GENIVI NavigationCore API

Release 3.0.1
Status: Approved

22 May 2014

Accepted for release by:
This document has been accepted for the GENIVI Gemini Release by the Expert Group Location Based Services (EG-LBS)

Abstract:
This document describes the API of the NavigationCore Abstract Component.

Keywords:
NavigationAPIs, NavigationCore.

Table of contents

1 Change History

Version	Date	Author	Change
0.1	27 Feb 2012	Marco Residori (XS Embedded)	Document Created.
0.2	19 Mar 2012	Marco Residori (XS Embedded)	Updated sequence diagrams. Updated *Interfaces* chapter.
0.3	21 Mar 2012	Marco Residori (XS Embedded)	Updated *Interfaces* chapter.
1.0	22 Mar 2012	Marco Residori (XS Embedded)	System Architecture Team (SAT) approval.
2.0 (beta)	07 Jun 2013	Marco Residori (XS Embedded)	Updated API description. API Version 2.0.
2.0	17 Jun 2013	Marco Residori (XS Embedded)	Updated API description. API fixes: GT-2691, GT-2689, GT-2651. API Version 2.0 (*gemini-final* tag)
3.0.0	21 Jan 2014	Marco Residori (XS Embedded)	Updated API description. API Version 3.0.0
3.0.1	22 May 2014	Marco Residori (XS Embedded)	Updated copyright notes.

2 Introduction

This document describes the NavigationCore API.

3 Terminology

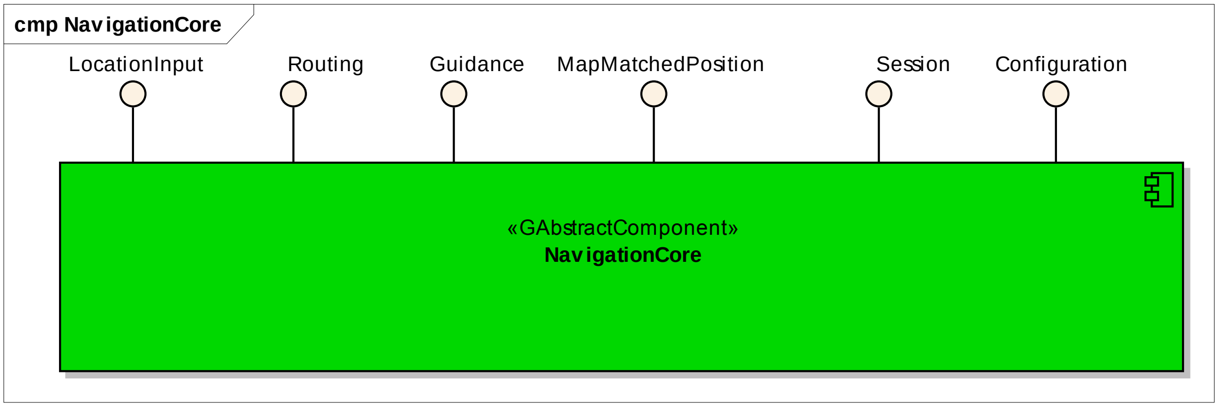
Term	*Description*
Link-ID	Identifier of a route segment in a database

4 Requirements

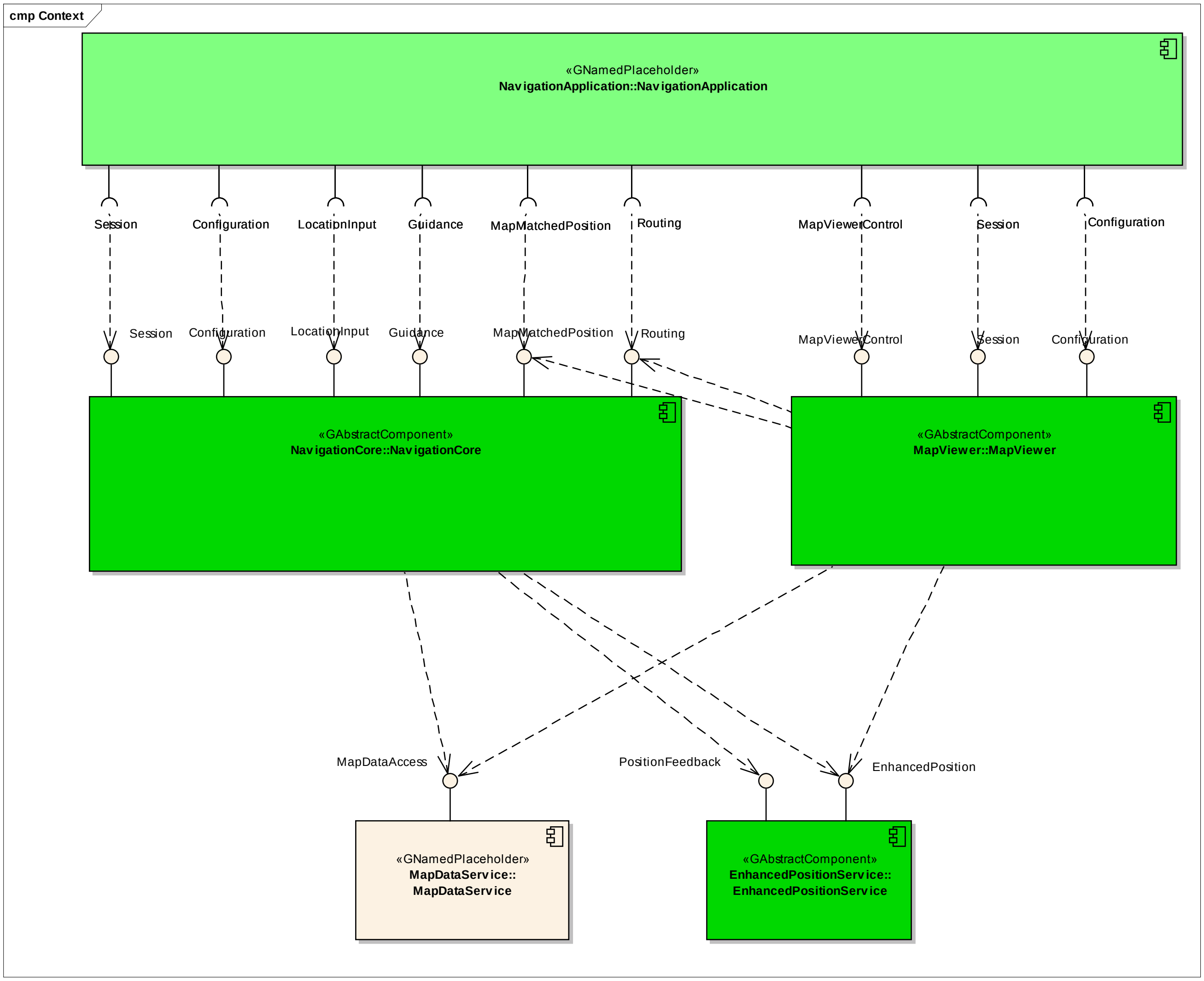
- Ease of Development
- Extensibility
- Multi-client Behavior
- Simplicity

5 Architecture

5.1 Interfaces



5.2 Interaction with other Components



6 API

6.1 D-Bus

The NavigationCore interfaces are D-Bus interfaces. They are defined using the D-Bus introspection data format, which is nothing but an IDL expressed in XML format.

For more information about the D-Bus data types please refer to the following website: http://dbus.freedesktop.org/doc/dbus-specification.html#message-protocol-signatures

For more information about the D-Bus introspection data format, please refer to the following website: http://dbus.freedesktop.org/doc/dbus-specification.html#introspection-format

6.2 Git Repository

The NavigationCore interfaces can be found in the GENIVI Git repository at: https://git.genivi.org/git/gitweb.cgi?p=navigation;a=tree;f=NavigationCore/api

6.3 Naming Conventions

Element	**Description**	**Example**
Interface File	genivi.<component name in lowercase character>.<interface name in lowercase characters>	genivi.navigationcore.routing.xml
Methods/Signal/Properties	Camel case naming convention First letter uppercase	CalculateRoute
Arguments	Camel case naming convention First letter lowercase	routeHandle

6.4 Data Types Convention

D-bus types code are used. Please refer to the following webpage for more information:

http://dbus.freedesktop.org/doc/dbus-specification.html

Element	D-Bus Data Type Code	Example
Enumerators	q (uint16)	
Handles	y (uint8)	
Maps	a{qv}	Dictionary of tuples (key, value) The key is expressed as an enumerator

6.5 Errors

Error Type	Description	Example	Error Documentation	Note
User Error	Error caused by user actions	The user tries to start route guidance, although guidance is already running	Application specific error string documented in the XML file	Can occur in final product
Hardware Error	Error related to hardware/database related problems	No map data	Application specific error string documented in the XML file	Can occur in final product
Protocol Error	Error caused by wrong sequence of commands	Wrong sequence of commands to enter destination	Standard D-Bus error string	Should not occur in final product
Bus Error	D-Bus communication error	Bus busy	Standard D-Bus error string	Can occur in final product
Programming Error	Programming Error	Invalid parameters	Standard D-Bus error string and debug messages	Should not occur in production code

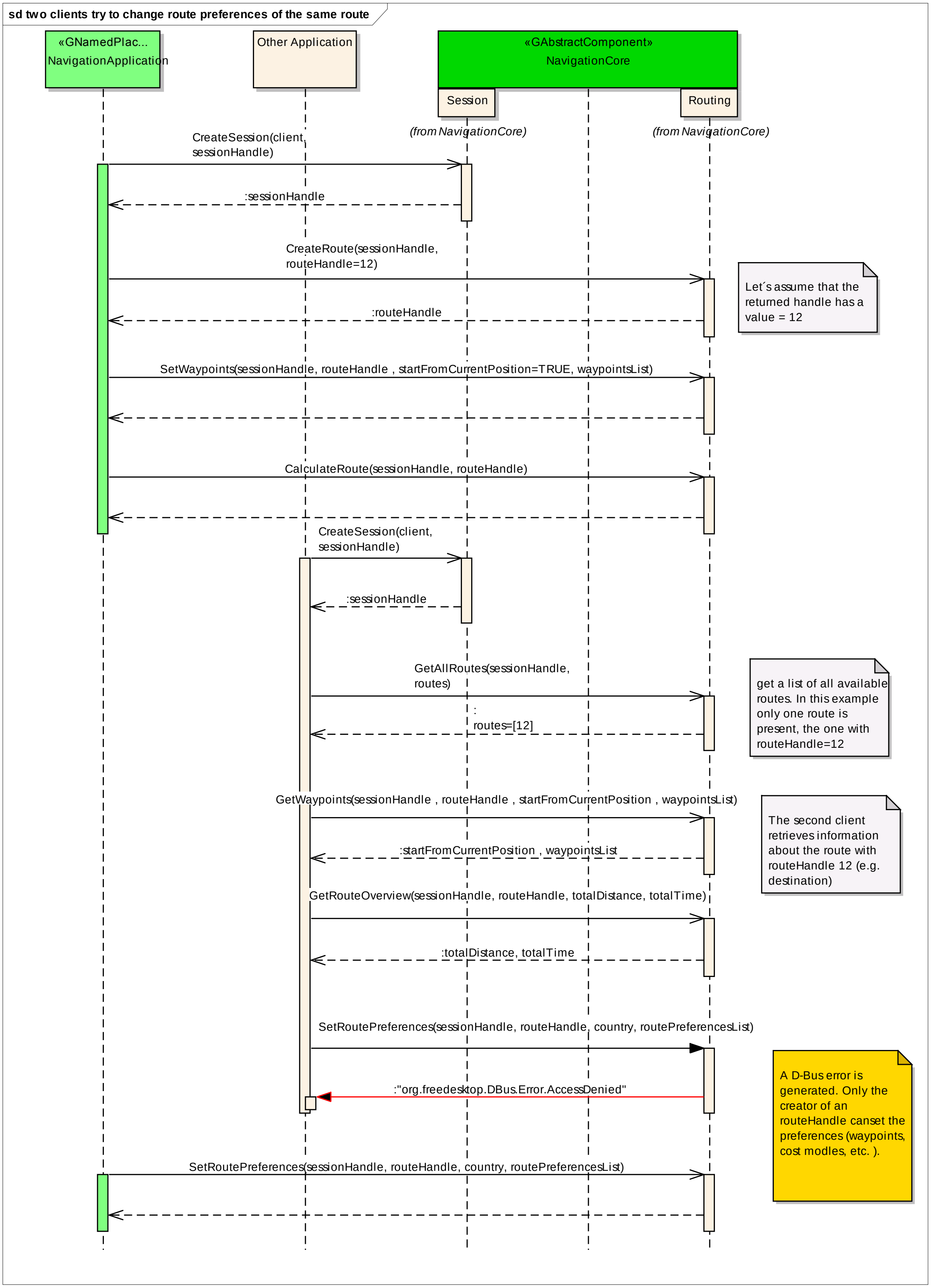
Only application-specific errors are documented directly in the interfaces (XML files). For all other errors, standard D-Bus strings are used. These kinds of strings are not documented in the interfaces. It is implicitly assumed that every method may return a standard D-Bus error string.

6.6 Sessions

A session-id identifies a requester. In a multi-client context only the requester that created an instance may be allowed to execute operations on that instance.

Other requesters may operate on the same handle (e.g. route handle, location input handle) with limited rights. For example, only the creator of a route handle can start/stop a route calculation on that handle. Other clients may simply be allowed to retrieve the total distance to the destination.

The following diagram shows an example of how session handles can be used:


sd two clients try to change route preferences of the same route
«GNamedPlac...
NavigationApplication
Other Application
«GAbstractComponent»
NavigationCore
Session
Routing
(from NavigationCore)
(from NavigationCore)
CreateSession(client, sessionHandle)
:sessionHandle
CreateRoute(sessionHandle, routeHandle=12)
:routeHandle
SetWaypoints(sessionHandle, routeHandle , startFromCurrentPosition=TRUE, waypointsList)
CalculateRoute(sessionHandle, routeHandle)
CreateSession(client, sessionHandle)
:sessionHandle
GetAllRoutes(sessionHandle, routes)
: routes=[12]
GetWaypoints(sessionHandle , routeHandle , startFromCurrentPosition , waypointsList)
:startFromCurrentPosition , waypointsList
GetRouteOverview(sessionHandle, routeHandle, totalDistance, totalTime)
:totalDistance, totalTime
SetRoutePreferences(sessionHandle, routeHandle, country, routePreferencesList)
:"org.freedesktop.DBus.Error.AccessDenied"
SetRoutePreferences(sessionHandle, routeHandle, country, routePreferencesList)

Let´s assume that the returned handle has a value = 12

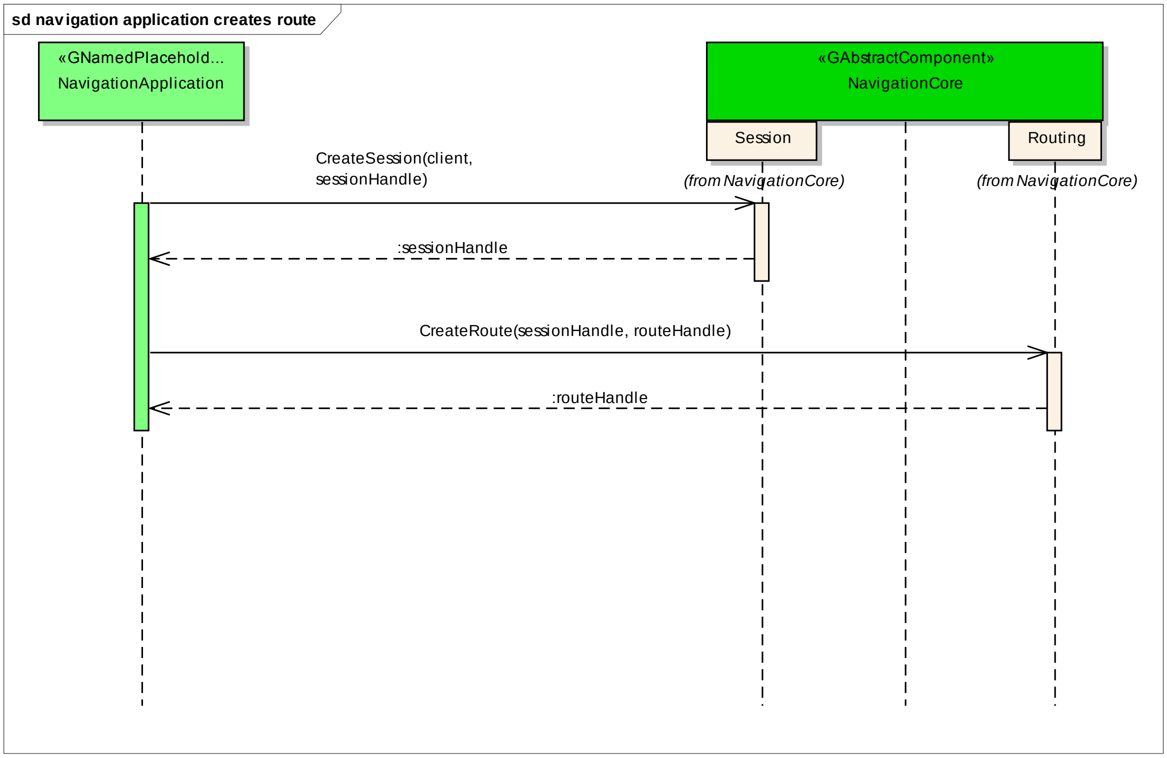
get a list of all available routes. In this example only one route is present, the one with routeHandle=12

The second client retrieves information about the route with routeHandle 12 (e.g. destination)

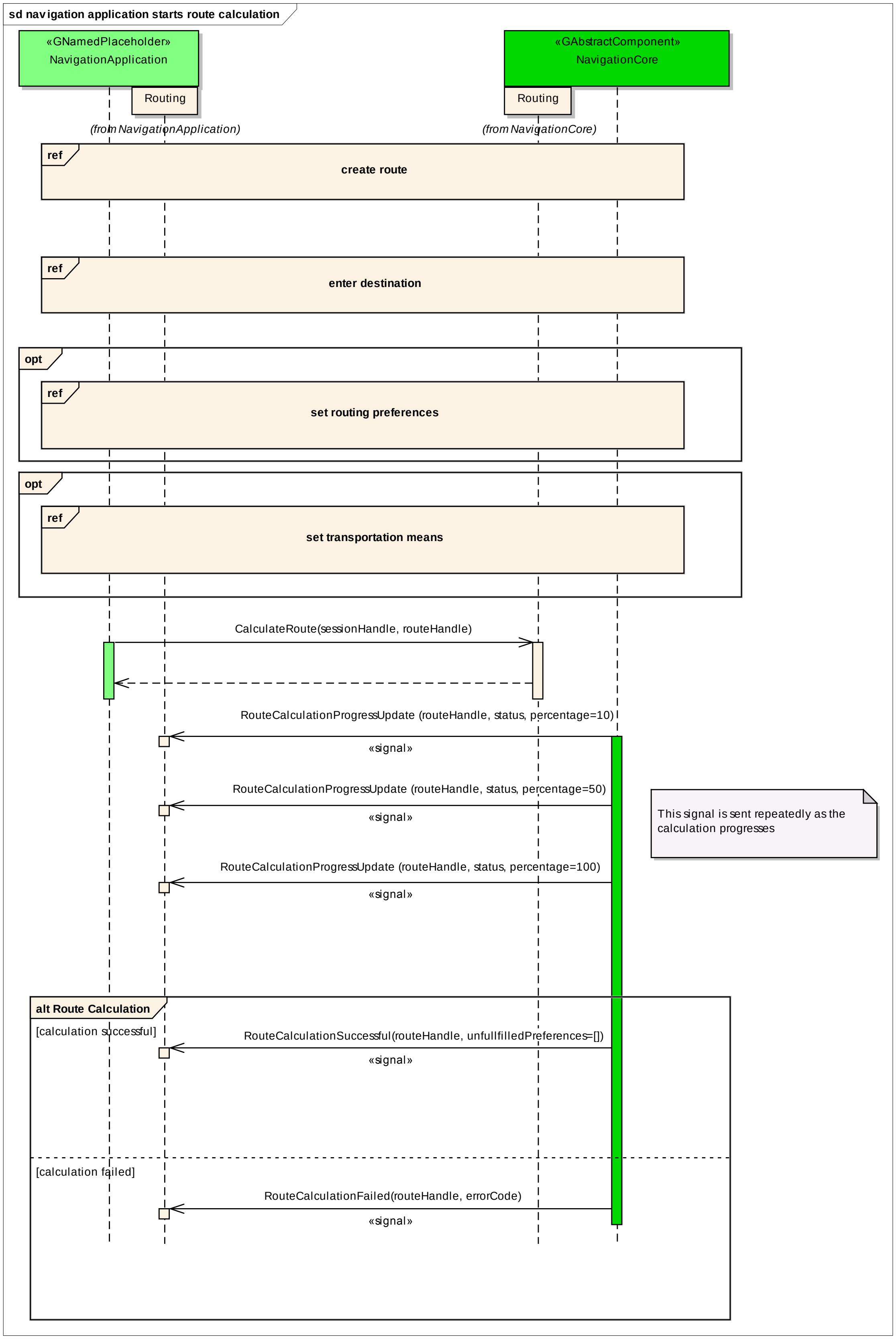
A D-Bus error is generated. Only the creator of an routeHandle canset the preferences (waypoints, cost modles, etc.).

6.7 *Sequence Diagrams*

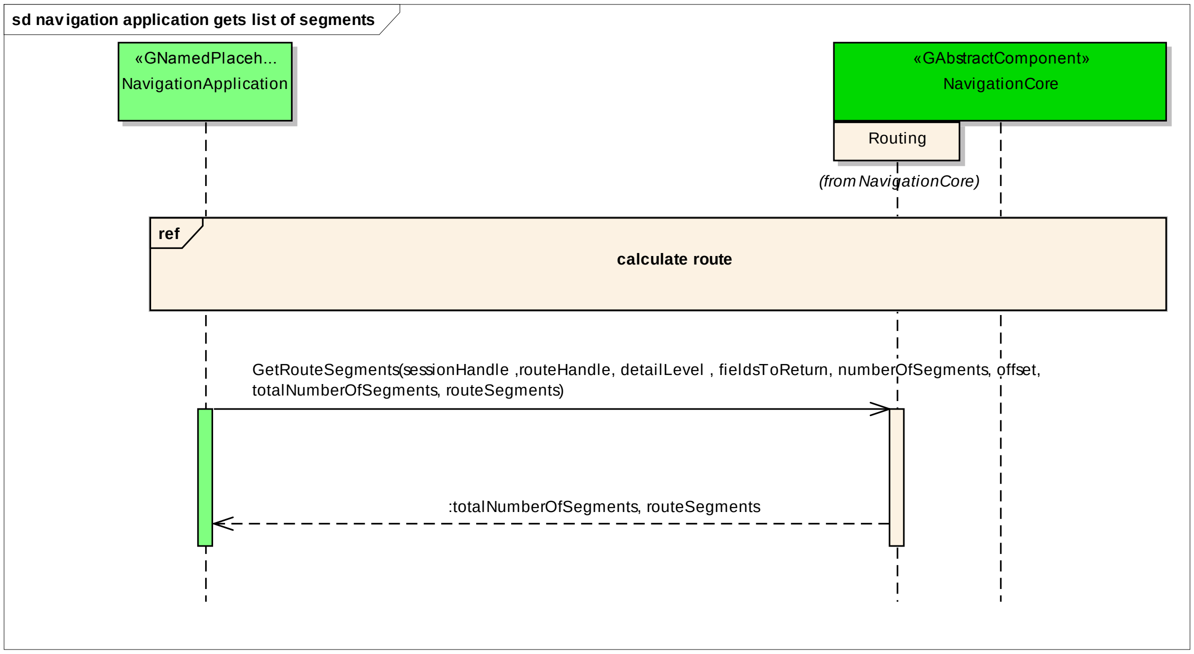
6.7.1 navigation application creates route



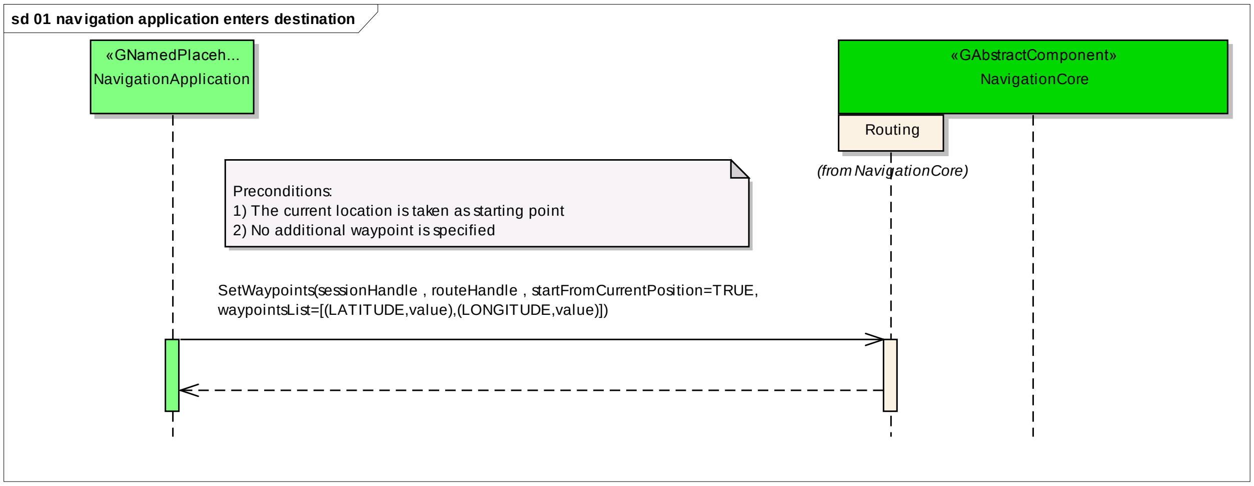
6.7.2 navigation application starts route calculation


sd navigation application starts route calculation
«GNamedPlaceholder»
NavigationApplication
«GAbstractComponent»
NavigationCore
Routing
(from NavigationApplication)
Routing
(from NavigationCore)
ref
create route
ref
enter destination
opt
ref
set routing preferences
opt
ref
set transportation means
CalculateRoute(sessionHandle, routeHandle)
RouteCalculationProgressUpdate (routeHandle, status, percentage=10)
«signal»
RouteCalculationProgressUpdate (routeHandle, status, percentage=50)
«signal»
This signal is sent repeatedly as the calculation progresses
RouteCalculationProgressUpdate (routeHandle, status, percentage=100)
«signal»
alt Route Calculation
[calculation successful]
RouteCalculationSuccessful(routeHandle, unfullfilledPreferences=[])
«signal»
[calculation failed]
RouteCalculationFailed(routeHandle, errorCode)
«signal»

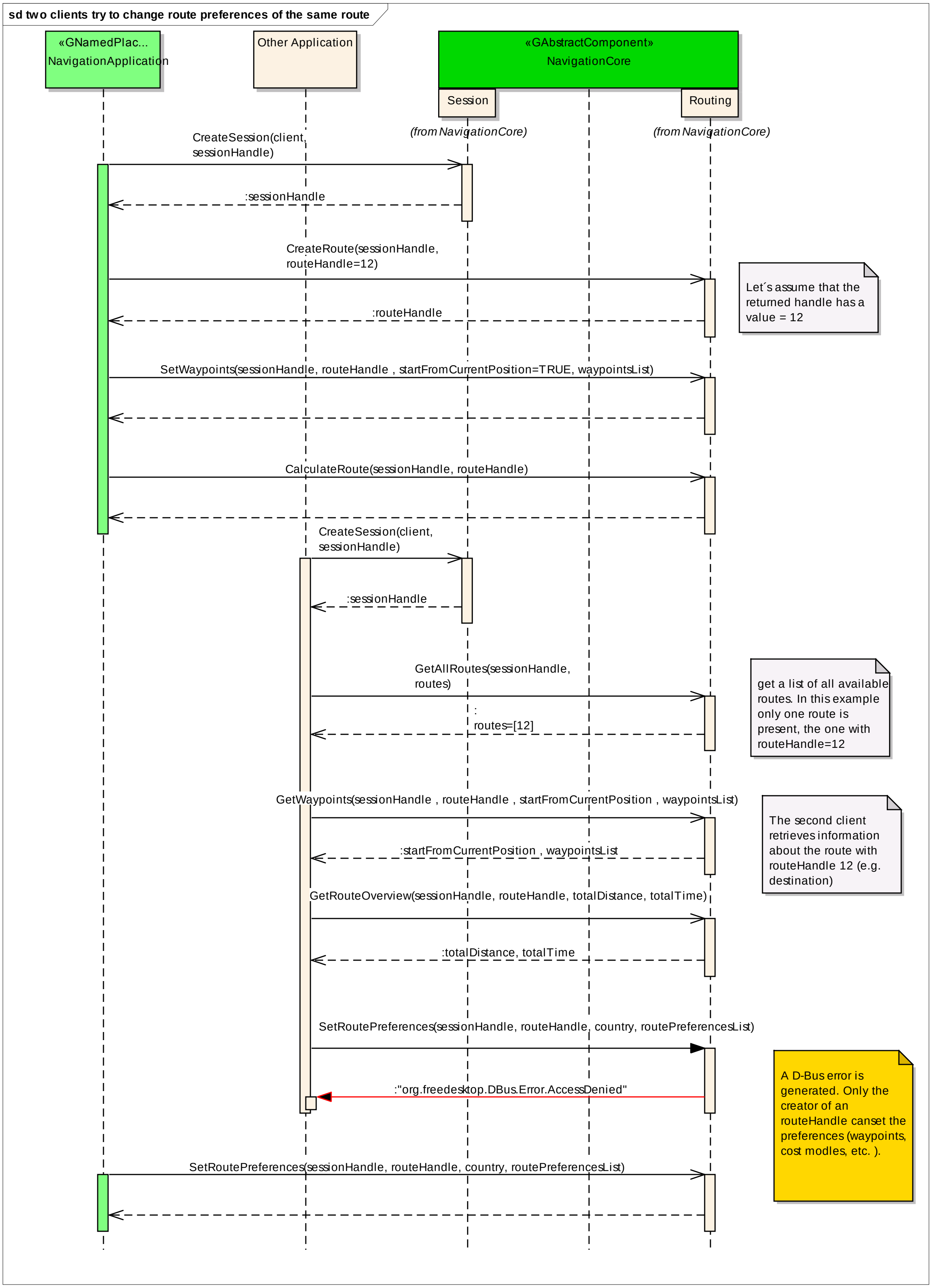
6.7.3 navigation application gets list of segments


sd navigation application gets list of segments
«GNamedPlaceh...
NavigationApplication
«GAbstractComponent»
NavigationCore
Routing
(from NavigationCore)
ref
calculate route
GetRouteSegments(sessionHandle ,routeHandle, detailLevel , fieldsToReturn, numberOfSegments, offset, totalNumberOfSegments, routeSegments)
:totalNumberOfSegments, routeSegments

6.7.4 navigation application enters destination


sd 01 navigation application enters destination
«GNamedPlaceh...
NavigationApplication
«GAbstractComponent»
NavigationCore
Routing
(from NavigationCore)
Preconditions:
1) The current location is taken as starting point
2) No additional waypoint is specified
SetWaypoints(sessionHandle , routeHandle , startFromCurrentPosition=TRUE,
waypointsList=[(LATITUDE,value),(LONGITUDE,value)])

6.7.5 two clients try to change route preferences of the same route


sd two clients try to change route preferences of the same route
«GNamedPlac...
NavigationApplication
Other Application
«GAbstractComponent»
NavigationCore
Session
(from NavigationCore)
Routing
(from NavigationCore)
CreateSession(client, sessionHandle)
:sessionHandle
CreateRoute(sessionHandle, routeHandle=12)
:routeHandle
SetWaypoints(sessionHandle, routeHandle , startFromCurrentPosition=TRUE, waypointsList)
CalculateRoute(sessionHandle, routeHandle)
CreateSession(client, sessionHandle)
:sessionHandle
GetAllRoutes(sessionHandle, routes)
: routes=[12]
GetWaypoints(sessionHandle , routeHandle , startFromCurrentPosition , waypointsList)
:startFromCurrentPosition , waypointsList
GetRouteOverview(sessionHandle, routeHandle, totalDistance, totalTime)
:totalDistance, totalTime
SetRoutePreferences(sessionHandle, routeHandle, country, routePreferencesList)
:"org.freedesktop.DBus.Error.AccessDenied"
SetRoutePreferences(sessionHandle, routeHandle, country, routePreferencesList)

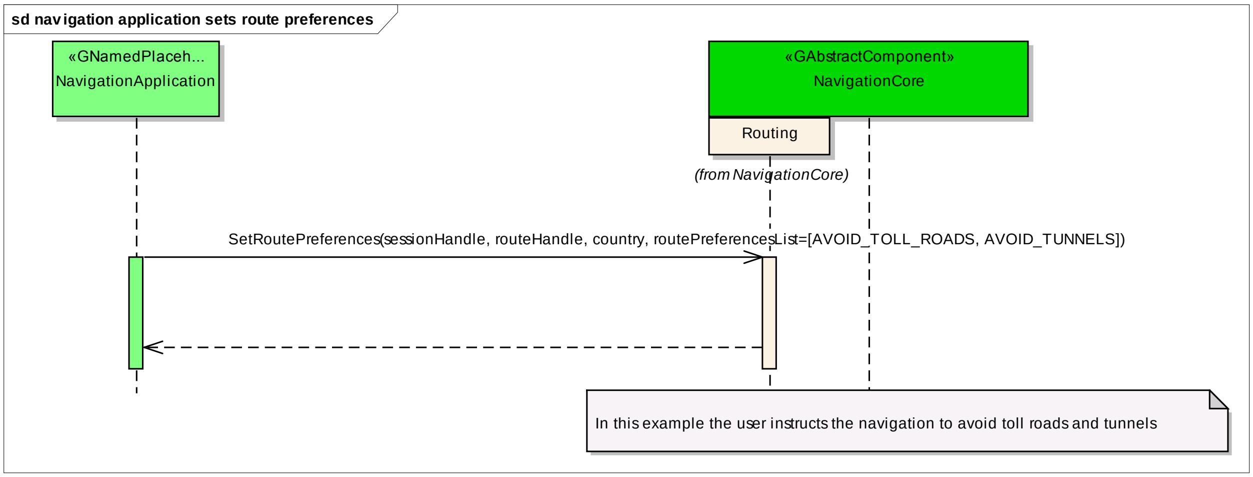
Let´s assume that the returned handle has a value = 12

get a list of all available routes. In this example only one route is present, the one with routeHandle=12

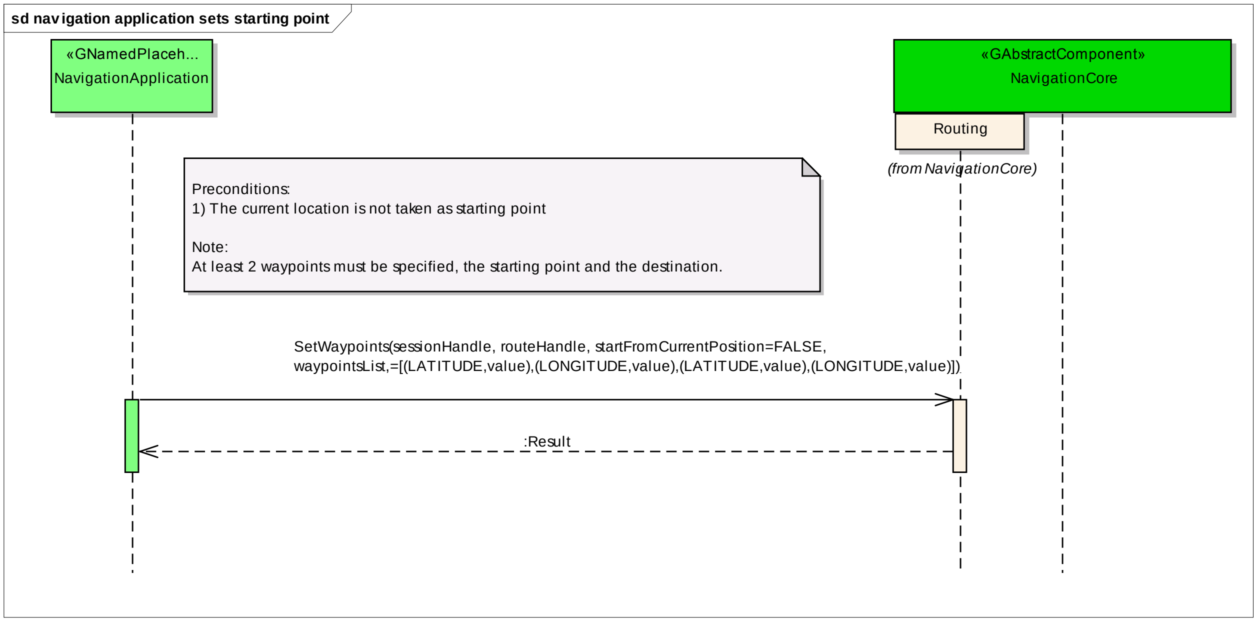
The second client retrieves information about the route with routeHandle 12 (e.g. destination)

A D-Bus error is generated. Only the creator of an routeHandle canset the preferences (waypoints, cost modles, etc.).

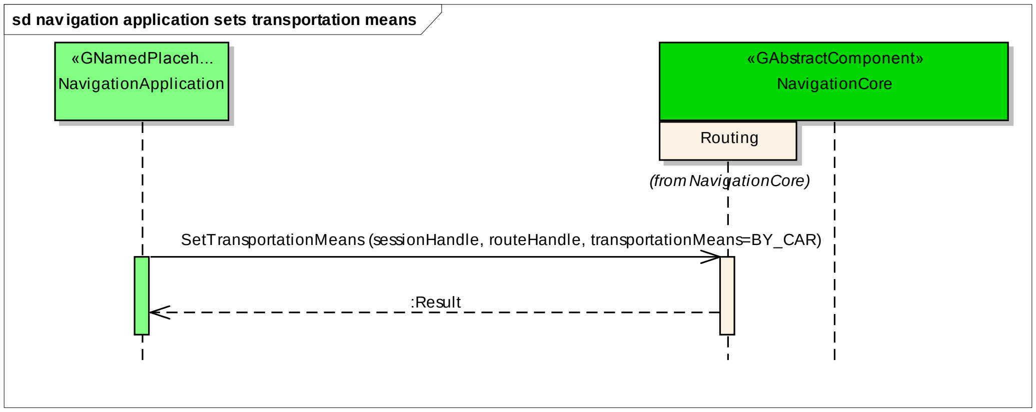
6.7.6 navigation application sets route preferences


sd navigation application sets route preferences
«GNamedPlaceh...
NavigationApplication
«GAbstractComponent»
NavigationCore
Routing
(from NavigationCore)
SetRoutePreferences(sessionHandle, routeHandle, country, routePreferencesList=[AVOID_TOLL_ROADS, AVOID_TUNNELS])
In this example the user instructs the navigation to avoid toll roads and tunnels

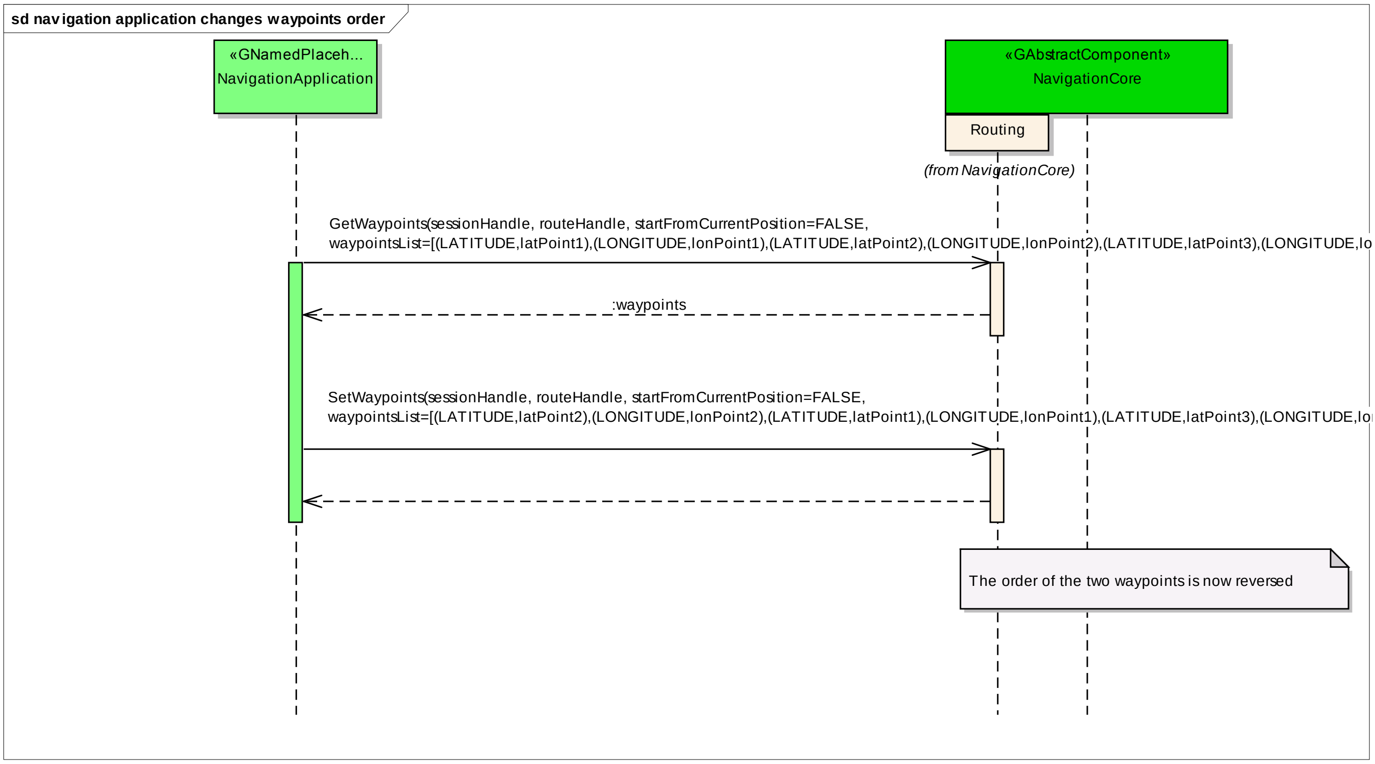
6.7.7 navigation application sets starting point


sd navigation application sets starting point
«GNamedPlaceh...
NavigationApplication
«GAbstractComponent»
NavigationCore
Routing
(from NavigationCore)
Preconditions:
1) The current location is not taken as starting point
Note:
At least 2 waypoints must be specified, the starting point and the destination.
SetWaypoints(sessionHandle, routeHandle, startFromCurrentPosition=FALSE,
waypointsList,=[(LATITUDE,value),(LONGITUDE,value),(LATITUDE,value),(LONGITUDE,value)])
:Result

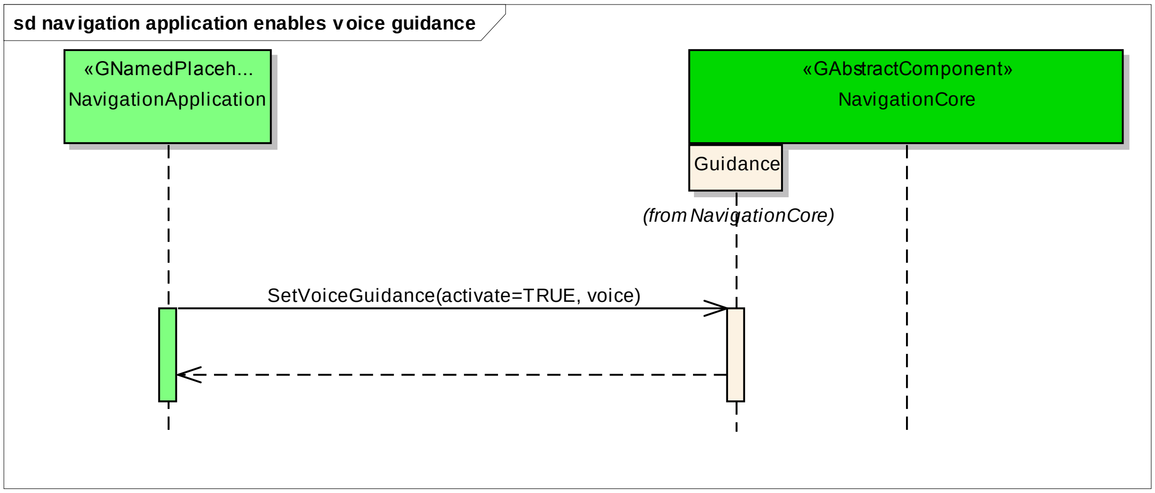
6.7.8 navigation application sets transportation means


sd navigation application sets transportation means
«GNamedPlaceh...
NavigationApplication
«GAbstractComponent»
NavigationCore
Routing
(from NavigationCore)
SetTransportationMeans (sessionHandle, routeHandle, transportationMeans=BY_CAR)
:Result

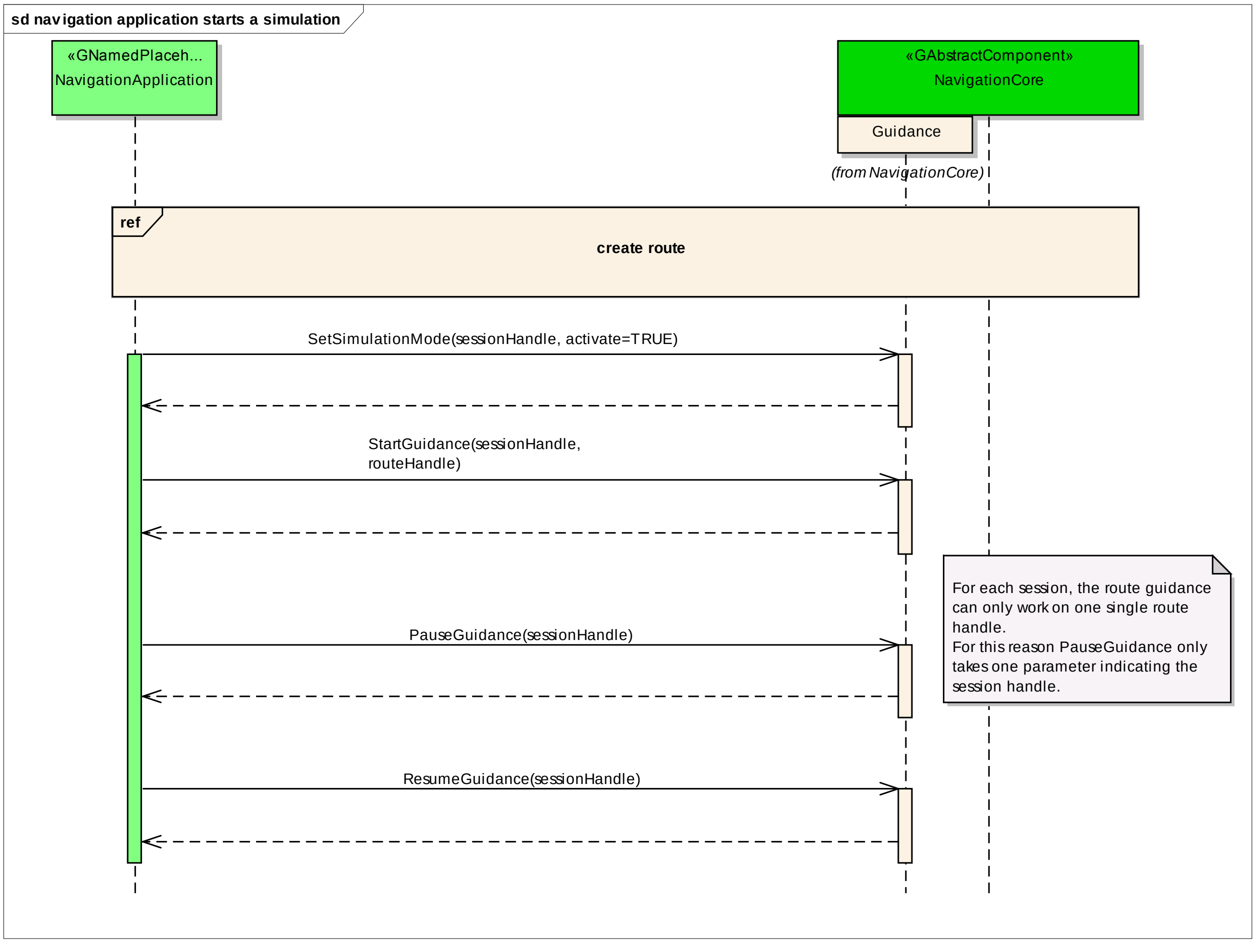
6.7.9 navigation application changes waypoints order


sd navigation application changes waypoints order
«GNamedPlaceh...
NavigationApplication
«GAbstractComponent»
NavigationCore
Routing
(from NavigationCore)
GetWaypoints(sessionHandle, routeHandle, startFromCurrentPosition=FALSE,
waypointsList=[(LATITUDE,latPoint1),(LONGITUDE,lonPoint1),(LATITUDE,latPoint2),(LONGITUDE,lonPoint2),(LATITUDE,latPoint3),(LONGITUDE,lo
:waypoints
SetWaypoints(sessionHandle, routeHandle, startFromCurrentPosition=FALSE,
waypointsList=[(LATITUDE,latPoint2),(LONGITUDE,lonPoint2),(LATITUDE,latPoint1),(LONGITUDE,lonPoint1),(LATITUDE,latPoint3),(LONGITUDE,lo
The order of the two waypoints is now reversed

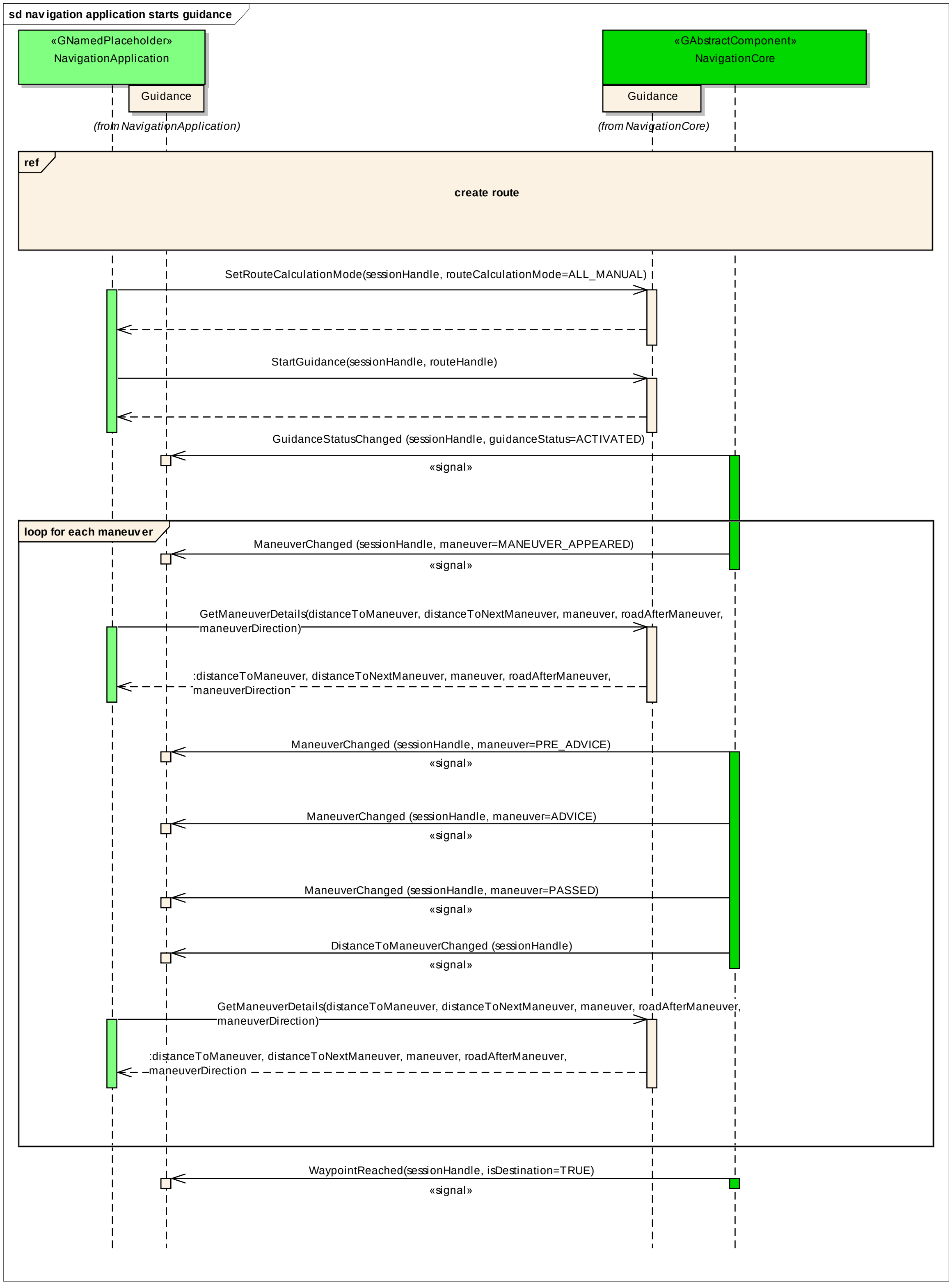
6.7.10 navigation application enables voice guidance



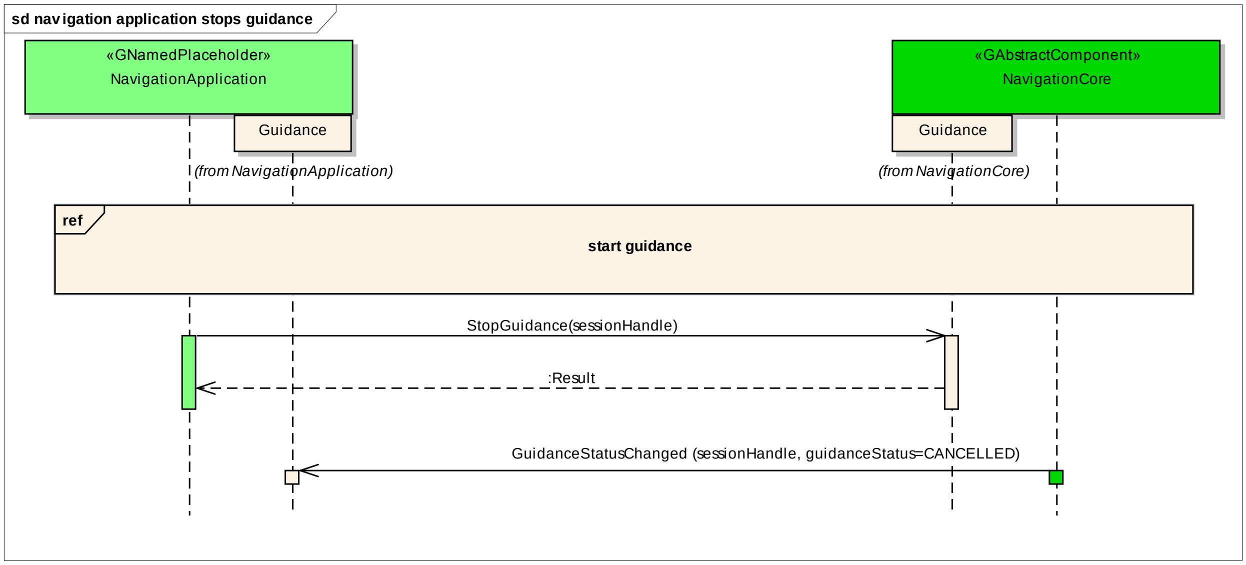
6.7.11 navigation application starts a simulation


sd navigation application starts a simulation
«GNamedPlaceh...
NavigationApplication
«GAbstractComponent»
NavigationCore
Guidance
(from NavigationCore)
ref
create route
SetSimulationMode(sessionHandle, activate=TRUE)
StartGuidance(sessionHandle, routeHandle)
PauseGuidance(sessionHandle)
ResumeGuidance(sessionHandle)
For each session, the route guidance can only work on one single route handle.
For this reason PauseGuidance only takes one parameter indicating the session handle.

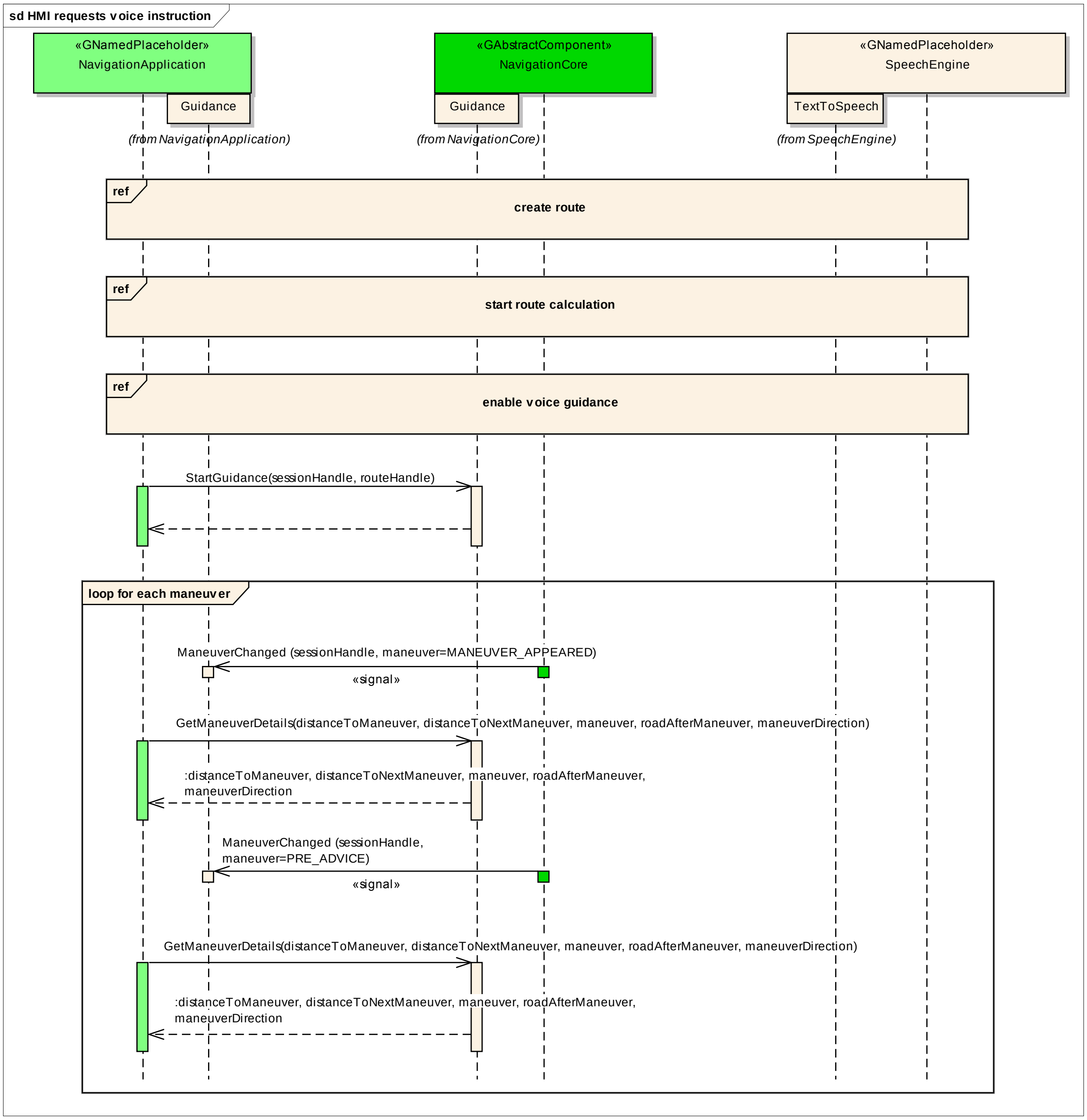
6.7.12 navigation application starts guidance


sd navigation application starts guidance
«GNamedPlaceholder»
NavigationApplication
«GAbstractComponent»
NavigationCore
Guidance
Guidance
(from NavigationApplication)
(from NavigationCore)
ref
create route
SetRouteCalculationMode(sessionHandle, routeCalculationMode=ALL_MANUAL)
StartGuidance(sessionHandle, routeHandle)
GuidanceStatusChanged (sessionHandle, guidanceStatus=ACTIVATED)
«signal»
loop for each maneuver
ManeuverChanged (sessionHandle, maneuver=MANEUVER_APPEARED)
«signal»
GetManeuverDetails(distanceToManeuver, distanceToNextManeuver, maneuver, roadAfterManeuver, maneuverDirection)
:distanceToManeuver, distanceToNextManeuver, maneuver, roadAfterManeuver, maneuverDirection
ManeuverChanged (sessionHandle, maneuver=PRE_ADVICE)
«signal»
ManeuverChanged (sessionHandle, maneuver=ADVICE)
«signal»
ManeuverChanged (sessionHandle, maneuver=PASSED)
«signal»
DistanceToManeuverChanged (sessionHandle)
«signal»
GetManeuverDetails(distanceToManeuver, distanceToNextManeuver, maneuver, roadAfterManeuver, maneuverDirection)
:distanceToManeuver, distanceToNextManeuver, maneuver, roadAfterManeuver, maneuverDirection
WaypointReached(sessionHandle, isDestination=TRUE)
«signal»

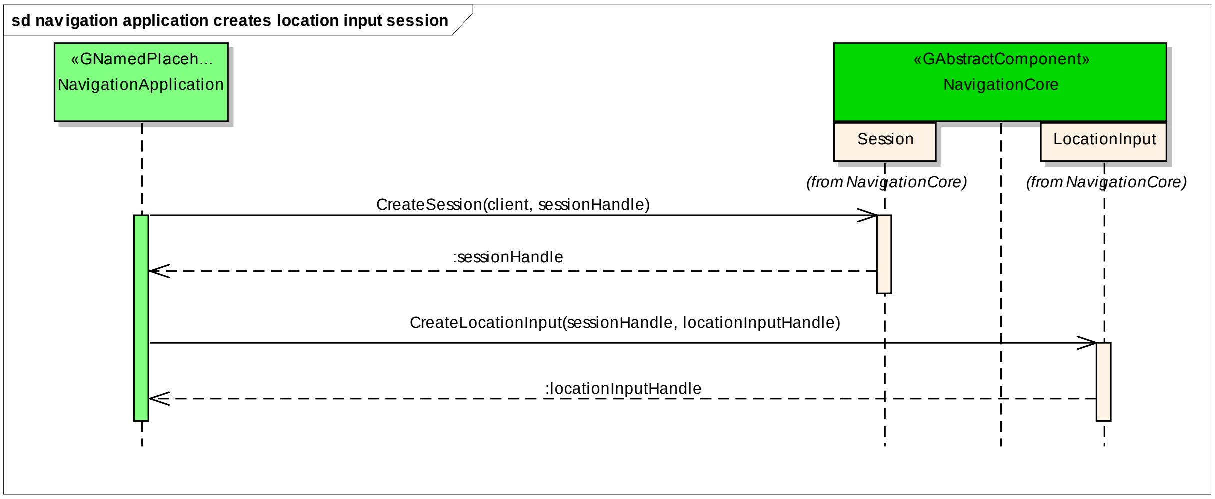
6.7.13 navigation application stops guidance


sd navigation application stops guidance
«GNamedPlaceholder»
NavigationApplication
Guidance
(from NavigationApplication)
«GAbstractComponent»
NavigationCore
Guidance
(from NavigationCore)
ref
start guidance
StopGuidance(sessionHandle)
:Result
GuidanceStatusChanged (sessionHandle, guidanceStatus=CANCELLED)

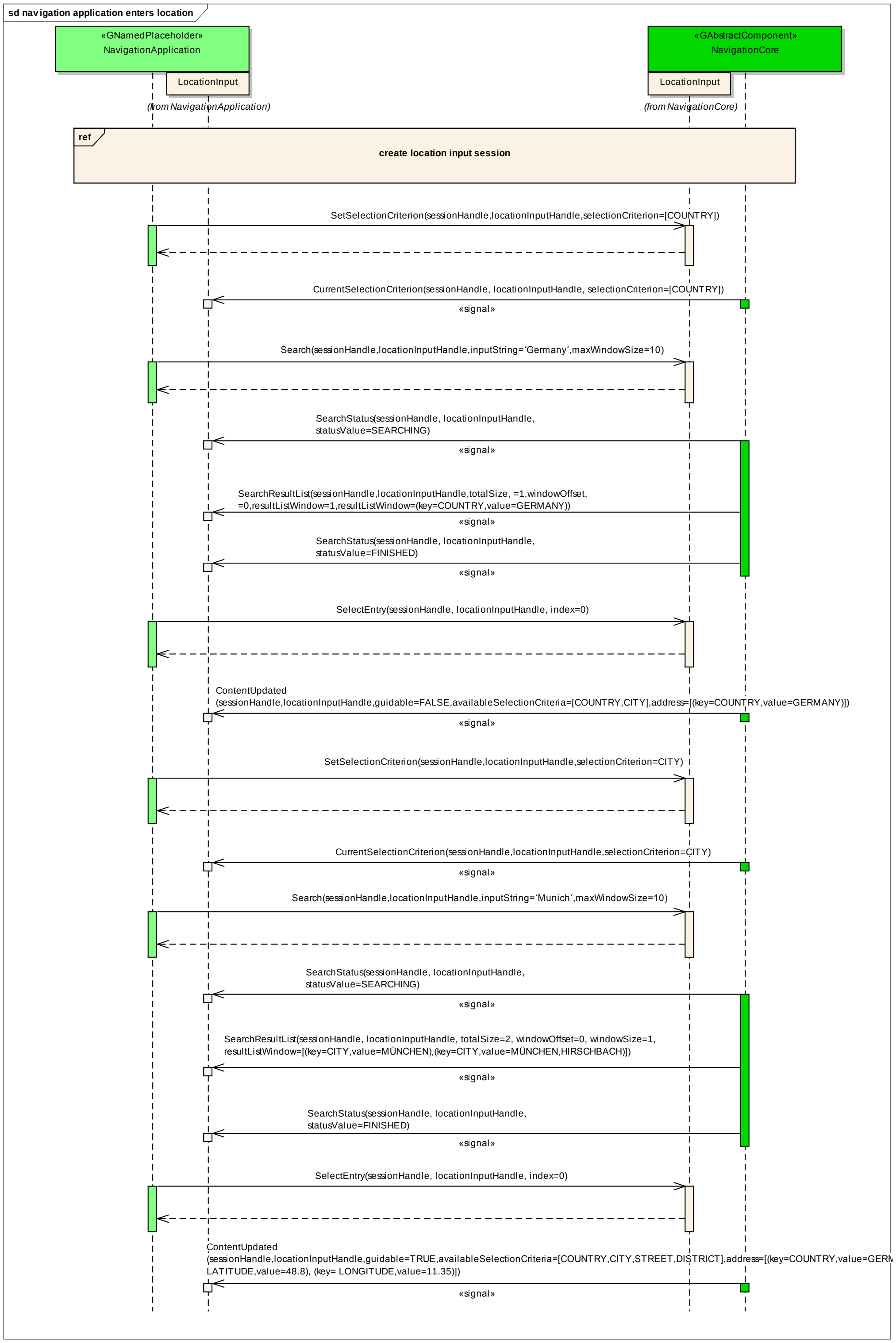
6.7.14 HMI requests voice instruction


sd HMI requests voice instruction
«GNamedPlaceholder»
NavigationApplication
Guidance
(from NavigationApplication)
«GAbstractComponent»
NavigationCore
Guidance
(from NavigationCore)
«GNamedPlaceholder»
SpeechEngine
TextToSpeech
(from SpeechEngine)
ref
create route
ref
start route calculation
ref
enable voice guidance
StartGuidance(sessionHandle, routeHandle)
loop for each maneuver
ManeuverChanged (sessionHandle, maneuver=MANEUVER_APPEARED)
«signal»
GetManeuverDetails(distanceToManeuver, distanceToNextManeuver, maneuver, roadAfterManeuver, maneuverDirection)
:distanceToManeuver, distanceToNextManeuver, maneuver, roadAfterManeuver, maneuverDirection
ManeuverChanged (sessionHandle, maneuver=PRE_ADVICE)
«signal»
GetManeuverDetails(distanceToManeuver, distanceToNextManeuver, maneuver, roadAfterManeuver, maneuverDirection)
:distanceToManeuver, distanceToNextManeuver, maneuver, roadAfterManeuver, maneuverDirection

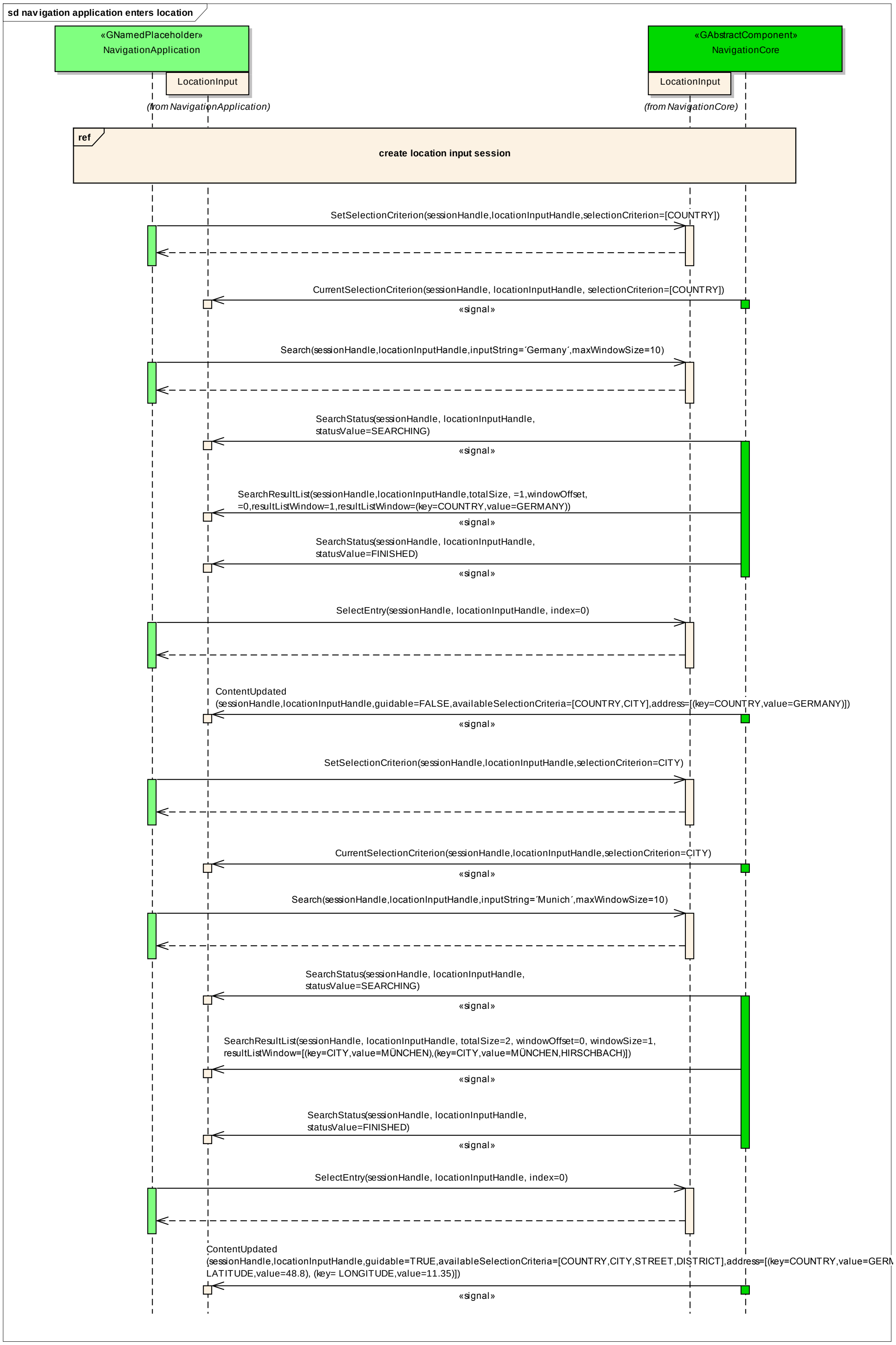
6.7.15 navigation application creates location input session



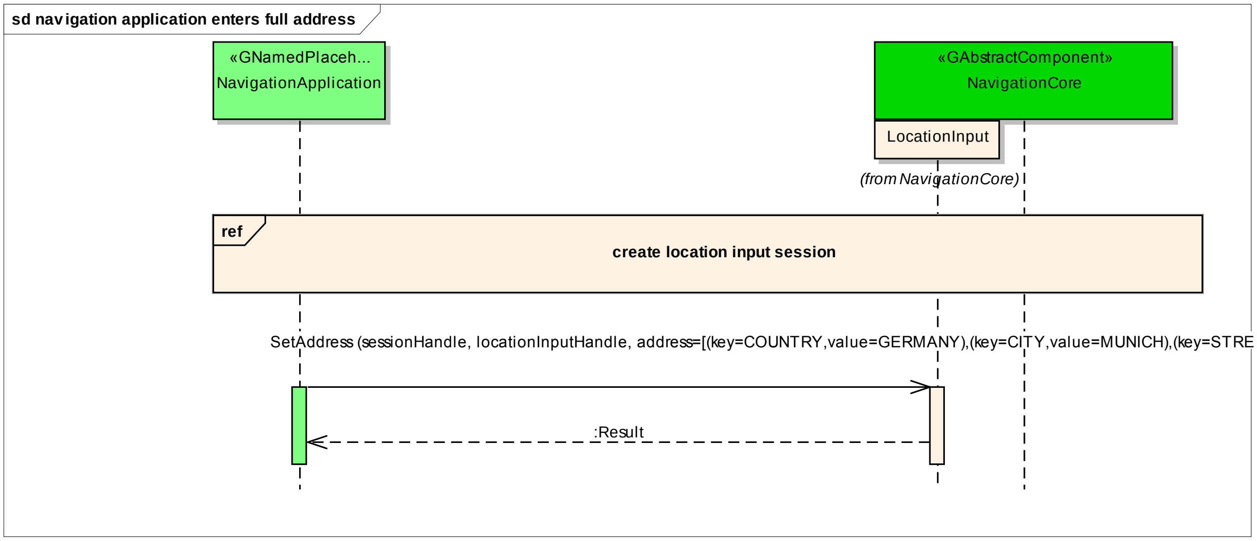
6.7.16 navigation application enters location


sd navigation application enters location
«GNamedPlaceholder»
NavigationApplication
LocationInput
(from NavigationApplication)
«GAbstractComponent»
NavigationCore
LocationInput
(from NavigationCore)
ref
create location input session
SetSelectionCriterion(sessionHandle,locationInputHandle,selectionCriterion=[COUNTRY])
CurrentSelectionCriterion(sessionHandle, locationInputHandle, selectionCriterion=[COUNTRY])
«signal»
Search(sessionHandle,locationInputHandle,inputString=´Germany´,maxWindowSize=10)
SearchStatus(sessionHandle, locationInputHandle, statusValue=SEARCHING)
«signal»
SearchResultList(sessionHandle,locationInputHandle,totalSize, =1,windowOffset, =0,resultListWindow=1,resultListWindow=(key=COUNTRY,value=GERMANY))
«signal»
SearchStatus(sessionHandle, locationInputHandle, statusValue=FINISHED)
«signal»
SelectEntry(sessionHandle, locationInputHandle, index=0)
ContentUpdated (sessionHandle,locationInputHandle,guidable=FALSE,availableSelectionCriteria=[COUNTRY,CITY],address=[(key=COUNTRY,value=GERMANY)])
«signal»
SetSelectionCriterion(sessionHandle,locationInputHandle,selectionCriterion=CITY)
CurrentSelectionCriterion(sessionHandle,locationInputHandle,selectionCriterion=CITY)
«signal»
Search(sessionHandle,locationInputHandle,inputString=´Munich´,maxWindowSize=10)
SearchStatus(sessionHandle, locationInputHandle, statusValue=SEARCHING)
«signal»
SearchResultList(sessionHandle, locationInputHandle, totalSize=2, windowOffset=0, windowSize=1, resultListWindow=[(key=CITY,value=MÜNCHEN),(key=CITY,value=MÜNCHEN,HIRSCHBACH)])
«signal»
SearchStatus(sessionHandle, locationInputHandle, statusValue=FINISHED)
«signal»
SelectEntry(sessionHandle, locationInputHandle, index=0)
ContentUpdated (sessionHandle,locationInputHandle,guidable=TRUE,availableSelectionCriteria=[COUNTRY,CITY,STREET,DISTRICT],address=[(key=COUNTRY,value=GERM
LATITUDE,value=48.8), (key= LONGITUDE,value=11.35)])
«signal»

6.7.17 navigation application enters location using speller


sd navigation application enters location
«GNamedPlaceholder»
NavigationApplication
«GAbstractComponent»
NavigationCore
LocationInput
(from NavigationApplication)
LocationInput
(from NavigationCore)
ref
create location input session
SetSelectionCriterion(sessionHandle,locationInputHandle,selectionCriterion=[COUNTRY])
CurrentSelectionCriterion(sessionHandle, locationInputHandle, selectionCriterion=[COUNTRY])
«signal»
Search(sessionHandle,locationInputHandle,inputString=´Germany´,maxWindowSize=10)
SearchStatus(sessionHandle, locationInputHandle,
statusValue=SEARCHING)
«signal»
SearchResultList(sessionHandle,locationInputHandle,totalSize, =1,windowOffset,
=0,resultListWindow=1,resultListWindow=(key=COUNTRY,value=GERMANY))
«signal»
SearchStatus(sessionHandle, locationInputHandle,
statusValue=FINISHED)
«signal»
SelectEntry(sessionHandle, locationInputHandle, index=0)
ContentUpdated
(sessionHandle,locationInputHandle,guidable=FALSE,availableSelectionCriteria=[COUNTRY,CITY],address=[(key=COUNTRY,value=GERMANY)])
«signal»
SetSelectionCriterion(sessionHandle,locationInputHandle,selectionCriterion=CITY)
CurrentSelectionCriterion(sessionHandle,locationInputHandle,selectionCriterion=CITY)
«signal»
Search(sessionHandle,locationInputHandle,inputString=´Munich´,maxWindowSize=10)
SearchStatus(sessionHandle, locationInputHandle,
statusValue=SEARCHING)
«signal»
SearchResultList(sessionHandle, locationInputHandle, totalSize=2, windowOffset=0, windowSize=1,
resultListWindow=[(key=CITY,value=MÜNCHEN),(key=CITY,value=MÜNCHEN,HIRSCHBACH)])
«signal»
SearchStatus(sessionHandle, locationInputHandle,
statusValue=FINISHED)
«signal»
SelectEntry(sessionHandle, locationInputHandle, index=0)
ContentUpdated
(sessionHandle,locationInputHandle,guidable=TRUE,availableSelectionCriteria=[COUNTRY,CITY,STREET,DISTRICT],address=[(key=COUNTRY,value=GERM
LATITUDE,value=48.8), (key= LONGITUDE,value=11.35)])
«signal»

6.7.18 navigation application enters full address


sd navigation application enters full address
«GNamedPlaceh...
NavigationApplication
«GAbstractComponent»
NavigationCore
LocationInput
(from NavigationCore)
ref
create location input session
SetAddress (sessionHandle, locationInputHandle, address=[(key=COUNTRY,value=GERMANY),(key=CITY,value=MUNICH),(key=STRE
:Result

6.8 Interfaces