

符合 SAE J2945 標準之 SPaT 和 MAP 的設計與實作

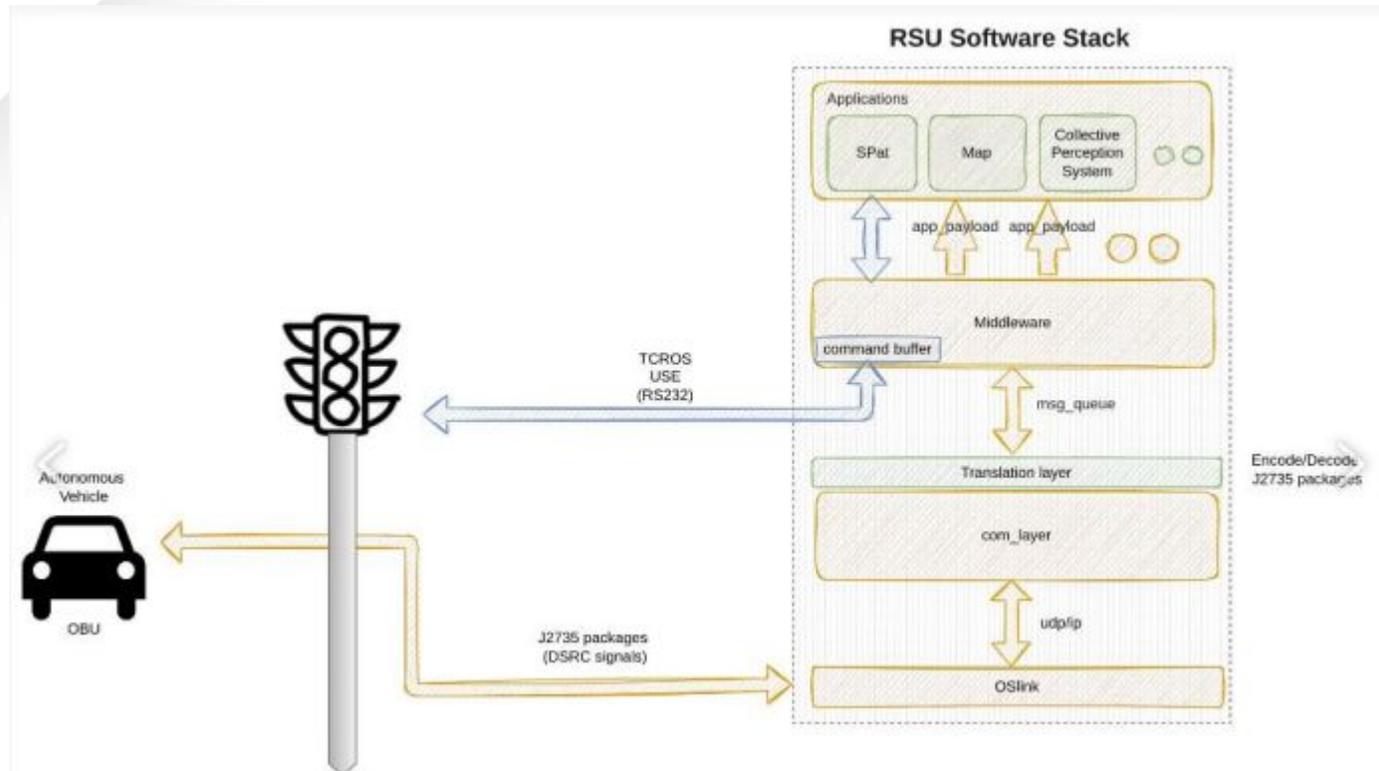
Design and Implementation of SPaT and MAP in the SAE J2945 Standard

指導教授：張大緯 教授

成員：徐宏斌 趙子翔

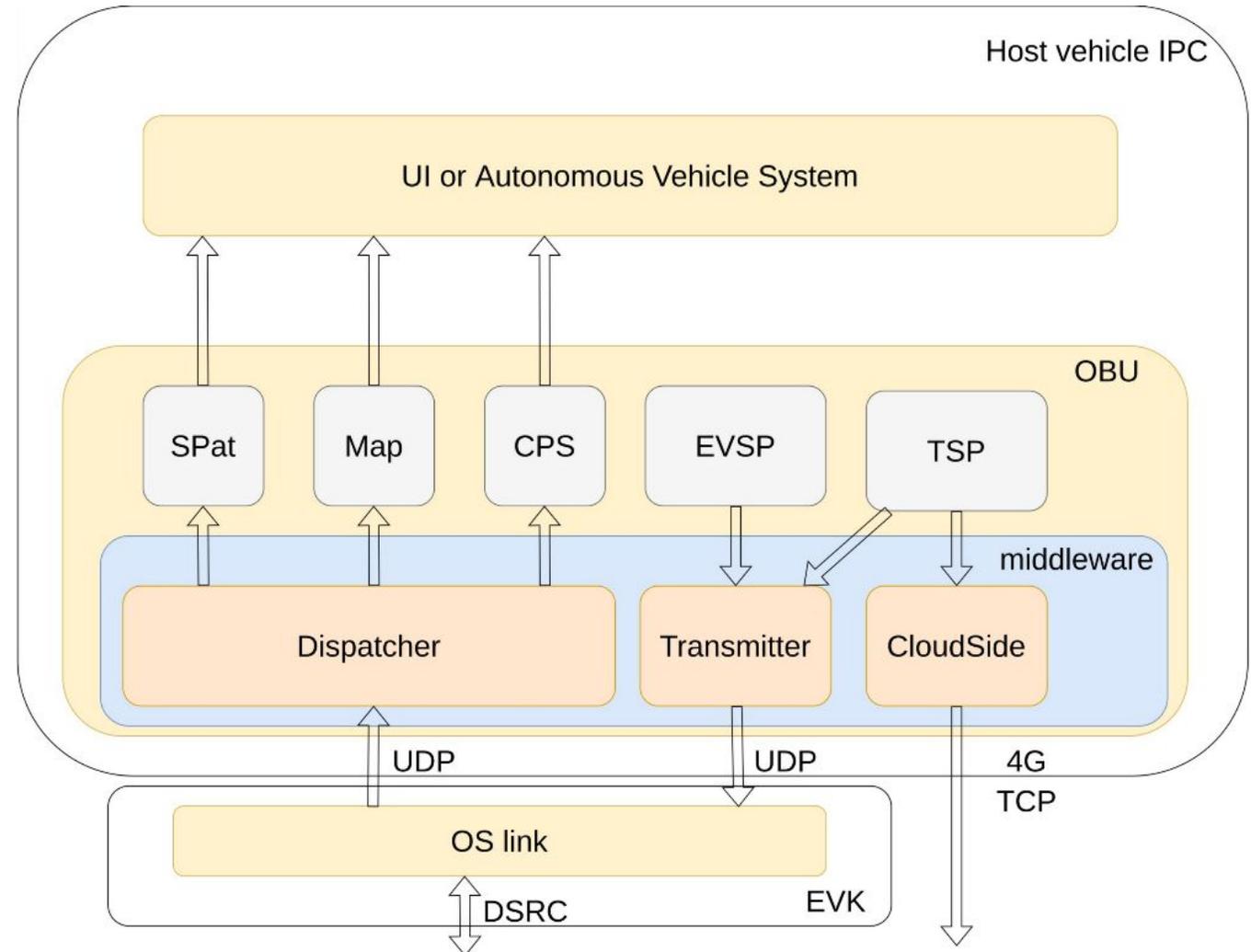
背景動機

由於智慧交通近年來的興起，智慧車輛和路口通信裝置的溝通也有了更完善的規定，根據規定去實作封包的傳送和建立裝置間的橋梁便是這次專題很大的重點。



基礎架構

利用DSRC和路口交通裝置拿取當前交通狀況
將拿到的訊息包裝成符合規定的封包
編碼封包成16進位整數字串
利用UDP傳輸給OBU端
HOST解碼資料便能獲得路口交通狀況



勘查路口狀況

勘查路口狀況，並了解道路資訊，以填入MAP的靜態資料中

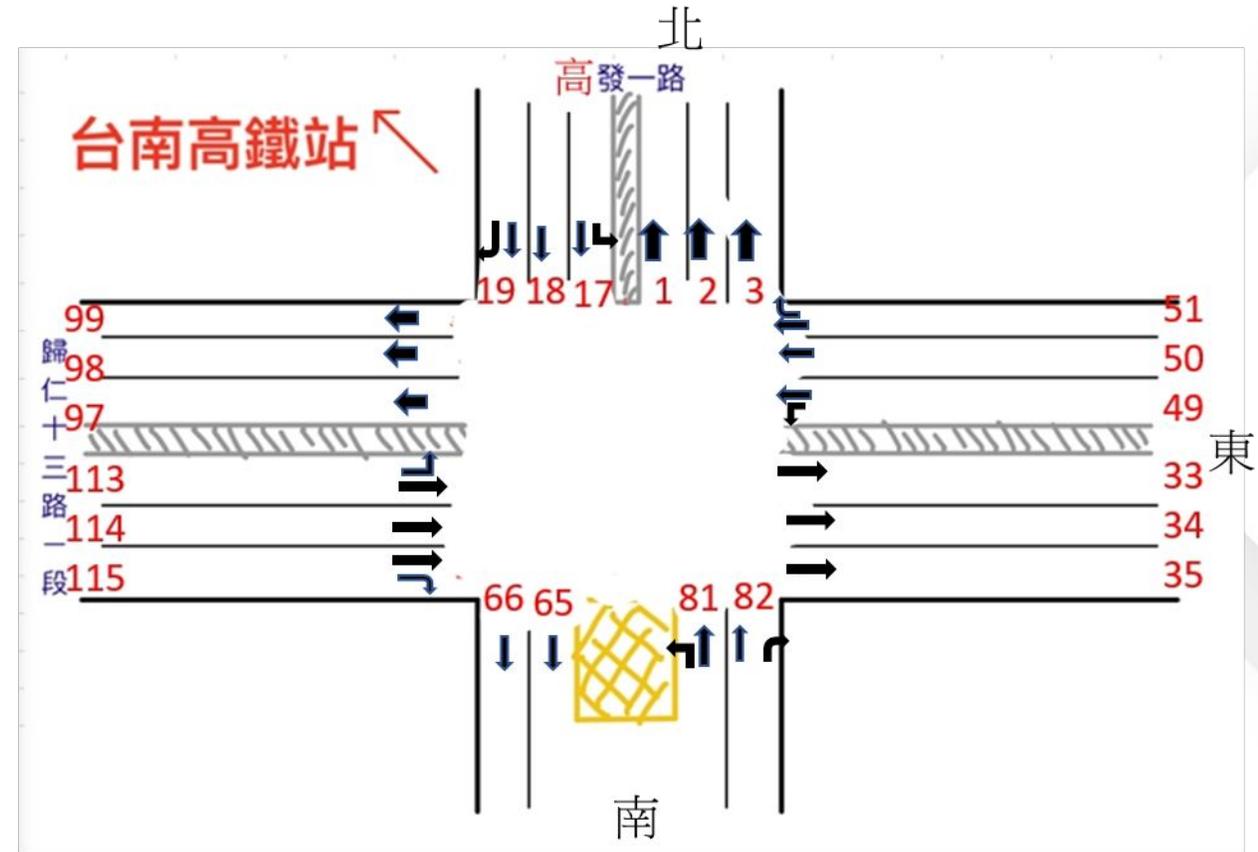


MAP填入

先了解路口狀況，路名、編號、路和路之間的連接、路的方位等等

按照TCROS和J2735的規定，填入封包內容

西



東

SPAT 填入

了解當前路口的燈號循環方式, 並根據當前路口的十字計畫填入封包

Green	PedGreen	Yellow	AllRed	Red
480	70	30	20	600

車內裝置配置



實地測試

在路口實際開車去接收路口傳送的封包，解碼並去讀封包內容是否有誤，和測試UDP傳送的封包遺失率



封包測試

```
MAP_packet_tx.c - RSU_Controller_v3-master [55H: 5429001] - Visual Studio Code
oslab@oslab-UNO-247: ~/OBU_controller_master

signalGroup: 2
ConnectsToList[4] *****
connectingLane lane: 66
signalGroup: 2

Decoded MAP =====
intersections count: 1
intersection [0] ----- id: 199, revision: 1
refPoint latitude: 229236390, longitude: 1202890910
laneWidth: 200
speedLimit[0] type: S, speed value: 694
Lane set count : 22
Lane[0] ID: 1, lane type: 0 *****
node list count: 2
[0] LatLon latitude: 229238660, longitude: 1202889900
[1] LatLon latitude: 229238660, longitude: 1202889900
Lane[1] ID: 2, lane type: 0 *****
node list count: 2
[0] LatLon latitude: 229238790, longitude: 1202890200
[1] LatLon latitude: 229238790, longitude: 1202890200
Lane[2] ID: 3, lane type: 0 *****
node list count: 2
[0] LatLon latitude: 229238920, longitude: 1202890490
[1] LatLon latitude: 229238920, longitude: 1202890490
Lane[3] ID: 17, lane type: 0 *****
node list count: 2
[0] LatLon latitude: 229238410, longitude: 1202889400
[1] LatLon latitude: 229238410, longitude: 1202889400
ConnectsToList count: 5
ConnectsToList[0] *****
connectingLane lane: 65
signalGroup: 1
ConnectsToList[1] *****
connectingLane lane: 66
signalGroup: 1
ConnectsToList[2] *****

msg queue is not full and then put msg into it
dsrc alive and postpone the timer handle execution
msg queue is not full and then put msg into it
dsrc alive and postpone the timer handle execution
msg queue is not full and then put msg into it
dsrc alive and postpone the timer handle execution
msg queue is not full and then put msg into it
dsrc alive and postpone the timer handle execution
msg queue is not full and then put msg into it
dsrc alive and postpone the timer handle execution
SFCC updating: set pretimed
correct packet sent
SF 10
msg queue is not full and then put msg into it
dsrc alive and postpone the timer handle execution
phase changed and pretimed for phase 1 is 40
update map information

send 622 packages
Transmitted 692 bytes!
send 623 packages
Transmitted 692 bytes!
send 624 packages
Transmitted 692 bytes!
send 625 packages
Transmitted 692 bytes!
collect
send 626 packages
Transmitted 692 bytes!
send 627 packages
Transmitted 692 bytes!
send 628 packages
Transmitted 692 bytes!
send 629 packages
Transmitted 692 bytes!
```

封包遺失

SPAT封包遺失率 < 1%

MAP封包遺失率 < 2%

因為這兩個封包會在一定時間內重複傳送相同內容，且沒有連續遺失的可能性(統計下的結果)，因此封包的遺失可以忽略

總結

對系統負擔不大：盡量減低填封包的時間，SPAT和MAP分別只需微秒級別的時間

封包遺失率低：因為遺失率低且不會連續遺失，因此無須擔心有車輛因遺失，沒收到封包

報告結束