Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Electronic Horizon

APIM Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.1

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FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
May 31st, 2013	1.0	Initial Release	
July 18, 2014	1.1	EH-FUR-REQ-092267/A-Detailed Intersection Widgit	<wstephe1> Requirement added by rpaquet2for EH related to NavRepeater (See requirement text)

Table of Contents

1 Overview

The Electronic Horizon (EH) feature is a mechanism for transmitting a standardized set of data onto the CAN bus for use by various devices (EH Clients). There are many potential applications of the EH data. As new applications are implemented and new EH Clients are identified, new features that utilize the EH feature will be added to the SPSS.

2 Architectural Design

2.1 EH-CLD-REQ-022394/A-Electronic Horizon Server (TcSE ROIN-199737-1)

Responsibility: The ElectronicHorizonServer is responsible for transmitting Electronic Horizon (EH) data to an ElectronicHorizonClient.

Review the implementation guide/static view/block diagram to locate the ElectronicHorizonServer object.

2.2 ElectronicHorizonServer Interface

2.2.1 EH-IIR-REQ-022395/A-ElectronicHorizonServer_Tx (TcSE ROIN-265745-1)

2.2.1.1 MD-REQ-022396/A-EHData1_MessageType (TcSE ROIN-201315-5)

This method is used to transmit Electronic Horizon (EH) message data from the Electronic Horizon Provider to the Electronic Horizon Client.

Note: EHData1_MessageType will be defined as a fixed 8-byte message. The data within the message is defined by the first three bits transmitted, which determine the 'type' of data transmitted. The different types are defined in the latest version of the "EH_Data_Dictionary" document.

Consult the Electronic Horizon Technology Owner for the "EH_Data_Dictionary" document.

2.2.1.1.1 MD-REQ-022397/A-MessageType_POSITION (TcSE ROIN-199680-3)

See latest version of "EH_Data_Dictionary" document.

2.2.1.1.2 MD-REQ-022398/A-MessageType_SEGMENT (TcSE ROIN-199703-4)

See latest version of "EH_Data_Dictionary" document.

2.2.1.2 MD-REQ-022399/A-EHData2_MessageType (TcSE ROIN-201317-5)

This method is used to transmit Electronic Horizon (EH) message data from the Electronic Horizon Provider to the Electronic Horizon Client.

Note: EHData2_MessageType will be defined as a fixed 8-byte message. The data within the message is defined by the first three bits transmitted, which determine the 'type' of data transmitted. The different types are defined in the latest version of the "EH_Data_Dictionary" document.

Consult the Electronic Horizon Technology Owner for the "EH_Data_Dictionary" document.

2.2.1.2.1 MD-REQ-022398/A-MessageType_SEGMENT (TcSE ROIN-199703-4)

See latest version of "EH_Data_Dictionary" document.

2.2.1.2.2 MD-REQ-022400/A-MessageType_STUB (TcSE ROIN-199723-3)

See latest version of "EH_Data_Dictionary" document.

2.2.1.2.3 MD-REQ-022401/A-MessageType_META-DATA (TcSE ROIN-199724-3)

See latest version of "EH_Data_Dictionary" document.

2.2.1.2.4 MD-REQ-022402/A-MessageType_PROFILE SHORT (TcSE ROIN-199725-3)

See latest version of "EH_Data_Dictionary" document.

2.2.1.2.5 MD-REQ-022403/A-MessageType_PROFILE LONG (TcSE ROIN-199726-3)

See latest version of "EH_Data_Dictionary" document.

3 General Requirements

3.1 EH-FUR-REQ-022389/A-Support ADASISv2 (TcSE ROIN-199739-3)

The EH Provider sends information about the road geometry ahead. The signal content and conditioning is specified in the Interface Requirements. The Interface Requirements should comply with current valid ADASISv2 specification.

3.2 EH-FUR-REQ-022390/A-Usage of Most Probable Path (MPP)/Most Likely Path (MLP) (TcSE ROIN-199761-2)

The EH Provider sends information about road geometry ahead according to calculated MPP/MLP. If a route guidance is active, the MPP is the calculated route. Otherwise a set of rules is defined.

3.3 EH-FUR-REQ-022391/A-Horizon Length (TcSE ROIN-199762-1)

The horizon length to be used is defined by the EH features being implemented. See each specific EH feature section for the required horizon length.

3.4 EH-FUR-REQ-022386/A-Update of Messages (TcSE ROIN-292623-1)

As soon as new data is ready to send for the defined horizon, the corresponding message is to be transmitted on the CAN bus. All signals within this message have to be assigned with the valid value (according to the requirements for the Electronic Horizon application being supported).

3.5 EH-SR-REQ-022387/A-EH Message Separation Timing (TcSE ROIN-296036-1)

Electronic Horizon data messages shall be transmitted on the CAN bus at least 20 ms apart and not more than 50 ms apart.

3.6 EH-SR-REQ-022388/B-EH Data Regions (TcSE ROIN-296637-1)

EH data shall be provided for the US/Canada/European+Russia/China regions.
Note: If there is no base EH data present, then EH shall not initialize.

4 Functional Definition

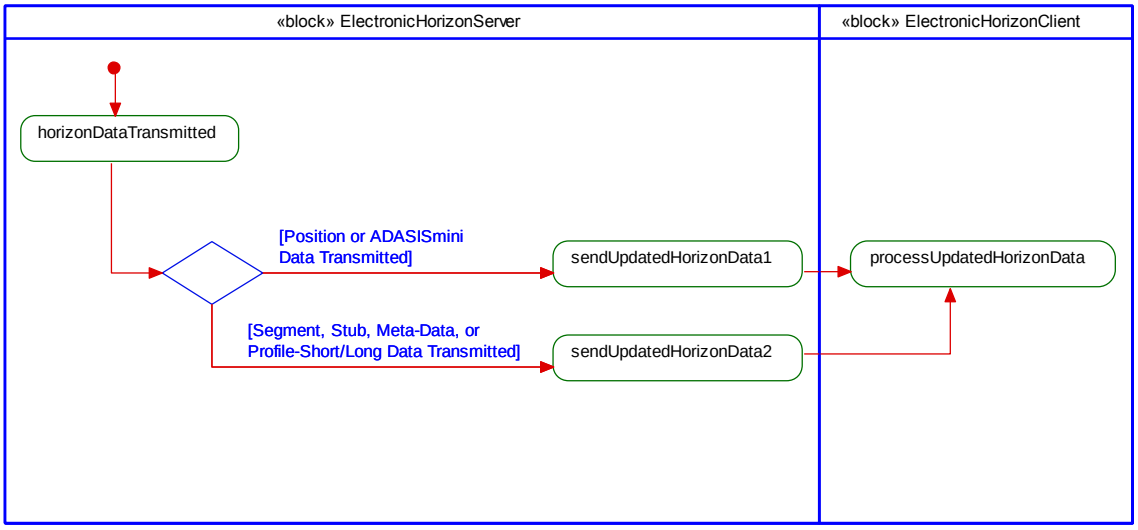
4.1 EH-FUN-REQ-022368/B-Transmit EH Data (TcSE ROIN-292624-1)

4.1.1 White Box View

4.1.1.1 Activity Diagrams

4.1.1.1.1 EH-ACT-REQ-022360/A-Transmit EH Data (TcSE ROIN-201318-2)

Activity Diagram



4.1.1.2 Sequence Diagrams

4.1.1.2.1 EH-SD-REQ-022369/A-EH_Data_Transmit (TcSE ROIN-199816-3)

Scenarios

Normal Usage

The defined horizon has new data ready to be sent, therefore the Electronic Horizon (EH) provider (EH Server) updates the EH data on the CAN bus.

Constraints

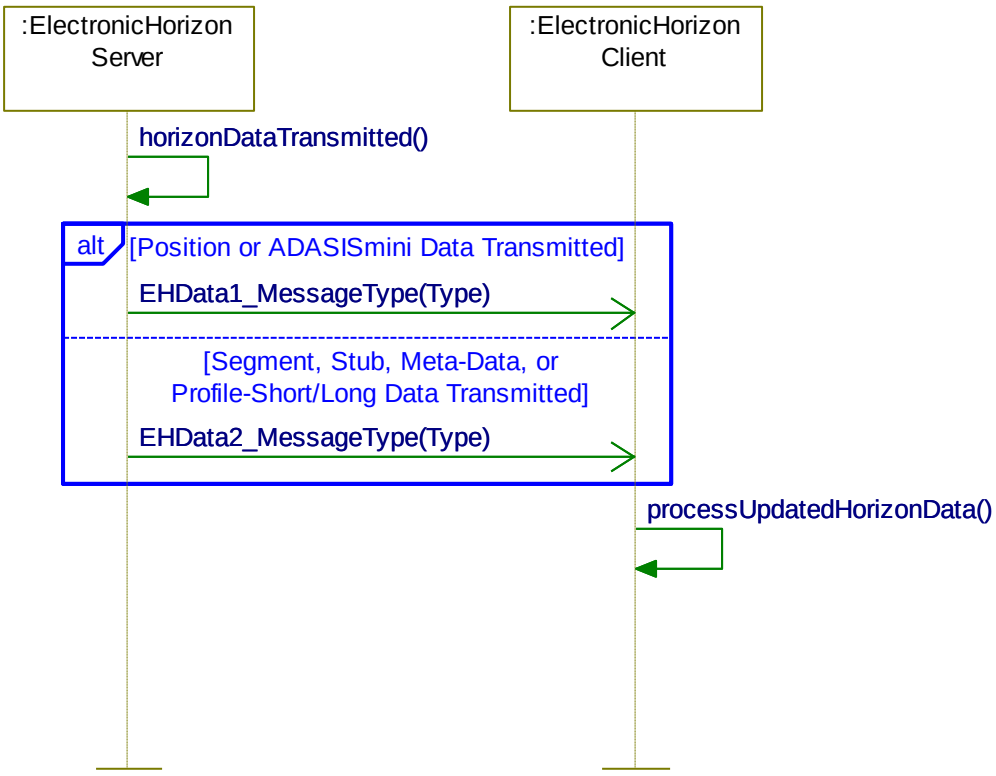
Pre-condition

EH data is available.

Post-condition

Updated EH data is received by the EH Client.

Sequence Diagram



4.1.2 Requirements

Requirements

4.1.2.1 EH-FUR-REQ-092267/A-Detailed Intersection Widgit

Given NAV Repeater conformance level of 2 or greater, the expansion of the most probable path must trigger UpcomingStreetName.St signal for each new stub identified. See NAV Repeater feature for UpcomingStreetName.St definition.

4.2 EH-FUN-REQ-022385/A-Transmit EH Data Required for Traffic Sign Recognition (TcSE ROIN-221327-1)

4.2.1 Requirements

4.2.1.1 TSR-FUR-REQ-022365/A-ADASISv2 Messages/Signals supported for TSR (TcSE ROIN-199763-3)

The Electronic Horizon (EH) Server will support the following ADASISv2 messages for the Traffic Sign Recognition (TSR) feature.

- POSTION
- SEGMENT
- STUB
- PROFILE SHORT
- META-DATA

Not all signals contained within the above messages must be supported. The following table specifies the default value to be supplied by the EH Server for those signals that may not be supported.

ADASISv2 Message	Unsupported Signal	Default Value
POSITION	Active Lane	0x7 = N/A

	Relative Heading	0xFF = N/A
SEGMENT	Tunnel	0x3 = N/A
	Bridge	0x3 = N/A
STUB	Functional Road Class	0x7 = N/A
	Complex Intersection	0x3 = N/A
	Right of Way	0x3 = N/A
	Number of Lanes Opposite Direction	0x3 = N/A
PROFILE SHORT	Control Point	0x0 = False
	Accuracy Class	0x3 = Lowest Accuracy
META-DATA	Hardware Version	0x0 = Unknown
	Region Code	0x7FFF = N/A

4.2.1.2 TSR-FUR-REQ-022366/A-TSR definition of PROFILE SHORT signal values "Value 0" & "Value1" (TcSE ROIN-200452-3)

The TSR specific signal encoding to be used for the signal values "Value 0" and "Value 1" within the Electronic Horizon Message Type, "PROFILE SHORT" is found in the latest version of the "EH_Data_Dictionary" document.

Please consult Electronic Horizon Technology Owner for "EH_Data_Dictionary" document.

4.2.1.3 TSR-FUR-REQ-022367/A-TSR Horizon Length (TcSE ROIN-200475-2)

The horizon length to be used for Traffic Sign Recognition (TSR) is dynamic based on vehicle speed. It will most presumably be a minimum distance of TBD to maximum of TBD ahead along the Most Probable Path.

4.3 EH-FUN-REQ-022370/A-Vehicle Driving on a Road (TcSE ROIN-292629-1)

4.3.1 Use Cases

4.3.1.1 EH-UC-REQ-022371/A-Driving on Road (TcSE ROIN-292574-1)

Actors	Vehicle Occupant
Pre-conditions	Location available Map Data contains ADASIS Data Vehicle configured for Electronic Horizon On
Scenario Description	The customer is driving on a road.
Post-conditions	The infotainment system generates an appropriate Most Probable Path (MPP) The infotainment system outputs the correct Electronic Horizon (EH) Data onto CAN Bus as defined in the latest ADASIS Protocol Specification.
List of Exception Use Cases	E1 – ADASIS Data Not Loaded E2 – Unmapped Location E3 – Navigation Engine Fault E4 – Broadcaster has a Blockage Greater Than 1 Second
Interfaces	G-HMI Navigation Engine Can Message Broadcaster Licensing Engine

4.3.1.2 EH-UC-REQ-022372/A-ADASIS Data Not Loaded (TcSE ROIN-292575-1)

Linked Elements
EH-UC-REQ-022371/A-Driving on Road (TcSE ROIN-292574-1)

Actors	Vehicle Occupant
Pre-conditions	Same as Normal Usage Use Case
Scenario Description	The customer is driving on a road and the data set licensed for customer usage does not include ADASIS data attributes or there is a map data related fault.
Post-conditions	The Electronic Horizon (EH) data output to the vehicle system interface corresponds to non-digitized area as defined in the latest version of the ADASIS protocol specification.
List of Exception Use Cases	NA
Interfaces	G-HMI

4.3.1.3 EH-UC-REQ-022373/A-Unmapped Location (TcSE ROIN-292576-1)

Linked Elements
EH-UC-REQ-022371/A-Driving on Road (TcSE ROIN-292574-1)

Actors	Vehicle Occupant
Pre-conditions	Same as Normal Usage Use Case
Scenario Description	The customer drives into an area where data does not include all data needed for ADASIS.
Post-conditions	The Electronic Horizon (EH) data output to the vehicle system interface corresponds to non-digitized area as defined in the latest version of the ADASIS protocol specification.
List of Exception Use Cases	NA
Interfaces	G-HMI

4.3.1.4 EH-UC-REQ-022374/A-Navigation Engine Fault (TcSE ROIN-292577-1)

Linked Elements
EH-UC-REQ-022371/A-Driving on Road (TcSE ROIN-292574-1)

Actors	Vehicle Occupant
Pre-conditions	Same as Normal Usage Use Case
Scenario Description	The customer is driving on a road while the navigation engine is not running.
Post-conditions	The Electronic Horizon (EH) data output to the vehicle system interface corresponds to non-digitized area as defined in the latest version of the ADASIS protocol specification.
List of Exception Use Cases	NA
Interfaces	G-HMI

4.3.1.5 EH-UC-REQ-022375/A-Broadcaster has a Blockage Greater Than 1 Second (TcSE ROIN-292578-1)

Linked Elements
EH-UC-REQ-022371/A-Driving on Road (TcSE ROIN-292574-1)

Actors	Vehicle Occupant
Pre-conditions	Same as Normal Usage Use Case
Scenario	For some systematic reason, the broadcasting layer is blocked from transmitting for

Description	more than a second, while the customer is driving on a road (EH requires a specific cadence for messaging).
Post-conditions	The Electronic Horizon (EH) data output to the vehicle system interface does not output more duplicate data in the same time period.
List of Exception Use Cases	NA
Interfaces	G-HMI

4.4 EH-FUN-REQ-022376/A-Electronic Horizon Data Broadcaster (TcSE ROIN-296045-1)

4.4.1 Overview

The broadcaster function is responsible for taking data from the ElectronicHorizon Table and sending it out via the IPC link to the VMCU for publication on the Infocan vehicle bus. This provides a methodology of sending application specific 8 byte payloads without having to deal with field encoding

4.4.2 Requirements

4.4.2.1 EH-REQ-022377/A-Electronic Horizon Table (TcSE ROIN-296038-1)

Schema for Electronic Horizon Table shall be created upon 1st boot and shall consist of the following:

Field Name	Data Type	Description	Sample data
lPrimaryKey	LongInteger	Primary key for table, used to guarantee data out in the correct order (this field shall auto populate as it is a counter)	1,2,3,…2123123
wMessageID	Word (two Bytes)	Identifier for which message that the VMCU should send out	0x200,0x201 (examples actual value needs to come from Systems Team)
Payload	8 Bytes	Payload of the message (Eight generic bytes)	0011223344556677

4.4.2.2 EH-REQ-022378/A-Initialization (TcSE ROIN-296039-1)

Electronic Horizon Table shall be truncated at every system initialization

4.4.2.3 EH-REQ-022379/A-Frequency of Queries (TcSE ROIN-296040-1)

Electronic Horizon Table shall be queried every 50ms to look for messages to be sent out

4.4.2.4 EH-REQ-022380/A-Record Criteria (TcSE ROIN-296041-1)

Records from the ElectronicHorizon Table should be transmitted with lower wMessageID as the first criteria, and lPrimaryKey as the second cirteria in case of messages with same Id

4.4.2.5 EH-REQ-022381/A-Record Priority (TcSE ROIN-296042-1)

If a record is added to the Electronic Horizon table while processing existing records, it shall be prioritized based on EH-GREQ-296041-Record Criteria

4.4.2.6 EH-REQ-022382/A-Record Deletion (TcSE ROIN-296043-1)

After a record is successfully sent to the VMCU via the IPC link, it shall be deleted from the ElectronicHorizon table

4.4.2.7 EH-REQ-022383/A-Design Dependency (TcSE ROIN-296044-1)

VMCU must support all messages required for the broadcaster

5 Appendix: Reference Documents

Reference #	Document Title
1	EH_Data_Dictionary
2	ADASIS v2 Specification
3	
4	
5	