# 實作於NXP-MPC5748G
# 車內混合式網路之微控制器閘道

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學生: 梁華軒、林群凱

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MCU 的網路拓樸

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微控制器單元

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車載網路通訊協定

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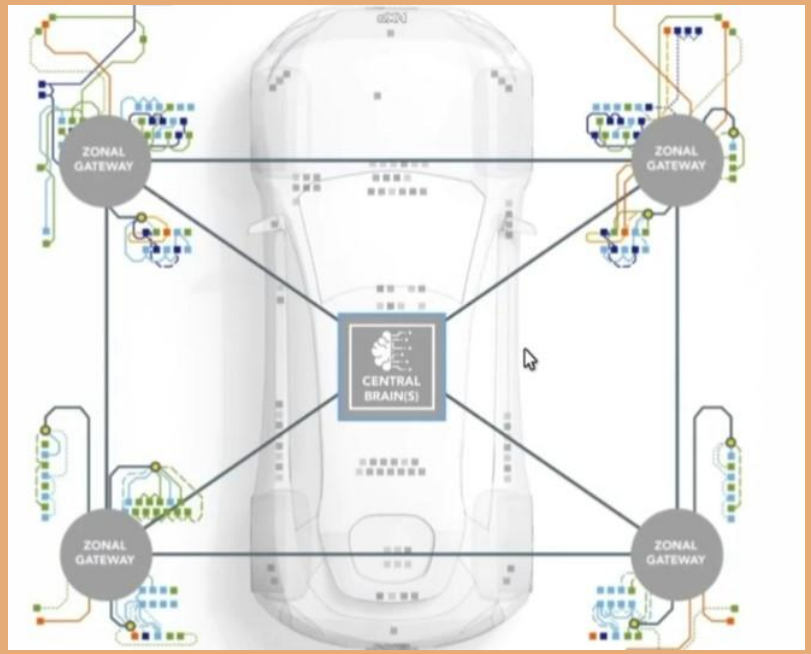
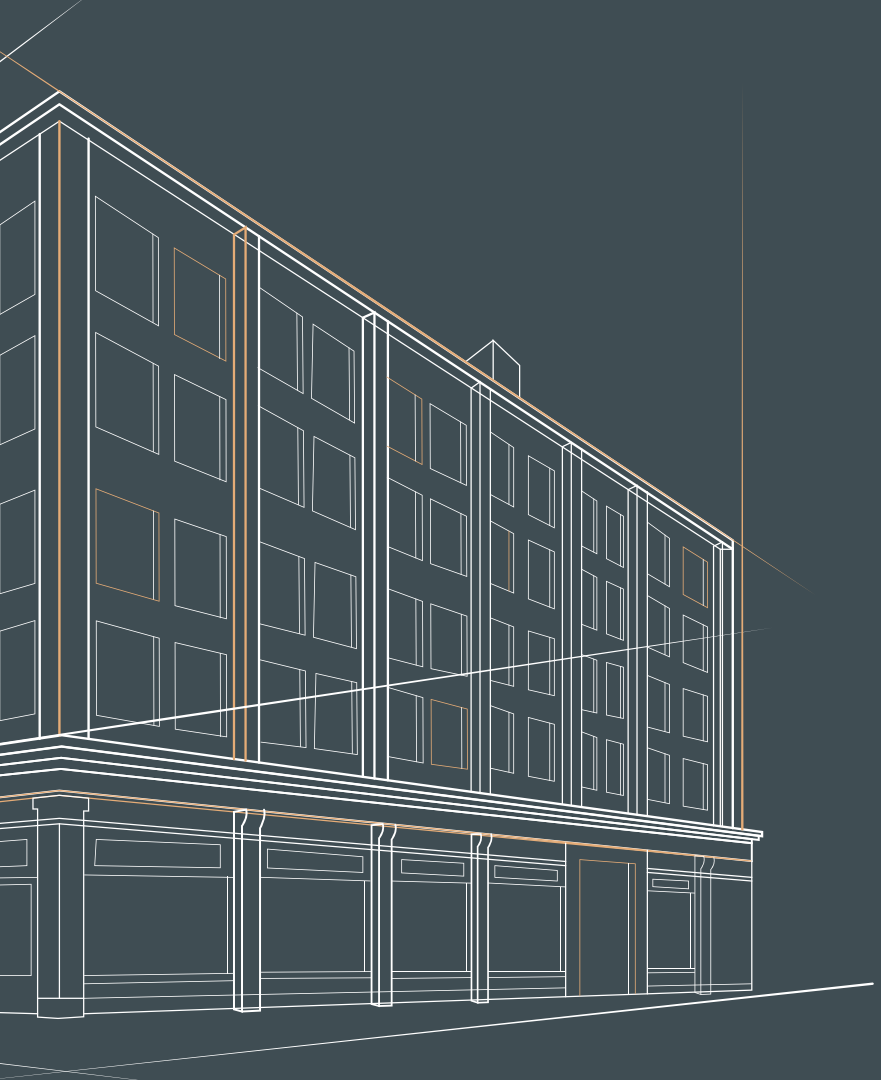
於 MCU 上實作網路拓樸

# 動機

- 電子儀器的增加
- 機器處理(中央控制)
- 統合各種不同的通訊協定



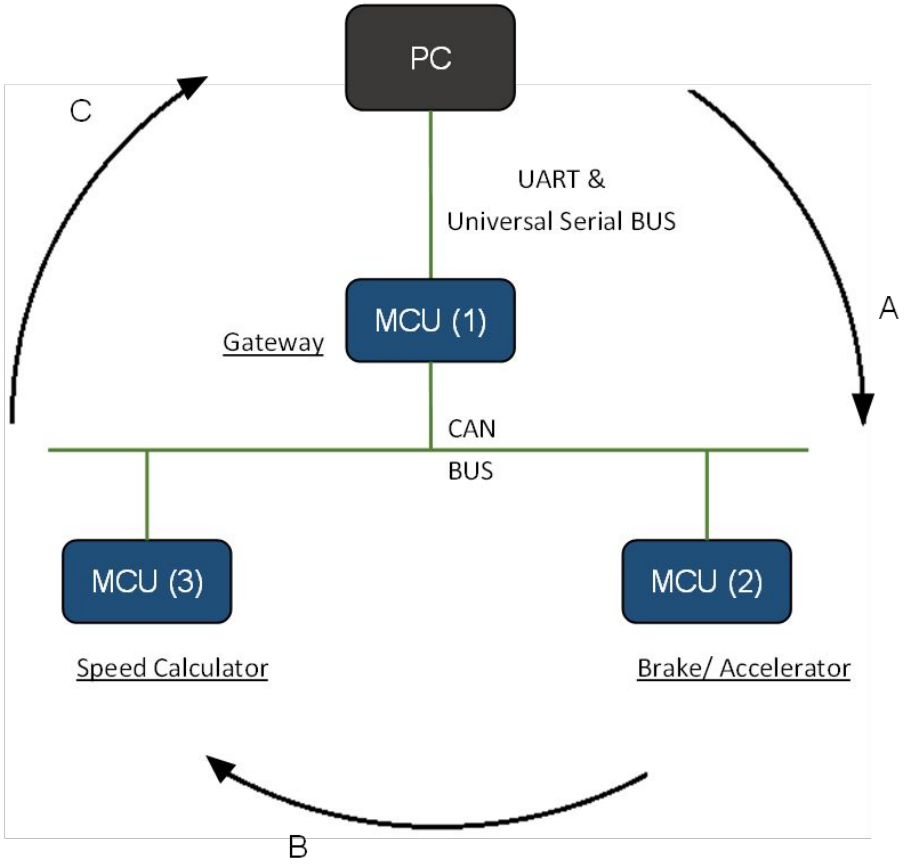


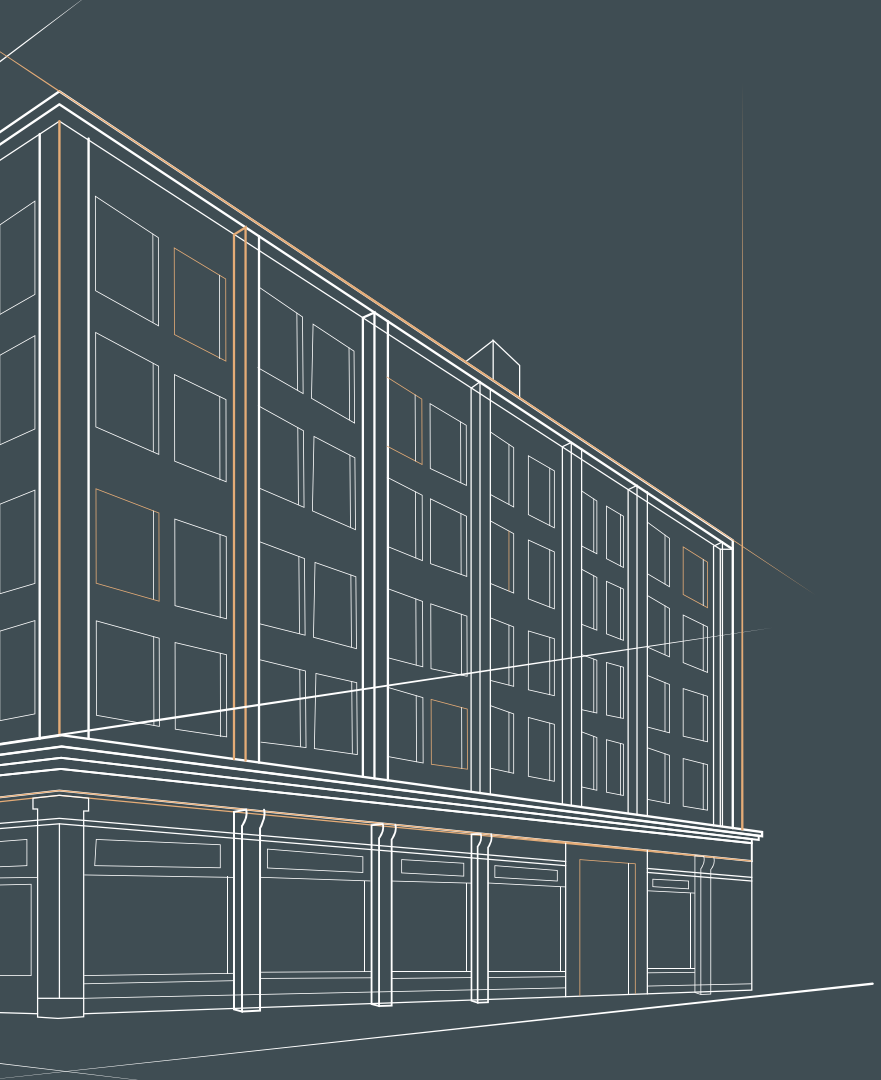
# 01

# 專題架構圖

MCU 的網路拓樸

# 整體架構


PC
C
UART &
Universal Serial BUS
A
Gateway
MCU (1)
CAN
BUS
MCU (3)
MCU (2)
Speed Calculator
Brake/ Accelerator
B



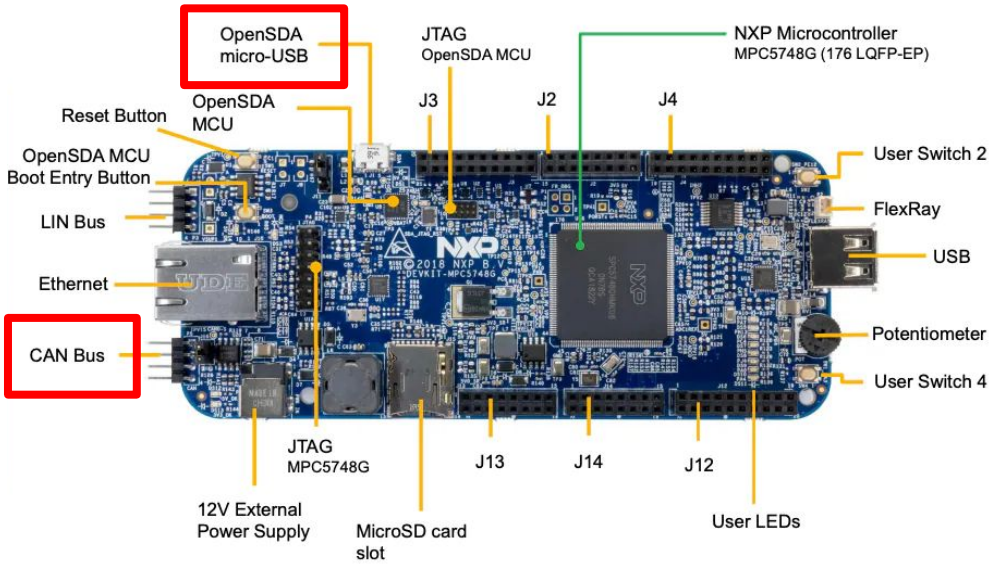
# 02

# MPC5748G

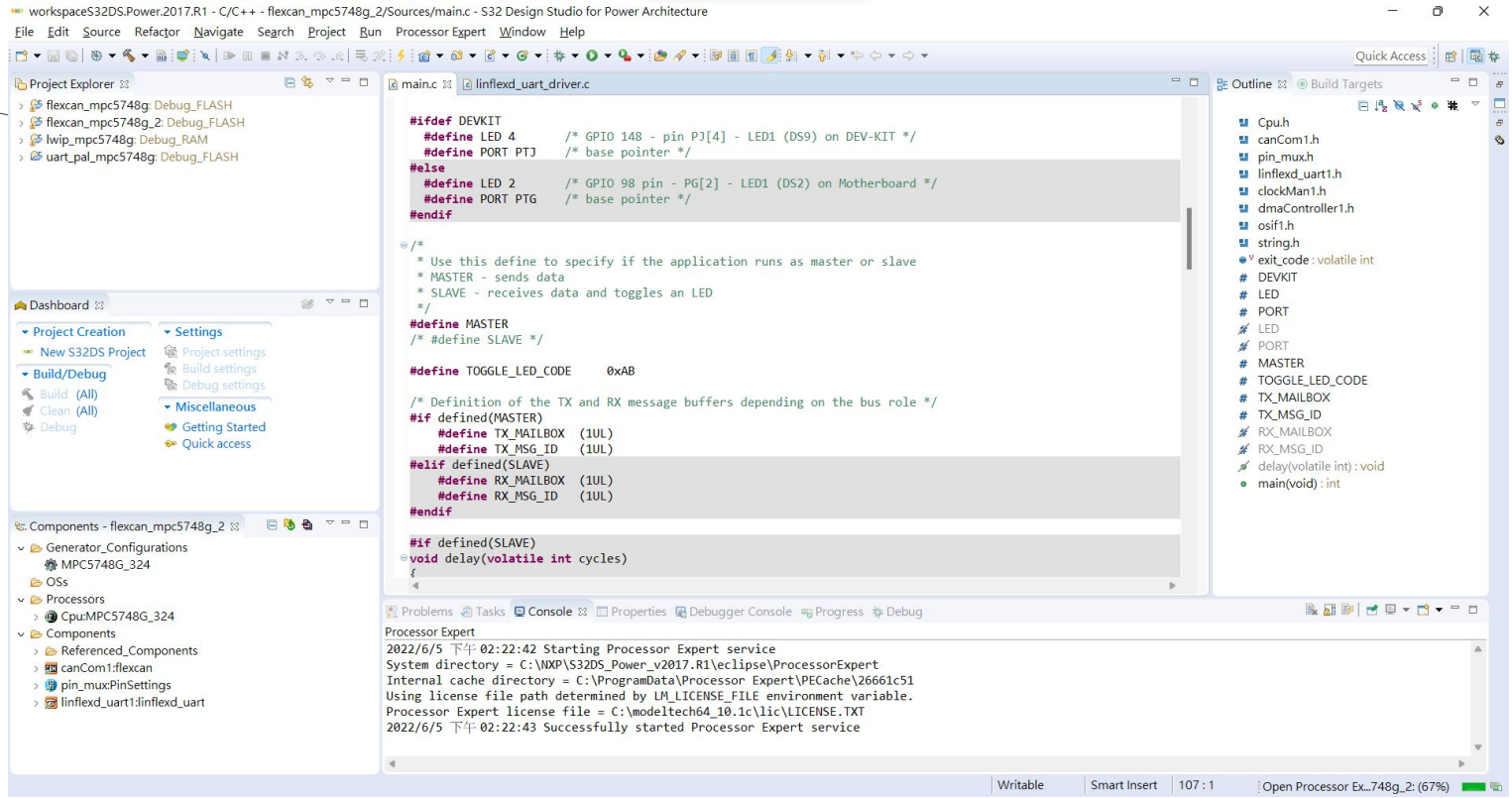
微控制器單元

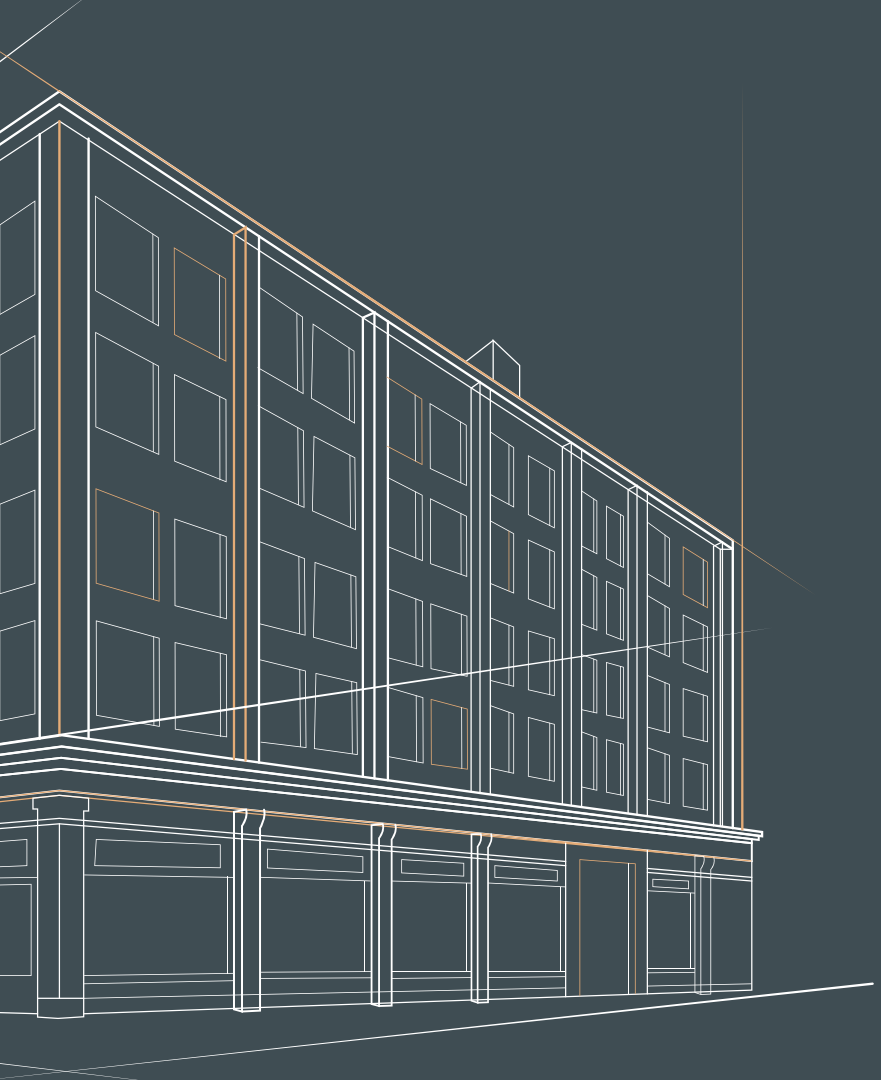
# MPC5748G

MPC5748G 基於32-bit Power Architecture 的微控制器單元，提供硬體安全模組(HSM)、廣泛的通信介面和靈活的記憶體選項。




- 名稱:MPC5748G
- 製造公司: 恩智浦(NXP)
- 程式語言: C
- 開發環境:
  - IDE: S32 Design Studio for Power Architecture® 2017.R1
  - SDK: S32 SDK


workspaceS32DS.Power.2017.R1 - C/C++ - flexcan_mpc5748g_2/Sources/main.c - S32 Design Studio for Power Architecture
File Edit Source Refactor Navigate Search Project Run Processor Expert Window Help
Quick Access
Project Explorer
flexcan_mpc5748g: Debug_FLASH
flexcan_mpc5748g_2: Debug_FLASH
lwip_mpc5748g: Debug_RAM
uart_pal_mpc5748g: Debug_FLASH
Dashboard
Project Creation
New S32DS Project
Build/Debug
Build (All)
Clean (All)
Debug
Settings
Project settings
Build settings
Debug settings
Miscellaneous
Getting Started
Quick access
Components - flexcan_mpc5748g_2
Generator_Configurations
MPC5748G_324
OSs
Processors
Cpu:MPC5748G_324
Components
Referenced_Components
canCom1:flexcan
pin_mux:PinSettings
linflexd_uart1:linflexd_uart
main.c
linflexd_uart_driver.c
#ifdef DEVKIT
#define LED 4 /* GPIO 148 - pin PJ[4] - LED1 (DS9) on DEV-KIT */
#define PORT PTJ /* base pointer */
#else
#define LED 2 /* GPIO 98 pin - PG[2] - LED1 (DS2) on Motherboard */
#define PORT PTG /* base pointer */
#endif
/*
* Use this define to specify if the application runs as master or slave
* MASTER - sends data
* SLAVE - receives data and toggles an LED
*/
#define MASTER
/* #define SLAVE */
#define TOGGLE_LED_CODE 0xAB
/* Definition of the TX and RX message buffers depending on the bus role */
#if defined(MASTER)
#define TX_MAILBOX (1UL)
#define TX_MSG_ID (1UL)
#elif defined(SLAVE)
#define RX_MAILBOX (1UL)
#define RX_MSG_ID (1UL)
#endif
#if defined(SLAVE)
void delay(volatile int cycles)
{
Outline
Build Targets
Cpu.h
canCom1.h
pin_mux.h
linflexd_uart1.h
clockMan1.h
dmaController1.h
osif1.h
string.h
exit_code : volatile int
DEVKIT
LED
PORT
LED
PORT
MASTER
TOGGLE_LED_CODE
TX_MAILBOX
TX_MSG_ID
RX_MAILBOX
RX_MSG_ID
delay(volatile int) : void
main(void) : int
Problems Tasks Console Properties Debugger Console Progress Debug
Processor Expert
2022/6/5 下午 02:22:42 Starting Processor Expert service
System directory = C:\NXP\S32DS_Power_v2017.R1\eclipse\ProcessorExpert
Internal cache directory = C:\ProgramData\Processor Expert\PECache\26661c51
Using license file path determined by LM_LICENSE_FILE environment variable.
Processor Expert license file = C:\modeltech64_10.1c\lic\LICENSE.TXT
2022/6/5 下午 02:22:43 Successfully started Processor Expert service
Writable
Smart Insert
107 : 1
Open Processor Ex...748g_2: (67%)



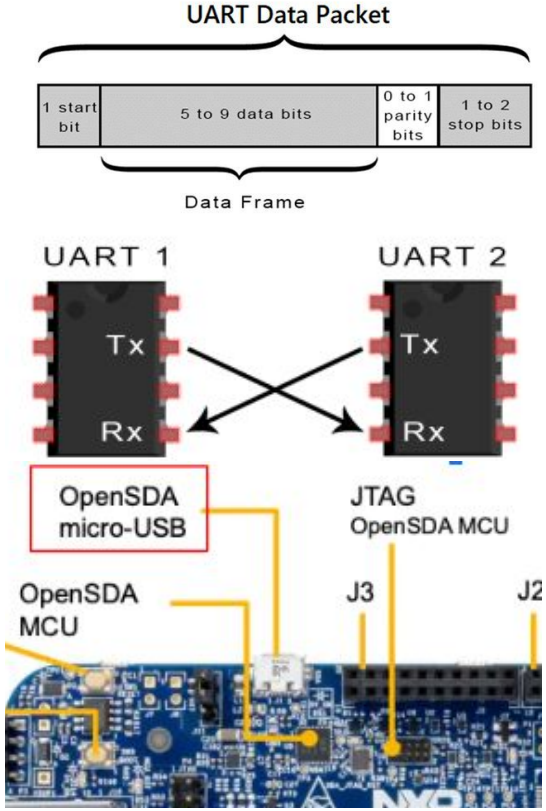
# 03

# UART&CAN

車載網路通訊協定

# UART

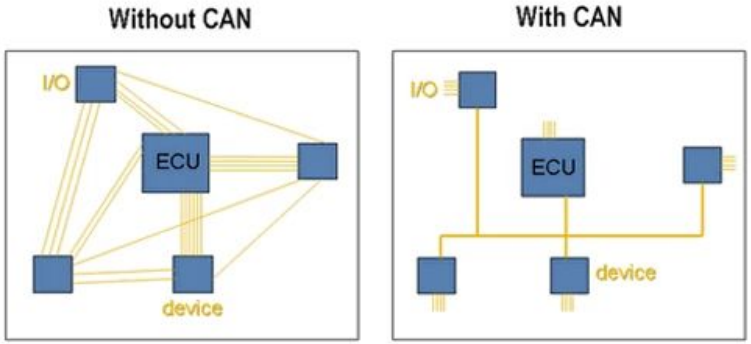
- 傳送以非同步來進行
- 雙方使用相同的頻率(baud rate)
- 有 parity bit 方便接收端檢查
- 此次專題中
  - MPC5748G 以 USB 和 PC 連接
  - PC 端以 python serial  進行接收



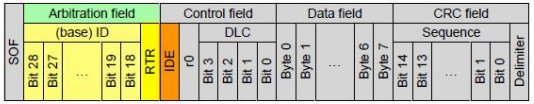
# CAN

## Controller Area Network

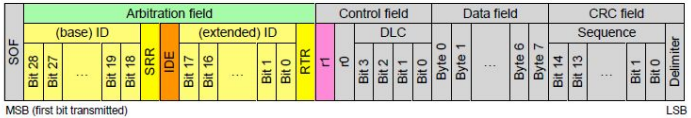
- 有新的裝置加入時，不需要將網路整個重新設計，只需要其連接到bus中即可
- 傳送完成後會有ack確認完成傳送
- 速度:40Kb-1Mb
- 此次專題中
  - 使用mailbox來處理bus是busy的狀態
  - 使用基本的ID長度

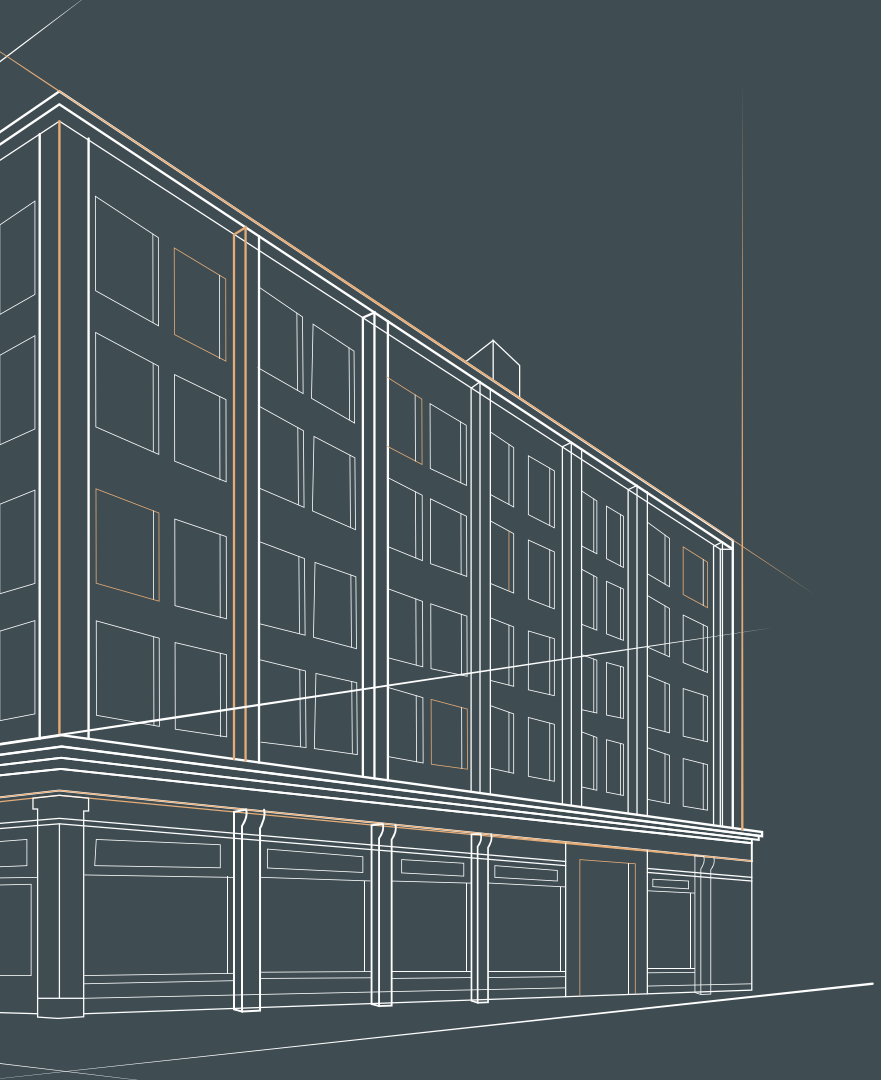



Base CAN data frame format




Extended CAN data frame format



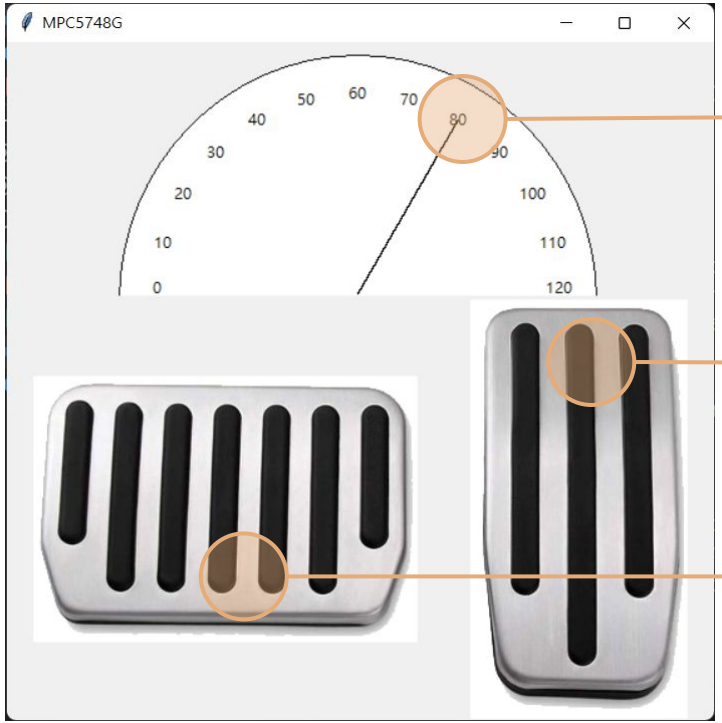


# 04

# 成果展示

於 MCU 上實作網路拓樸

# 成果展示




## 儀錶板

顯示目前的速度

## 油門

增加目前速度

## 煞車

降低目前速度