

Lab 1: Labview and USRP

NTU Communication Laboratory

Outline

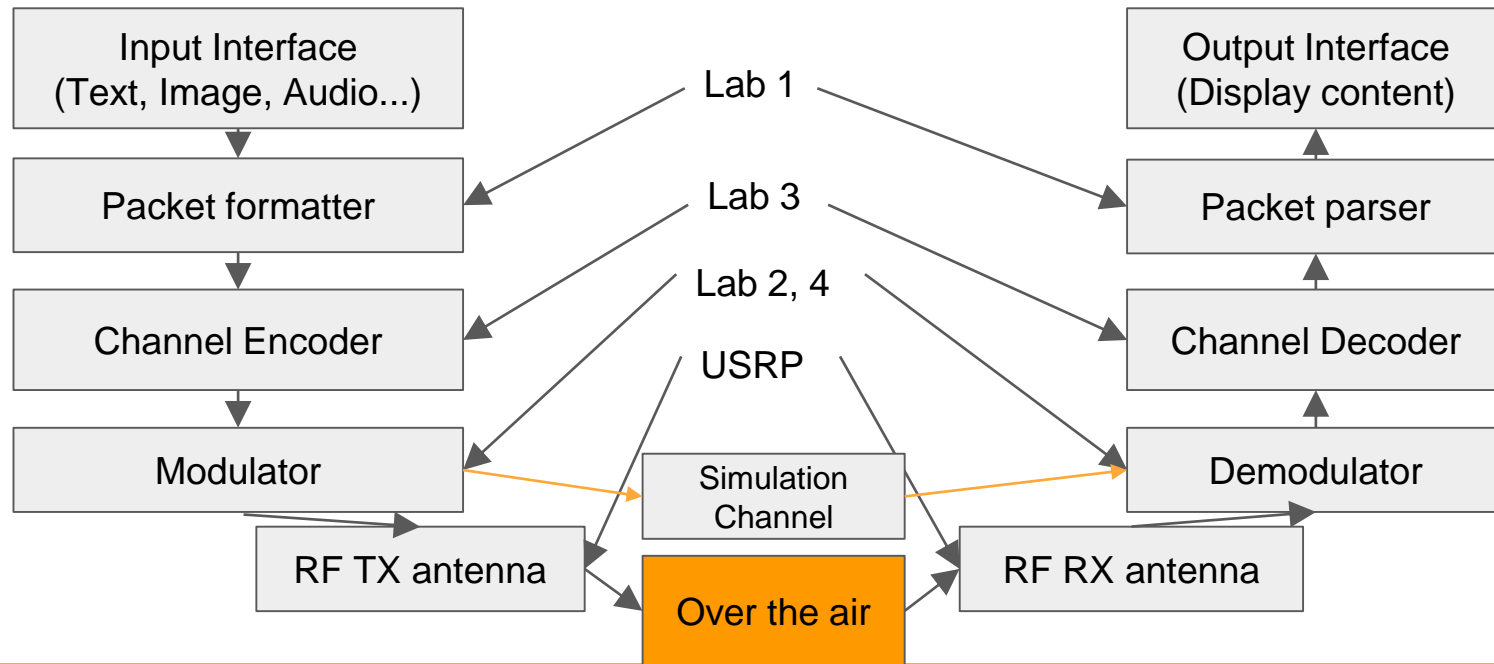
- 基本原理與系統架構
 - 基本原理與實驗目的
 - 相關module的I/O
 - 系統架構
- 模擬與實驗
 - LABVIEW模擬
 - USRP實作

基本原理與系統架構

- 基本原理與實驗目的:
 - 熟悉Labview語法與操作
 - 學習以封包形式分割資料
 - 熟悉USRP之操作方法

基本原理與系統架構

● 系統架構



基本原理與系統架構

- 相關module的I/O
 - Queue modules:
 - ✓ Get queue status
 - ✓ Enqueue
 - ✓ Dequeue
 - Modulation toolkit:
 - ✓ System parameters
 - ✓ Pulse shaping coefficient generator
 - ✓ AWGN channel simulator

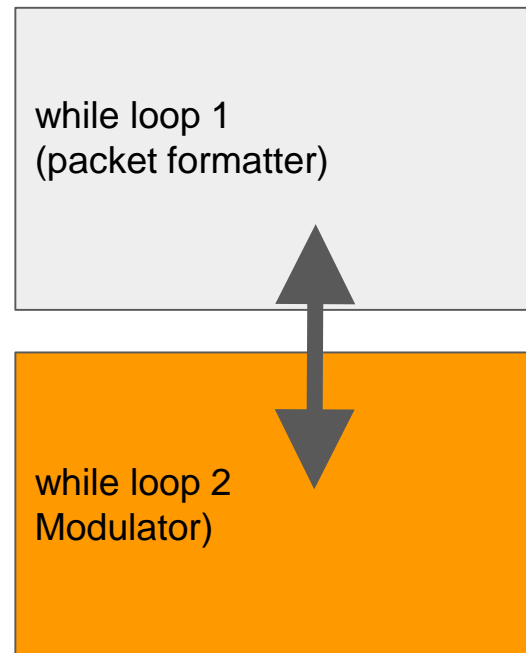
Queue

◆ 為什麼需要使用他？

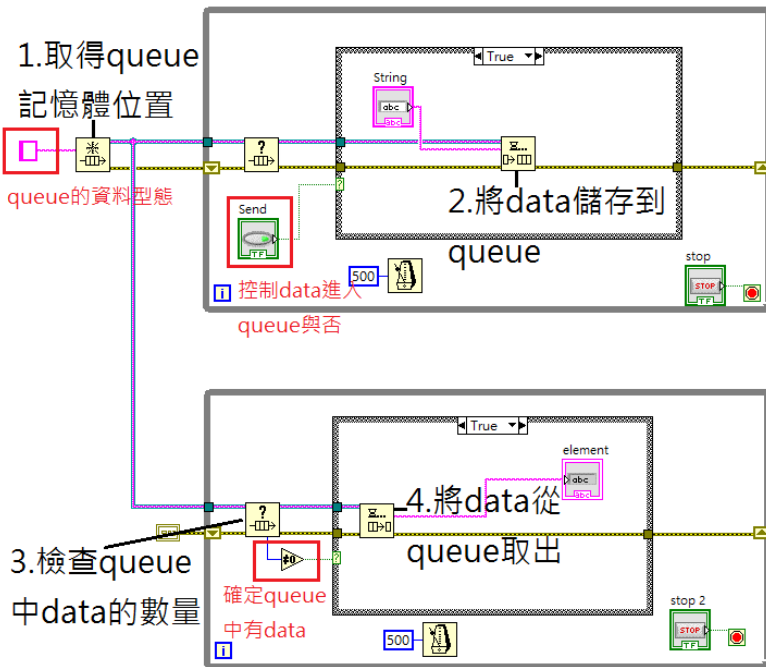
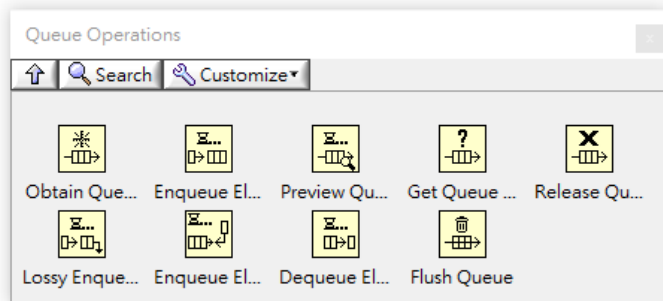
1. 將資料流在不同迴圈中傳遞
2. 使不同資料流獨立運作

◆ 重要概念:

1. Queue本質為一記憶體位置，因此不同迴圈皆可存取
2. 呼叫queue相關函數前必須確定queue status



Queue 使用範例



LabVIEW 模擬

- 實驗內容

- Packet formatter

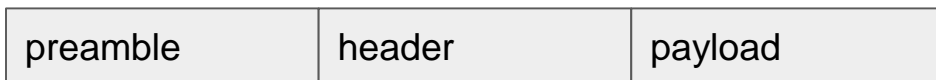
- ◆ 以封包形式傳輸資料, 並且將收到封包的資訊還原
 - ◆ 學習基本的封包標頭格式, 並知道欄位的功能

- Basic communication system

- 使用LabVIEW模擬通信系統之傳輸

Exercise-packet formatter

- **簡介:** 一般通信系統常用封包形式傳遞資訊，常見之封包格式如下:



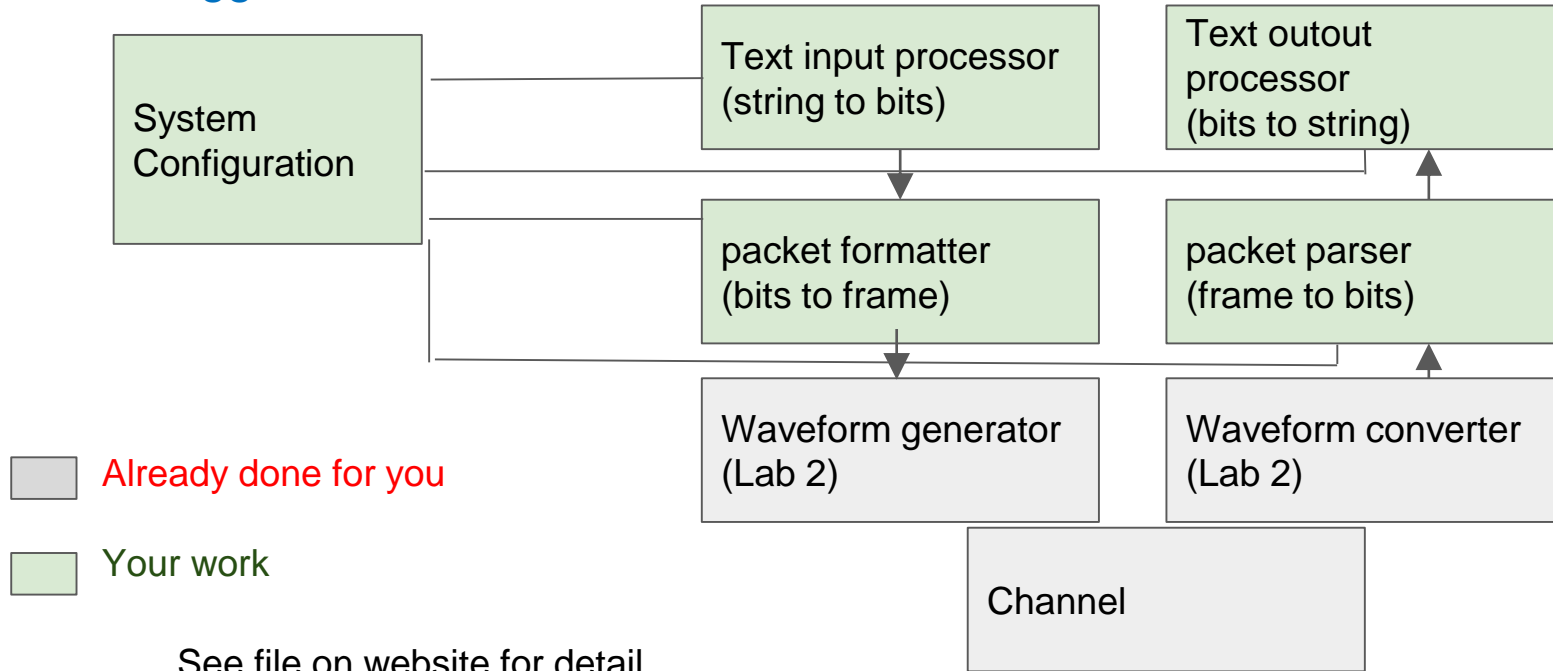
- **各欄位功能:**

- preamble: 對於傳輸端與接收端，已知的一段資訊，作為辨識封包開頭的信號
- header: 封包的標頭，通常說明傳收端的網路位置，也常會含有解碼封包內容的資訊
- payload: 封包攜帶之內容

- **如何辨識並且解開封包? Discuss with your team members**

Exercise-packet transceiver

- Suggested structure:



See file on website for detail

USRP實作

- 內容:

- 結合封包傳收系統，並利用LabVIEW內建之通信系統工具，傳收封包
- 學習如何整合USRP到LabVIEW程式中並且能夠穩定的運作
- 操作USRP的RF參數以熟悉其功能

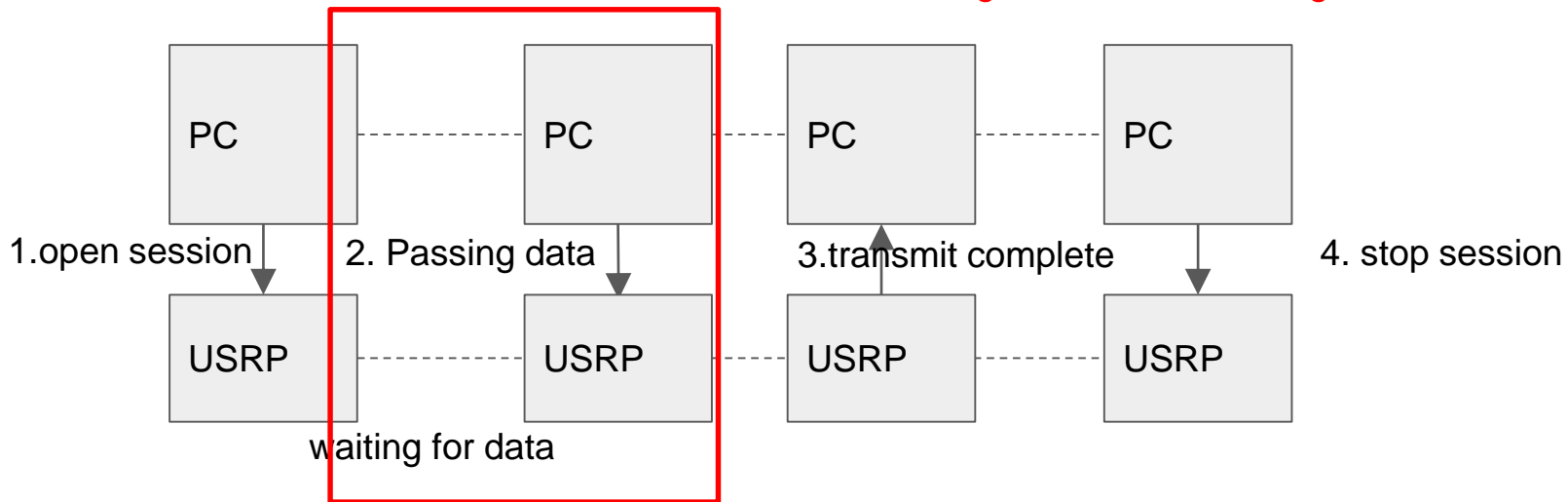
- 目標:

- 了解如何使用LabVIEW來控制USRP之傳收
- 學習如何有效率地將LabVIEW模擬程式，修改成可以USRP實驗的版本

USRP 運作流程

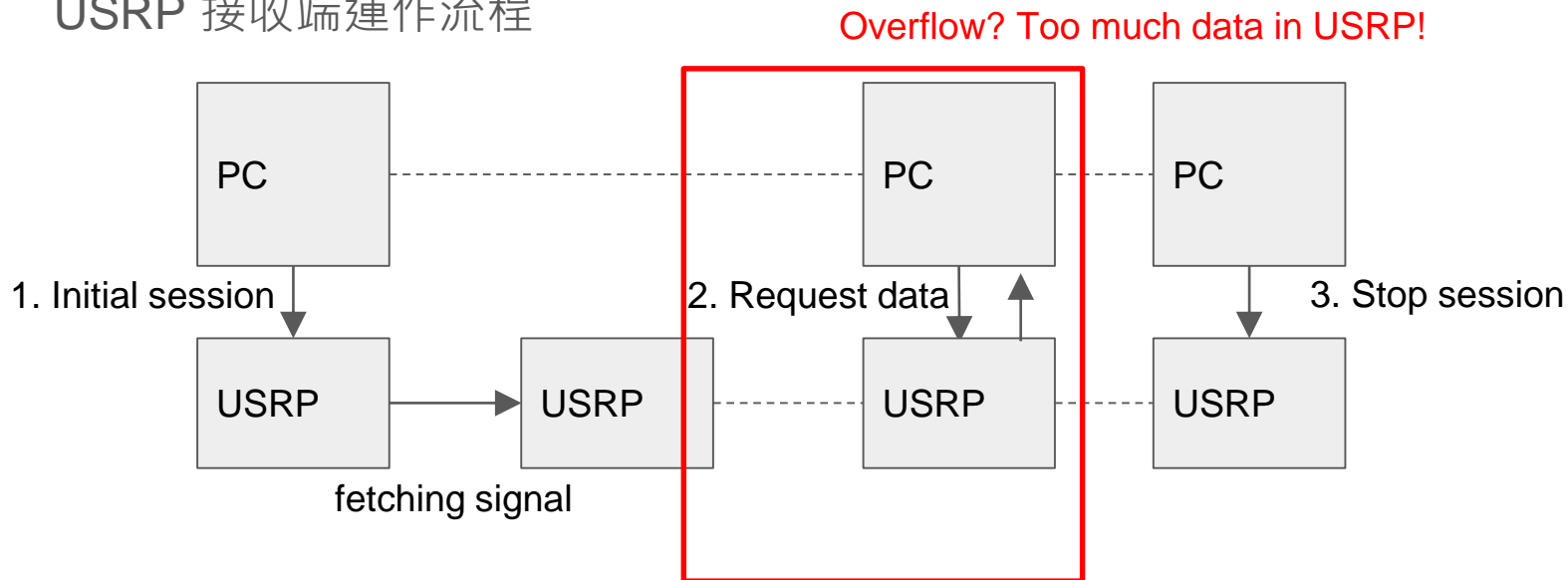
USRP 傳輸端運作流程

Underflow? USRP waiting for data, but nothing return.



USRP 運作流程

USRP 接收端運作流程

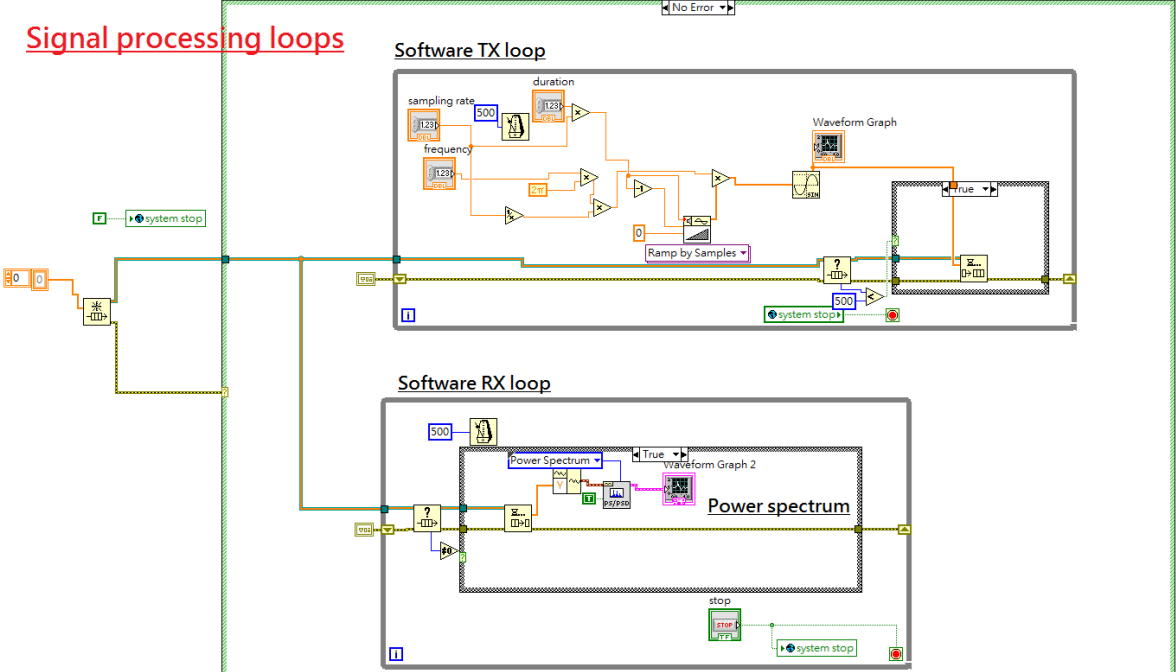


Tips for debugging USRP error

1. Check the RF parameters and configuration control
2. Search articles in NI forum
3. Ask TAs or teacher

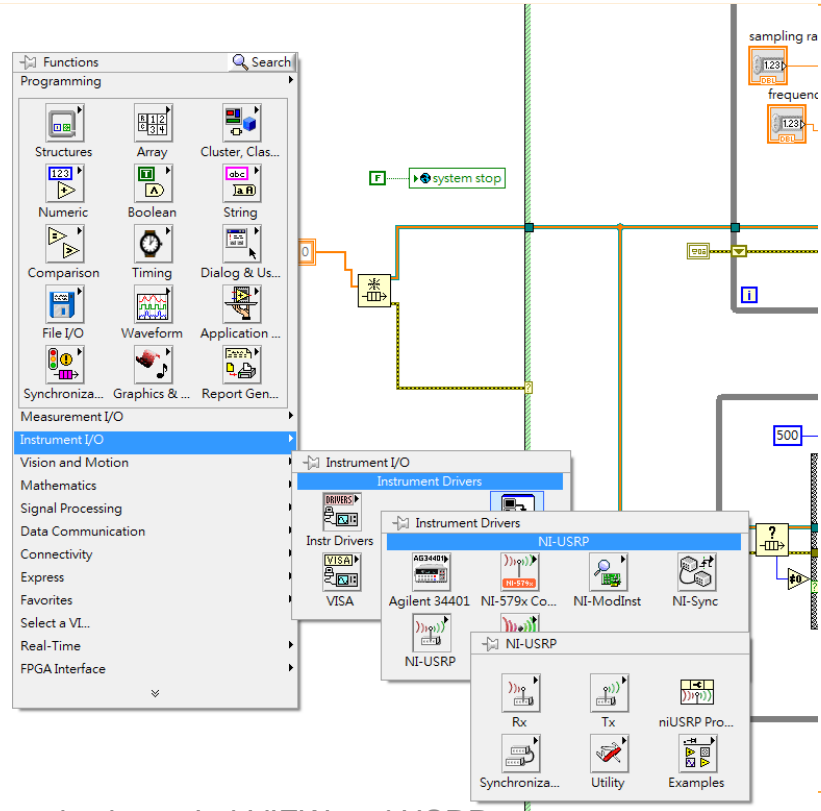
From LabVIEW to USRP

Lab1 example: sinewave signal generator



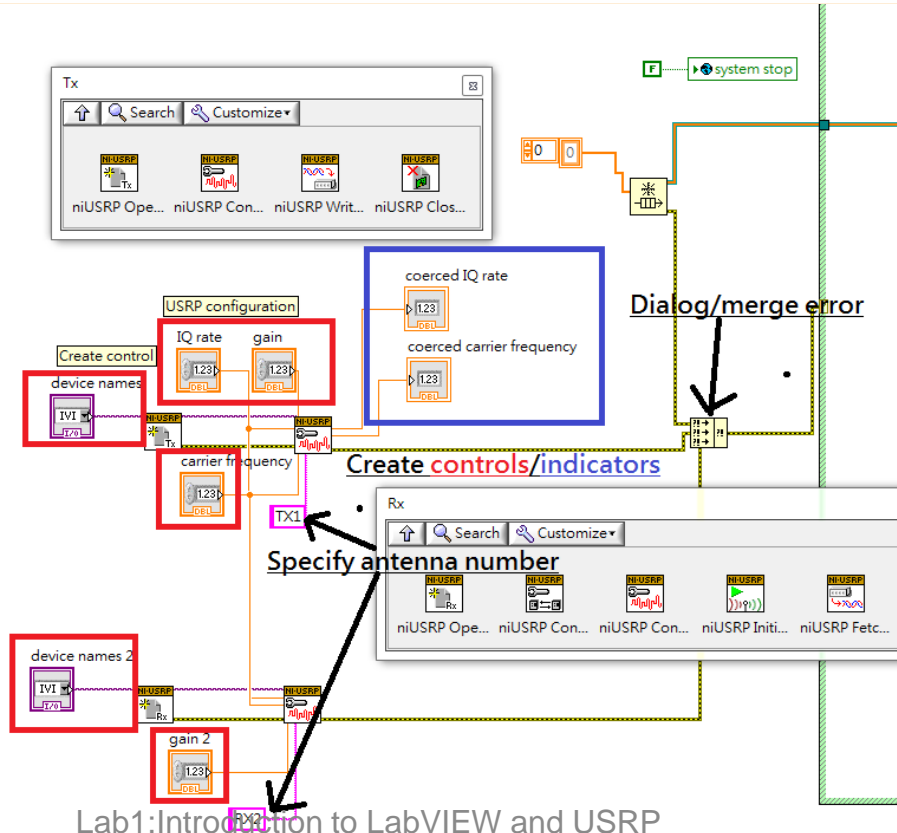
Create USRP interface

Step 1: find USRP modules



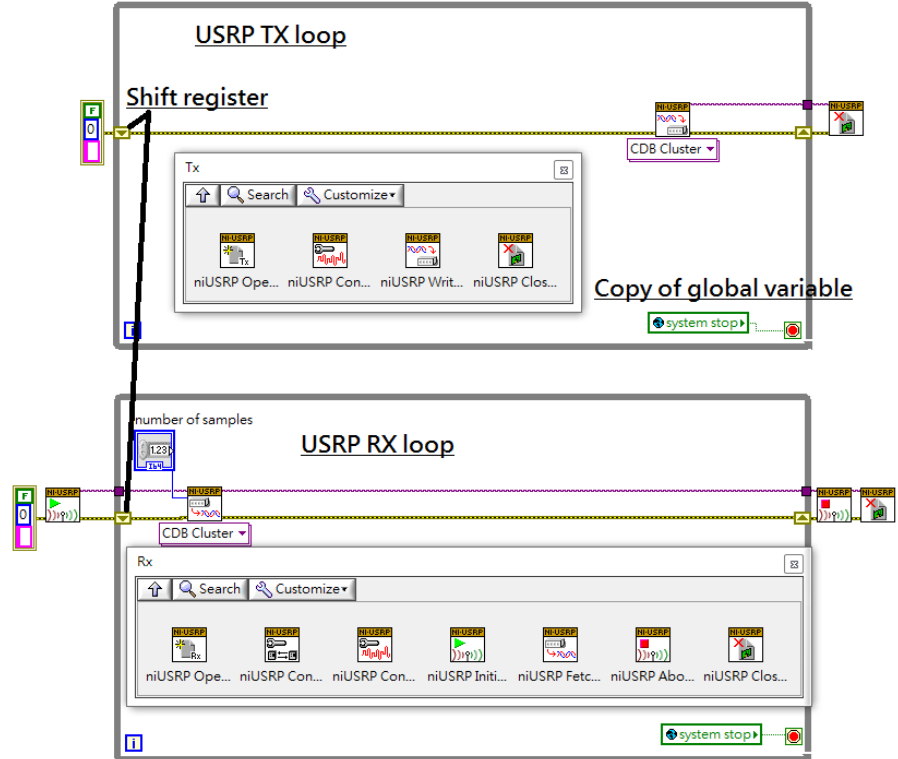
USRP configuration interface

Step 2: config. blocks

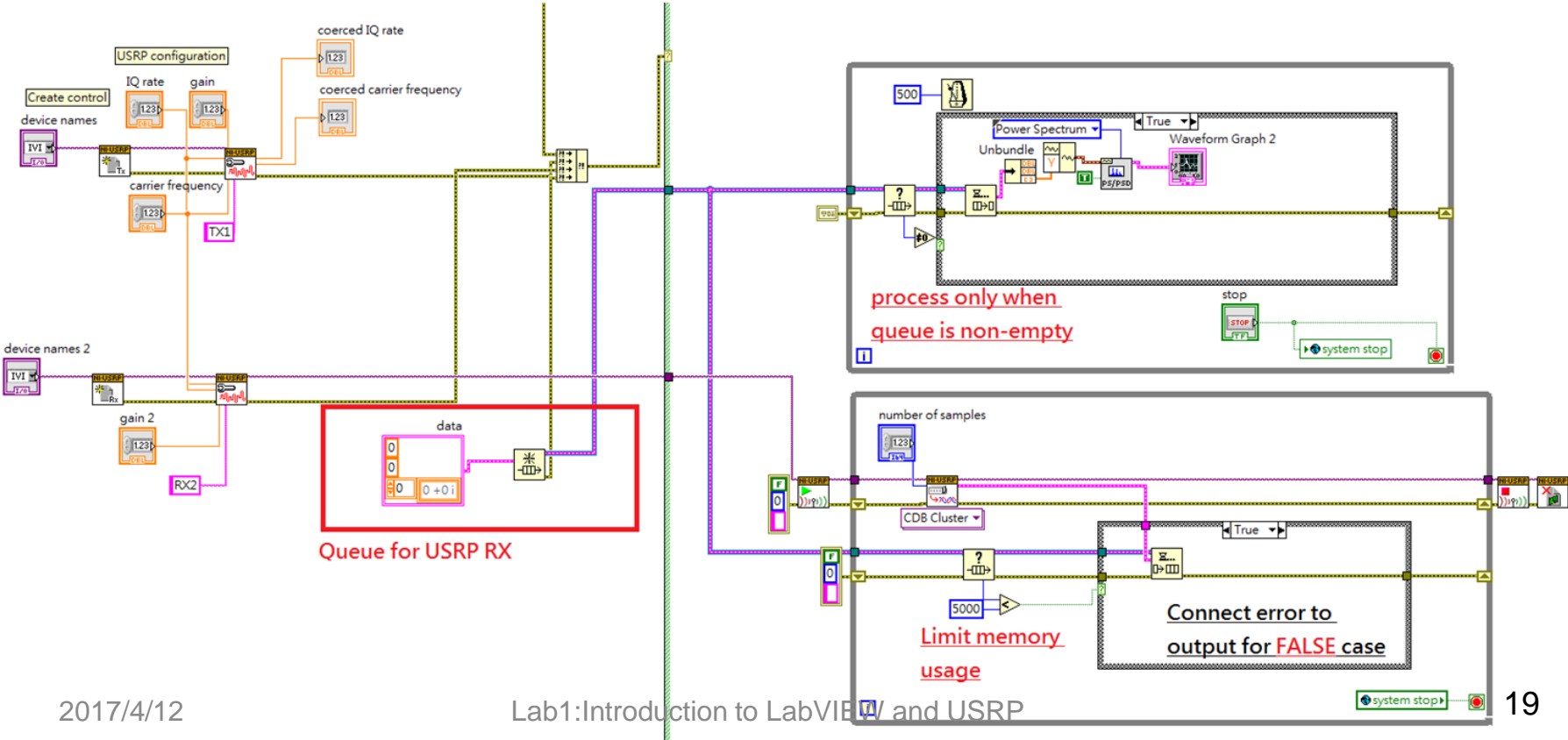


Create USRP-LabVIEW interface

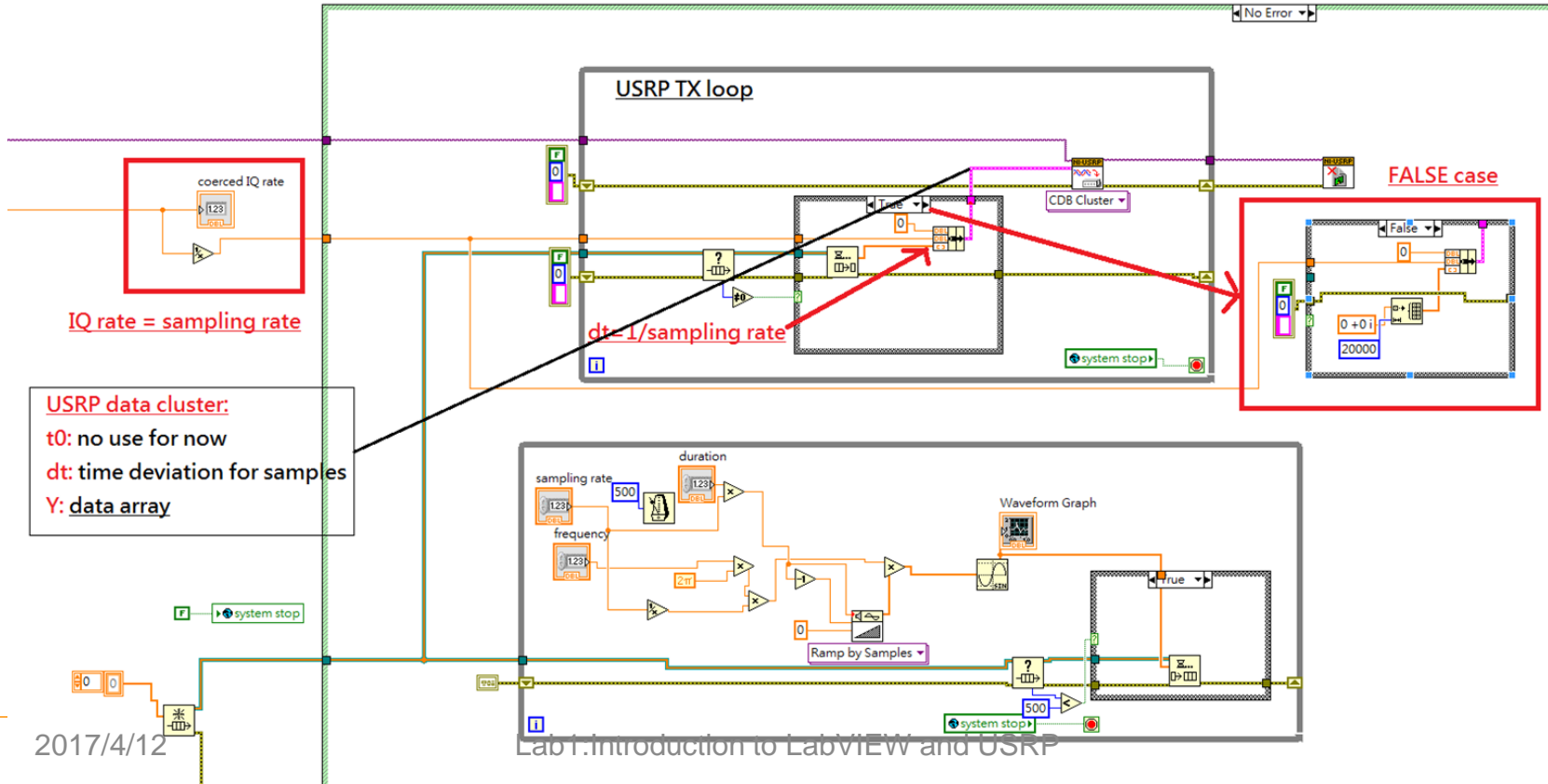
Step 3: create TX/RX loops



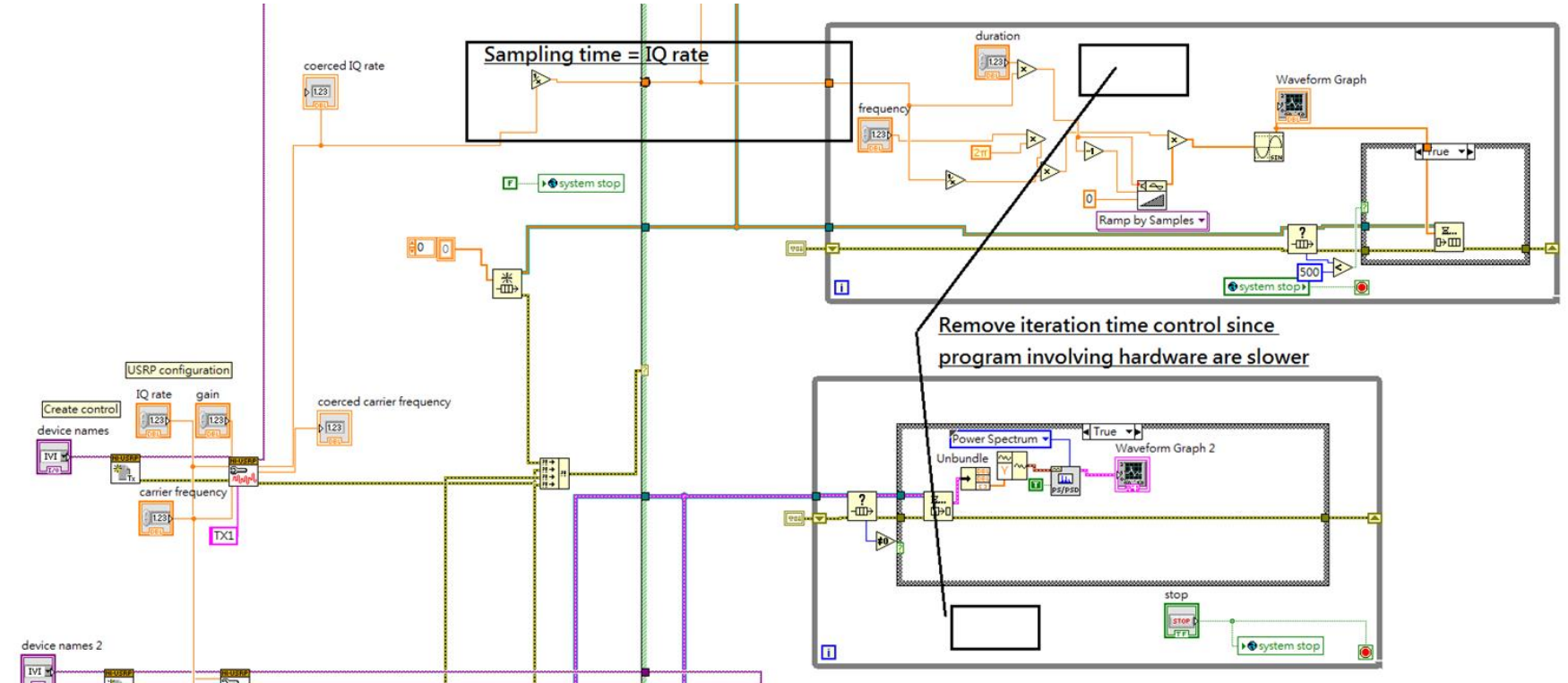
Modify RX loops



Modify TX loops



Modify signal processing loops



實驗問題

- 模擬:

1. 請讀取附件，並且將其代表的文字還原，列出在報告中
2. 將給定文字轉為bit level與給定答案做比對

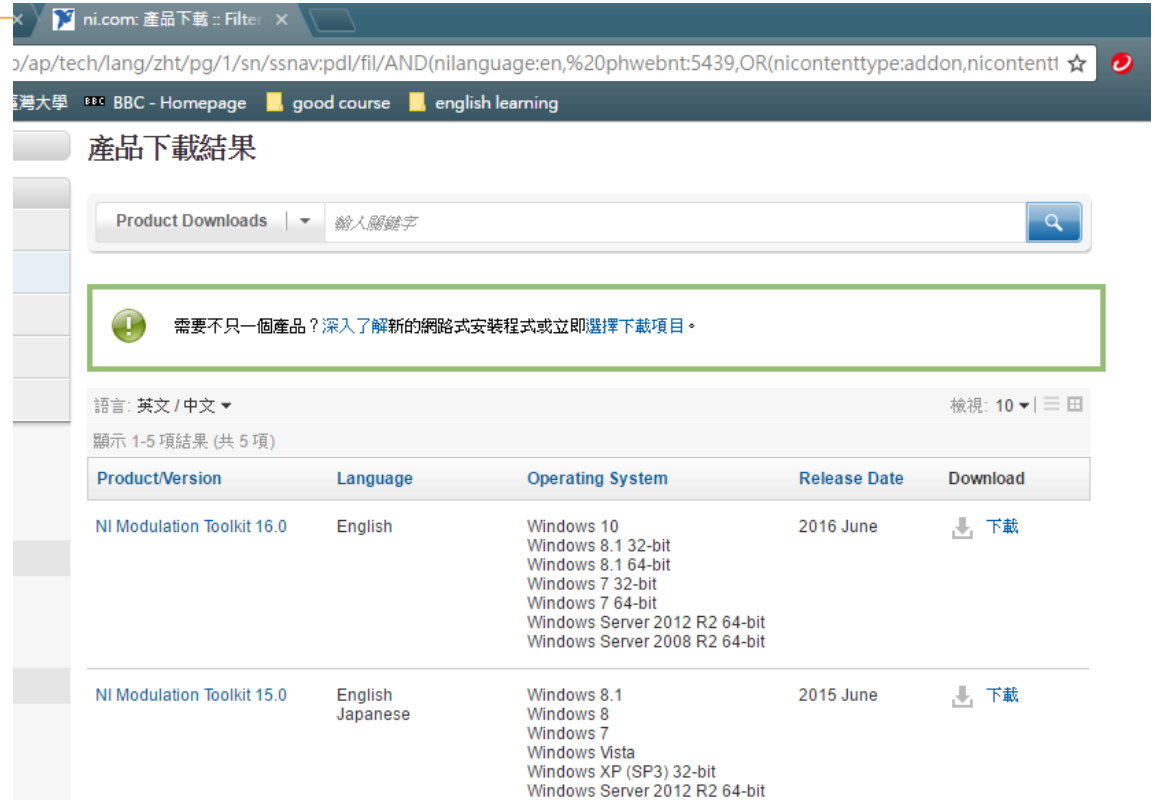
- USRP實驗:

1. 測試參數並記錄得到的結果
2. 按照handout 的指示將 LabVIEW simulation 改寫成USRP 程式

NI Modulation Toolkit Installation

NI Modulation toolkit

- Search “NI modulation toolkit” on NI support website
- Download the latest version
- Enter license number (same as LabVIEW 2014)



The screenshot shows the NI website's product download page. The browser address bar indicates the URL is [ni.com: 產品下載 :: Filter](http://ni.com/ap/tech/lang/zht/pg/1/sn/ssnav:pdI/fil/AND(nilanguage:en,%20phwebnt:5439,OR(nicontenttype:addon,nicontenttype:software))). The page title is "產品下載結果". A search bar contains the text "Product Downloads" and "輸入關鍵字". A green box highlights a message: "需要不只一個產品? 深入了解新的網路式安裝程式或立即選擇下載項目。". Below the search bar, there is a language selector set to "英文 / 中文" and a view selector set to "檢視: 10". The search results show 1-5 items out of 5 total. The table below lists the available products.

Product/Version	Language	Operating System	Release Date	Download
NI Modulation Toolkit 16.0	English	Windows 10 Windows 8.1 32-bit Windows 8.1 64-bit Windows 7 32-bit Windows 7 64-bit Windows Server 2012 R2 64-bit Windows Server 2008 R2 64-bit	2016 June	下載
NI Modulation Toolkit 15.0	English Japanese	Windows 8.1 Windows 8 Windows 7 Windows Vista Windows XP (SP3) 32-bit Windows Server 2012 R2 64-bit	2015 June	下載

Location of modulation toolkit in LabVIEW 2014

