OptoFidelity

NIDays 2013

Hello, I’m Mikko

- Mikko Vaarala
- OptoFidelity 3/2012 →
  - Project management, Sales support, Product development, LabVIEW development.
  - 7 years of LabVIEW experience.
  - Lectures at Tampere university of applied sciences.

Agenda

- OptoFidelity Oy – the company
- Development case: Actor framework
- LabVIEW example: Linked Network Actor+cRIO
- Product example: Side Actuator

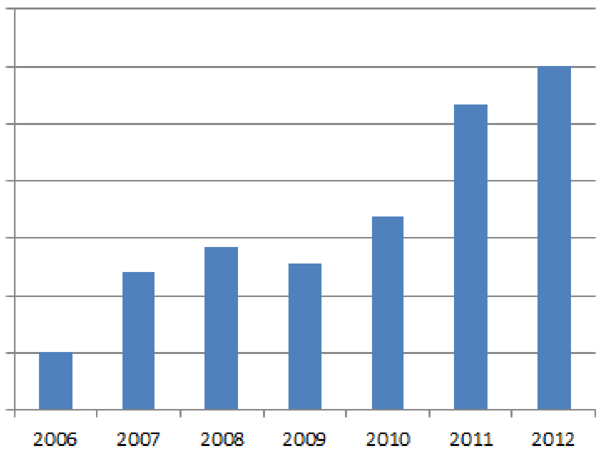
OptoFidelity, high-fidelity engineering

- OptoFidelity is a growing expert engineering company specializing in test and measurement automation, machine vision systems and test and engineering services.

- We offer test and measurement systems for R&D and product/component validation.

- We have patented technology for testing display and touch screen visual image quality and user experience

- Cross-functional expertise:
  - Machine vision and imaging
  - Test&Measurement technology
  - Signal processing
  - Test automation
  - SW / HW Engineering



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Global project deliveries

Partner company in Korea:
KJ Corporation

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Development case

Linked Network Actor

Actor framework

- Actor Framework (AF)
    - Framework/Architecture distributed with LabVIEW 2012
    - Suited to applications that need/allow multiple parallel processes communicating (primarily) asynchronously
    - Uses LabVIEW classes instead of Case Selector + Case Data
- Starting from the LabVIEW 2012 AF template projects
    - Basic AF
    - The evaporative cooler

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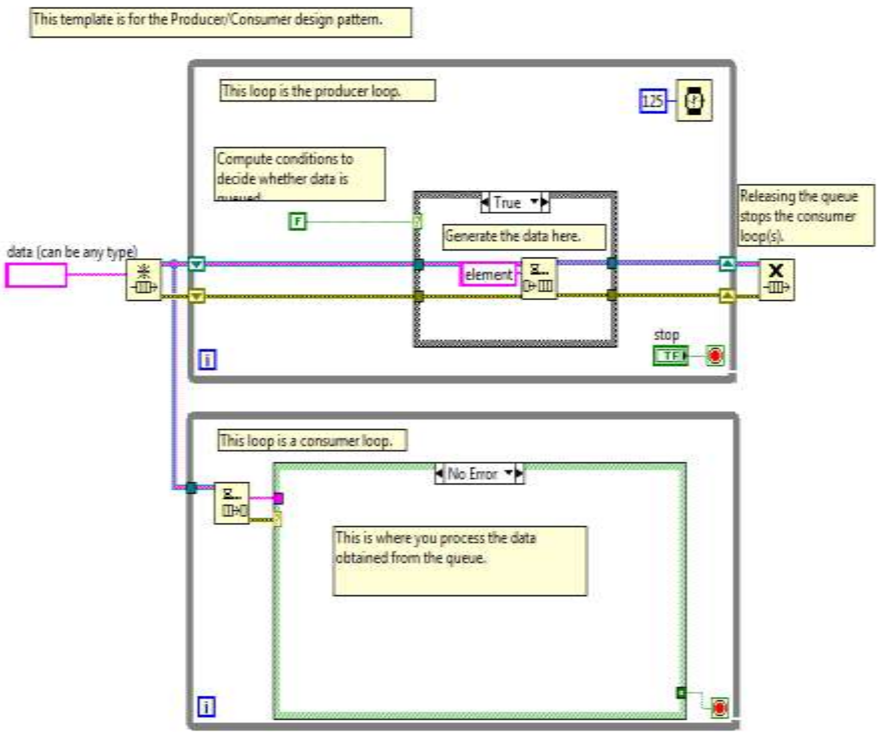
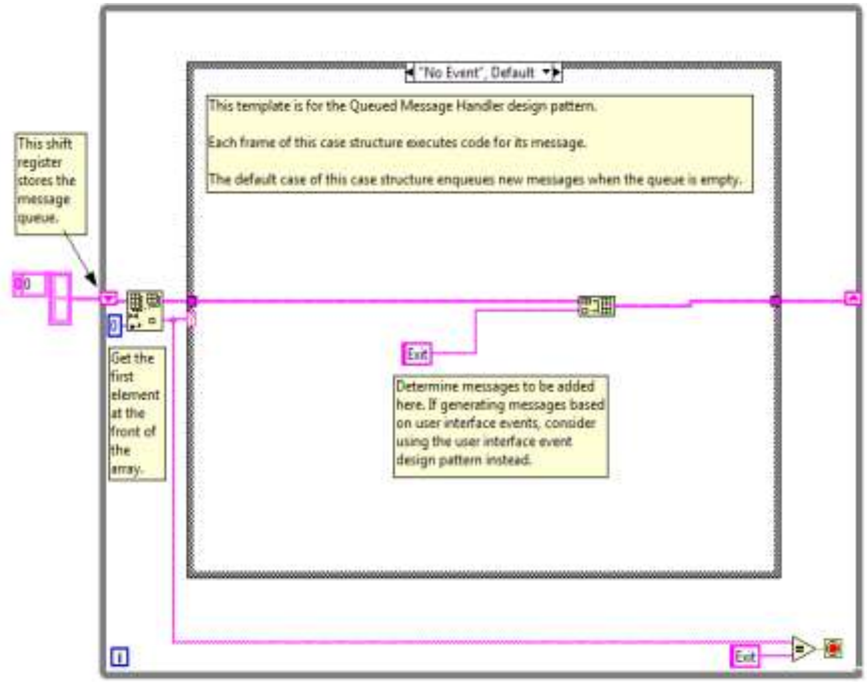
Architectures

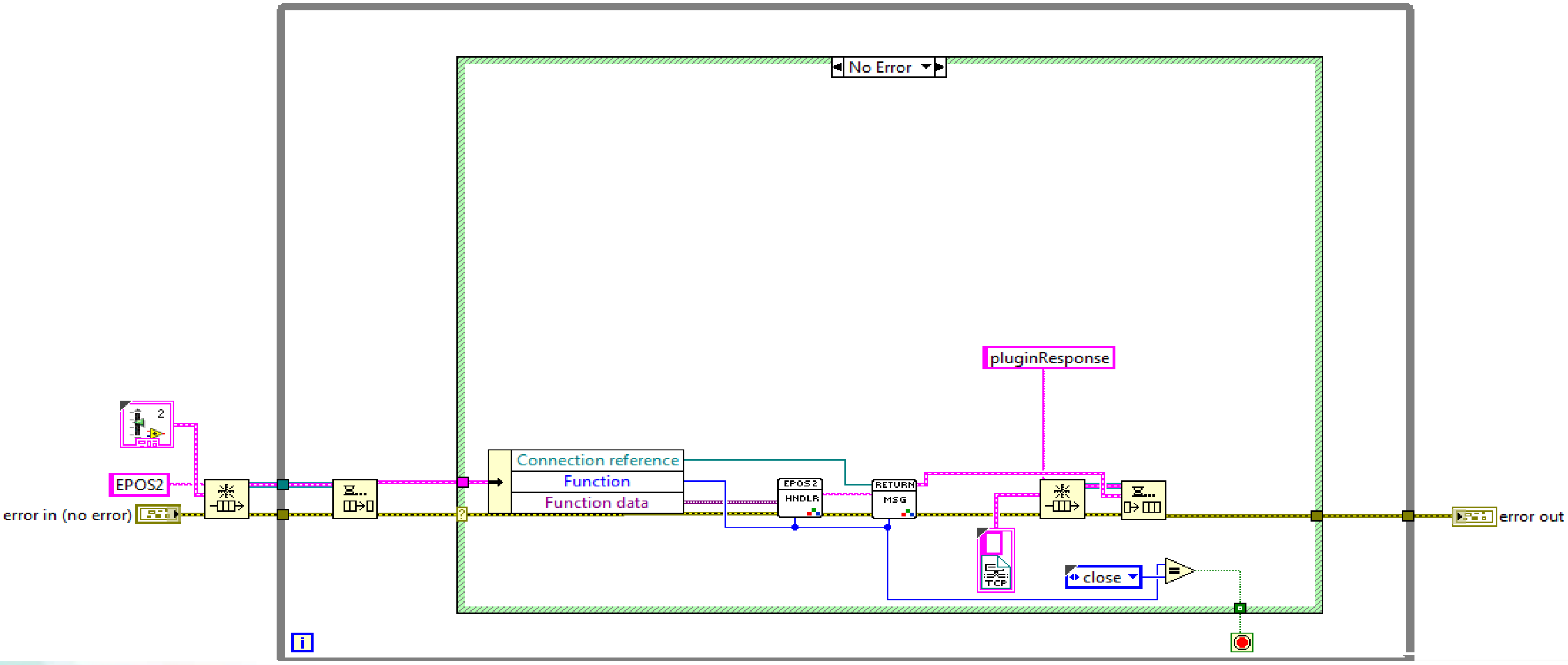




- Producer / Consumer
- Queued state machine

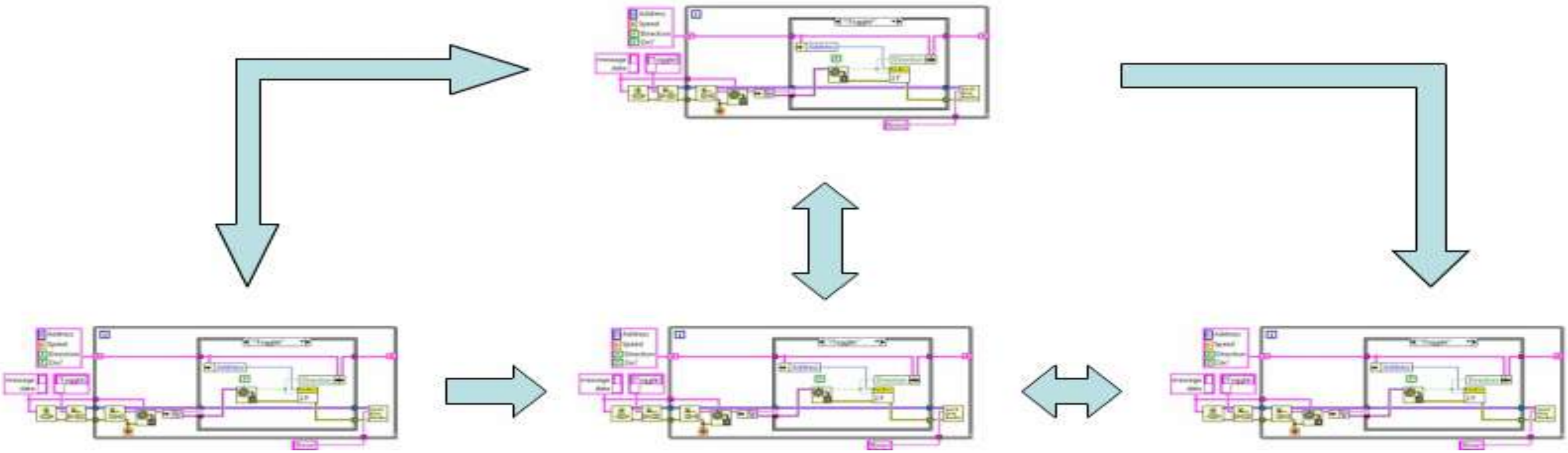
Queued Message Handler

- Data located in shift register (private)
- Queue of clusters

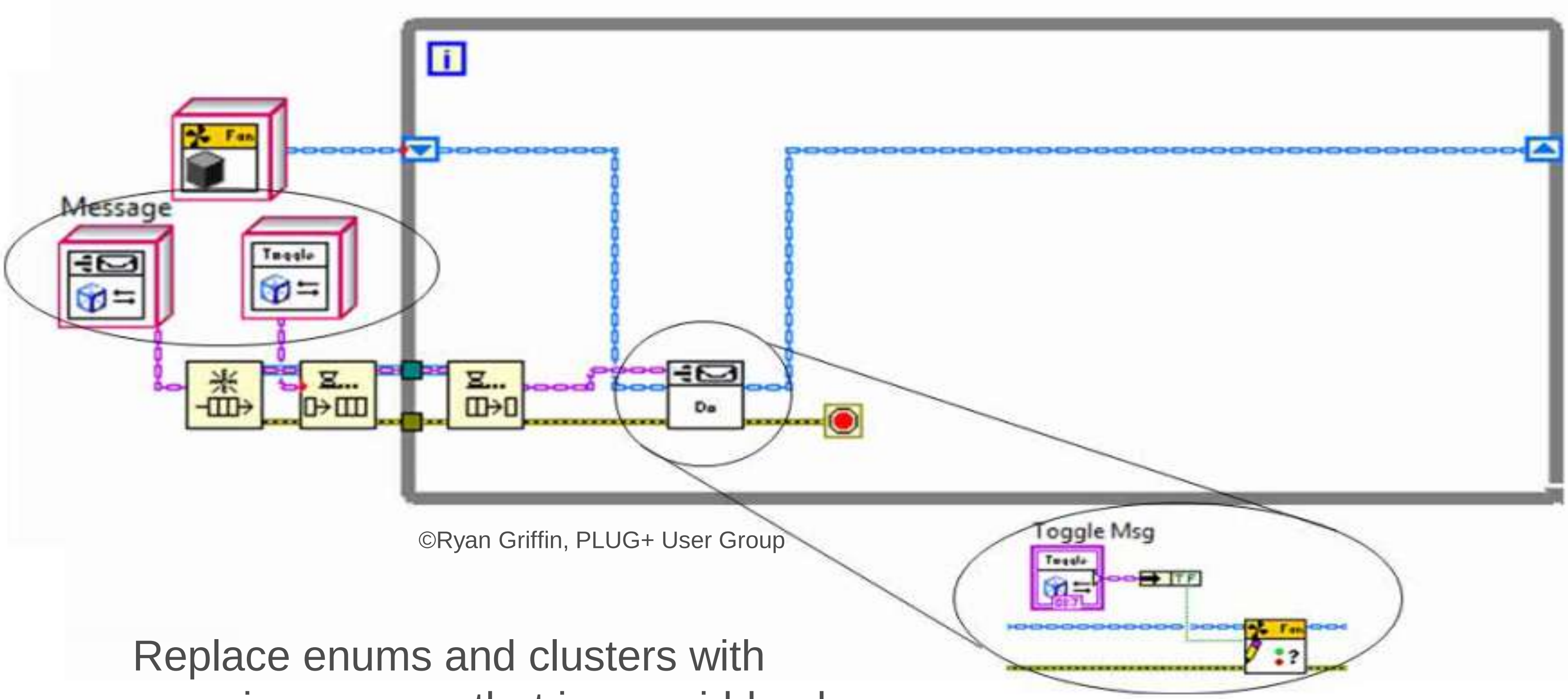


Multiple Queued State Machines

- Introduces communication between code modules
  - Which module owns the communication channel between a pair of modules?
  - Queue? Semaphore? Global Variable? Functional Global/Action Engine?



Actor messages



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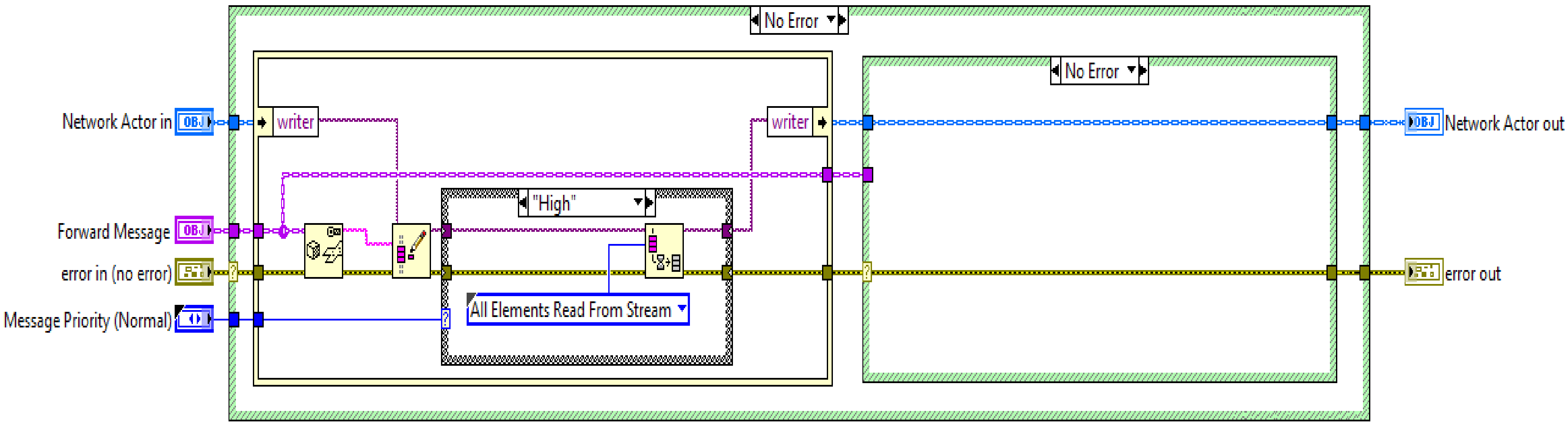
Replace enums and clusters with generic message that is overridden by child classes

Benefits

- Framework allows multiple independent instances of actors to co-exist
  - No need to duplicate code
  - Example: multiple GPIB or serial devices that are doing independent tasks
- Messages are strongly typed
  - Eliminates the need for the receiving function to know the exact form and data types
- Solves the problem of making sure the messages are received
  - framework makes sure that the receiver always owns it's own input queue. That way, it always gets the last message saying the other guy shut down. "Channel has the lifetime of the receiver"

Networked messages

- Two streams are opened
  - To send a message
  - To receive return messages
- Message classes are serialized to string with ”Flatten to String” function
  - Messages travel throught network in serialized string form



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Linked Network Actor+cRIO

- PROS:
  - Extensible architecture that allows new features to be added with relative ease
  - Underlying streams can handle continous data transfer as well as single status queries
- CONS:
  - Can be a bit tricky to debug (reentrant Vis are not debuggable in RT, use console or other means)
  - Community scope metohds do not work prior LV2012-RT f1

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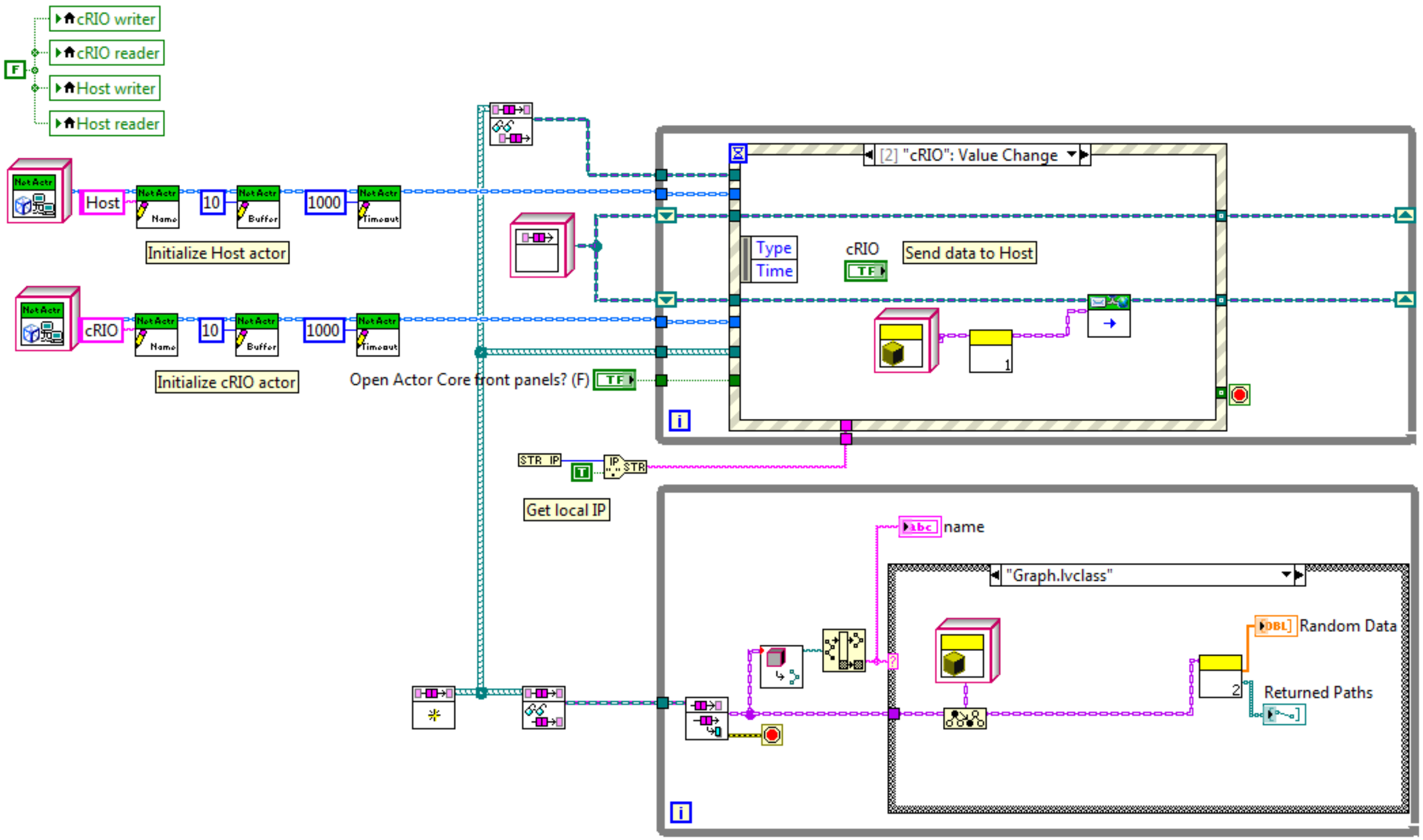
LabVIEW

Example

Example overview



Example opens two networked actors and on demand sends 100 random points between each other to demonstrate

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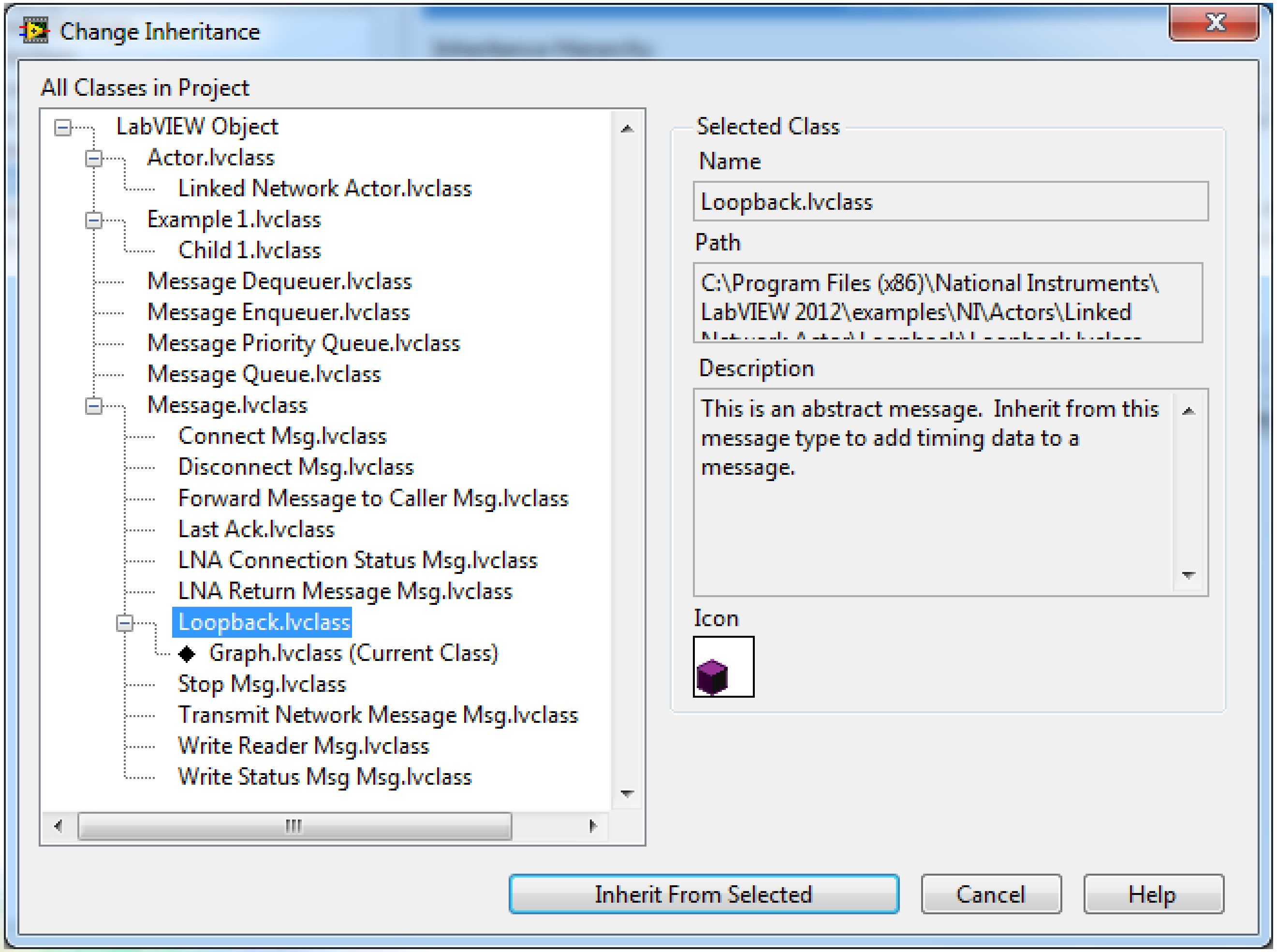
Inheritance



- Sample Graph class inherits from Message and Loopback classes which are part of the actor framework

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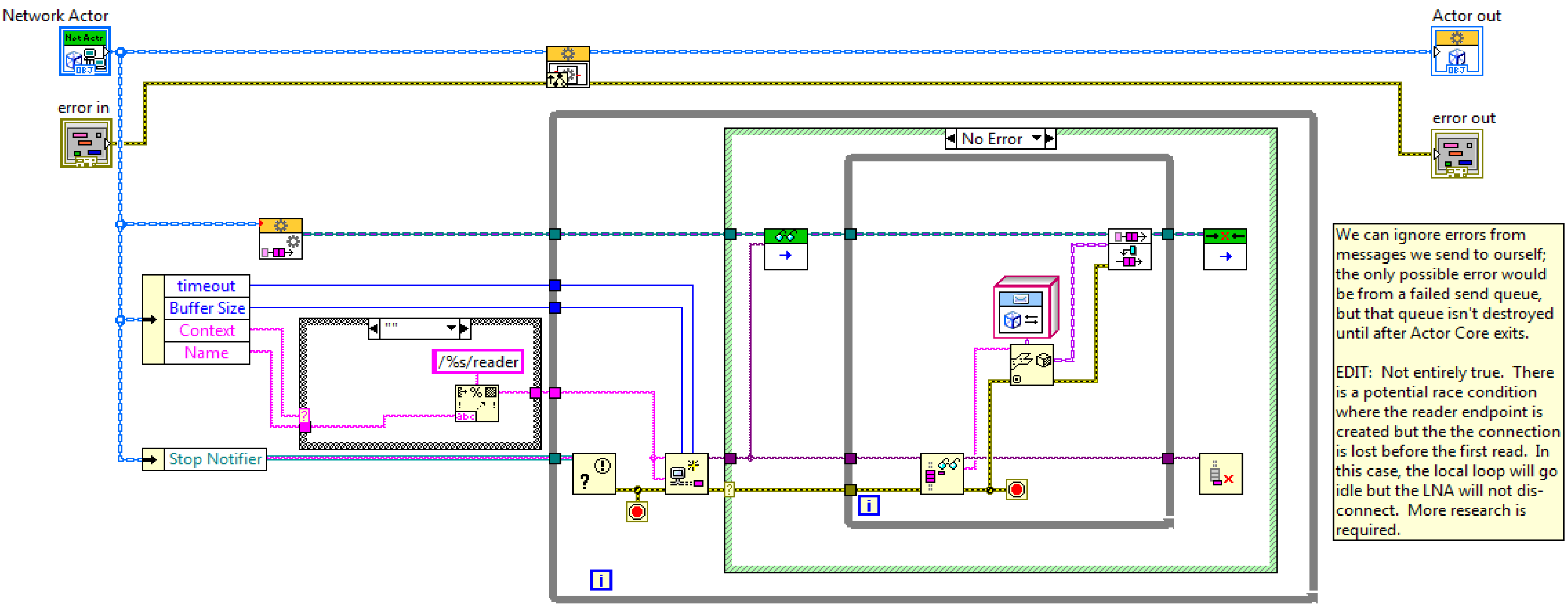
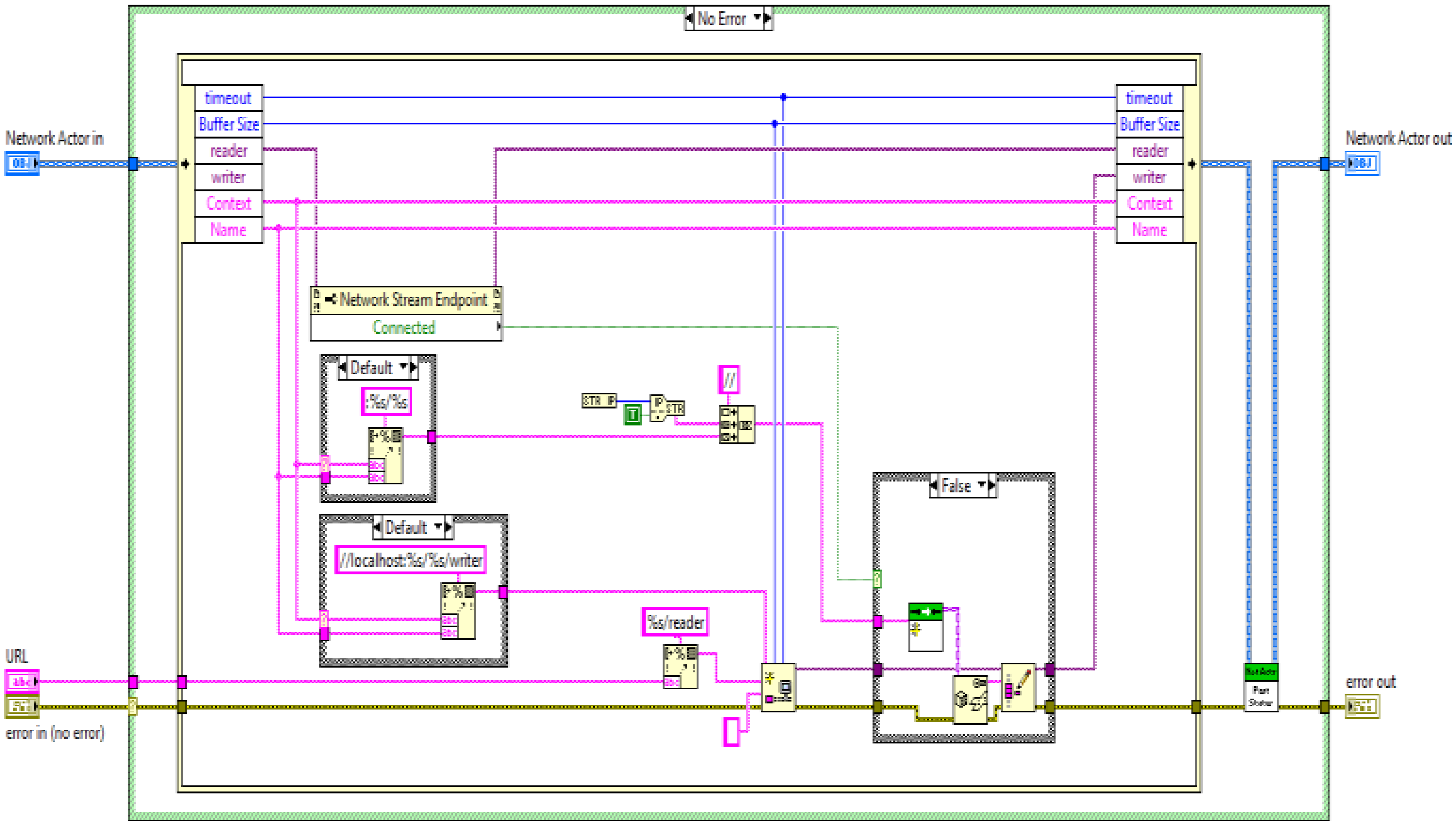
Network actor core



Reads and unflattens messages from other networked actors using the information provided.

Network actor::Connect



Creates a stream writer endpoint and sends connect message URL to another actor in the network

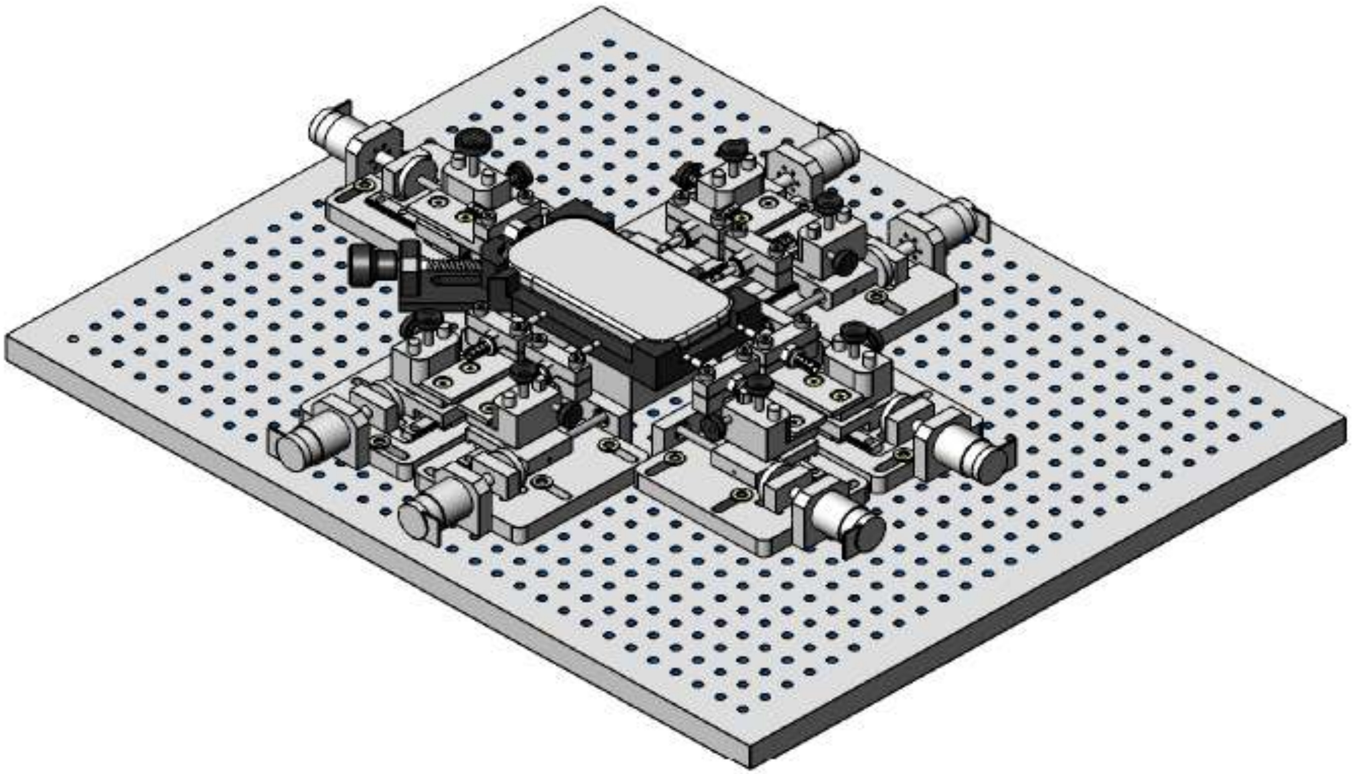
Product

Side Actuator

Presented at OptoFidelity stand

Overview

- OptoFidelity Side actuator
- Customized mechanics for seven actuators



System break out

- Servo motor driven µm-screw
  - Limit switches
- Embedded drive parameter control with NI cRIO
- NI hardware:
  - NI cRIO
  - 7 x NI9505 DC brushed Servo drive
  - NI 9423 Digital IO module
- NI software:
  - RT: Communication and ramp calculations
  - FPGA:
    - PID-control for drive parameters
    - Safety limit control

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Example found in OptoFidelity stand

- Use cases:
  - DUT side button activation
  - Inserting peripheral cables
  - Durability testing
- Linked network Actor framework is viable solution for control and status message exchange between the cRIO and control PC

Thank you for your time

For more information:

Visit the codebusters-bar at NIDays 2013

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