



INTRODUCTION

Rafael Lin's work experiences in synaptics



Responsibility

- Developed application for touch controller, which is used by entire ecosystem. Key features include configuration tuning, diagnostic, performance evaluation and production test (WinForm/C# and C++)
- Designed/developed in-system firmware update and test application (C++)
- Provided customer support, such as performance/failure analysis and mass-production application (WinForm/C# and C++)
- Designed/developed windows library to communicate with touch controller firmware through Socket, I2C, SPI, HID and USB interface (C++)

Responsibility

Platform releases

Customer support

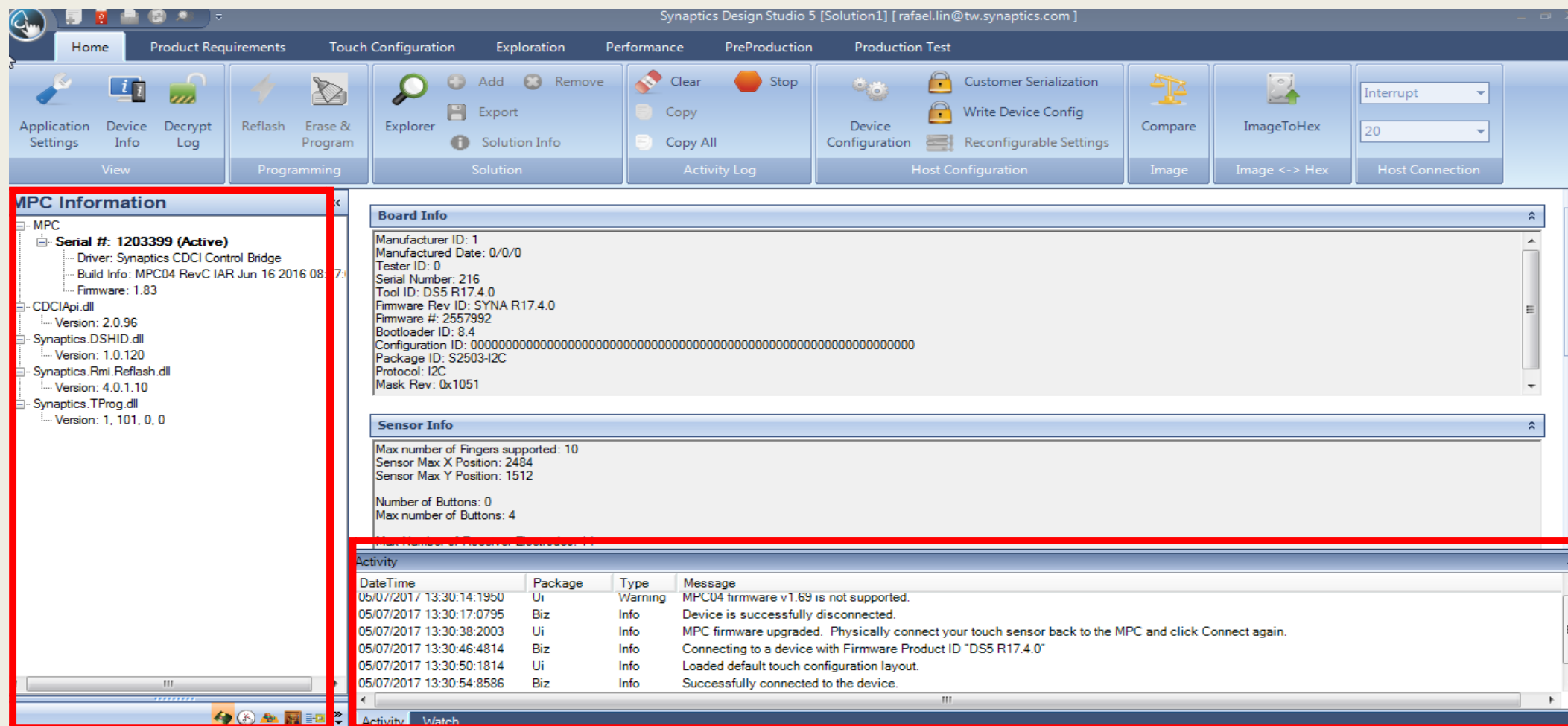
DS4	DS5	DS6	TSLite	Customer issues
Slim projects	LTDI LTS Wearable Proton	TDDI projects	LTS	All projects
DS4 3.5.5 DS4 3.5.6 DS4 4.1.0	DS5 7.0.0 DS5 7.1.0 DS5 7.2.0 DS5 9.1.0 DS5 15.3.0 DS5 17.1.0 DS5 17.2.0	DS6 1.0.0	TSLite 2.3.0.0 TSLite 3.1.0.0	DS4/5 X.X.X

DS5 Introduction

- The primary tool used from bring-up to mass production
- Each component is a plugin
 - *Flexible and useful for customization*
- Transfer data through multiple protocols
 - *Integrated CDCI API to communicate with Bridge Board(MPC04)*
 - I2C, SPI, WIFI, HID2USB
- RMI (register map interface)
 - *communication interface with touch controller*
 - *1) Function01 : control and configure touch controller*
 - *2) Function12 : 2D touch position*
 - *3) Function34 : Flash memory management*
 - *4) Function54 : test reporting and analog diagnostic*

The look of DS5

- **Side** : control panel ; **buttom** : activity panel ; **main** : major functionality



Control panel in DS5

- Provide connection status, control and basic diagnostic capacity.

The screenshot displays the DS5 Control Panel interface with four main tabs:

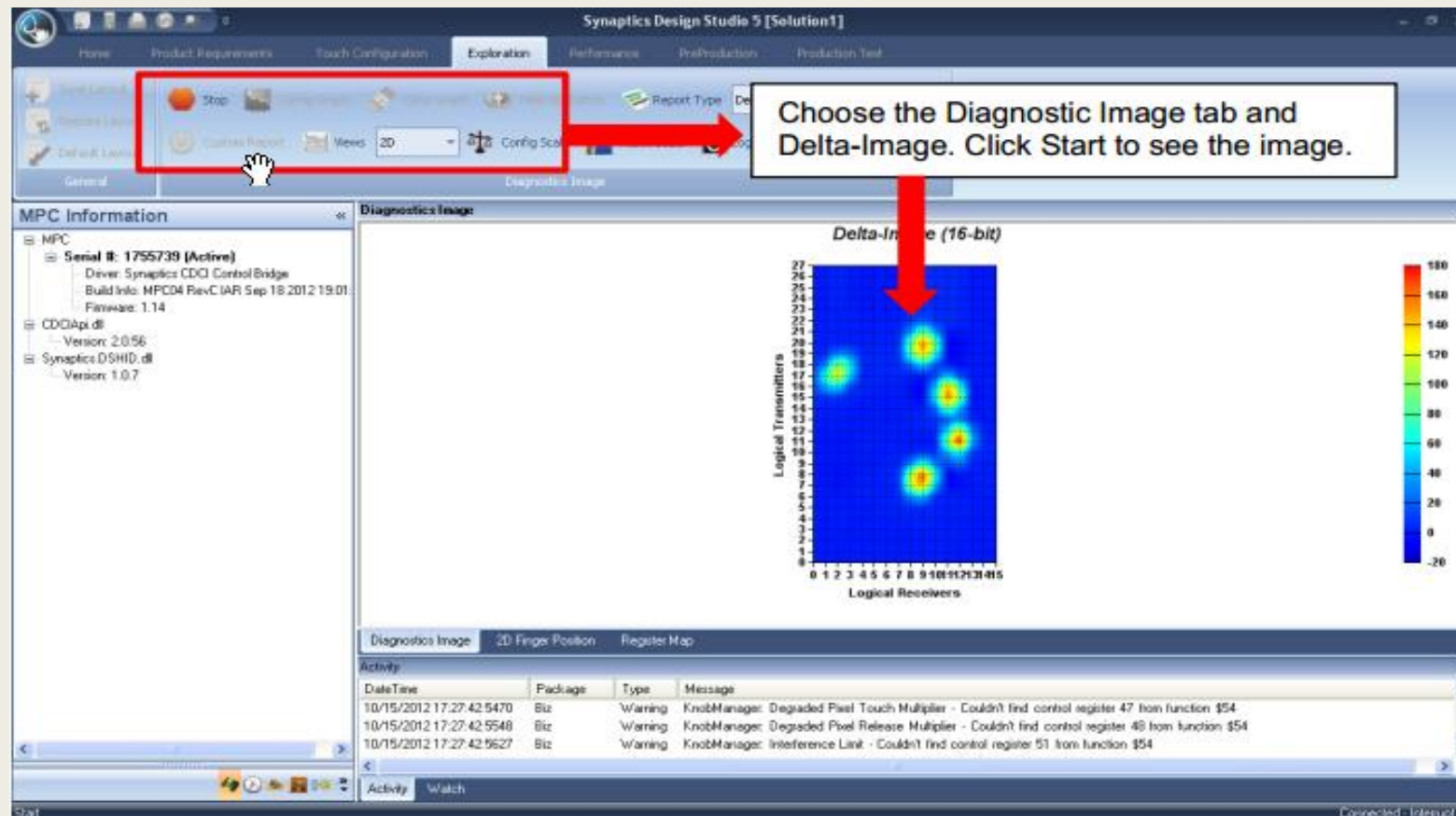
- MPC Information**: Shows MPC details including Serial # 1203399 (Active), Driver: Synaptics CDCI Control Bridge, Build Info: MPC04 RevC IAR Jun 16 2016 08:37, Firmware: 1.83, and various DLL versions (CDCIApi.dll: 2.0.96, Synaptics.DSHID.dll: 1.0.120, Synaptics.Rmi.Reflash.dll: 4.0.1.10, Synaptics.TProg.dll: 1, 101, 0, 0).
- 2D Finger Position**: Displays a grid for finger position with a 'Tx' label and a 'Sensed Object' table below.
- Image Data**: Shows a heatmap titled 'RT 2: Delta-Image (fF)' with axes for Logical Transmitters (0-24) and Logical Receivers (0-13).
- Commands & Controls**: Contains buttons for Reset, ForceUpdate, ForceCal, Read Interrupt Status, and Unlock RAM. It also has a Controls section with Operating Mode (No Sleep, Normal, Sensor Sleep, Sensor Sleep No AutoCal), No Relax, and Disable Noise Mitigation options.

A text box overlay states: "Switch tabs to check different purpose". Red boxes highlight the tab navigation arrows at the bottom of each panel.

Obj	Type	X	Y	Z
1				
2				

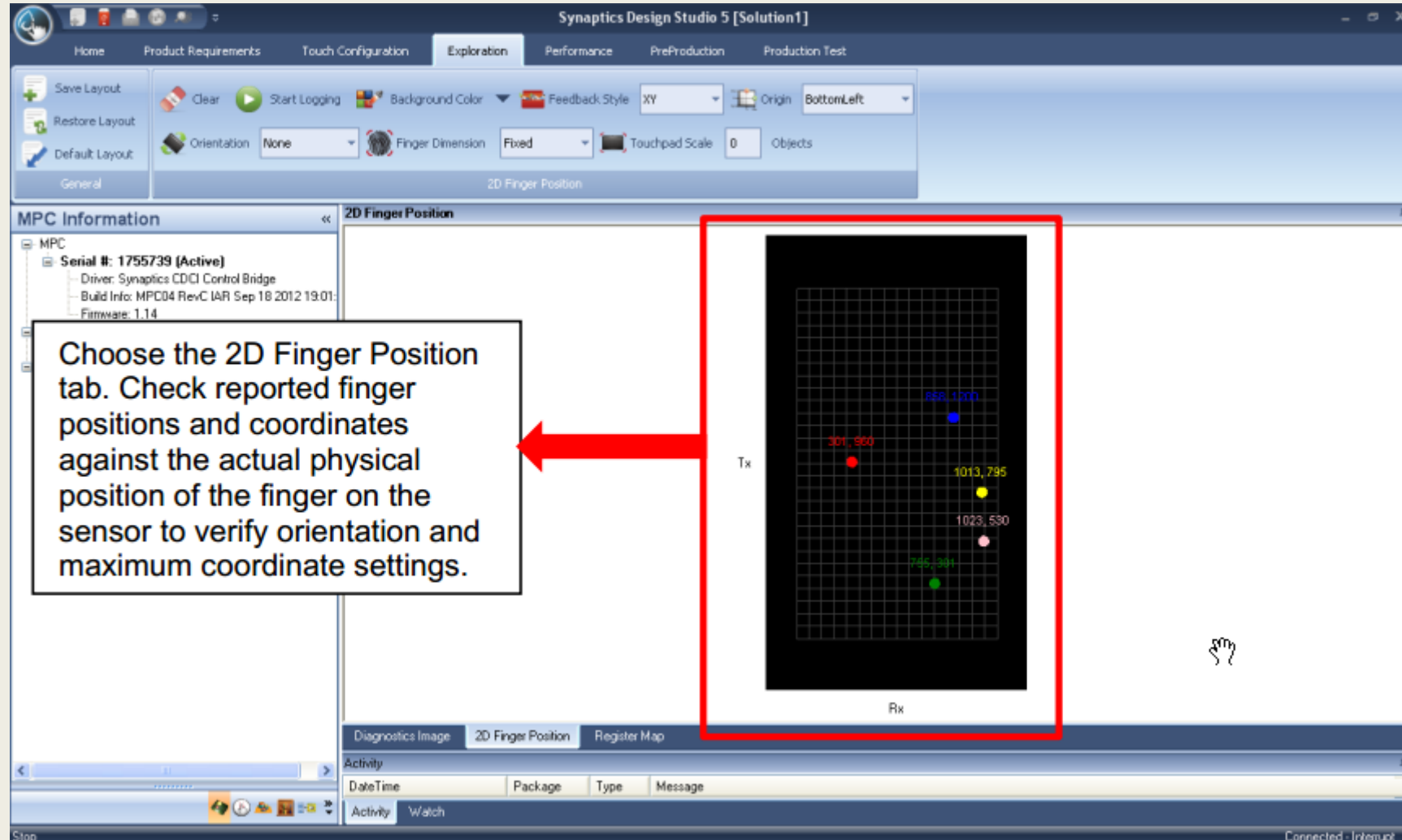
Raw Data Observation

- Get report data from Function 54 through polling mode



2D Finger position

- Get 2D finger touch position from Function12 through interrupt mode



Touch Configuration – Advance View

- Tune specific knobs and save it by “WriteToRam” or “WriteToFlash”

Synaptics Design Studio 5 [Solution1]

Home Product Requirements Touch Configuration Exploration Performance

Tx/Rx Analog Tuning Sensor Tuning Noise Tuning Mapping Tuning

Save Layout Save Layout to Image File Show Table Show Table to Solution

Click to populate the advanced view.

Save Config to Image File Export Config Export Register Map into HTML Image Export

MPC Information

Configuration ID: HEX 00000000 * ASCII

MPC

- Not found
- CDCIapi.dll
 - Version: 2.0.56
- Synaptics.DSHID.dll
 - Version: 1.0.12

Name	Value
Negative Finger Amplitude T	64
Tx Low Edge Comp	1
Tx High Edge Comp	1
Rx Low Edge Comp	1
Rx High Edge Comp	1
Slow Relax Rate,IF/s	1
Fast Relax Rate,IF/s	10
Blending Small Corner	1
Blending Large Corner	1

Name	Value
Trans Cap Hel Hi,pt	4.824
Rx Fdbk Cap,pF	30.5
Ref Rx Fdbk Cap,pF	30.5
Trans Cap Gain Stage	2.0
Trans Cap CBC,pF	Click here to see
Bias Current	0
Force Fast Relaxation	<input type="checkbox"/>
No Scan	<input type="checkbox"/>

CBC settings.

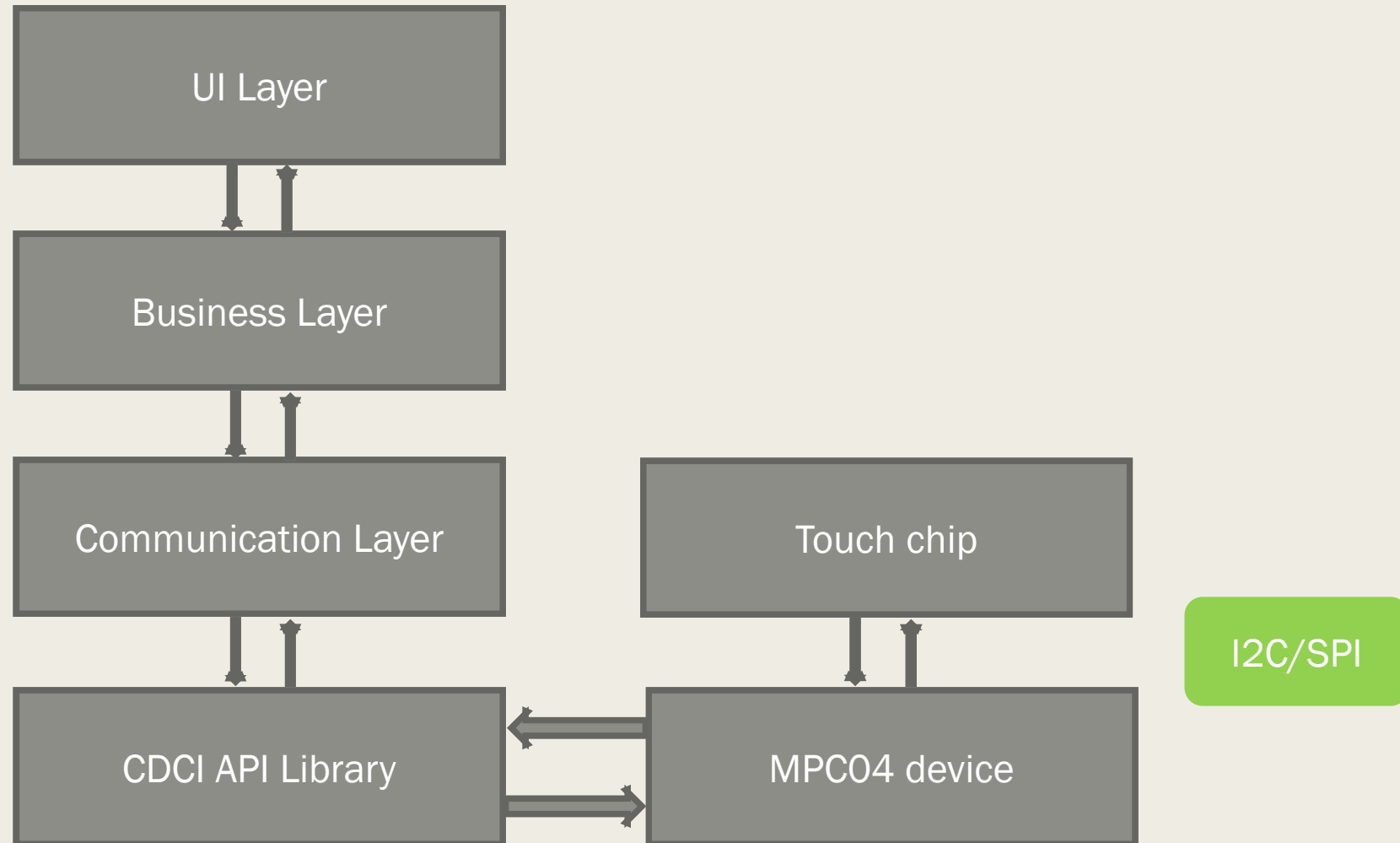
Name	Value
Tx Pitch,mm	4
Rx Pitch,mm	4

Name	Value
Noise Floor,IF	15
Charger Connected	<input type="checkbox"/>
Num Of Noise Bursts	4
No Noise Mitigation	<input type="checkbox"/>
Med Noise Thresh	65535

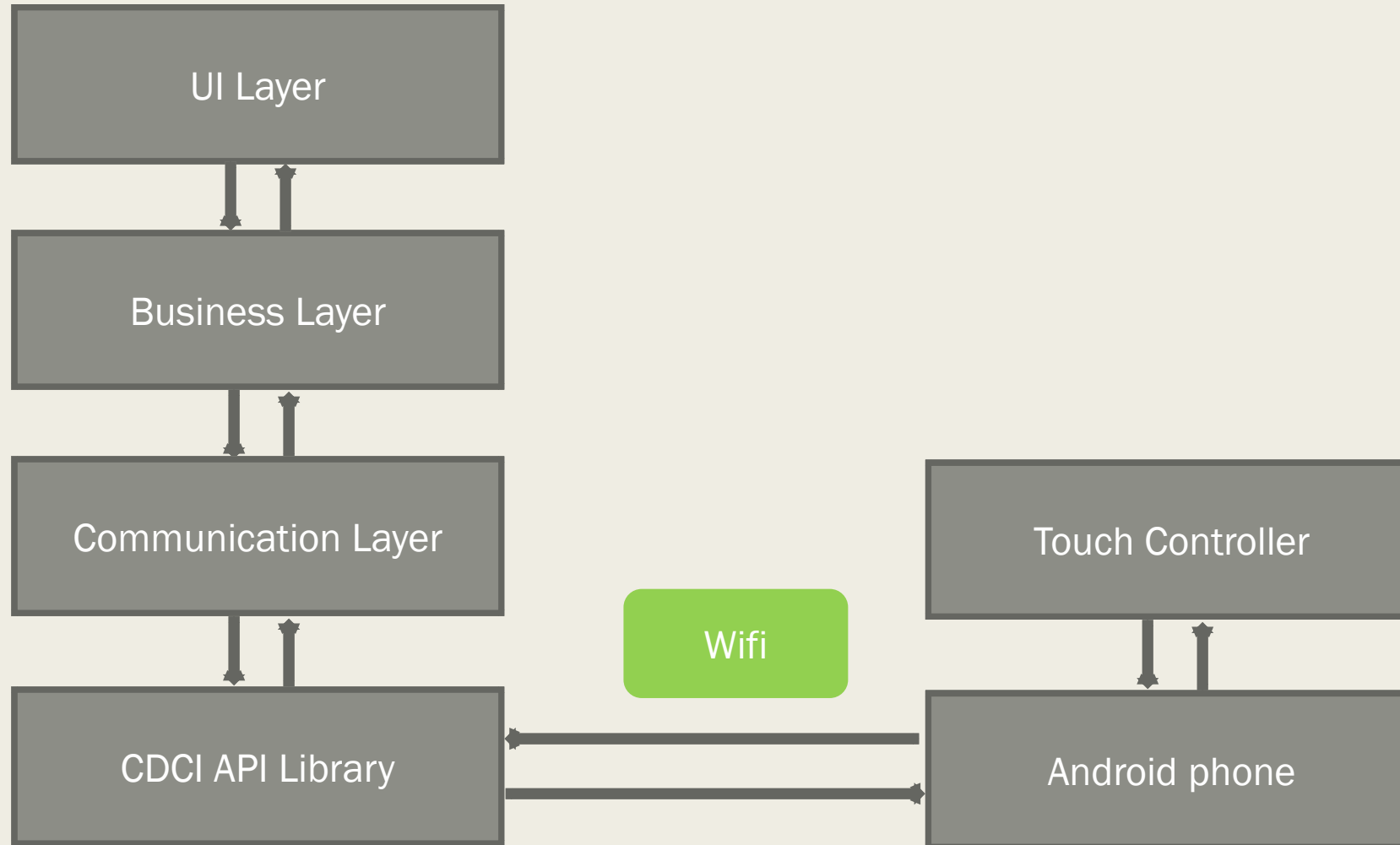
Name	Value
Configured	<input checked="" type="checkbox"/>
Report Rate	0
No Sleep	<input checked="" type="checkbox"/>
Sleep Mode	0

Name	Value
Tx Mapping	49,48,51,50,46,47,45,44,43,
Rx Mapping	23,22,25,19,26,17,27,21,28,
Physical To Logical Axes	Rx on X-Axis and Tx on Y-Axis
TRX Sense	<input checked="" type="checkbox"/>
TRX Conf	<input type="checkbox"/>

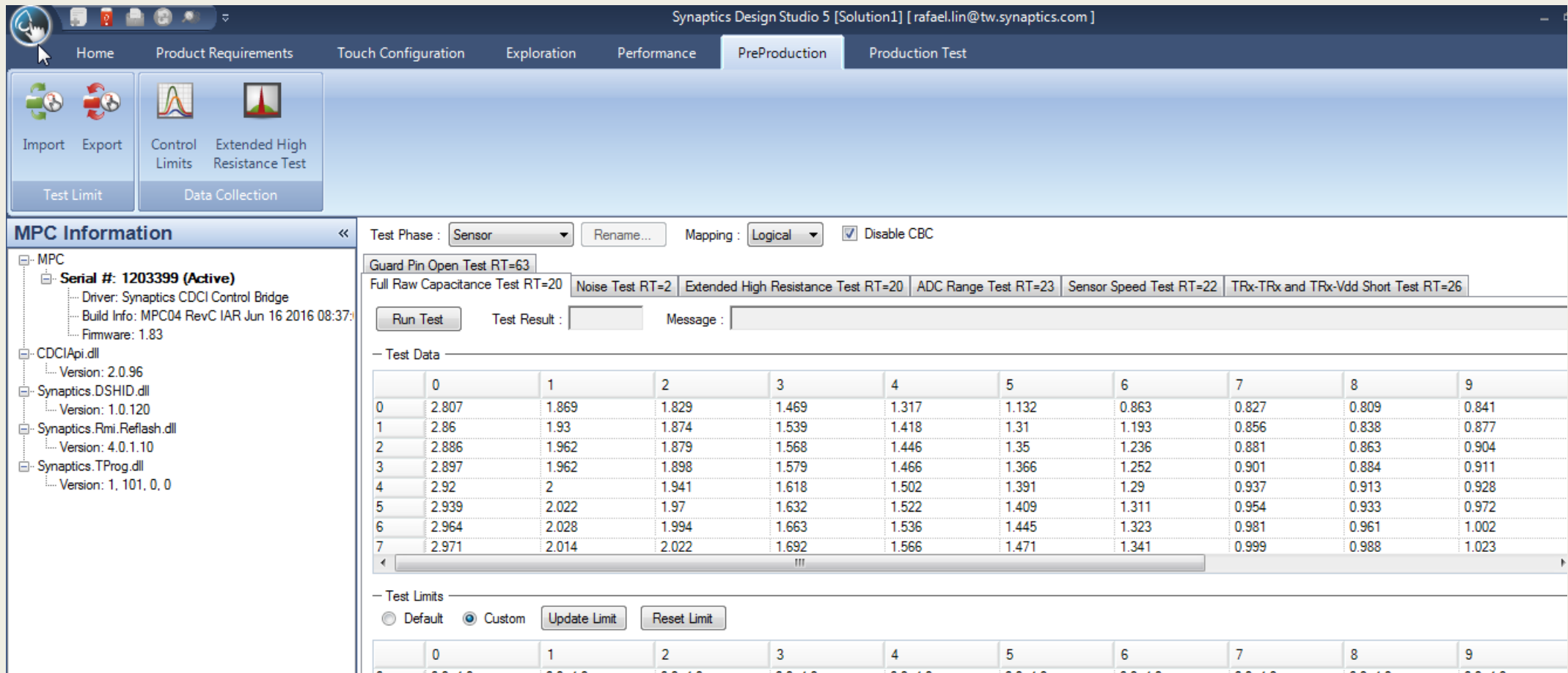
System Diagram (I2C/SPI)



System Diagram (Wifi)



- Make the recipe which consists of a list of customized test items.
- Save it into Solution and used for TestStudio5 in factory.



Misc. functionality

- Test Studio 5 (Production Test)
- Tuning Wizard
 - *Analog, TRX mapping,*
- Performance Tuning Wizard
 - *SNR, Linearity, Jitter*

Auxiliary tools

- 1) jenkins : CI/CD (continuous integration/continuous delivery)
- 2) jira : issues tracking system
- 3) setupfactory : installer-maker for customers to install new tool
- 4) packrat server : download FW and provide RMI information
- 6) infragistic : unique, outstanding and useful framework