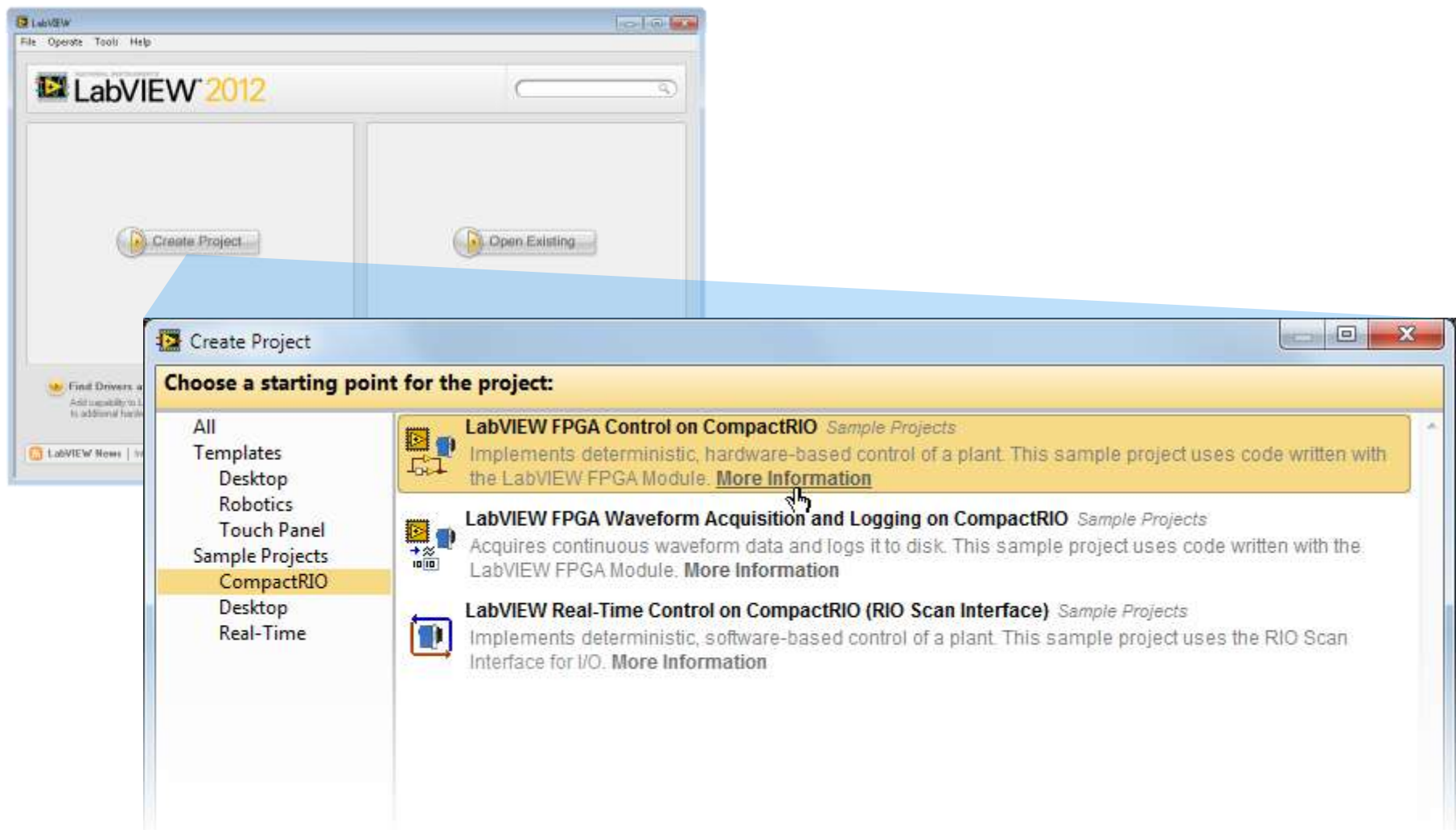
- **True Parallelism** – Provides parallel tasks and pipelining
- **High Reliability** – Designs become a custom circuit
- **High Determinism** – Runs algorithms at deterministic rates down to 25 ns (faster in many cases)
- **Reconfigurable** – Create new and alter existing task-specific personalities

Discussion: LabVIEW Real-Time

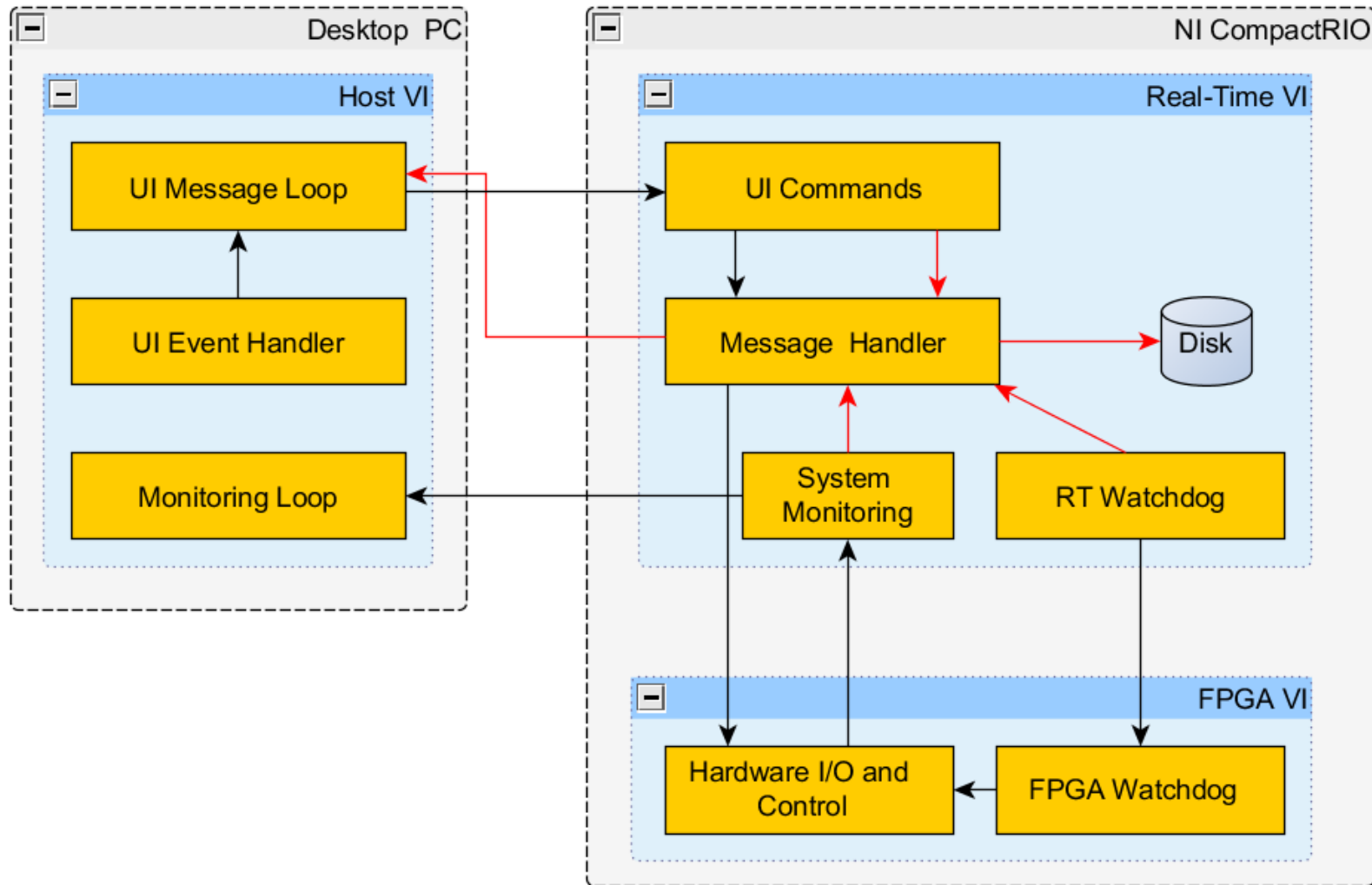
What tasks are best implemented on each target?



LabVIEW 2012 RIO Sample Projects



LabVIEW FPGA Control Sample Project



Data Communication Types

Current Values (Tags)	<i>Latest value data, e.g., “Temp = 29° C”</i>
Messages/Commands	<i>Intermittent data, low latency, e.g., “Stop”</i>
Stream	<i>Continuous acquisition, e.g., “Waveform”</i>

