commsignia

Commsignia Foresight tool description

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1. Overview of the Foresight tool

Foresight is an Android application that is used to visualize and query CFF Entities and Notifications through a CFF API connection, by populating a map with visual markers, that represent entities and their connections in real time. It is intended to be used for quickly evaluating CFF applications or for demonstration purposes.

1.1. Main features

- Live map showing tracked entities as well as tracks, lanes and intersections
- Real time notifications, categorized by entity
- Server list that's easy to maintain using labels for each connected device
- Full compatibility with the Commsignia software stack and safety applications
- Flexible map configurations with selectable layers and data sources
- A wide range of compatible devices. Foresight is designed to run on any phone or tablet with Android 5.0 or later software
- An easy to use and quickly configurable tool for testing and demonstration purposes

1.2. Licensing

Using the Foresight tool requires a one-time license, which is obtained from Commsignia. The user name and license key must be entered in the **`License activation`** menu to unlock the features of the tool.

Figure 1. License activation

1.3. Requirements

Foresight is a software tool that can be used on Android tablets and smart phones that meet the following requirements:

- OS: Android 5.0 or later
- At least 2 Gb RAM
- Storage space: A minimum of 100 Mb is required for Foresight. Additional storage may be required depending on usage.

2. Adding and managing connections

Before accessing the live map view, users must configure a connection to a device running a V2X software stack. This chapter describes the steps to add or manage connections in Foresight.

Foresight must running on a compatible Android device and the device must be connected to a wireless network. Another device running a V2X software stack must be available for connection on the same network.

1. Opening Foresight brings up the connection list view. This is where you can see a list of already configured connections if you have any. To add a new connection, tap on the + icon in the bottom right corner of the screen.

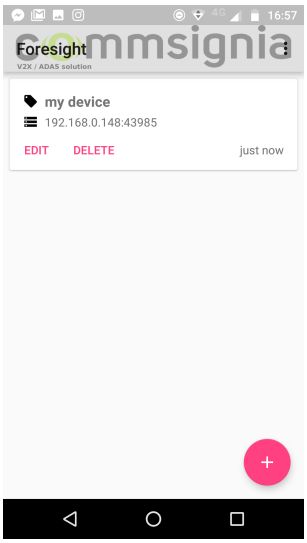


Figure 2. Connection list with one device already added

2. In the Create new device menu, enter the **Host** address. The default port number is **43985**. Optionally, you can add a custom label for the connection.

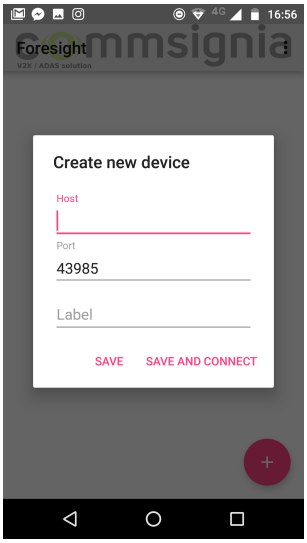


Figure 3. Adding a new connection

3. After entering the connection details you can select **SAVE** to save the connections. It will be available for modifying or connecting in the connection list. You can also select **SAVE AND CONNECT** to immediately connect to the device and open the live map view.

The configured connection is active and can be selected for live map view.

3. Live Map configuration options

The following chapters provide details about Foresight's configuration options.

3.1. Downloading map regions for offline access

Foresight lets users download map regions for offline access. This can be done by following the steps detailed in this chapter.

1. Open the top menu

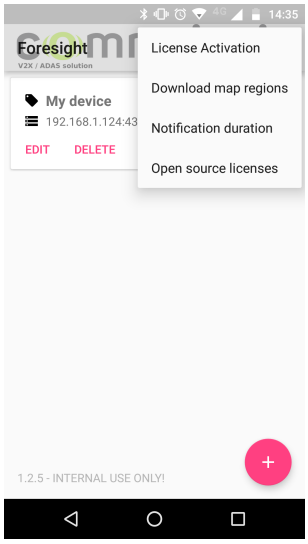


Figure 4. Top menu items

2. By selecting **Download map regions** the current map viewport area will be saved for offline use.

Figure 5. Downloading map region

3. Downloaded map regions can be renamed or deleted from the list.

Figure 6. Downloaded map regions list

The map region is saved and can be accessed offline.

3.2. Filtering by Data Sources

Entities shown on the map can be filtered based on their data source. Entities which did not match the filter will not be shown. The user can choose between the following filters:

Table 1. Filtering by data source

Filter name	Description
V2X_ONLY	Show entities with a V2X data source only.
SENSOR_ONLY	Show entities with a Sensor data source only.
All	Show all entities, regardless of data source.

Example 1.

NOTE

Track-based visual items (e.g. lanes from intersections or zones from roadevents) are only shown if the trackset they reference also matches the filter

3.3. Configuring notification duration

Foresight displays event notifications only for their duration, which may be too short for tracking or testing purposes, so you can configure the duration for which the notifications are displayed.

1. Open the top menu.

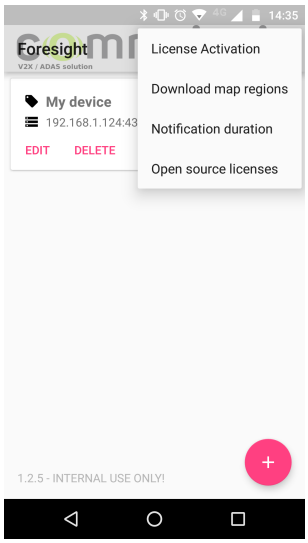


Figure 7. Top menu items

2. Select the **Notification duration** menu item. This will open a new window where you can select the duration time in seconds.

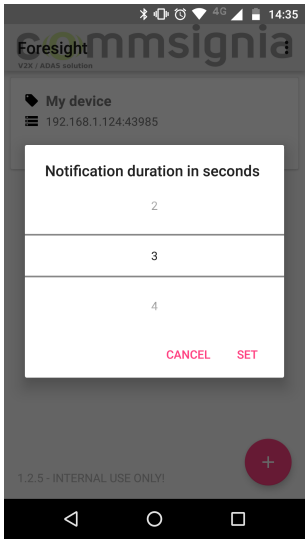


Figure 8. The notification duration menu

3. Select the duration time by scrolling and then tapping **Set**. You can also go back to the main screen by tapping **Cancel**.

Foresight will display event notifications for the configured duration.

3.4. Map layers

The Foresight live map shows Intersections and Entities on different layers. Users can select which layers to view by tapping on the layers icon.

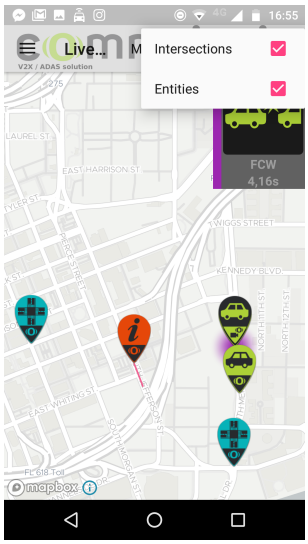


Figure 9. The layers menu

3.5. Camera modes

Users can view the map and the host vehicle as well as other entities on the live map using the camera modes described in this chapter. The camera mode can be selected at the top menu in the live map view. The available camera modes are the following:

Table 2. Camera modes

Camera mode	Description
Follow	The host vehicle is always in the center of the view. The user can zoom in and out, but cannot use rotation gestures.
Fly	The map is tilted at 60 degrees and the view is following the host vehicle. All user gestures are disabled.
Overview	The zoom level is fixed at the minimum value, so that every entity is visible on the map. All user gestures are disabled.
Manual	The user can freely pan, rotate and zoom the map.

3.6. Open source licenses

You can check the information about the Open Source licenses used by Foresight in the top menu, under **`Open Source Licenses.`**

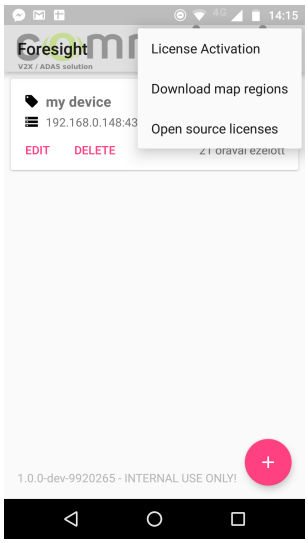


Figure 10. Top menu items

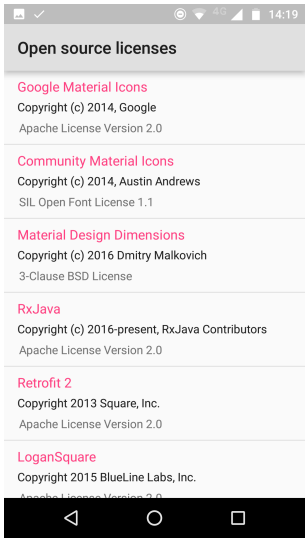


Figure 11. Open source licenses

4. Entities

The following chapters describe the entity types and the corresponding icons shown on the live map in Foresight.

4.1. Entity types

Foresight uses the following icons to represent entities on the live map

Table 3. Entity types

Entity	Icon
Vehicle	
Pedestrian	
Road Event	
Intersection	
Bicycle	
Traffic Information	

Entity	Icon
Unknown Entity	

Intersection entity markers are only represented below a certain zoom level. At higher zoom levels, the intersection lanes and lights are shown instead of the marker. TrackSet entities do not have their own icon, since their purpose is to be referenced from other entities.

Icons for traffic info entities are positioned based on the geographic position of their relevance zone. If the relevance zone is a circle zone, the icon is placed in the center of the circle. If the relevance zone is a track zone, the icon is placed at the start of the track. If the traffic info entity has no relevance zones, its icon will not be shown.

The host entity has similar icons, but is shown with inverted colors.

Table 4. Host entity types

Host entity	Icon
Vehicle	
Pedestrian	
Bicycle	
Unknown	

The data source of each entity is represented by variations in the bottom parts of the entity icons. The following examples show the various different sources of the vehicle entity type. Other entity types can have the same variations.

Table 5. Data sources of the vehicle entity type

Data source	Icon
Unknown	
Sensor	
V2X	
V2X and Sensor	

4.2. Intersections

Intersections are shown on the live map based on the track, lane and traffic light properties.

4.2.1. Tracks

TrackSet entities do not have associated markers on the map, but their tracks are shown when they aren't referenced by entities, as this can often be useful information for debugging. Disabled tracks are visually not distinguished from other tracks. Tracks are represented with dark gray lines:

Figure 12. Example tracks

4.2.2. Lanes

Lanes are represented with two shades of blue lines on the map. Ingress lanes are represented with a darker shade of blue, while "egress" lanes are represented with a brighter shade. Restricted lanes are represented with dashed lines.

Lanes with both ingress and egress properties are represented with the darker shade of red, as ingress lanes.

Lanes with no ingress or egress property are represented with the brighter shade of red, just like egress lanes.

Table 6. Lane types

Lane type	Visual indicator
Ingress	
Egress	
Restricted ingress	
Restricted egress	

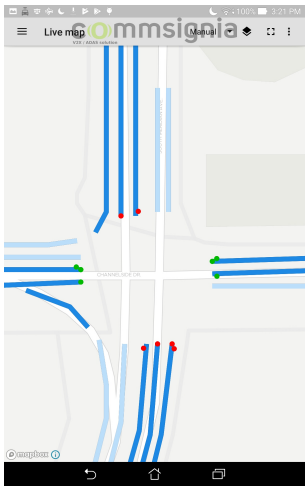


Figure 13. Example lanes

4.2.3. Traffic lights

SPaT MovementPhaseState values are represented by the following icons at the ends of ingress lanes. The relative position of the icon to the lane (left, middle, right) represents the corresponding movement direction.

The following mapping is used between the MovementPhaseState values and icons:

Table 7. Traffic light states and their corresponding icons

MovementPhaseState values	Icon
dark or unavailable	
stop-Then-Proceed	
stop-And-Remain	
pre-Movement	
permissive-Movement-Allowed	

MovementPhaseState values	Icon
protected-Movement-Allowed	
permissive-clearance	
protected-clearance	
caution-Conflicting-Traffic	

Foresight assumes the following properties about SPaT messages when displaying traffic heads. If a SPaT message does not meet these criteria, the representation of traffic heads will be undefined.

- At most 3 signal groups are applicable to any lane. This is important because at most 3 icons can be represented for a given lane.
- For a lane, each signal group that is applicable to it must correspond to distinct movement directions (left, straight, right). This is important because the position of the icons on the ingress lane are directly related to these movement directions.
- When enumerating the possible connections from an ingress lane from left to right, each signal group must belong to a continuous sequence. This is important for having an unambiguous order of icons from left to right.

When categorizing lane connections to the above mentioned directions, the following method is used:

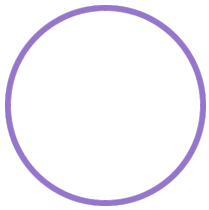
- If a lane connection is more then 20 degrees left, it is considered as a "left" direction
- if a lane connection is less then 20 degrees left and right, it is considered as a "straight" direction
- If a lane connection is more then 20 degrees right, it is considered as a "right" direction
- If multiple signal groups belong to one direction, only the icon of one of them will appear in the position corresponding that direction, but the order of icons will be valid.
- A signal group which has connecting lanes to multiple directions is represented by multiple icons at different relative positions if possible.

4.3. Zones

Circle zones of TrafficInfo and RoadEvent entities are represented with appropriately sized circles on the map. Track zones are represented as line segments. The following table shows examples for the visual appearance of each zone type.

Table 8. Zone types

Zone type	Visual appearance
Track based road event relevance zone	

Zone type	Visual appearance
Track based road event awareness zone	
Track based road event detection zone	
Track based traffic info relevance zone	
Track based traffic info awareness zone	
Track based traffic info detection zone	
Road event relevance zone perimeter	
Road event awareness zone perimeter	
Road event detection zone perimeter	
Traffic info relevance zone perimeter	
Traffic info awareness zone perimeter	

Zone type	Visual appearance
Traffic info detection zone perimeter	

5. Notifications

Notifications are represented at the top right corner of the screen, grouped in rows. Each row represents notifications relating to the same entity. The following table shows the list of notifications, their associated icon, and additional information displayed below the icon.

Table 9. Notifications

Notification	Icon	Information
BSW - Blind Spot Warning		Direction (LEFT/RIGHT)
EEBL - Electronic Emergency Brake Light		None
GLOSA - Green Light Optimal Speed Advise		Advised speed in Km/h
IMA - Intersection Movement Assist		Time to collision
WWR - Wrong Way Remote		None
WWE - Wrong Way Entry		None
TTG - Time To Green		Time in seconds
CLW - Control Loss Warning		Time to collision

Notification	Icon	Information
FCW - Forward Collision Warning		Time to collision
HLW - Hazardous Location Warning		None
LCA - Lane Change Assist		None
RLV - Red Light Violation		None
SW - Speeding Warning		Speed limit in Km/h
LTA - Left Turn Assist		Time to collision
RTA - Right Turn Assist		Time to collision
DNPW - Do Not Pass Warning		None
PCW - Pedestrian Collision Warning		Time to collision
GCW - Generic Collision Warning		Time to collision

Notification	Icon	Information
AWW - Adverse Weather Warning		
OHV - Overheight Vehicle		Height
REW/HLW - Hazardous Location Warning		
RWW - Road Works Warning		

At the left side of each notification row (as in a group of notifications referring to the same entity), there is a thin color bar with a color that is unique to that notification group. As long as the notification group is visible, a blurred circle with the same color appears under the marker of the entity that the notifications from the row refer to.

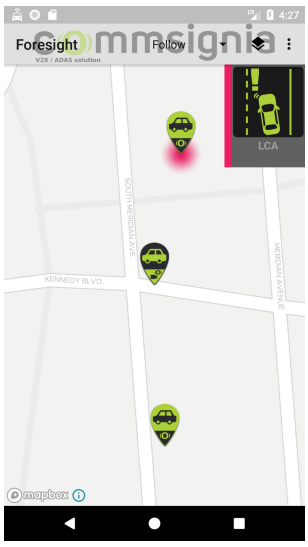


Figure 14. Notifications are associated with entities by matching colors

By selecting entities (including markers and line segments as well) and notifications, a dialog box appears showing the raw data of the entity or notification. Raw data includes the structure and fields that were present in the CFF API message.