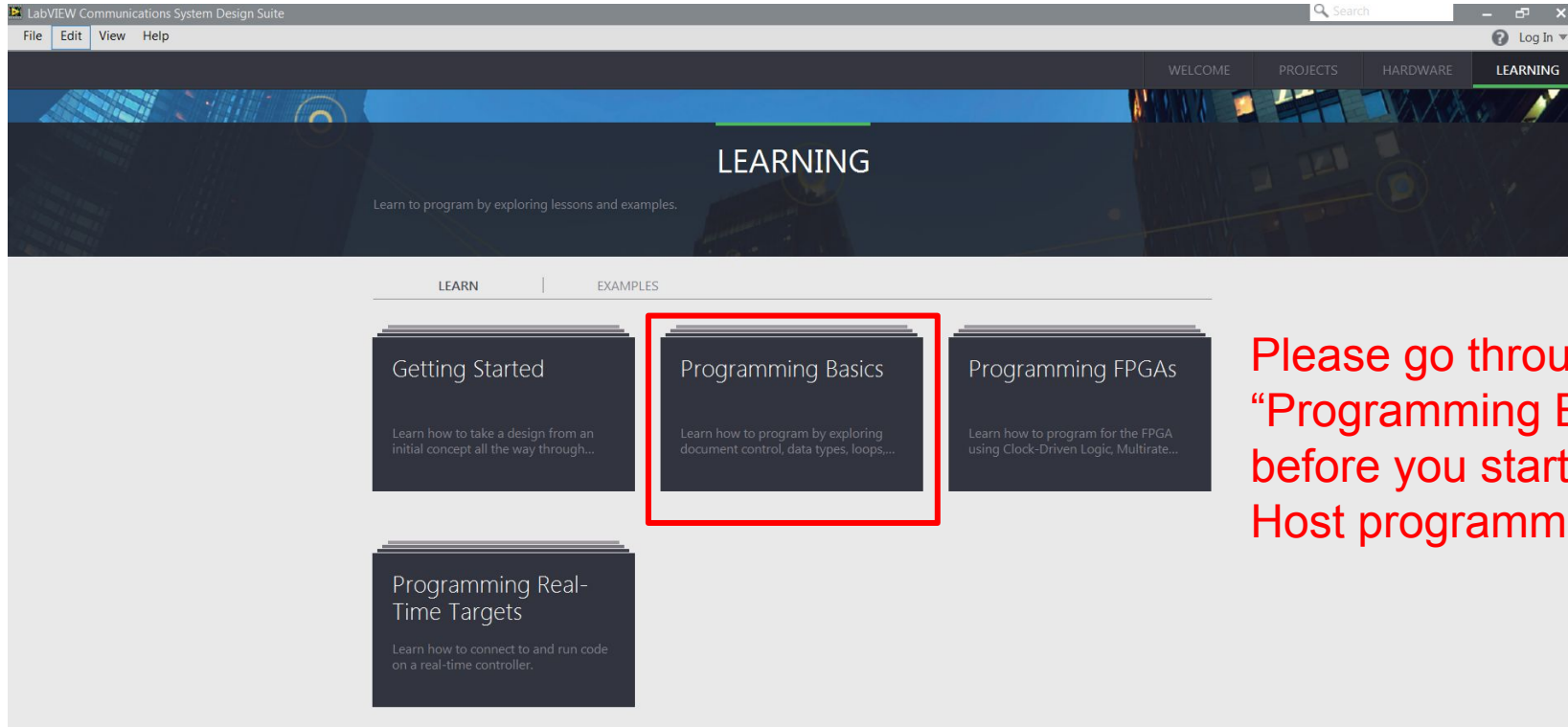# WiMAC Bootcamp: Week 1

WiMAC Team

Warm-Up: LabVIEW Communication Examples

Please go through "Programming Basics" before you start LV Host programming

Programming Basics

<

Designing a User...

This lesson illustrates how to design a user interface, or UI, for a program.

Controlling the...

Learn how to use diagram components to define what happens to your data while your VI runs.

Storing and...

This lesson demonstrates how to capture, store, view, and analyze data.

Debugging Your...

Learn where to find and how to use debugging tools to troubleshoot your code.

Identifying and...

Learn how to create code that is scalable and reusable.

Basic Data Types

This lesson illustrates the basic data types available in graphical programming.

Arrays

This lesson illustrates how to create and manipulate arrays.

Clusters

This lesson teaches you how to create and manipulate clusters.

While Loops

This lesson teaches you how to use a While Loop to repeat code until a

TODOs and Timeline

Part 1: Hook up LV Host and VLC player: 2 week ⬅— We are here

Part 2: Implement basic scheduling in FPGA: 3 weeks

Part 3: Implement our smart policy: 4 weeks

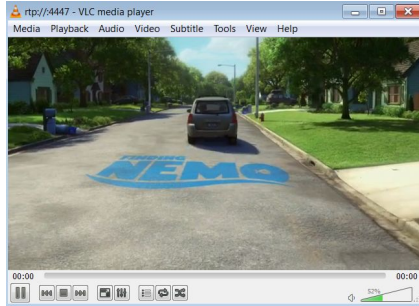Part 4: Verification and more advanced topics: 3 weeks

Part 5: Produce a demo video: 2 weeks
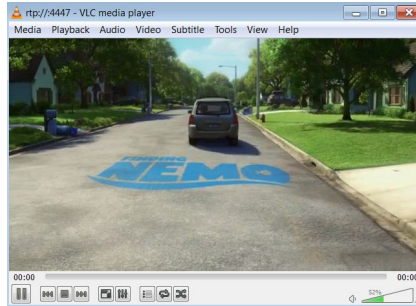
Let's target "Dec 15, 2017" for this mini-project!

Task 1: Stream 1 Video to 1 UDP Sink

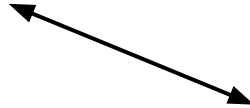# Task 1: Stream 1 Video to 1 UDP Sink

VLC (Source)

VLC (Sink)

- Use vanilla version
- Use RF Loopback
(MAC source address
= MAC destination address)

LabVIEW Host

LabVIEW FPGA

Task 1 Highlights: Stream 1 Video to 1 UDP Sink

- Use the vanilla version which supports 1 UDP source

- All you need to do is change the front panel settings
  - UDP source and UDP sink

- See the following 3 pages about how to hook up LV Host and VLC player

- Note: You can run the LV code using 1 USRP RIO with RF loopback

802.11 Application Framework: Vanilla Version
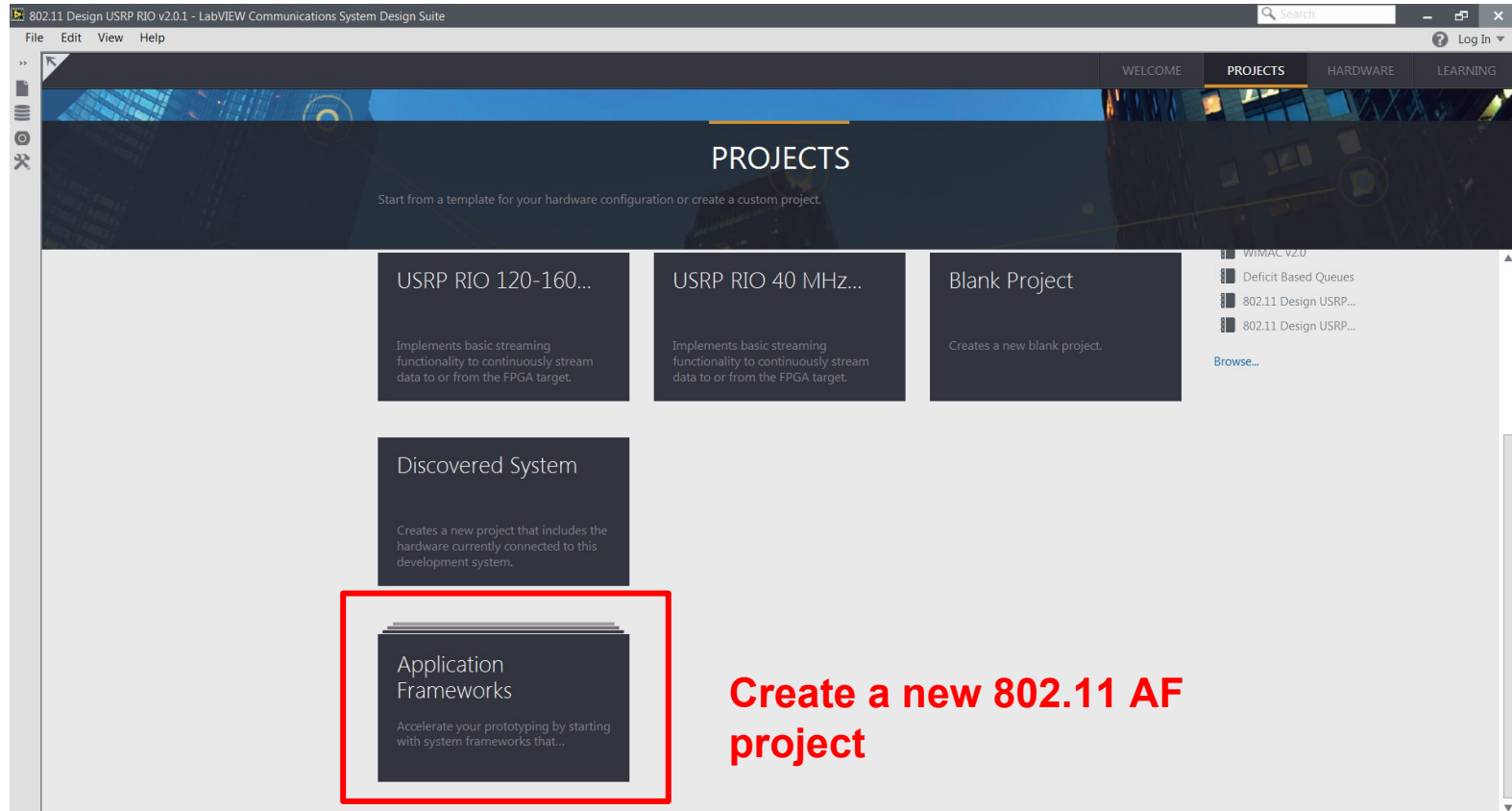
Hint: Hook Up RX and VLC Player: LabVIEW Host
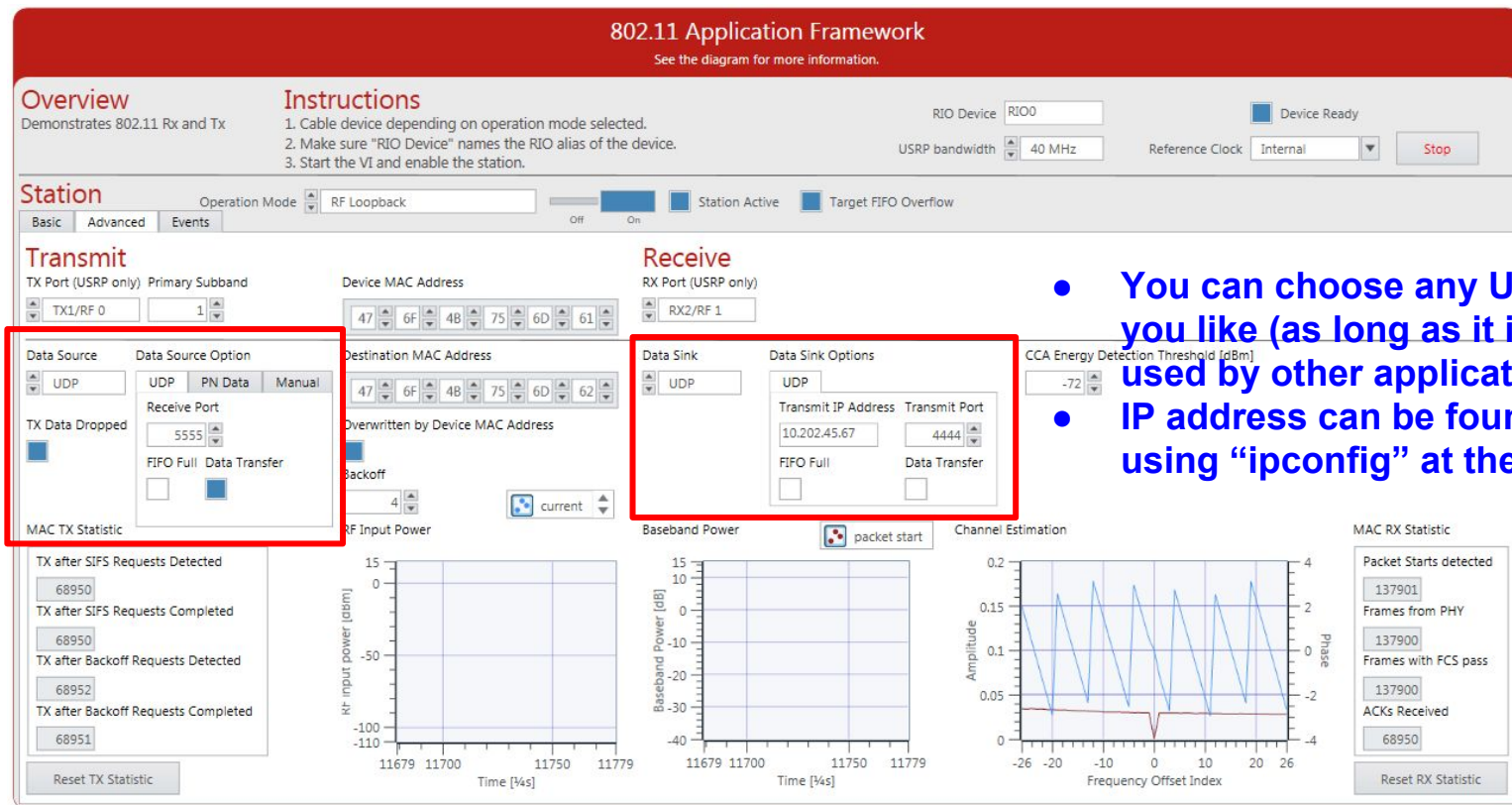
- **You can choose any UDP port you like (as long as it is not used by other applications)**
- **IP address can be found by using "ipconfig" at the Terminal**

Hint: Hook Up RX and VLC Player: Source

- UDP source: VLC application
  - Media -> Stream, then "Add" a video file and press "Stream"
  - Select "RTP/MPEG Transport Stream" and check "Display locally", then press Add
  - Type in the IP address and UDP port # of the Host machine
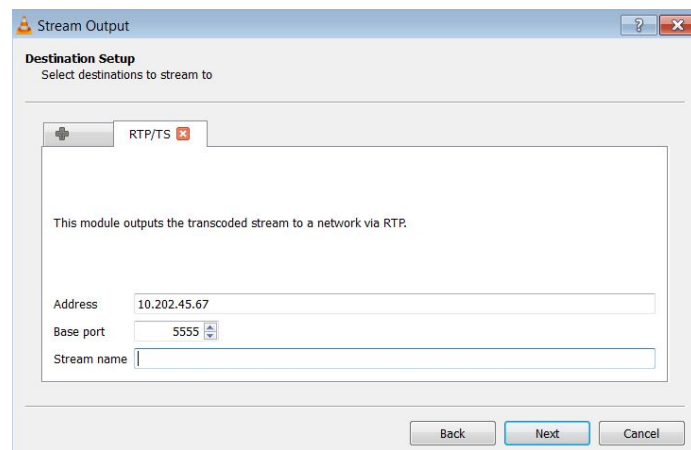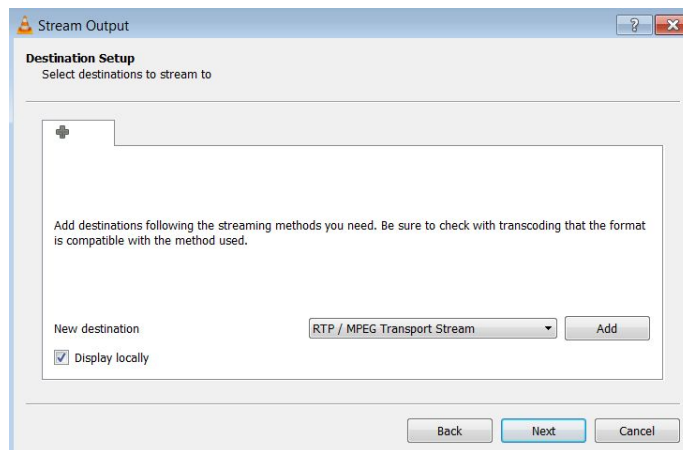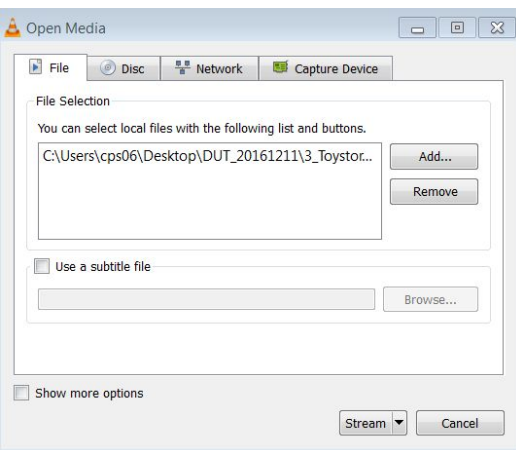
Hint: Hook Up RX and VLC Player: Sink

- UDP sink: VLC application
  - Media -> Open Network Stream, then enter the network URL (e.g. rtp://@:4444, 4444 is the port # of UDP sink)
  - Then, click "Play"
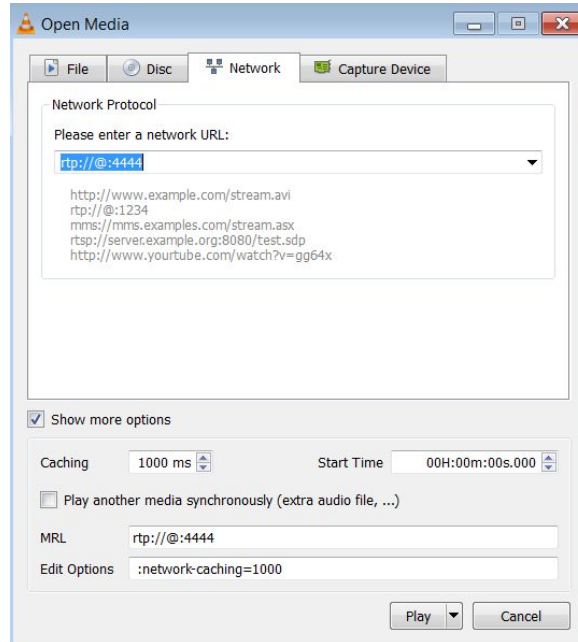
Task 2: Stream 5 Videos to 1 UDP Sink
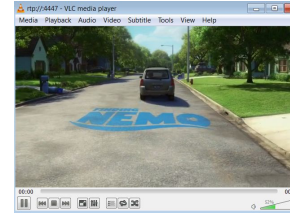
Task 2: Streaming Multiple Videos on WiMAC
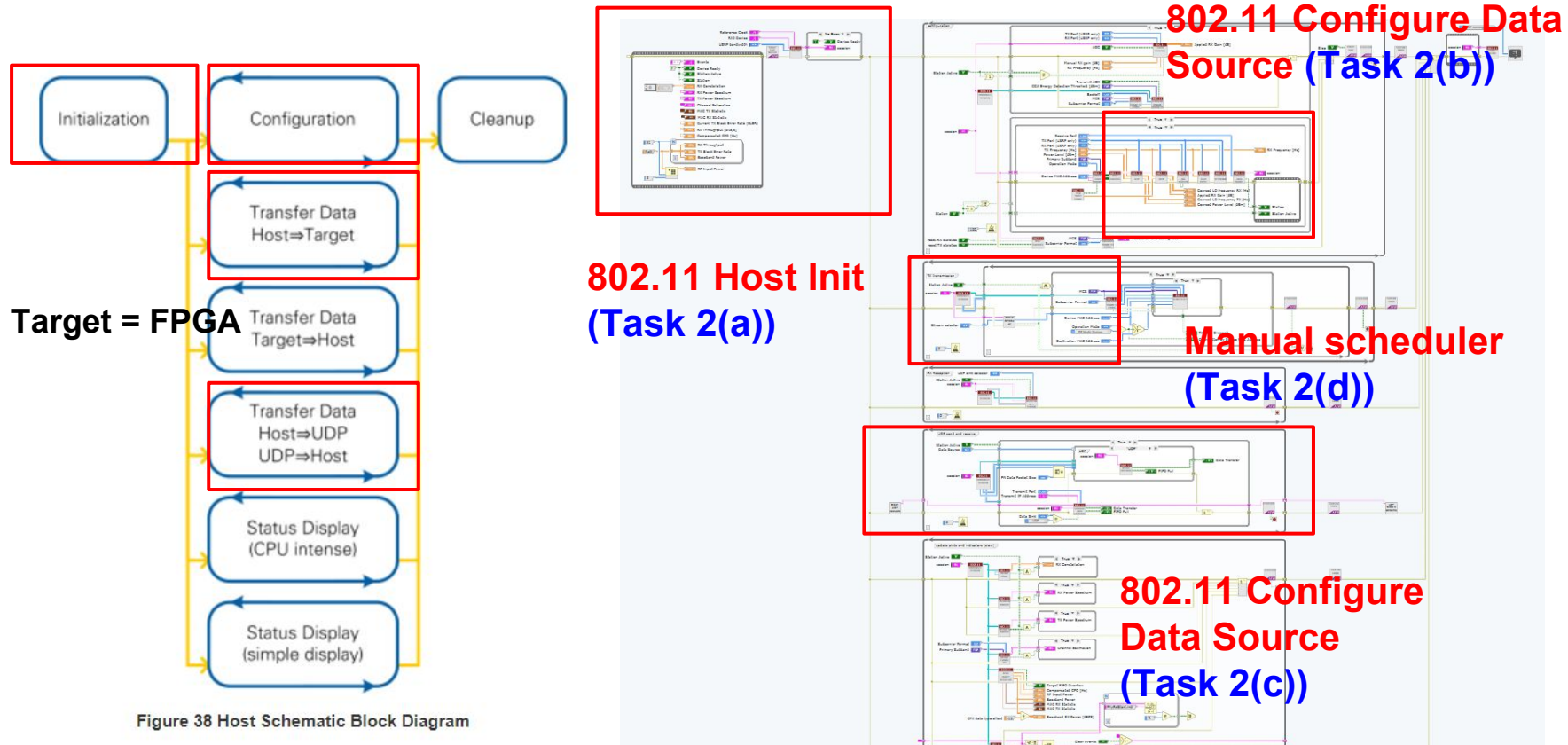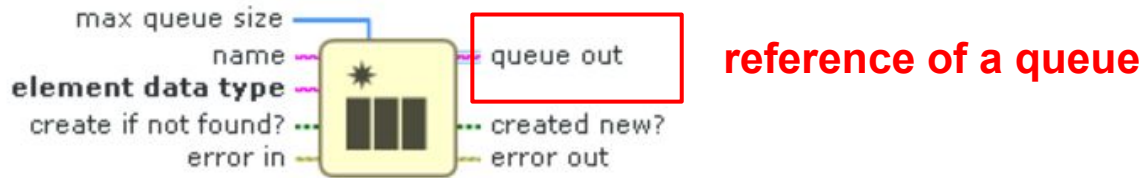
Task 2 Highlights: Stream 5 Videos to 1 UDP Sink

- Extend the vanilla version so that it supports 5 UDP sources
- All you need to do is change Host code

  - Task 2(a): Create 5 Host queues (See "802.11 Host Init")

  - Task 2(b): Create 5 UDP sources (See "802.11 Configure Data Source" and "802.11 Receive UDP Data")

  - Task 2(c): Push data from 5 UDP sources to 5 Host queues

  - Task 2(d): Create a manual video scheduler (a new module) so that you can choose 1 out of 5 video streams anytime

- How to test? Manually schedule 1 video stream using a front panel control

Top-Level VI (802.11 Host.gvi)

Figure 38 Host Schematic Block Diagram

Target = FPGA

802.11 Configure Data Source (Task 2(b))

802.11 Host Init (Task 2(a))

Manual scheduler (Task 2(d))

802.11 Configure Data Source (Task 2(c))

Task 2(a): Host Queues

- Create a queue by using "Obtain Queue"

max queue size
name
element data type
create if not found?
error in

queue out   **reference of a queue**
created new?
error out

- "Enqueue" and "Dequeue" and more

Task 2(a): How to Create 5 Host Queues?

- 802.11 Host Init.gvi
- In vanilla version, only 1 "send queue"

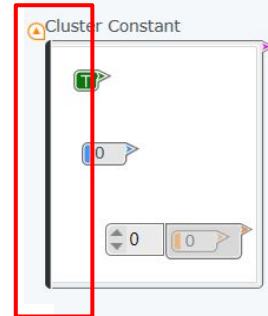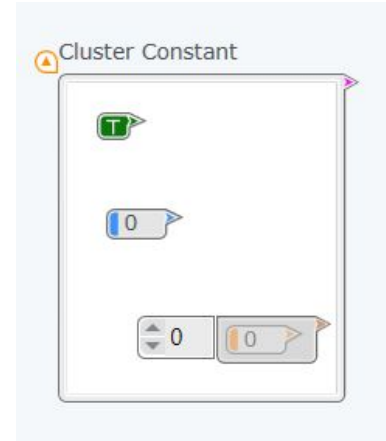**Group into "session" type**

Obtain Queue
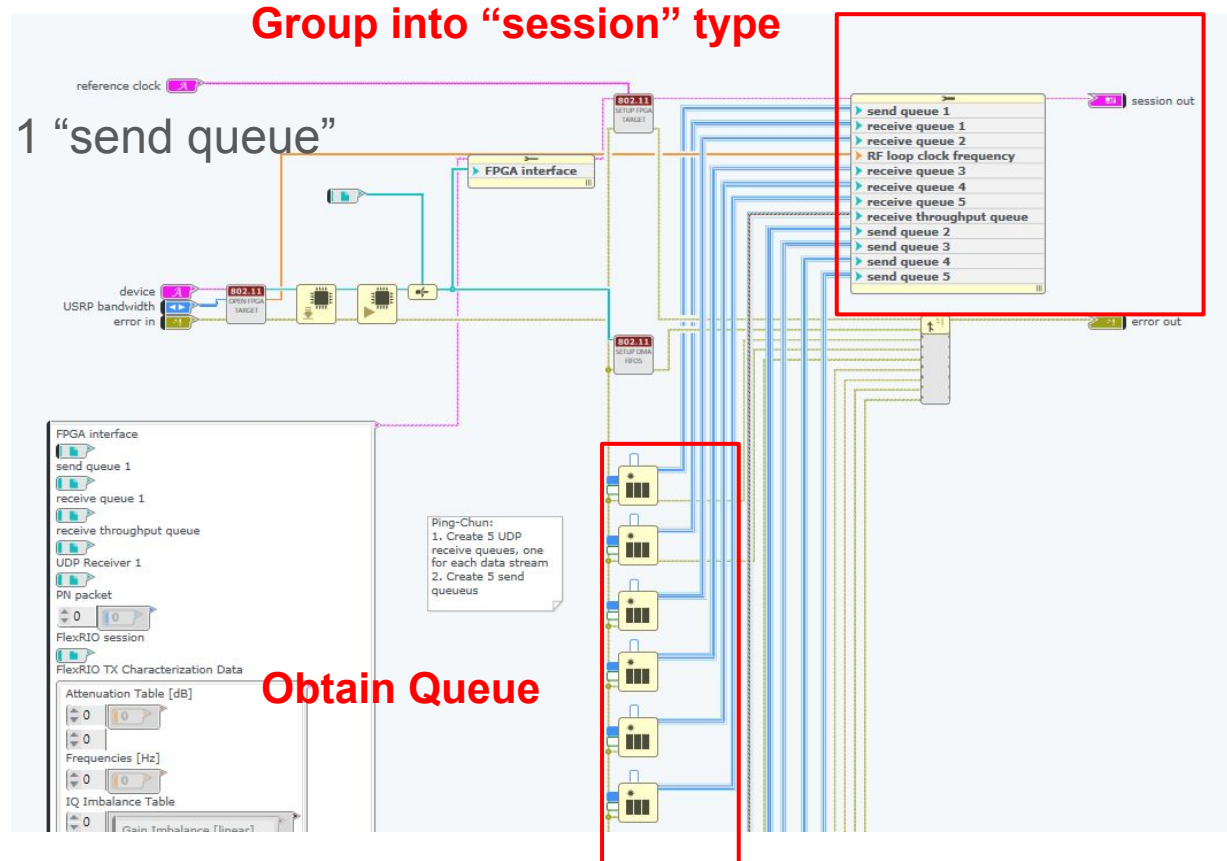
Session: "Cluster" & "Type Definition"

- Cluster = a group of elements
  - Possibly different data types

- Type = similar to "struct" in C language
  - "Type" can be created from cluster
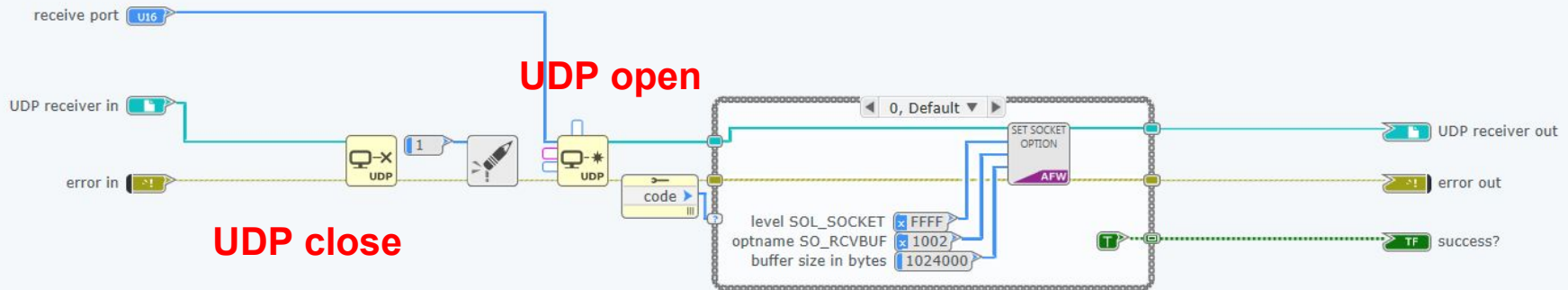 - A cluster can be connected/not connected to a type
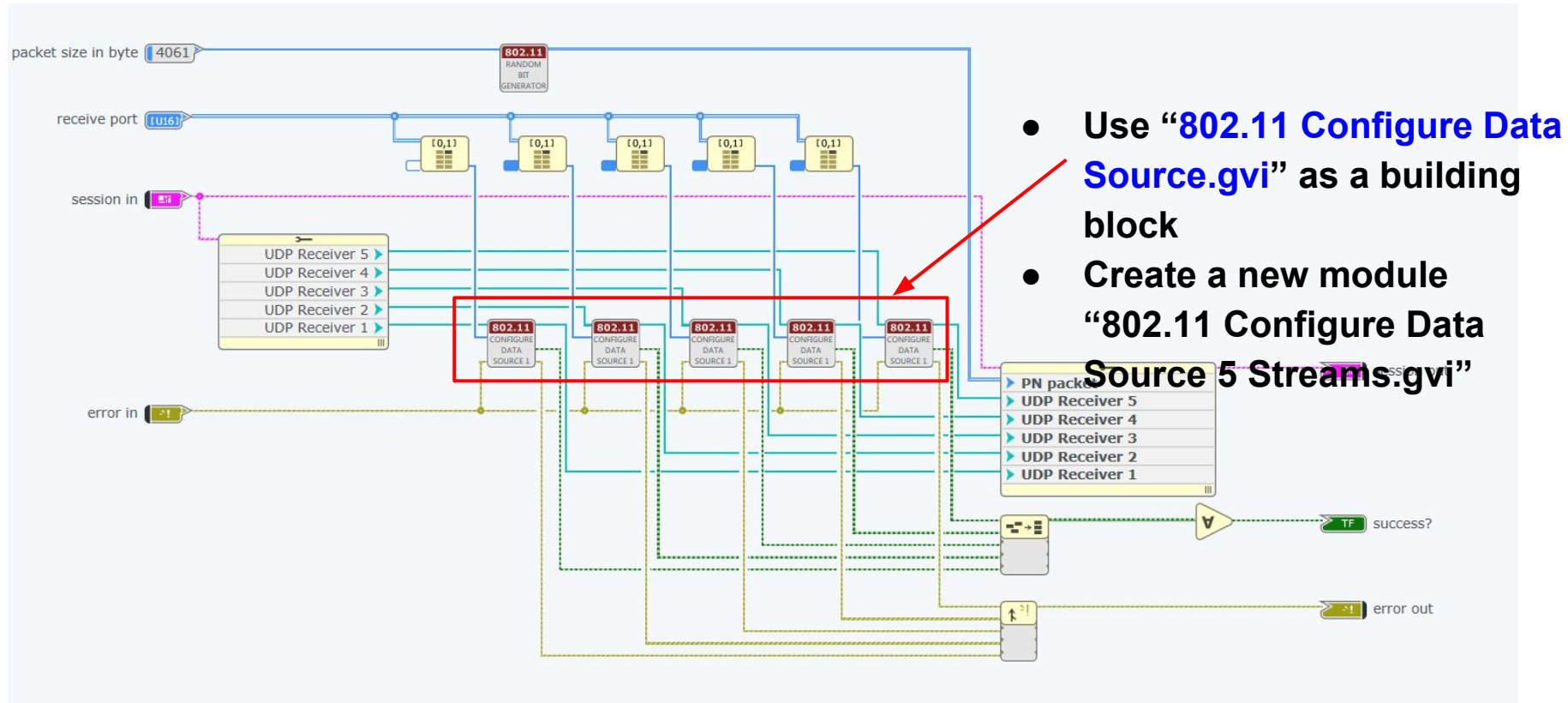

Type definition

Task 2(b): UDP Source

- See "802.11 Configure Data Source.gvi"
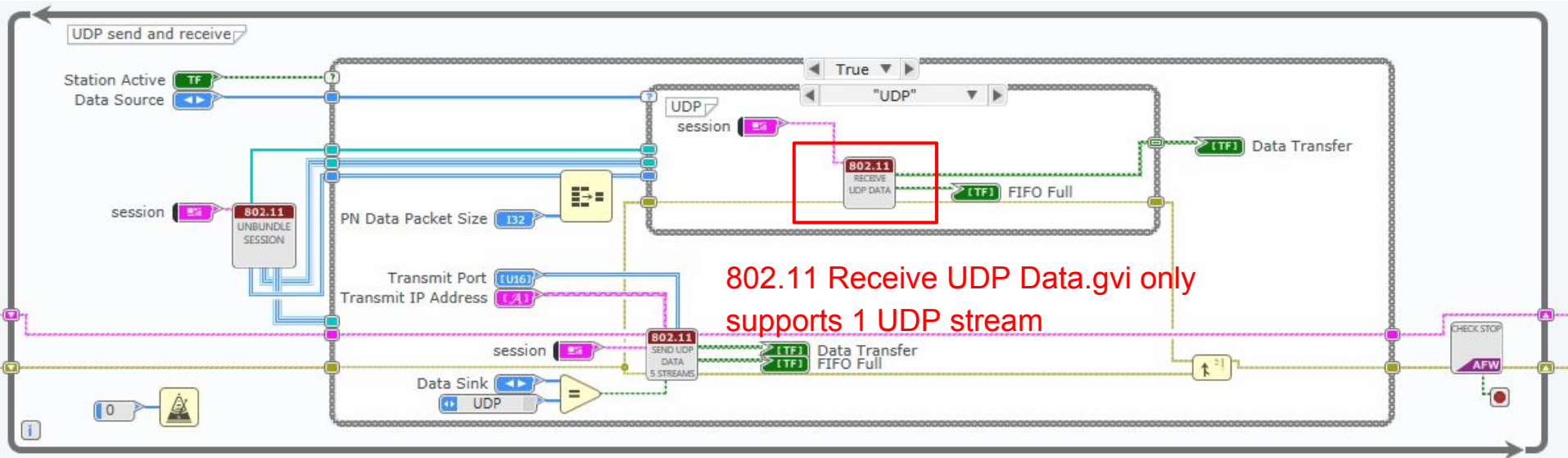- Follow the same approach and create 4 more UDP receiver

Hint: Configure 5 UDP Sources

- Use "**802.11 Configure Data Source.gvi**" as a building block
- Create a new module "**802.11 Configure Data Source 5 Streams.gvi**"

Task 2(c): Push Data from UDP to Host Queues

- While loop for UDP send and receive
  - Please see 802.11 Receive UDP Data.gvi

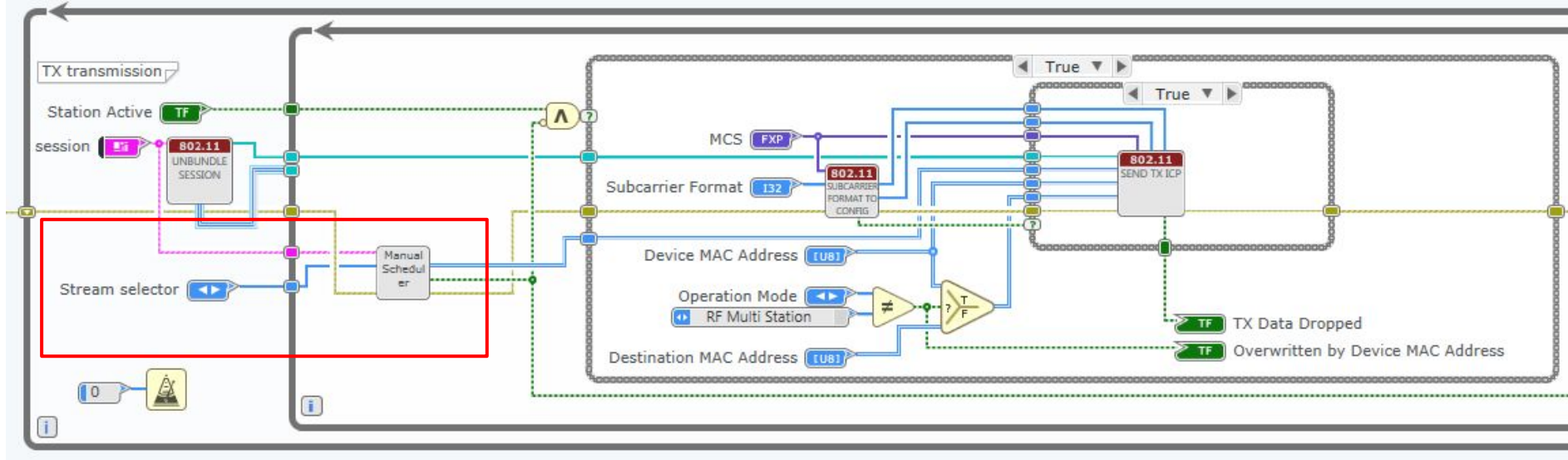802.11 Receive UDP Data.gvi only supports 1 UDP stream

Hint: Push UDP Data to 5 Host Queues

- **Create a new module "802.11 Receive UDP Data 5 Streams.gvi"**
- **Follow the same approach as the original "802.11 Receive UDP Data.gvi", but with 5 UDP sources and 5 Host queues**
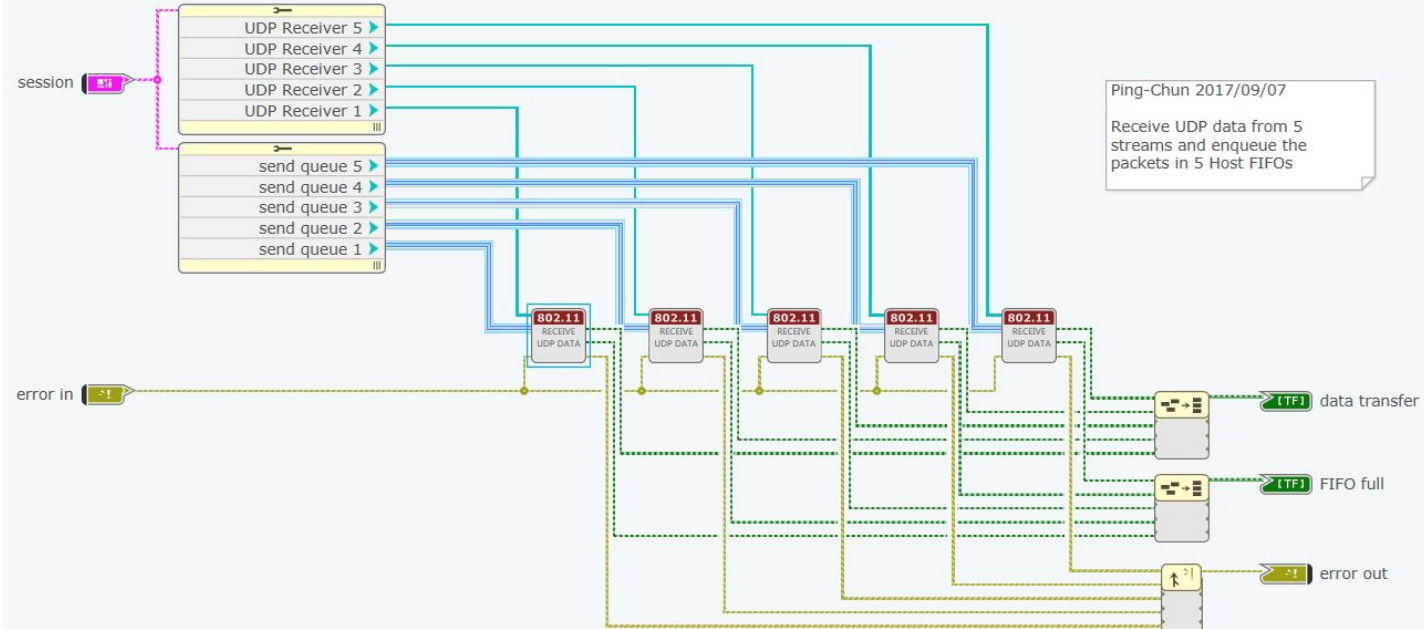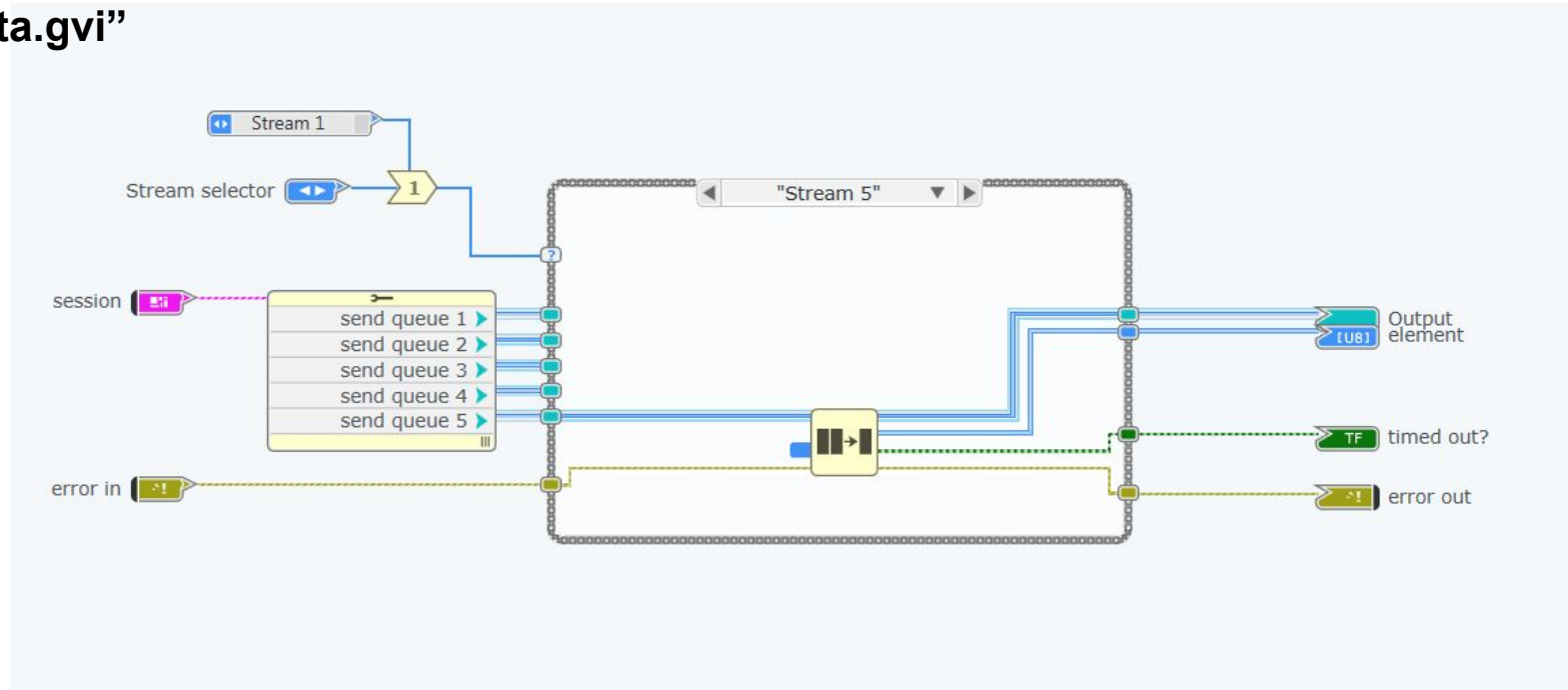
Task 2(d): Manual Scheduler

- In the While loop for TX Transmission
  - Create a new module "Manual Scheduler"

Hint: Manual Scheduler

- **Create a new module "Manual Scheduler.gvi"**
- **Follow the same approach as the original "802.11Receive UDP Data.gvi"**

Hint: Manual Scheduler

- Put the control "Stream selector" on the front panel

Last But Not Least!

1. ALWAYS PUT COMMENTS in your code!!!
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3. ALWAYS PUT COMMENTS in your code!!!
4. Take snapshots and write your own technical documents
5. Check in your code to GitHub (recommended)
6. Whenever you have a question, check the online manual first:
7. http://www.ni.com/documentation/en/labview-comms/2.0/manual/labview-comms-manual/
8. http://www.ni.com/white-paper/53279/en/