V2I LITE in SYNC+ 4.0

Product Requirement Document (PRD)

Feature Document (FD)

V1.4

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1 Introduction

1.1 Purpose

The purpose of the document is to describe and specify each “V2I/ Vehicle to infrastructure” feature, which will be deployed in the SYNC+ system.

1.2 Scope

For a vehicle to support the feature, the vehicle must have all of the following capabilities but are not limited to

- SYNC+
- GPS Antenna
- Embedded Navigation (Map data)
- TCU / Embedded Moden

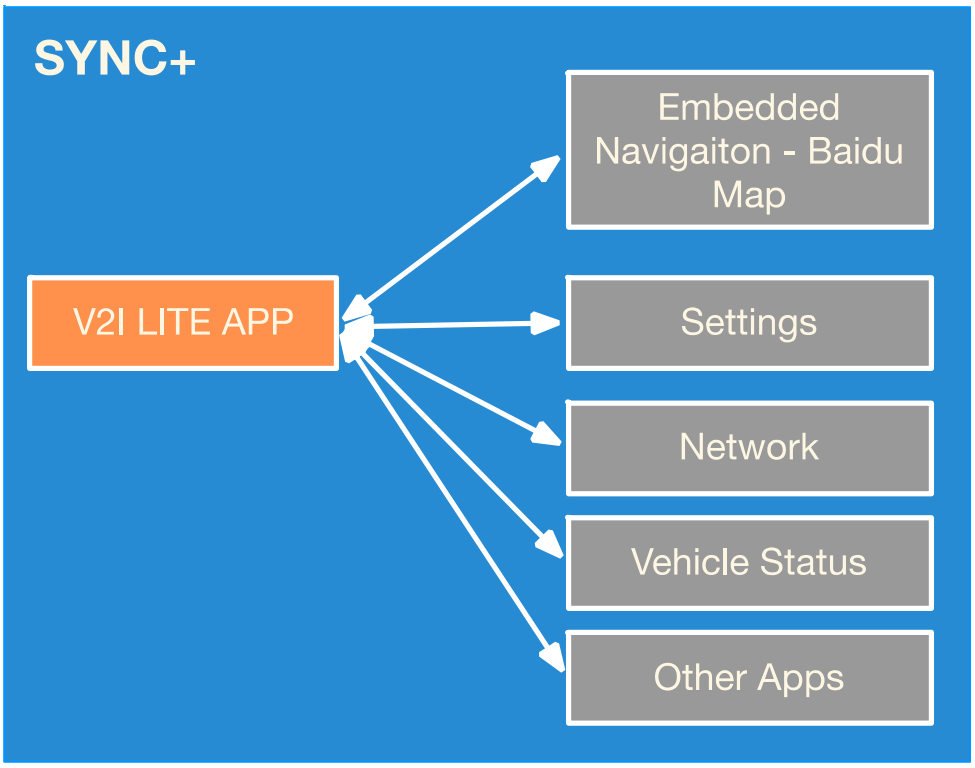
1.3 Audience

- Ford
  - Feature team
  - E/E Architecture team
  - Netcom team
  - HMI team (UX/UI designer)
  - Function component team
  - Testing team
- SYNC+ integration
  - Embedded Navigation, Settings, Voice Assistant
  - System Level engineer
  - IntegrationTester
- Nominated supplier
  - UX/UI designer
  - Tester
  - Interviewer designer

1.4 Terms, Acronyms and Definitions

Term or Acronym	Definition
SYNC+	The new generation of SYNC android-based system for China market.
V2I	Vehicle to Infrastructure
TLI	Traffic Light Information
GLN	Green Light Notification
GLWOA(GLOSA)	Green Light Wave Optimal Advisory
RLVW	Red Light Violation Warning
RSI	Road Side Information
OASS	Optimization of Automatic Start-stop Engine
V2I LITE APP	Ford in-house development V2I application
Embedded Navigation	Map on SYNC+

1.5 Components



- **V2I LITE APP** is a standalone android application installed in SYNC+ providing the V2I series function to the driver.
  - Act as a host to monitor the conditions from other modules.
  - Act as a host to send commands under certain circumstances.
- **V2I LITE APP** needs to set up some data/command channels with Embedded Navigation, Settings, Network, Vehicle status, etc.., which will be defined in detail in the following sections.
- **V2I LITE APP** needs to be capable to broadcast calculated traffic light data, and functional signals to other in-vehicle ECUs to attain different UX and provide other functionalities. For example, utilizing the Cluster as an external display, supplement with the PCM(Start-stop) functions.

1.6 Operational Mode

V2I LITE APP is a kind of information application and follows the design principle – “Less is more”. There are two **Operational Modes** provided to the user and the exact sub-function will behavior variant based on which mode is activated.

Mode	Definition
Cruise Mode	User doest not set any desitaiton. The system can not predict where the user would like to.
Navigation Mode	Users set a destination in their Embedded Navigation system. The turn-by-turn info is available after the user selects and starts route navigation.

2 Feature Description

2.1 TLI

2.1.1 Description

This feature enables the Driver to be informed of the most relative Traffic Light information from his/her intention, for example, the current light status, phase, duration/countdown, types, etc. The computed result will be displayed via the HMI system, which would be specified on a vehicle basis.

This feature provides an in-vehicle display of the status of the traffic signal that the vehicle is approaching the signalized intersection.

2.1.2 Assumptions

- The system works in those cities that have been granted access to the traffic control data.
- The Embedded Navigation may receive the command from V2I LITE APP.(defined in 3.Functional Architecture)
- The system receives real-time signal information from the external traffic management system. (City C-V2X platform)

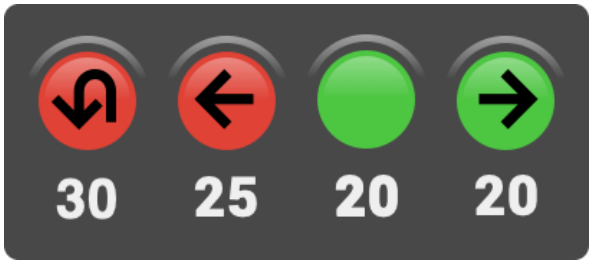
2.1.3 User Stories

User Story ID	User Story
2.1.3.1	As a driver, I would like to be provided an in-vehicle display of the status of the traffic signal that the vehicle is approaching the signalized intersection.
2.1.3.2	As a driver under navigation mode, I would like to be provided with the most interested Traffic Light information, and the other direction could be hidden.
2.1.3.3	As a driver, I can disable/enable or set the frequency on when the Traffic light information can be presented.

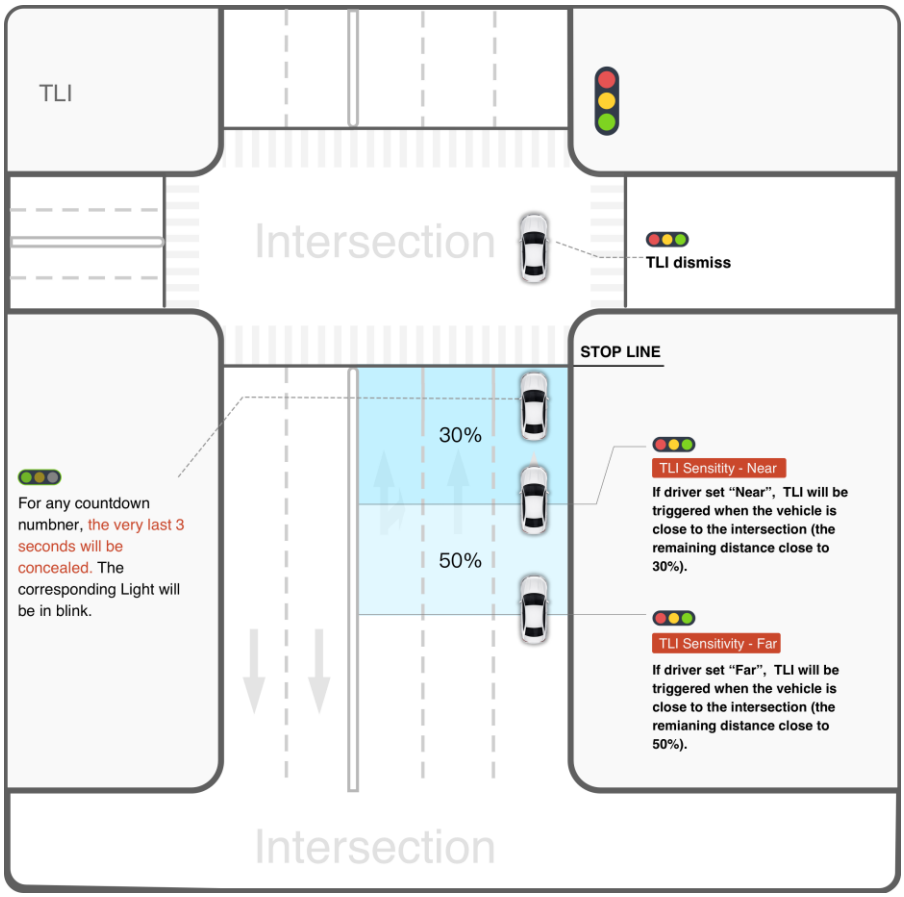
2.1.4 Requirements

Requirement ID	Title	Description
2.1.4.1	Receive command from V2I LITE APP	**V2I LITE App** will use the determined Signal interface (defined in ***3. Functional Architecture***) to send and trigger the events, in different scenarios, for example, Navigation mode, Cruise mode, and others.
2.1.4.2	Privilege	**V2I LITE APP** can be granted with necessary privilege while daily using.
2.1.4.3	Display Traffic Light info	Timely digital display & update the facing Traffic light information from real world, including Phase(Color), Manuever(Direction), likelyEndTime(Countdown). • **Cruise Mode** All the physical lights shall be presented. • **Navigation Mode** Only display the direction(one light) from Turn-by-turn guidance.
2.1.4.4	Setting Preference(Displaying) on TLI	• **Near –** TLI will be displayed when the remaining distance is close to 30% within a link road. • **Far –** TLI will be displayed when the remaining distance is close to 50% within a link road.
2.1.4.5	Countdown conceal	The very last 3 seconds will be concealed and start to blink. To reduce driving distraction, “Keep eyes on the road” is the basic principle that may follow. Driver shall get well prepared for the impending Traffic light.
2.1.4.6	TLI dismiss	TLI will be dismissed after the vehicle pass through the intersection(STOP LINE) or it can not receive the SPAT from the city platform.

2.1.5 Use Cases

Use Case ID	2.1.5.1
Use Case	The traffic light info can be presented in Embedded Navigation in Cruise mode.
User Stories	2.1.3.1
Requirements	2.1.4.1, 2.1.4.3
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. Embedded Navigation is equipped. 4. V2I LITE APP is active.
Trigger	1. V2I LITE App sends the software signals.
Driving Scenarios & Expected Behavior	1. The driver can perceive the traffic light information from the display. 
Post Conditions	
Exceptions	<IPC failed to receive the signal sent from V2I LITE APP>

Use Case ID	2.1.5.2
Use Case	The traffic light info can be presented in Navigation mode.
User Stories	2.1.3.2
Requirements	2.1.4.1, 2.1.4.3
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. Embedded Navigation is equipped. 4. V2I LITE APP is active.
Trigger	1. V2I LITE App sends the software signal periodically.
Expected Behavior	1. The driver can perceive the traffic light information from the Embedded Navigation.  2. Driver can perceive the traffic light information from IPC. 
Post Conditions	
Exceptions	<Embedde Navigation failed to receive the signal sent from V2I LITE APP>

Use Case ID	2.1.5.3
Use Case	TLI Displaying Tatic (Settings / dismiss)
User Stories	2.1.3.3
Requirements	2.1.4.1, 2.1.4.2, 2.1.4.4, 2.1.4.5, 2.1.4.6
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. V2I LITE APP is active.
Trigger	1. Settings send the trigger signal to V2I LITE APP.
Expected Behavior & Driving Scenario	1. The driver can set their preferences from Settings. 2. TLI shall be dismissed after the vehicle goes through the stop line. 
Post Conditions	
Exceptions	<V2I LITE APP failed received the signals.>

2.1.6 Driving Scenarios

2.2 GLN

2.2.1 Description

This feature enables the Driver to be notified of the most relative Traffic Light shifting from Red to Green within the very last pre-defined seconds (**eg. 3/5/8 seconds**). The computed result will be prompted via recognized audible sound and visualized HMI. The feature can help assist Drivers to prepare to move in ahead and traffic efficiency can be improved, especially for the congested intersections.

2.2.2 Assumptions

- The system works in those cities that have granted access to their traffic control data.
- The Embedded Navigation may receive the command from V2I LITE APP.(defined in 3.Functional Architecture.)
- The system receives real-time signal information from the traffic management system.

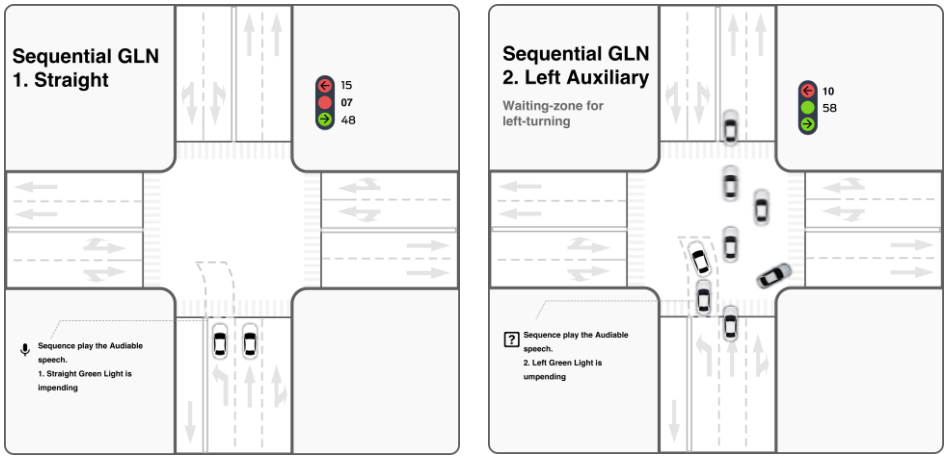
2.2.3 User Stories

User Story ID	User Story
2.2.3.1	As a driver under Cruise Mode, I would like to be notified when the phase shifting of the traffic light is impending whatever which lane/direction is.
2.2.3.2	As a driver under Navigation Mode, I would like to be notified when the most interested lane/direction's traffic light phase-shifting(from Red to Green) is impending.
2.2.3.3	As a driver, I can disable/enable it or preset the time to be notified. (ahead 3, 5, and 8 seconds before the phase shifting.)

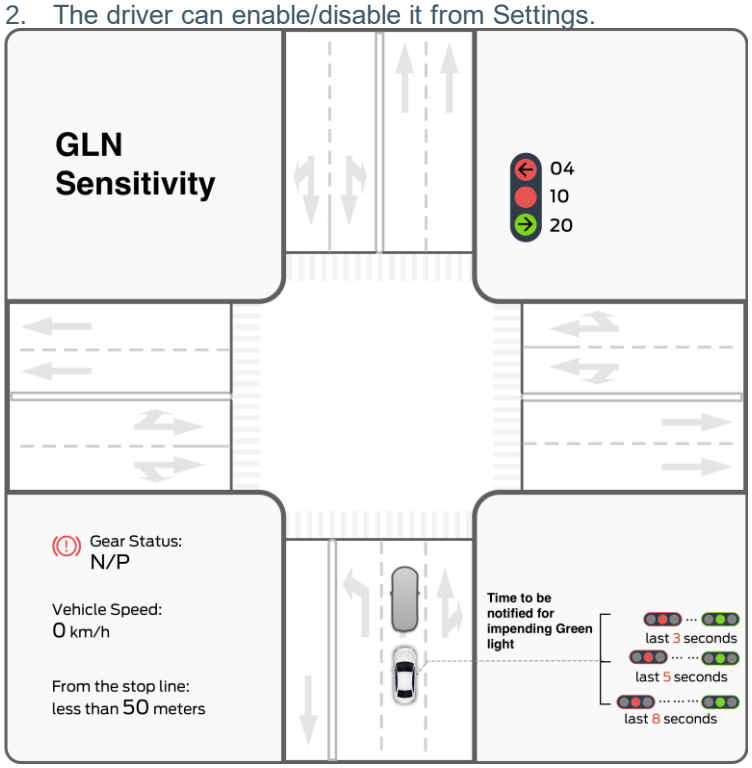
2.2.4 Requirements

Requirement ID	Title	Description
2.2.4.1	Receive command from V2I LITE APP.	V2I LITE APP will use the determined Signal (defined in ***3. Functional Architecture)*** to send and trigger the events, under different scenarios, for example, navigation mode, cruise mode, and others.
2.2.4.2	Privilege	V2I LITE APP can be granted with necessary privilege while daily using.
2.2.4.3	Sequential Green Light Notification	The driver can be notified of the phase shifting with presetting ahead of time (3/5/8 seconds). • **Cruise Mode** Normally, there will be a Left Auxiliary (waiting zone as dash line) extending from the stop line towards the center of the intersection. For those drivers, who would like to turn left, may receive the sequential GLN (Firstly Straight, Then Left). • **Navigation Mode** Only the focused direction's GLN will be activated via Turn-by-turn info.
2.2.4.4	Setting Preference(Ahead of Time) on GLN	The driver can preset the time that how far ahead of GLN can be executed when the phase shifting(Red to Green) will take place. **3 / 5 / 8 Seconds.**
2.2.4.5	GLN triggercondition	The vehicle is standstill (the selected gear in the car is: Neutral, Parking) and the distance to the stop line is close to 50 meters.

2.2.5 Use Cases

Use Case ID	2.2.5.1
Use Case	Auditory notification prompt to the driver when the phase shifting of the light is impending in Cruise Mode.
User Stories	2.2.3.1
Requirements	2.2.4.1, 2.2.4.2, 2.2.4.3
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. V2I LITE APP is active.
Trigger	1. V2I LITE APP sends the trigger software signal.
Expected Behavior & Driving Scenario	1. The driver may perceive the auditory notification from SYNC+ under pre-defined time (3/5/8 seconds). 2. The driver may get the notification of Straight, Left Auxiliary(Waiting Zone). 
Post Conditions	
Exceptions	<V2I LITE APP failed to send the signals.>

Use Case ID	2.2.5.2
Use Case	Auditory notification prompt to the driver when the phase shifting of the light is impending in Navigation Mode.
User Stories	2.2.3.1
Requirements	2.2.4.1, 2.2.4.2, 2.2.4.3
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. V2I LITE APP is active.
Trigger	1. V2I LITE APP sends the command.
Expected Behavior	1. The Driver may perceive the auditory notification in their most interested direction from Turn-by-turn information.
Post Conditions	
Exceptions	<V2I LITE APP failed to send the signal.>

Use Case ID	2.2.5.3
Use Case	GLN Setting Preference
User Stories	2.2.3.3
Requirements	2.2.4.1, 2.2.4.2, 2.2.4.4, 2.2.4.5
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. V2I LITE APP is active.
Trigger	1. Setting sent the signals.
Expected Behavior & Driving Scenario	1. The driver can set their preferred ahead of time from Settings. 2. The driver can enable/disable it from Settings. 
Post Conditions	
Exceptions	<V2I LITE APP failed to send the signals.>

2.3 GWA/GLOSA

2.3.1 Description

This feature enables the Driver to be assisted on whether the vehicle can pass through the intersection clearly on time which can improve traffic efficiency. The computed result will be displayed in HMI, which would be specified on a vehicle basis.

Vehicles approaching signalized intersections would be continued to receive SPaT messages from the intersections, and they would receive advisories to indicate if they can pass through the intersection with a green wave indication activated.

2.3.2 Assumptions

- The system works in those cities that have granted access to their traffic control data.
- The Embedded Navigation may receive the command from V2I LITE APP.(defined in ***3.Function Interface.)***
- The system receives real-time signal information from the traffic management system.

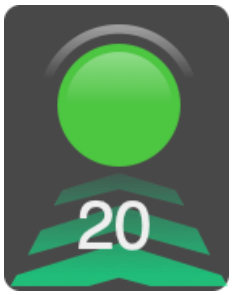
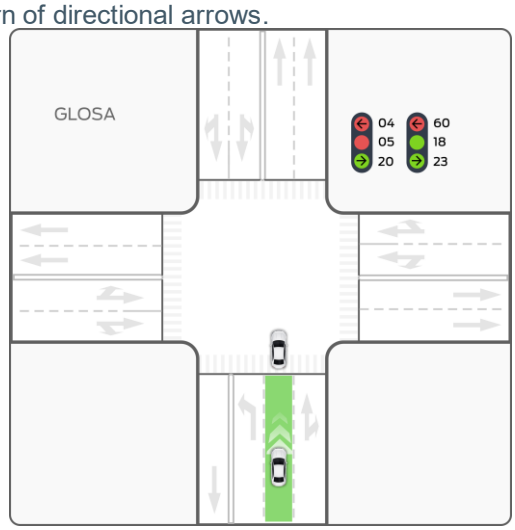
2.3.3 User Stories

User Story ID	User Story
2.3.3.1	As a driver under navigation mode, I would like to know if I can pass through and catch up with the signalized intersection under current conditions.
2.3.3.2	As a driver, I can enable or disable it from Settings.

2.3.4 Requirements

Requirement ID	Title	Description
2.3.4.1	Receive command from V2I LITE APP.	V2I LITE APP will use the determined API (defined in ***3. Function Interface***) to send and trigger the events, under different scenarios, for example, navigation mode, cruise mode, and others.
2.3.4.2	Privilege	V2I LITE APP can be granted with necessary privilege while daily using.
2.3.4.3	Setting Preference on GLOSA	The driver can turn ON/OFF the GLOSA from the setting.
2.3.4.4	GLOSA triggercondition	It is only activated under **Navigation mode** since the system can predict where the driver would like to go and give a precise advisory. It can avoid the mismatched indication/alarm caused by the low accuracy of localization.

2.3.5 Use Cases

Use Case ID	2.3.5.1
Use Case	Visualized indicator and Text-to-Speech on passing through the signalized intersection in Navigation mode.
User Stories	2.3.3.1
Requirements	2.3.4.1, 2.3.4.2, 2.3.4.4
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. V2I LITE APP is active.
Trigger	1. V2I LITE APP sends the software signals.
Expected Behavior	1. If the current speed is applicable, the relative/determined traffic light will turn translucent green with the pattern of directional arrows.  
Post Conditions	
Exceptions	<V2I LITE APP failed to send the signal.>

Use Case ID	2.3.5.2
Use Case	Driver settings.
User Stories	2.3.3.2
Requirements	2.3.4.1, 2.3.4.2, 2.3.4.3
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. V2I LITE APP is active.
Trigger	2. Settings sent the trigger signal.
Expected Behavior	1. The driver can disable/enable it from Settings.
Post Conditions	
Exceptions	<V2I LITE APP failed to send the signal.>

2.4 RLVW

2.4.1 Description

This feature enables the Driver to be notified of a warning under an emergency, when the vehicle comes to a Green or Yellow light, it will give a warning for the driver to decelerate before the light changes and avoid unintentionally violating the traffic rule before Stop line.

Vehicles approaching a signalized intersection are continuously receiving SPaT messages from the intersections, which are used by the vehicle to estimate whether it is on a trajectory that would cause it to cross the stop line after the onset of the red phase. If indeed it is on track to cross the stop line in red, the system issue an auditory alert to the driver urging him or her to stop. This is intended to reduce red light violations and the crashes associated with them.

2.4.2 Assumptions

- The system works in those cities that have granted access to their traffic control data.
- The Embedded Navigation may receive the command from V2I LITE APP.(defined in 3.Functional Architecture.)
- The system receives real-time signal information from the traffic management system.

2.4.3 User Stories

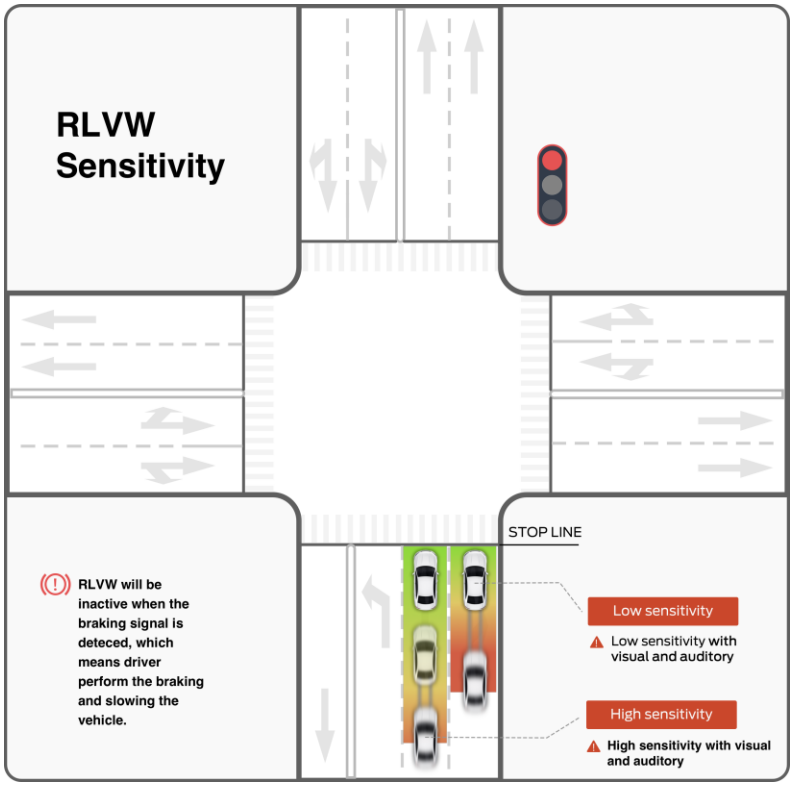
User Story ID	User Story
2.4.3.1	As a driver under navigation mode, I would like to be notified by a warning/alert if the situation is critical and may run the red light.
2.4.3.2	As a driver, I can tune the warning occurrence with different sensitivity levels in Settings. (High / Low)

2.4.4 Requirements

Requirement ID	Title	Description
2.4.4.1	Receive command from V2I LITE APP.	V2I LITE APP will use the determined signals (defined in 3. Functional Architecture) to send and trigger the events, under different scenarios, for example, navigation mode, cruise mode, and others.
2.4.4.2	Privilege	**V2I LITE APP** can be granted with necessary privilege while daily using.
2.4.4.3	RLVW trigger condition	It is only activated under **Navigation mode** since the system can predict where the driver would like to go and give a precise advisory. It can avoid the mismatched indication/alarm caused by the low accuracy of localization.
2.4.4.4	Setting Preference on RLVW	• **High –** The warning will be triggered earlier and the driver may perform a comfort braking to slow down the vehicle in front of the stop line. • **Low –** Normally, the warning will be triggered under an emergency case and the driver may perform hard braking to slow down the vehicle in front of the stop line. A calibrate deceleration degree will be used to measure what is **comfortable** and what is **hard braking**. For example, 0.2g vs. 0.3g.

2.4.5 Use Cases

Use Case ID	2.4.5.1
Use Case	Visual and Auditory alert if it is predicted to reach the stop line after the red onset.
User Stories	2.4.3.1
Requirements	2.4.4.1, 2.4.4.2, 2.4.4.3
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. The red light will onset. 4. V2I LITE APP is active.
Trigger	1. VI2 LITE APP sends the software signal.
Expected Behavior	1. The visual and auditory alerts will be prompt to driver it is predicted to reach the stop line after the red onset. 
Post Conditions	
Exceptions	<V2I LITE APP failed to send command.>

Use Case ID	2.4.5.2
Use Case	RLVW Setting
User Stories	2.4.3.2
Requirements	2.4.4.1, 2.4.4.2, 2.4.4.4
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. V2I LITE APP is active.
Trigger	1. Settings sent the signal to V2I LITE APP.
Expected Behavior	1. The driver can enable/disable it from Settings. 2. The driver can select the sensitivity on High / Low. 
Post Conditions	
Exceptions	<Settings failed to send V2I LITE APP.>

2.5 RSI

2.5.1 Description

This feature enables the Driver to be broadcasted with the nearby road information, for example, hazardous warnings, emergency vehicle upcoming warnings, construction zones, black-ice roads, slippery roads, etc. The computed result will be prompted with audible Text-to-Speech and visualized HMI, which would be specified on a vehicle basis.

2.5.2 Assumptions

- The system works in those cities that have granted access to their traffic control data.
- The system may receive the command from V2I LITE APP.(defined in 3.Functional Architecture
- The system receives real-time signal information from the traffic management system.

2.5.3 User Stories

User Story ID	User Story
2.5.3.1	As a driver, I would like to be broadcasted the near by latest Traffic information in the vehicle from Road Side Unit.
2.5.3.2	As a driver, I can enable or disable the notification in Settings.

2.5.4 Requirements

Requirement ID	Title	Description
2.5.4.1	Receive command from V2I LITE APP.	V2I LITE APP will use the determined signals (defined in 3. Functional Architecture) to send and trigger the events, under different scenarios, for example, navigation mode, cruise mode, and others.
2.5.4.2	Privilege	V2I LITE APP can be granted with necessary privilege while daily using.

2.5.5 Use Cases

Use Case ID	2.5.5.1
Use Case	The driver receives the nearby Traffic information (Static / Dynamic) from Road Side Unit.
User Stories	2.5.3.1
Requirements	2.5.4.1, 2.5.4.2
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. V2I LITE APP is active.
Trigger	1. V2I LITE APP sends the software signal.
Expected Behavior	1. Visual and auditory message to the driver from the incoming message. 
Post Conditions	
Exceptions	<V2I LITE failed send the command.>

2.6 OASS (TBD)

2.6.1 Description

This feature enables the Driver to be recommended manually disable the Automatic Start-Stop engine under certain conditions. The purpose of an automatic start/stop engine is to reduce the amount of time the engine spends idling, thereby reducing fuel consumption and emission for the internal combustion engine. With the traffic light count number of Red lights, it may help to predict the idling time and avoid the annoying Start-Stop engine under too short a period.

2.6.2 Assumptions

- The system works in those cities that have granted access to their traffic control data.
- The system may receive the command from V2I LITE APP.(defined in ***3.Function Interface.)***
- The system receives real-time signal information from the traffic management system. User Stories.

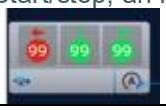
2.6.3 User Stories

User Story ID	User Story
2.6.3.1	From those vehicles equipped with Engine Start/Stop, as a driver, I would like to the system automatically disable the Engine Start/Stop may avoid the annoying under too short idling period.

2.6.4 Requirements

Requirement ID	Title	Description
2.6.4.1	Receive command from V2I LITE APP.	V2I LITE APP will use the determined API (defined in ***3. Function Interface***) to send and trigger the events, under different scenarios, for example, navigation mode, cruise mode, and others.
2.6.4.2	Privilege	V2I LITE APP can be granted with necessary privilege while daily using.

2.6.5 Use Cases

Use Case ID	2.6.5.1
Use Case	Manually / Automatically alter the Engine Start/Stop function.
User Stories	2.6.3.1
Requirements	2.6.4.1, 2.6.4.2
Pre-Conditions	1. The signalized intersection is active. 2. The host vehicle radio connection is enabled. 3. The red light will onset. 4. V2I LITE APP is active.
Trigger	1. V2I LITE APP sends the command.
Expected Behavior	1. For those vehicles that need to manually disable the Engine Start/stop, an indicator will be presented accompanied by Text-to-Speech. 2. For those vehicles that can automatically temporarily disable the Engine Start/stop, an indicator will be presented as the result. 
Post Conditions	
Exceptions	<V2I LITE App failed to send command.>

2.7 Turn-by-turn information

2.7.1 Description

The embedded navigation shall sync up the turn-by-turn information to V2I LITE APP, for example, direction (left, right, straight), and how much distance to the turn.

2.8 Settings

2.8.1 Description

The driver may easily tune their preferences (visual, auditory) for each sub-functions from the Settings page. The exact combination/preferences can be found in 2.8.2 Preferences.

The design will reuse as many existing UI components from SYNC+/Settings. While some items contain a separate info page to elaborate the functions. More details mockup, UI maker can be found at [Ford-V2I]Settings_UI_Design-V1.0-20200325.pdf, [Ford-V2I]_Settings_markup_20200325.pdf

The visual assets can be found at [Ford-V2I]_Settings UI Design-V1.0-20200325_assets.zip.

- Toggle button
- Switch
- Choice box

2.8.2 Preferences

Function Name	Description	Options
V2I Notification	Overall feature switch: ON / OFF.	**ON(Default)**
		OFF
Traffic Light Information	The driver may set different sensitivity(distance from the stop line) on presenting TLI.	**Far Distance(Default)**
		Short Distance
		OFF
Green Wave Advisory	The driver may set ON/OFF on that feature.	**ON(Default)**
		OFF
Green Light Notification	The driver may set different sensitivity on how to trigger the notification.	Sensitivity – 8 Seconds
		Sensitivity – 5 Seconds
		Sensitivity – 3 Seconds(Default)
		OFF

Red Light Violation Warning	The driver may set different sensitivity on how to trigger the warning.	**High Sensitivity (Default)**
		Low Sensitivity
		OFF
Road Side Information	To receive the nearby Road Side information.	**ON(Default)**
		OFF
Audio settings	Overall Audio ON / OFF.	**Detailed(Default)**
		Concise
		OFF
Widget	A widget[1]	**ON(Default)**
		OFF

Note:

1. In general, V2I is displayed on the IPC through CAN Bus or internal communication-DBus (this is a formal solution), but in the early models without these signals on CAN Network, V2I displayed TLI and RSI on the IVI through the widget and displayed RLVW through the breathing bar. When the widget option is closed, the display of TLI, RSI, and RLVW on the IVI will be closed, and at the same time, the TTS will broadcast normally, and the map will display TLI, and RSI normally.

2.9 Master Reset

2.9.1 Description

This feature enables the Driver to reset V2I LITE APP to factory default settings, and the authorization of the account will be canceled.

2.9.2 Assumptions

- The system works in those cities that have been granted access to the traffic control data.
- The Embedded Navigation may receive the command from V2I LITE APP.
- The system receives real-time signal information from the external traffic management system. (City C-V2X platform)

2.9.3 User Stories

User Story ID	User Story
2.9.3.1	As a driver, I can reset V2I LITE APP to factory default settings utilizing selecting the Master Reset operation.

2.9.4 Requirements

Requirement ID	Title	Description
2.9.4.1	Receive command from V2I LITE APP	**V2I LITE App** will use the determined Signal interface to send and trigger the events, in different scenarios, for example, Navigation mode, Cruise mode, and others.
2.9.4.2	Privilege	**V2I LITE APP** can be granted with necessary privilege while daily using.

2.9.5 Use Cases

Use Case ID	2.9.5.1
Use Case	Driver select Master Reset in SYNC+ system.
User Stories	2.9.3.1
Requirements	2.9.4.1, 2.9.4.2
Pre-Conditions	1. V2I LITE APP is active.
Trigger	1. V2I LITE App sends the software signal.
Driving Scenarios & Expected Behavior	1. Driver authorization info will be canceled. 2. The driver needs to re-enroll for the V2I service when he or she wants to experience it again.  
Post Conditions	N/A
Exceptions	<IPC failed receive the signal sent from V2I LITE APP>

2.10 Enrollment

2.10.1 Description

This feature enables the Driver to enroll in the V2I LITE APP software service.

When the enrollment failed, the driver should be informed of the result, e.g. Application failed. The result will be displayed via the HMI system, which would be specified on a vehicle basis.

2.10.2 Assumptions

- The system works in those cities that have been granted access to the traffic control data.
- The Embedded Navigation may receive the command from V2I LITE APP.
- The system receives real-time signal information from the external traffic management system. (City C-V2X platform)

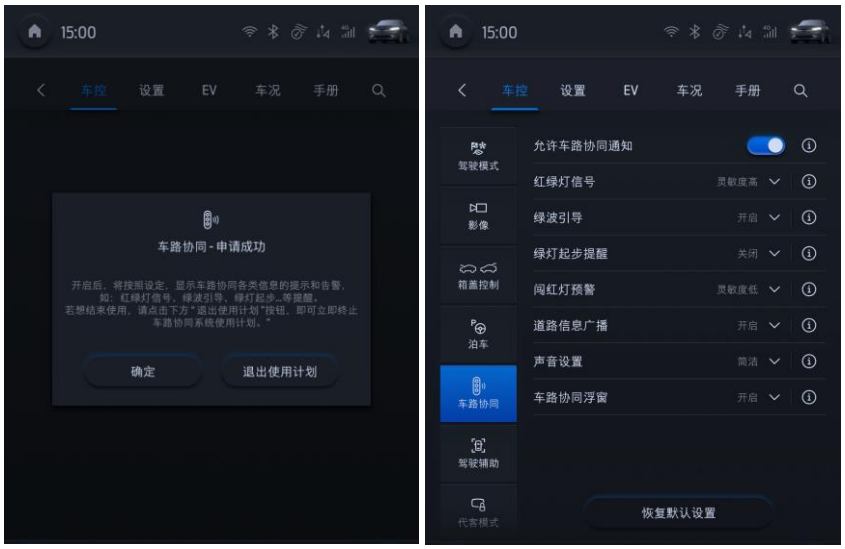
2.10.3 User Stories

User Story ID	User Story
2.10.3.1	As a driver, I can enroll in the V2I LITE APP software service.
2.10.3.2	As a driver, I would like to be informed of the result when the enrollment failed.

2.10.4 Requirements

Requirement ID	Title	Description
2.10.4.1	Receive command from V2I LITE APP	**V2I LITE App** will use the determined Signal interface to send and trigger the events, in different scenarios, for example, Navigation mode, Cruise mode, and others.
2.10.4.2	Privilege	**V2I LITE APP** can be granted with necessary privilege while daily using.

2.10.5 Use Cases

Use Case ID	2.10.5.1
Use Case	Driver select Enrollment in V2I LITE APP/SYNC+ system.
User Stories	2.10.3.1
Requirements	2.10.4.1, 2.10.4.2
Pre-Conditions	1. V2I LITE APP is inactive.
Trigger	1. V2I LITE App sends the software signals.
Driving Scenarios & Expected Behavior	1. The driver can experience the service normally when his or her application is successfully approved. 
Post Conditions	N/A
Exceptions	<IPC failed to receive the signal sent from V2I LITE APP>

Use Case ID	
Use Case	The result of enrollment failure can be presented in HMI.
User Stories	2.10.3.2
Requirements	2.10.4.1, 2.10.4.2
Pre-Conditions	1. V2I LITE APP is inactive.
Trigger	1. V2I LITE App sends the software signals.
Driving Scenarios & Expected Behavior	1. The driver can perceive the visual notification of enrollment failure from HMI.
Post Conditions	N/A
Exceptions	<IPC failed to receive the signal sent from V2I LITE APP>

**[Non-Functional Requirements]*

** Exception records, including invalid city-code or city-code not in the city list file provided by Baidu, should be stored in the V2I Cloud. It's necessary for problem tracing and a closed loop.*

2.11 Audio Arbitration

2.11.1 Description

Two or more TTS / Audio can be played to the same output stream simultaneously. One of the options is to mix everything. While this is technically impressive, it can be very aggravating for the user. To avoid every media source playing at the same time, **V2I LITE APP** will follow the existing IVI - Audio Arbitration strategy as much as possible and self-management **Audio Focus** to be cooperative with other SYNC+ apps and offer a better experience with Navigation.

2.11.2 Arbitration Flow Chart

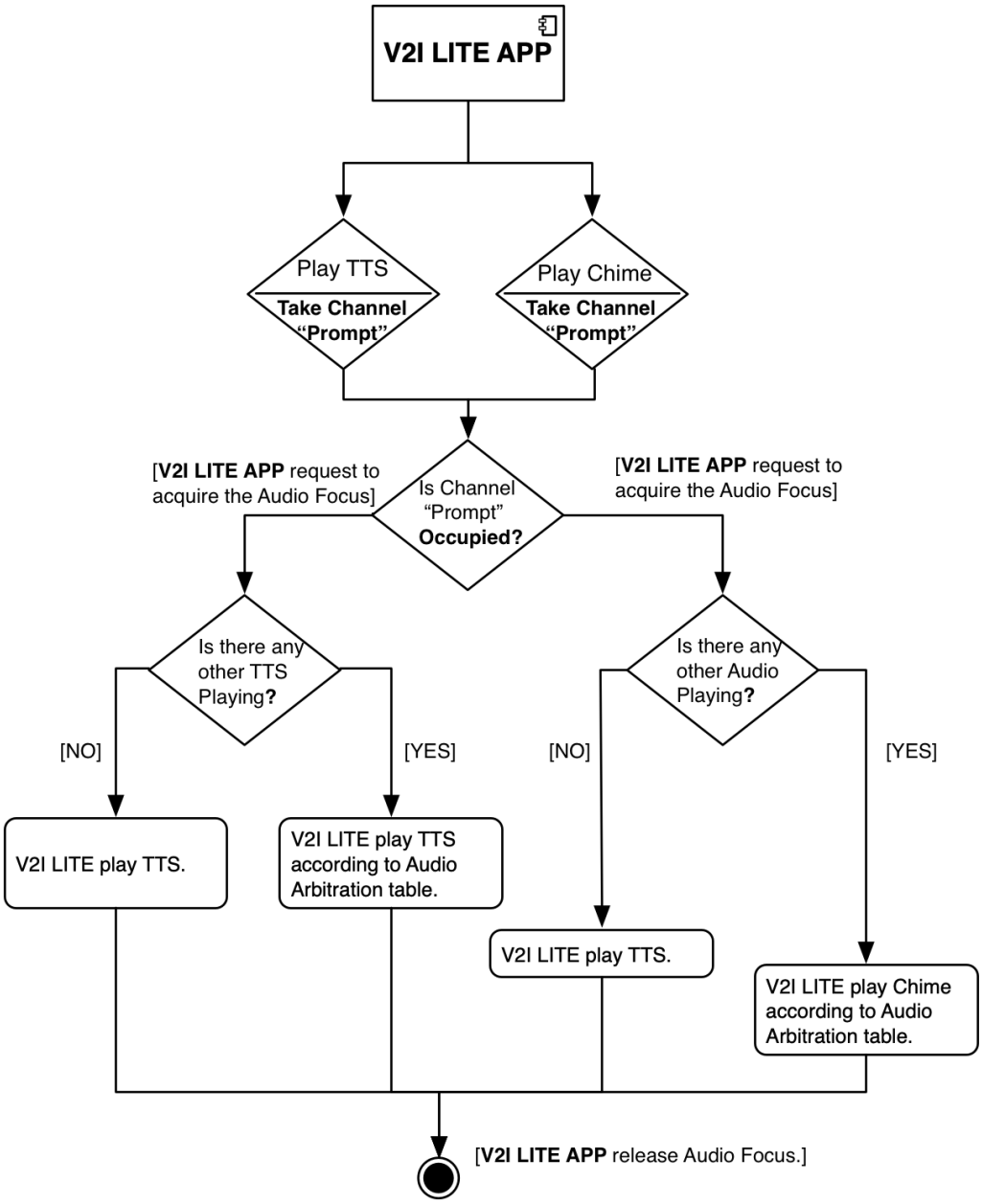


Table 2.9.2.1 SYNC+音频管理补充需求_Ver1.11

Current / New	Media/Radio	Telephone	Prompt - Navi.User	Prompt & V2I	PTT & VR	Mute	Standby
Media/Radio	Granted	Delay	Mix	Mix	Reject	Granted	Reject
Telephone	Granted	Granted 注 1	Mix 注 13	Granted	Granted	Granted	Reject
Prompt - Navi.User	Mix 注 12	Mix	Granted	Granted	Granted	Granted	Reject
Prompt & V2I	Mix	Reject	Reject	Granted	Reject	Granted	Reject
PTT & VR	Granted	Reject	Granted	Granted	Granted 注 2	Granted	Reject
Mute	mute	Reject	Reject	Reject	Reject	Granted 注 5	Reject
Standby	Granted	Granted	Granted	Granted	Granted	Granted 注 10	Granted

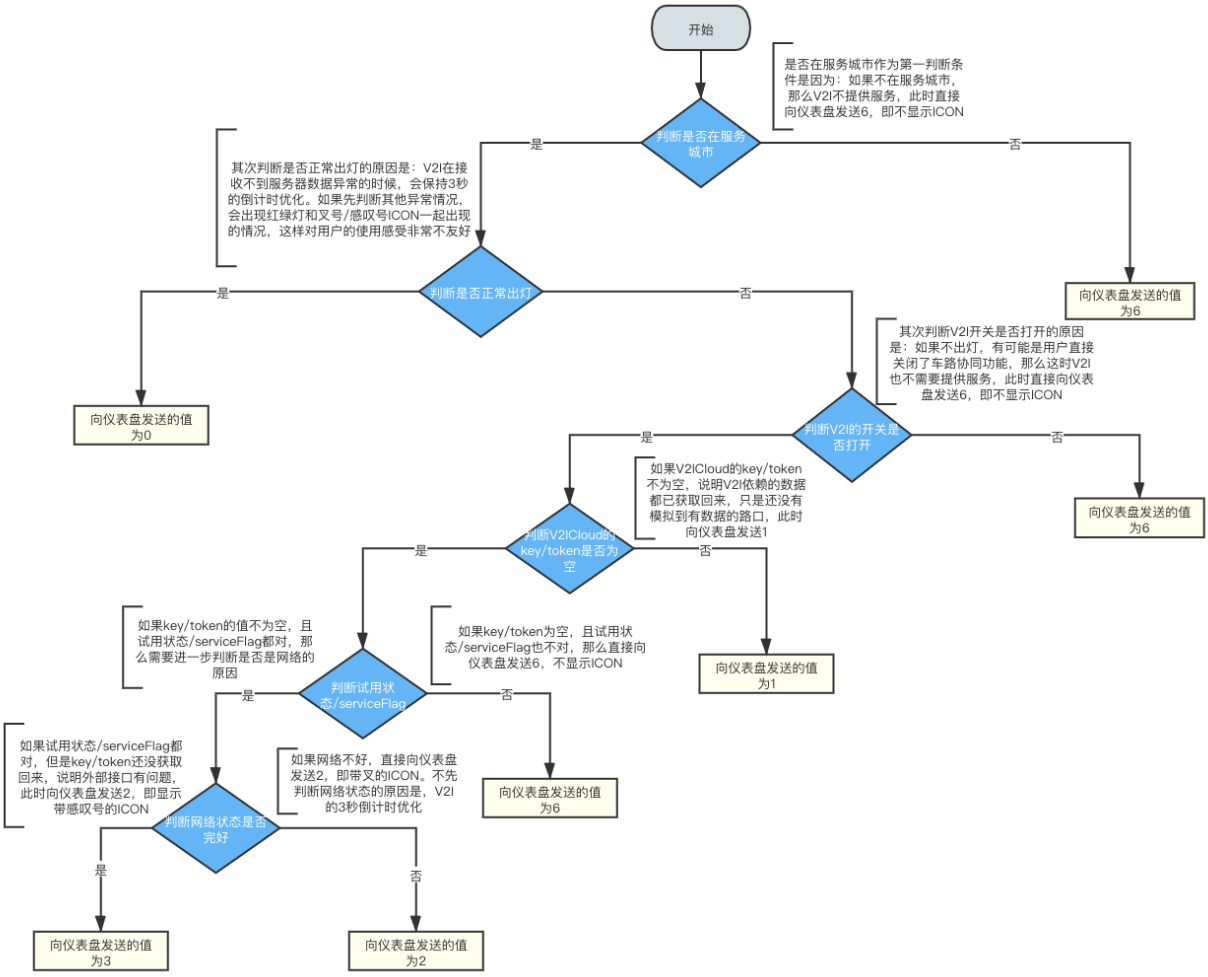
2.12 System abnormal & misbehavior indication

2.12.1 Description

No	STATUS_ICON	WORDING English	WORDING Chinese	DESCRIPTION
1		Traffic Light Symbols with real-time Countdown + Phase Color.		Normal working condition.
2		Out of Service Area	前方区域无服务	In-Service but without V2I Data.
3		Service is temporarily unavailable	服务暂不可用	Lost Wireless / internet connection.
4		Service is temporarily unavailable	服务暂不可用	sub-component is in malfunction, for example, car sensor, input data error, etc.

Note: The style of the status icon is subject to the actual HMI design document.

2.12.2 Flow Chat

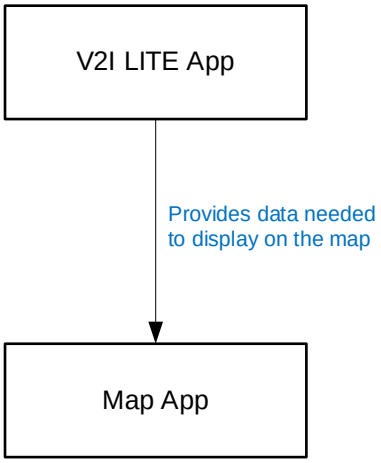


3 Function Interface

3.1 Ford V2I APP 提供地图显示所需数据

3.1.1 Functions

Ford V2I LITE APP 会定时发送红绿灯等相关显示数据给 MAP APP，地图需要按照需求显示对应图标及播放 TTS。



3.1.2 Communication Method

Content Provider

3.1.3 Transmit frequency

N/A

3.1.4 Data Sending

Sending parameters as below.

Item 1	Item 2	Type	Descriptopn
highlightView	base64Icon	String	base64 picture data
bubbleView	base64Icon	String	base64 picture data

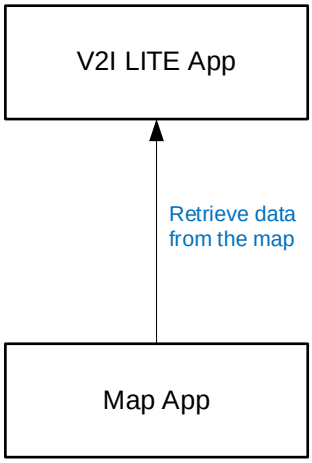
3.1.5 Response

N/A

3.2 获取地图数据

3.2.1 Functions

根据 request 的经纬度返回最近一个路口多个进口方向道路坐标点（GJC02 坐标系）等数据。



3.2.2 Communication Method

AIDL

3.2.3 Data Sending

Parameters	Required	Type	Description
lon.	Yes	Double	The longitude of the intersection
lat.	Yes	Double	The latitude of the intersection

3.2.4 Response

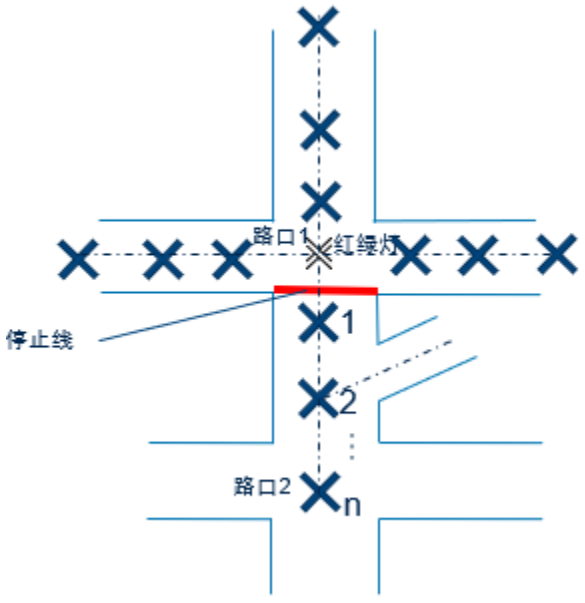
Parameters		Type			Description
[…]			List		Multi-Roads
	lon.		Double		The longitude of the intersection
	lat.		Double		The latitude of the intersection
	roads		List		道路级别数据，路口进口方向路网数据集合①
	-	points	List		组成当前道路的几何位置点坐标，此集合的**最后一个坐标点必须为停止线位置坐标**②
	-	-	lon.	Double	道路点的经度
	-	-	lat.	Double	道路点的纬度

	-	-	is_left_allowed	Boolean	道路是否允许左转
	-	-	is_straight_allowed	Boolean	道路是否允许直行
	-	-	is_right_allowed	Boolean	道路是否允许右转
	-	-	point_type	Enum	点位类型（普通，普通停止点，左转待行区停止点)
	-	-	limit_speed	Double	道路限速
	-	limit_speed		Double	道路限速
	-	is_left_allowed		Boolean	道路是否允许左转
	-	is_straight_allowed		Boolean	道路是否允许直行
	-	is_right_allowed		Boolean	道路是否允许右转

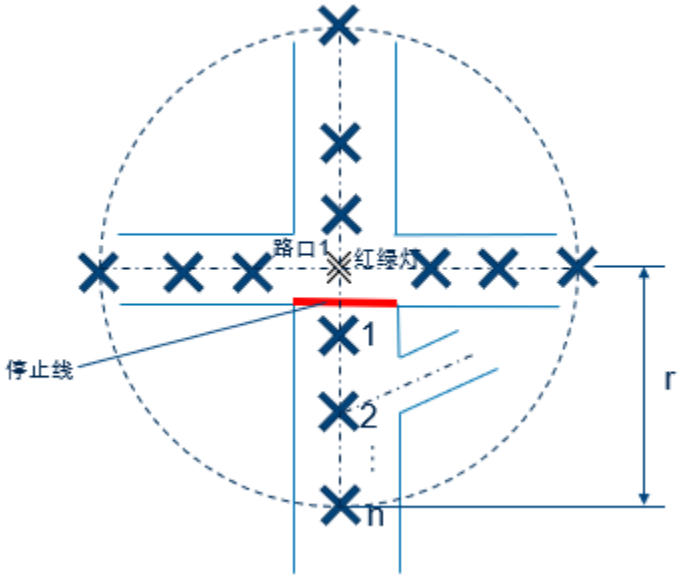
备注：

① 根据 request 的经纬度返回最近一个路口多个进口方向道路坐标点（GJC02 坐标系）等数据，根据有无连续路口，分为两种情况。

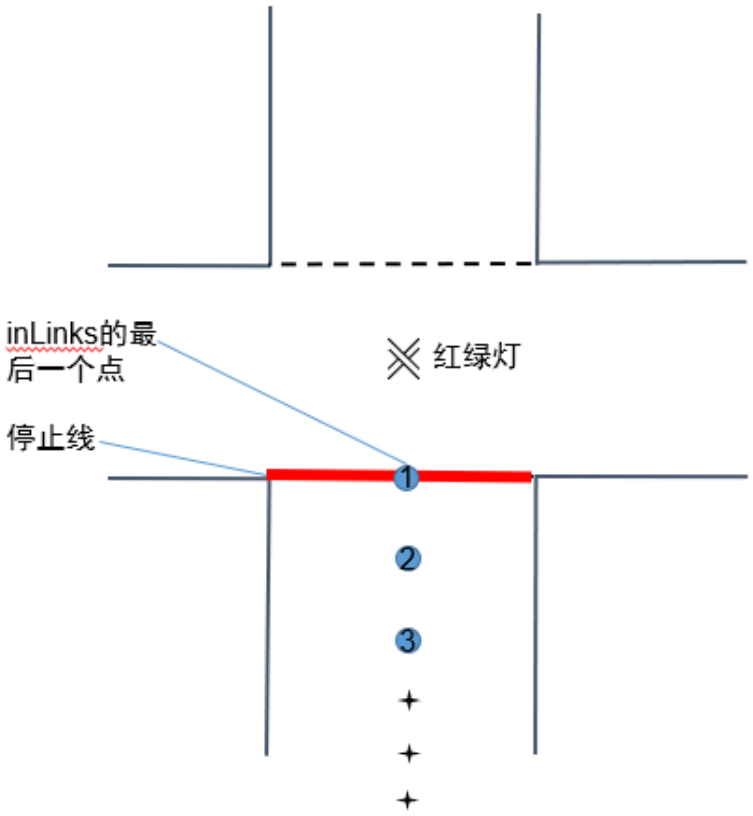
第一种情况：存在连续路口。如图，路口 1 和 2,那么第 n 个坐标为路口 2 的中心点坐标。



第二种情况：不存在连续路口。如图，那么第 n 个坐标是以红绿灯为圆点，半径为 r 的位置坐标。r 为 1000 米。



② Ford 希望“停止线的位置”以“组成当前道路的几何位置点坐标”形式提供。如下图所示，若一条路由坐标点 1、2、3...的集合构成，填充在 inlinks 消息中的坐标点必然包含点 2 和点 3，除此之外 Ford 要求填充在 inlinks 消息中的最后一个坐标点必须是停止线的位置坐标点 1。最后百度提供的 inlinks 消息集中实际上包含了坐标点 1、2、3。



Sample:

```
{
  // 1. 交叉路口中心点坐标
  "lon": 120.3114752,
  "lat": 31.4907072",
  // 2. 能够组成路口进口方向路网的道路位置点集合
  "roads": [{
          // 2.1 （例：南向北方向）组成道路几何形状的坐标点，最后一个坐标点为停止线
          "points": [{
              "lon": 120.318137,
              "lat": 31.486645
              }, ... , {
              "lon": 120.316067, // 最后一个坐标点为道路停止线坐标点
              "lat": 31.488676
              }],
          // 2.2 当前道路限速
          "limit_speed": 60,
          // 2.3 当前路口是否允许左转
          "left_turn": true,
```

```
            // 2.4 当前路口是否允许直行
            "straight": true,
            // 2.5 当前路口是否允许左转
            "right_turn": true
        }, {
            // 2.1 （例：北向南方向）组成道路几何形状的坐标点，最后一个坐标点为停止线
            "points": [{
                "lon": 120.318137,
                "lat": 31.486645
                }, ... , {
                "lon": 120.316067, // 最后一个坐标点为道路停止线坐标点
                "lat": 31.488676
                }],
            // 2.2 当前道路限速
            "limit_speed": 60,
            // 2.3 当前路口是否允许左转
            "left_turn": true,
            // 2.4 当前路口是否允许直行
            "straight": true,
            // 2.5 当前路口是否允许左转

            "right_turn": true
        },{
            // 2.1 （例：西向东方向）组成道路几何形状的坐标点，最后一个坐标点为停止线
            "points": [{
                "lon": 120.318137,
                "lat": 31.486645
                }, ... , {
                "lon": 120.316067, // 最后一个坐标点为道路停止线坐标点
                "lat": 31.488676
                }],
            // 2.2 当前道路限速
            "limit_speed": 60,
            // 2.3 当前路口是否允许左转
            "left_turn": true,
            // 2.4 当前路口是否允许直行
            "straight": true,
            // 2.5 当前路口是否允许左转
            "right_turn": true
        },{
            // 2.1 （例：东向西方向）组成道路几何形状的坐标点，最后一个坐标点为停止线
            "points": [{
                "lon": 120.318137,
```

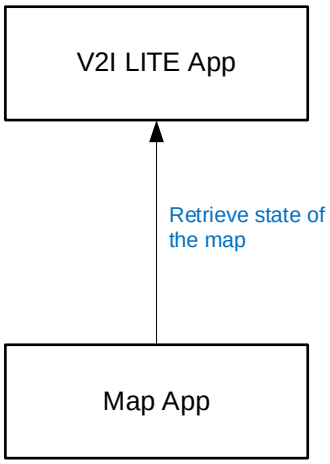
```
                "lat": 31.486645
                }, ... , {
                "lon": 120.316067, // 最后一个坐标点为道路停止线坐标点
                "lat": 31.488676
                }],
            // 2.2 当前道路限速
            "limit_speed": 60,
            // 2.3 当前路口是否允许左转
            "left_turn": true,
            // 2.4 当前路口是否允许直行
            "straight": true,
            // 2.5 当前路口是否允许左转
            "right_turn": true
        }

    ]}
}
```

3.3 获取当前状态

3.3.1 Functions

当用户不在百度地图页的时候，Ford V2I LITE APP 会浮窗显示红绿灯等信息。需要进入百度地图和退出地图 APP 的时候发出相应广播通知 Ford APP，然后 Ford APP 决定是否显示浮窗。百度地图 APP 不可见，则显示 Ford V2I LITE 自身浮窗；百度地图 APP 可见，则 Ford APP 发送数据给百度地图并显示。



3.3.2 Communication Method

Broadcast(TBD)

3.3.3 Transmit frequency7

当地图可见状态发生变化时发出对应广播

3.3.4 Data Sending

Sending parameters as below.

广播名称	说明
android.intent.action.BD_MAP_RUNNING_VISIBLE	百度地图(运行中)可见广播
android.intent.action.BD_MAP_RUNNING_NOTVISIBLE	百度地图(运行中)退到后台（不可见）广播

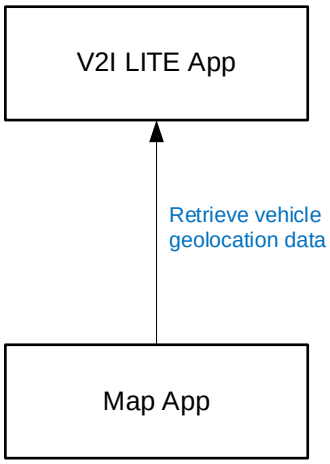
3.3.5 Response

N/A

3.4 获取车辆定位信息

3.4.1 Functions

Ford V2I LITE APP 需要获取车辆经纬度（GCJ02）。



3.4.2 Communication Method

AIDL

3.4.3 Transmit frequency

N/A

3.4.4 Data Sending

是否需要获取参数

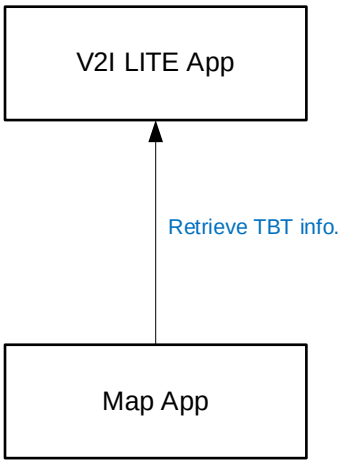
3.4.5 Response

信号	信号说明
车辆经度	新添加（GCJ02 坐标系）
车辆纬度	新添加（GCJ02 坐标系）
城市名称	车辆所在的城市（需要百度提供的城市代码类型和城市名称）
GPS 角度	GPS Bearing
GPS 精度	GPS Accuracy
GPS 时间戳	GPS Time

3.5 已规划路线信息 / Turn-by-turn information

3.5.1 Functions

Ford V2I LITE APP 中的应用场景需要获取导航模式下前方路口导航方向（调头、左转、直行、右转）。



3.5.2 Communication Method

AIDL

3.5.3 Transmit frequency

Event-driven.

3.5.4 Data Sending

N/A

3.5.5 Response

信号	信号说明
导航方向	导航模式下，车辆即将进入前方路口的导航行进方向（调头、左转、直行、右转）
经度	导航模式下，车辆即将进入前方路口的经度
纬度	导航模式下，车辆即将进入前方路口的纬度
距离机动点的距离	单位: 米
导航目的地剩余距离	单位: 米

3.6 路侧消息 / Road-Side Information

3.6.1 Functions

Ford V2I LITE APP 中的应用场景需要获取前方道路的（静态的）交通标志牌及（半静态及动态）交通事件。

3.6.2 Communication Method

AIDL

3.6.3 Transmit frequency
Event-driven.

3.6.4 Data Sending
N/A

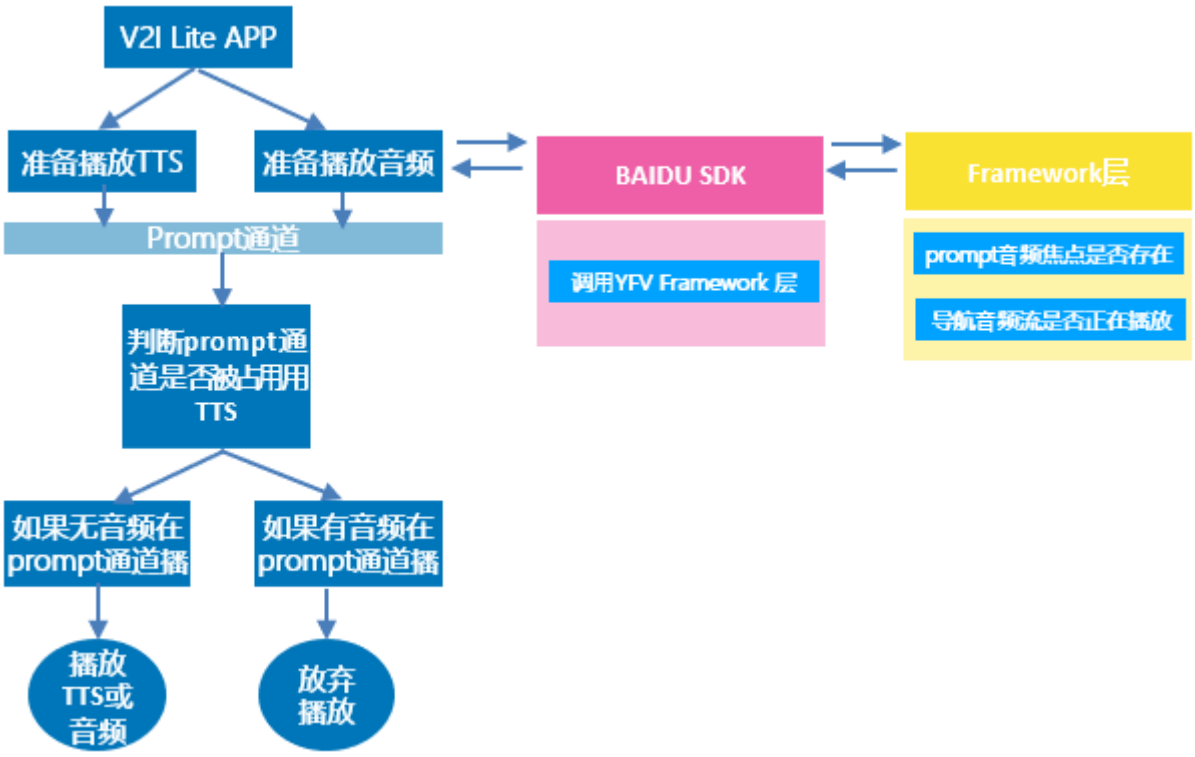
3.6.5 Response

信号	信号说明
交通标志牌	

信号	信号说明
交通事件	

3.7 音频资源仲裁 / Audio Arbitration （Baidu&YFV）

3.7.1 Functions
V2I 信息播报分为 TTS 播报和音频（MP3）播报，都走 prompt 通道进行播报，但是在播报前需要判断当前通道是否被占用，具体流程如下：



所以，对于 V2I TTS 播报来说：

- 导航在播，则 V2I 的 TTS 不不播
- V2I 的 TTS 在播，导航 TTS 来了了会打断 V2I 的 TTS

- 音乐在播放，V2I 的 TTS 也播放，会和音音乐混音音

对于 V2I 音频（MP3）播报来说：

- V2I 音频正在播放，如果这时用用户打开音乐混音（media 降到 5，Prompt 按照调音音大大小小，不不论先后只要混就是这样）
- 如果当前音音乐正在播放，V2I 音频会混音音（不不论先后，同上）
- 如果导航在播，V2I 音频准备播，导航被抢占
- V2I 音频在播，导航准备播，则导航抢占 V2I 音频

因此，需要准备三个接口：

- 接口 1:(YFV) prompt 是否被占用用（发生生变化需要通知）
- 接口 2:(百度) 在 prompt 通道播放 TTS
- 接口 3:(百度) 在 prompt 通道播放短促音音频

3.7.2 Communication Method

SDK update.

3.8 系统异常状态提醒 / System abnormal & misbehavior indication

3.8.1 Functions

依据 SYNC+ 系统对状态定义的形式处理 。

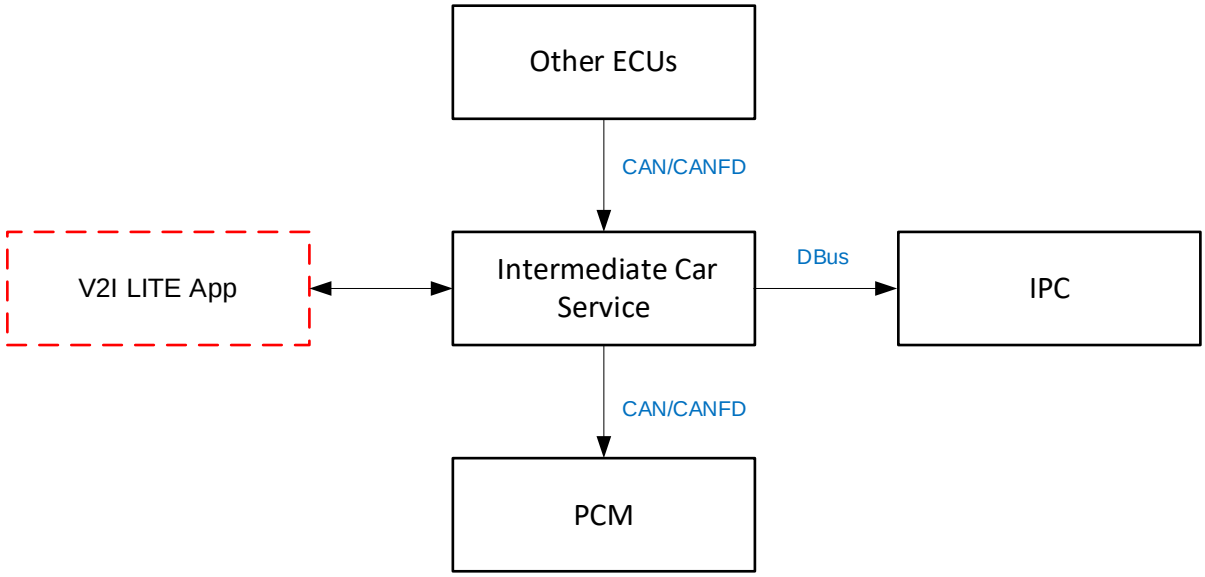
3.8.2 Communication Method

TOAST

3.9 通过 Carservice 获取车辆数据（YFV）

3.9.1 Functions

Ford V2I LITE APP 需要获取车辆车速，左右转信号灯等数据，通过 Car Service 来获取，需要 YFV 提供对应的接口。



3.9.2 Communication Method

通过 Car Service SDK 获取，需要 YFV 提供 SDK 并提供相应 MCU 版本

3.9.3 Transmit frequency

N/A

3.9.4 Data Requirement

Sending parameters as below.

信号	信号名称	上报周期	备注
车辆识别码	VehicleGGCCData	状态读取	
车速	Veh_V_ActlEng	差分上报/状态读取	
左转信号	TurnLghtLeft_D_Rq	差分上报/状态读取	
右转信号	TurnLghtRight_D_Rq	差分上报/状态读取	
档位信号	GearLvrPos_D_Actl		
	GearLvrPos_D_Actl_UB	差分上报/状态读取	
刹车踏板信号&刹车灯信号	BpedDrvAppl_D_Actl	差分上报/状态读取	刹车踏板信号&刹车灯信号共用信号
	BpedDrvAppl_D_Actl_UB	差分上报/状态读取	
后轮转数	WhlRotatRl_No_Cnt	差分上报/状态读取	
	WhlRotatRr_No_Cnt		
自动启停状态	StopStrtDrvMde_D_Indic	差分上报/状态读取	
	StopStrtStdby_D_Indic	差分上报/状态读取	
方向盘方向转角	StePinComp_An_Est	差分上报/状态读取	

	StePinComp_An_Est_UB	差分上报/状态读取	
	StePinCompAnEst_D_Qf	差分上报/状态读取	
加速踏板信号	ApedPos_Pc_ActlArb	差分上报/状态读取	
双闪灯状态	TurnLghtLeftOn_B_Stat	差分上报/状态读取	
	TurnLghtRightOn_B_Stat	差分上报/状态读取	
失控状态信号	LaActvStats_D_Dsply(LKA/LDW telltale)	差分上报/状态读取	
	StabCtlBrkActv_B_Actl(ESC activate status)	差分上报/状态读取	
	DrvSlipCtlLamp_D_Rq(ESC telltale)	差分上报/状态读取	
	DrvAntiLckLamp_D_Rq(ABS malfunction telltale)	差分上报/状态读取	
	DrvSlipCtlOffLamp_D_Rq(TCS OFF telltale)	差分上报/状态读取	
	DrvSlipCtlOffLamp_D_Rq_UB(TCS OFF telltale update-bit)	差分上报/状态读取	

4 Acceptance Criteria

4.1 External SDK, APIs

The external SDK and APIs defined in Chapter 3. shall be fully conducted functional testing and submit the corresponding testing reports/results to the Ford team.

Functional Testing comprises Unit Testing, Integration Testing, System Testing, Smoke Testing, GUI Testing, Sanity Testing, Regression Testing, and Acceptance Testing.

4.1.1 Unit Testing

Each component or module shall be tested by the Baidu(development team or tester). It guarantees the software component or module meets the requirement and functional works as expected.

4.1.2 Integration Testing

The Baidu team shall cooperate with the Ford team on all of the integrated external modules to verify the combined functionality after integration.

4.1.3 Smoke Testing

Whenever a new build is provided by the Baidu development team, the Ford team shall validate the software build and ensures that no major issue exists.

The Baidu team shall ensure that the software build is stable. The Smoke Testing shall be checked that no show stopper defect exists in the new build which will prevent the integration and testing of the application in detail.

4.1.4 Sanity Testing

The sanity testing shall be performed to determine if a new build is performing well enough to accept it for a major testing effort or not. For example, if a new build is crashing for the initial use, then the build is not stable enough for further testing. Hence another build is assigned to fix it immediately.

4.1.5 Graphic User Interface Testing

The expected GUIs of the application are defined in Chapter 2. Feature Requirement and the series mock-up screens are recorded with separate files. The GUI testing comprises the size of the buttons, input field present on the screen, alignment of the text/layout, content in the tables, etc.

4.1.6 Acceptance Testing

Ford team shall perform the Acceptance Testing and verify whether the end-to-end flow of the whole system is as per business requirements or not and if it is as per the needs of the end-user. Ford's team accepts the software only when all the features and functionalities work as expected. It is the last phase of the testing, after which the software goes into production. Baidu team shall provide technical collaboration with the Ford dev team on any changes that happened from **Go/No-Go decision** for the V2I product.

4.2 Program Testing

Ford will initiate a formal type of pre-market V2I product testing in Real Environment, which is carried out by the customer. It will be released to a certain number of real customers in a specific area.

Baidu team shall keep on and ensure providing technical support on major defects/failures in the V2I product during the testing arising from external components/modules. It is successful when the customer accepts the product.

4.3 Metadata

4.3.1 The direction of Road Link

Road link describes the road segment between two intersections. For the V2I product, the directional "inbound" from Intersection A to Intersection B (*Fig 4.3.1.1*) is taken into account.

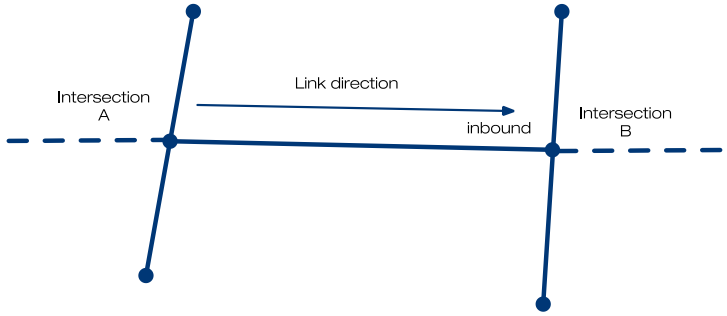


Fig 4.3.1.1 Link direction

4.3.2 Points of Intersection Geometry

The usage of points is defined in Chapter 3.2 从百度获取地图数据. The points data output from the Baidu interface shall be well organized and can be used to describe the intersection as *Fig 4.3.2.1.*

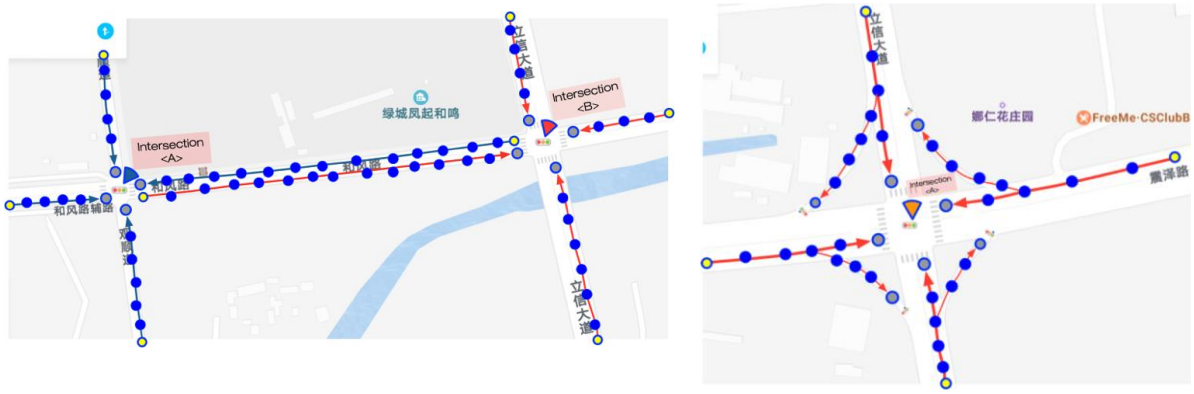
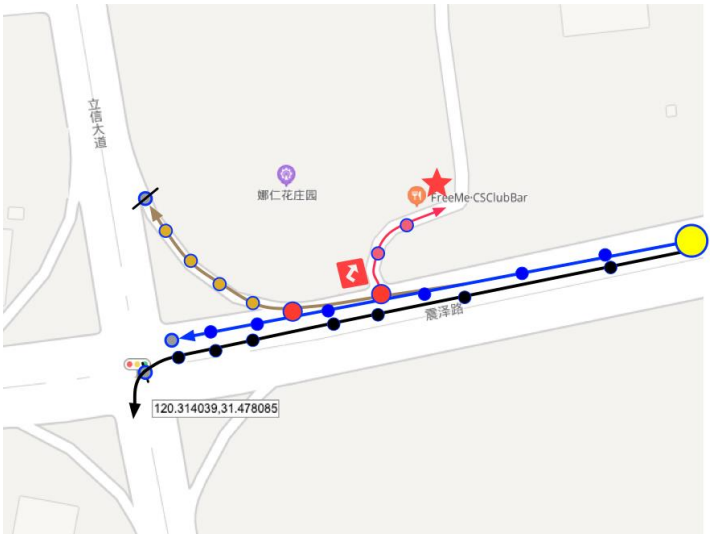


Fig 4.3.2.1 Points of Road Geometry



No.	Symbol	Description
1		Road shape points to connect the Road links.
2		The first points of next inbound from Road Link.
3		STOP LINE representation.
4		Road Link direction. The maximum length is 1000 meters.

5		User journey way-point.(GPS Coordinate required)
6		Destination
7		Singularity Connection Point
8		Auxiliary Lane – Right Auxiliary Lane – Left

4.3.3 Exceptional condition and special attention

The majority of the road geometries can be covered in 4.3.2 Points of Intersection Geometry. But there would be exceptional conditions, which might be caused by broken/error data, wrong reference point, low quality of surviving data, etc. We hereby define and continuously capture the exception here and act as a long-term complementary service.

Hashtag styled Road

Typically in Wuxi, there are some **#(Hash-tag) styled Road** and the surrounding Traffic lights sharing the same traffic light data (as a single location marker). **V2I LITE APP** may request the virtual intersection(the single location marker in Fig 4.3.3.1.1) and the Map interface shall respond to the Road network data according to the real road geometry.

Fig 4.3.3.1.1 Hashtag-styled Road


120.305400,31.482792
801
立信大道
辅路
册之丘
10米

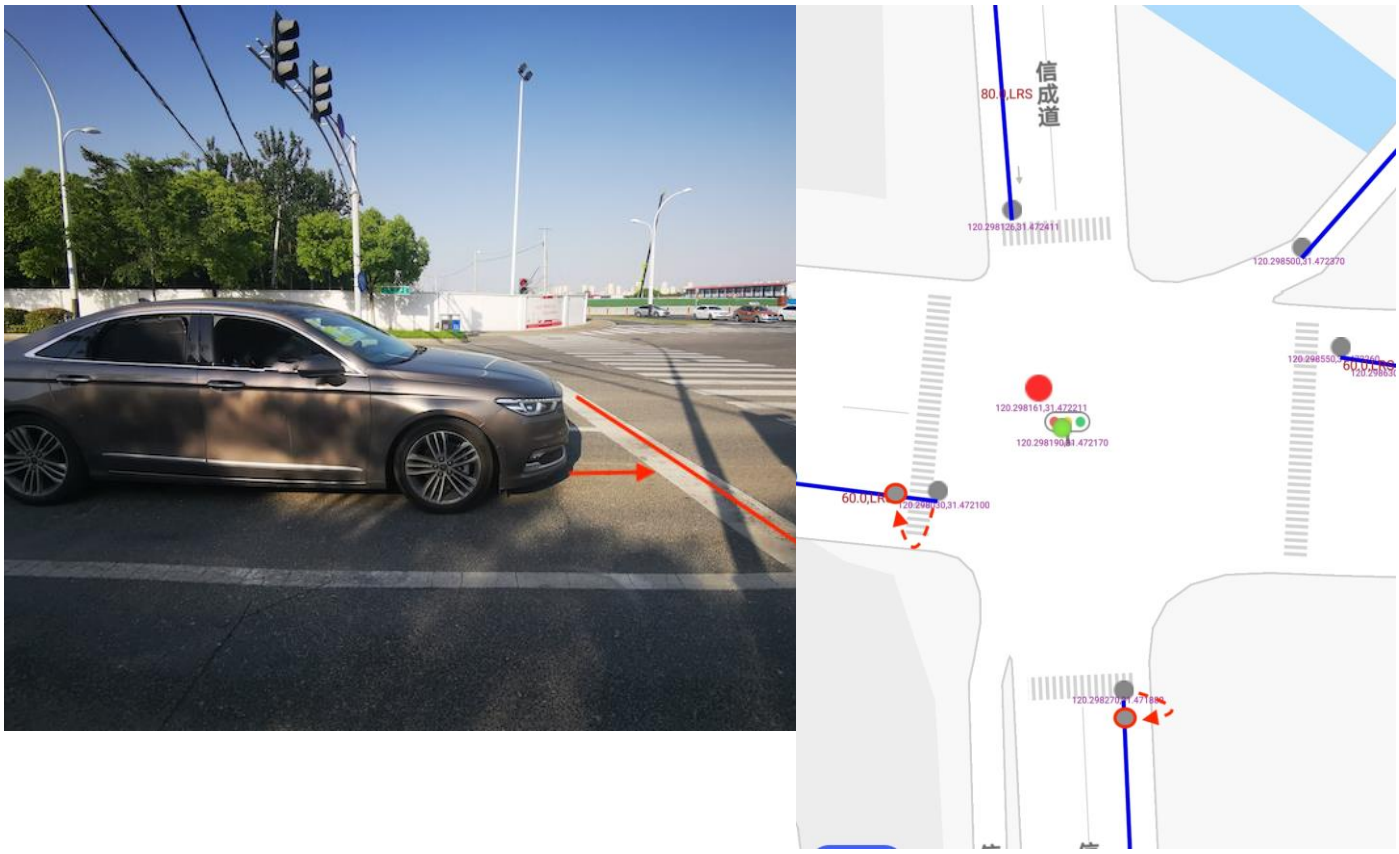
STOP LINE

A STOP LINE is a type of road surface marking used to inform drivers of the point where they are required to stop at an intersection or roundabout controlled by the Traffic light signal. In normal cases, the stop line is used in advance of mid-block crosswalks.

The erroneous representation of STOP LINE(point) may dramatically impact how well the function would be offered to the customer, which means it deserves more attention on dedicated surveying at that point.

For example, the surveying vehicle shall keep a standstill when capturing the point.

Fig 4.3.3.2.1 Normal scenario of STOP LINE and expected STOP LINE representation on map layer



4.3.4 Data Quality Requirements

Data		Requirements	Confidence level
1		The number of stop line shape points is greater than or equal to 3.	⩾95%
2		The starting point is within 1 kilometer of the intersection where the stop line is located, and the direction of connection from the starting	⩾95%

		point to the other shape points points to the intersection where the stop line is located	
3		The intersection stop line and the stop-yield line intersect vertically with the link, and the stop line point in the waiting area is located in the middle of the stop line in the waiting area (shall be within 5 meters from the zebra crossing)	⩾90%
4	completeness	All stop lines at covered intersections on urban roads of level 1 – level 6 with traffic lights covered are all required	⩾95%
5	Availability	All stop lines available at all intersections	⩾95%

5 Classification Key

Classification	Notes
Proprietary	Information created or obtained in the normal course of business and not classified as Secret or Confidential
Confidential	Information that provides the Company with a competitive advantage, that supports its technical or financial position, and which, if disclosed without authorization, could cause damage to the Company.
Secret	Information of a strategic or highly sensitive nature that, if disclosed without authorization, would cause substantial, severe, or irreparable damage to the Company or its relationships.

6 Document Status Key

Status	Notes
DRAFT	The document is currently being worked on. Shall not be used as a solid reference to information included in this document.
AFR	Available For Review. Document information is not eligible for changes. The approving manager will revise this document and if all the information is found to be completely valid, then the document will change to REL status. If the document is found to have errors, the document will change to DRAFT status.
REL	Released. The document is completely valid at the time of review and is now available to be used as a solid reference of information.

7 Changes

Author	Date (YYYY/MM/DD)	Status	Notes
Henry Fan &Yifei Li	2019/12/05	DRAFT	Version 0.1 – Initial the document. Add Chapter “Feature Requirment”
Yuanyan Zhang & Gong hang	2019/12/06	DRAFT	Version 0.1 – Add chapter “Function Interface”
Yifei Li & Yuanyan Zhang& Gong hang	2020/01/21	DRAFT	Version 0.2 – Add chapter “2.7 / 2.8 / 2.9 / 2.10 / 3.5 / 3.6 / 3.7 / 3.8”
Gong Hang	2020/01/21	DRAFT	Version 0.3 – Update “Function Interface”
Gong Hang	2020/02/28	DRAFT	Version 0.4 – Update “3.5 Settings”； Add chapter 3.10； Update chapter 3.7
Yifei Li	2020/03/04	DRAFT	ISSUE Version 0.4 . initiate “4. Acceptance Criteria”
Yifei Li	2020/03/24	DRAFT	Compose “4. Acceptance Criteria”
Yifei Li	2020/03/24	DRAFT	ISSUE Version 0.5
Gong hang	2020/04/09	DRAFT	Version 0.6 – update 3.6.4.2 interface No.2
Gong hang	2020/04/28	DRAFT	Version 0.7 -Delete 3.1.4 data response of latitude and longitude -Add 3.4 response data -Combine chapter 3.8 into chapter 3.4 4 -The original state of "0" was added in 3.6.4.2
Yifei Li	2020/04/30	DRAFT	ISSUE Version 0.8 • 2.10 System Abnormal & Misbehavior Indication • 4.3.2 Points of Intersection Geometry • 4.3.3 Exceptional condition & Special attention
Yifei Li & Yuanyan zhang	2020/05/13	DRAFT	Version 0.9 • 3.2 revise response data structure with “Multi-Roads”, “Road Types” etc.. • 3.4 revise response data – GPS bearing, GPS accuracy. Etc.
Yifei Li	2020/05/15	DRAFT	Version 1.0 • 2.11 CAN message & signals • 4.3.3.2 STOP LINE
Wei Zhang	2020/0707	DRAFT	Version 1.1 -Add 2.9 Master Reset -Add 2.10 Enrollment
Wei Zhang	2020/07/30	DRAFT	Version 1.2 -Add 2.12.2 Flow Chat
Wei Zhang	2020/08/05	DRAFT	Version 1.3 - Add: Notification of enrollment failure-2.10.3.2、2.10.5.2
Wei Zhang	2020/07/29	DRAFT	Version 1.4 - Update: 2.8.2 Preferences - Update: 2.12.1 Description - Add:4.3.4 Data Quality Requirements - Add:3.6 Road-Side Infomation

8 Contacts

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