



Research & Vehicle Technology
“Infotainment Systems Product Development”

Drive Video Record

Feature Level Specification

Version 1.6

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Version Date: Jan. 09, 2023

FORD CONFIDENTIAL



Revision History

Date	Ver	Notes	
April. 17, 2022	1.0	<ul style="list-style-type: none">Initial Release	Niu, Kobe (Y.) initial.
June. 29, 2022	1.1	<ul style="list-style-type: none">Update according to benchmark	Niu, Kobe (Y.) update.
July. 25, 2022	1.2	<ul style="list-style-type: none">Update according to HMI UE input	Niu, Kobe (Y.) update.
Sep. 05, 2022	1.3	<ul style="list-style-type: none">Update section 1.1 system B-DiagramUpdate section 2.6 DVR interfaceAdd DVR EOL requirement in section 3.6Update section 3.7 vehicle data collectionUpdate section 4.2 video/photo recordAdd timeout logic in section 4.3.1Add screenshot function in section 4.2.1.5Wording and image optimization for all sections	Niu, Kobe (Y.) update.
Nov. 10, 2022	1.4	<ul style="list-style-type: none">Add description about functions which will not be supported on DVROffboardClientUpdate according to function team reviewUpdate according to UE V3.5.0	Niu, Kobe (Y.) update.
Dec. 02, 2022	1.5	<ul style="list-style-type: none">Section 4.2.3.2.3 Manual Video Record sequence diagram updateSection 4.2.1.7 All DVR video should support watermarkSection 3.1 Power management strategy updateSection 4.2.1.1 update TF card file system design	Niu, Kobe (Y.) update.
Jan. 09, 2023	1.6	<ul style="list-style-type: none">Section 3.1 update load shed signal descriptionSection 3.1.5 Update scenario B duration from 45s to 30s by defaultSection 4.2.1.1 TF card file system should only have one folder to contain all copied files	Niu, Kobe (Y.) update.



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1 Overview

The Drive Video Record (DVR) feature allows the user to capture video and photo from a dash camera while driving, and customer could save the data to an external TF card or download to smart phone via Wi-Fi. The DVR camera is mounted behind the vehicle windshield glass without the obstruction from interior components.

The DVR system could capture the video of exterior environment automatically, and when collision happening, DVR will capture/save a special video labeled as “emergency video”, user could also trigger the video or photo recording manually to save the beautiful view or important scene, at the same time the necessary information like VIN, date, time will be saved as watermark. Users could also playback the video via the center stack or Ford APP, DVR will also provide vehicle monitor function after ignition off.

1.1 System Diagram

Below is the B diagram of DVR system:

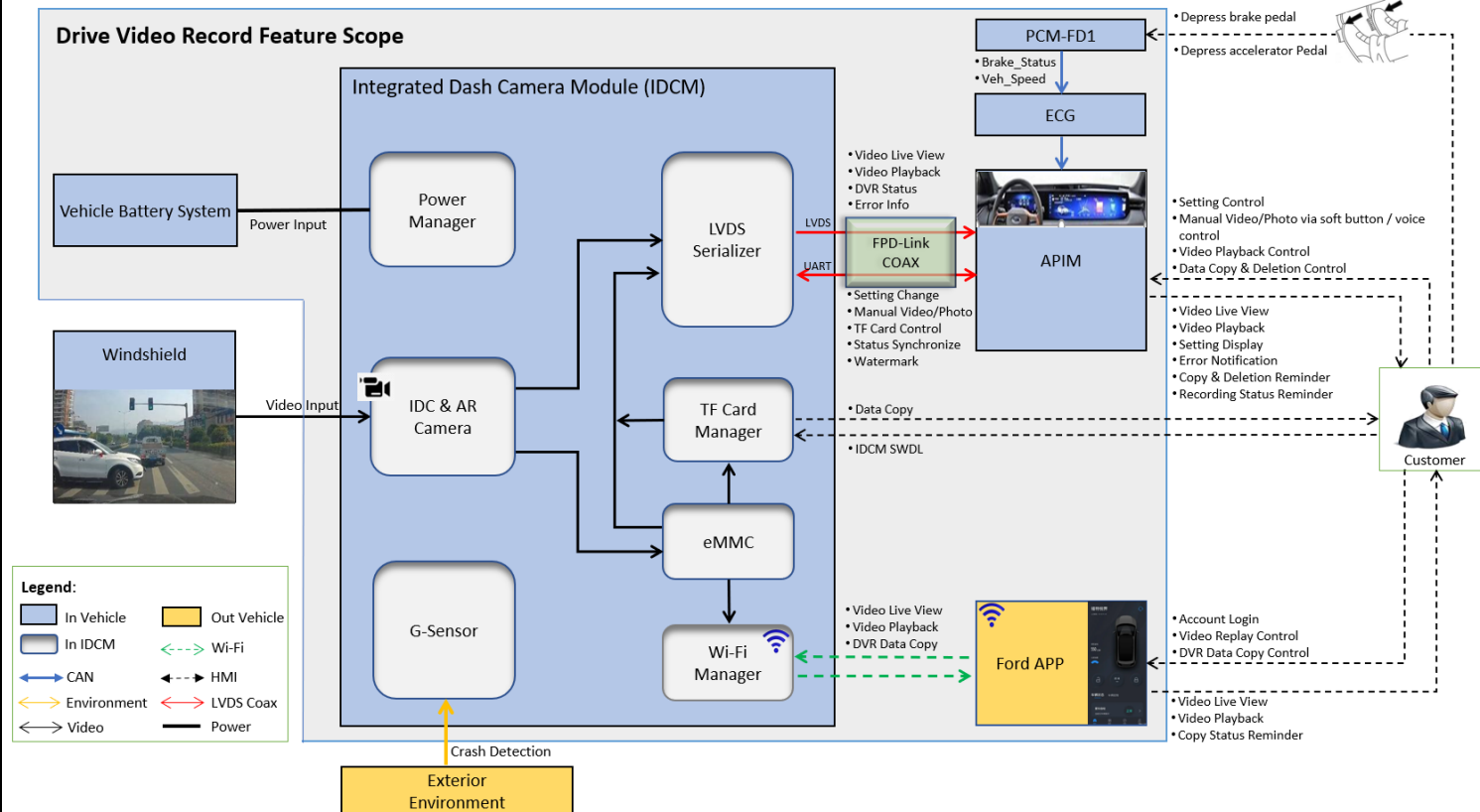


Figure 1-1 DVR System Diagram

1.2 Terminology and Abbreviations

The following table lists terminologies that are used in this document along with a brief description.

Term	Description
APIM	Auxiliary Protocol Interface Module
DVR	Drive Video Record
ECG	Enhanced Central Gateway
IDCM	Integrated Dash Camera
FNV X.X	Fully Networked Vehicle Architecture X.X
HMI	Human Machine Interface
POC	Powered Over Cable defined in TI FPD-Link protocol

Table 1-1 Terminology and Abbreviation



2 Architectural Design

2.1 XXXXX-REQ-xxxxxx/A-DVR User

People who are using DVR functions via DVROnboardClient, DVROffboardClient and DVR server, include video play, data copy and DVR setting, etc.

2.2 XXXXX-REQ-xxxxxx/A-DVR Onboard Client

The DVR Onboard Client (DVROnboardClient) is located inside vehicle, responsible for providing in vehicle HMI to DVR user for functions include video live view, playback, DVR setting, vehicle data collection and TF copy/deletion, etc.

2.3 XXXXX-REQ-xxxxxx/A-DVR Offboard Client

The DVR Offboard Client (DVROffboardClient) is located out of vehicle, responsible for providing APP HMI to the user for live view, video playback, and data download, etc. APP in DVROffboardClient may include FordPass, LinclonWay and Mach-E.

2.4 XXXXX-REQ-xxxxxx/A-DVR server

The DVR Server (DVRServer) is located inside vehicle, responsible for video recording/saving, collision detection and processing DVR user's request from DVROnboardClient or DVROffboardClient.

2.5 Physical Mapping of Classes

The table below shows an example of how the logical classes that make up the DVR feature may be mapped into physical modules.

Logical Class	Physical Module (ECU)
DVROnboardClient	APIM -- Accessory Protocol Interface Module
DVROffboardClient	Smart Phone
DVRServer	IDCM -- Integrated Dash Camera Module

Table 2-1 Physical Mapping

2.6 Signal Mapping

The signals mentioned throughout this document shall refer to the signal's logical name. The logical names shall be mapped to their actual signal names, all actual signals in this document are defined in <Drive Video Record UART Protocol>.

2.7 DVRServer Interface

DVROnboardClient and DVRServer communicates via UART over FPD-Link, the hardware relays on a LVDS cable, all RX and TX interface is defined in <Drive Video Record UART Protocol>.



3 General Requirements

3.1 XXXXX-REQ-xxxxxx/A-Power Mode Design

DVR system shall support below power modes handled by DVRServer:

Control Factors				Output	
POC ¹ status	Load Shed ⁵	Monitor Timer ²	Monitor Counter ³	DVR Power Mode	DVR Function
On	/	/	/	Full Power Mode	All function
Off	N	< Timer Threshold	< Counter Threshold	Standby Mode ⁴	Only vehicle monitor
Off	N	>= Timer Threshold	>= Counter Threshold	Sleep Mode	No function
Off	Y	/	/		

Table 3-1 DVR System Power Mode

- #1 -- POC (Power Over Cable) is HW signal provided by DVROnboardClient to DVRServer:
 - POC = On, when DVROnboardClient is not in <IVI sleep mode>.
 - POC = Off, when DVROnboardClient is in <IVI sleep mode>.
- #2 -- Monitor Timer is DVRServer internal clock for KOL protection, the default threshold is 5 days. The Monitor Timer should be reset whenever DVR leaves standby mode, and could be configurable via DVROnboardClient CAN diagnostic.
- #3 -- Monitor Counter is DVRServer internal counter for KOL protection, which defined as video numbers captured during standby mode, the default threshold is 10. The Monitor Counter should be reset whenever DVR leaves standby mode, and could be configurable via DVROnboardClient CAN diagnostic.
- #4 -- Standby Mode is an optional status, DVRUser could disable vehicle monitor function in DVROnboardClient setting page.
- #5 -- Whenever DVROnboardClient goes to <IVI sleep mode> due to load shed via analyzing below CAN message:
 - 0x3B1 -- Body_Info_7_HS3
 - 0x423 -- Battery_Mgmt_2_HS3

DVROnboardClient should set POC to on and cascade this information to DVRServer via UART message APIM_LoadshedReq_Enum, after DVRServer feedback the response via UART message IDCM_LoadshedResp_Enum, DVROnboardClient should set POC to Off, then DVRServer should jump standby mode and go to Sleep Mode directly.

3.1.1 Full Power Mode

When:

$POC == On$

DVR should be in full power mode, and all functions should be available.

3.1.2 Standby Mode

When:

$(POC == Off) \ \&\& \ (Monitor \ Timer < Timer \ Threshold) \ \&\& \ (Monitor \ Counter < Counter \ Threshold) \ \&\& \ (Load \ Shed == N)$

DVR will be in standby mode, only vehicle monitor function defined in Section 4.6 should be available.

3.1.3 Sleep Mode

When:

$(POC == Off) \ \&\& \ (Load \ Shed == Y)$

Or

$(POC == Off) \ \&\& \ (Load \ Shed == N) \ \&\& \ ((Monitor \ Timer \geq Timer \ Threshold) \ || \ (Monitor \ Counter \geq Counter \ Threshold))$

DVR should go to sleep mode, all functions should be disabled.

3.1.4 Other Special Vehicle Mode

When:

Vehicle lifecycle is in ~~Factory mode~~ or Transport mode or Critical Battery mode

DVROnboardClient should set POC to Off, and DVR should go to sleep mode, all functions should be disabled.

3.1.5 Power Mode Switch

Power mode switch state machine if no IVI load shed happens:

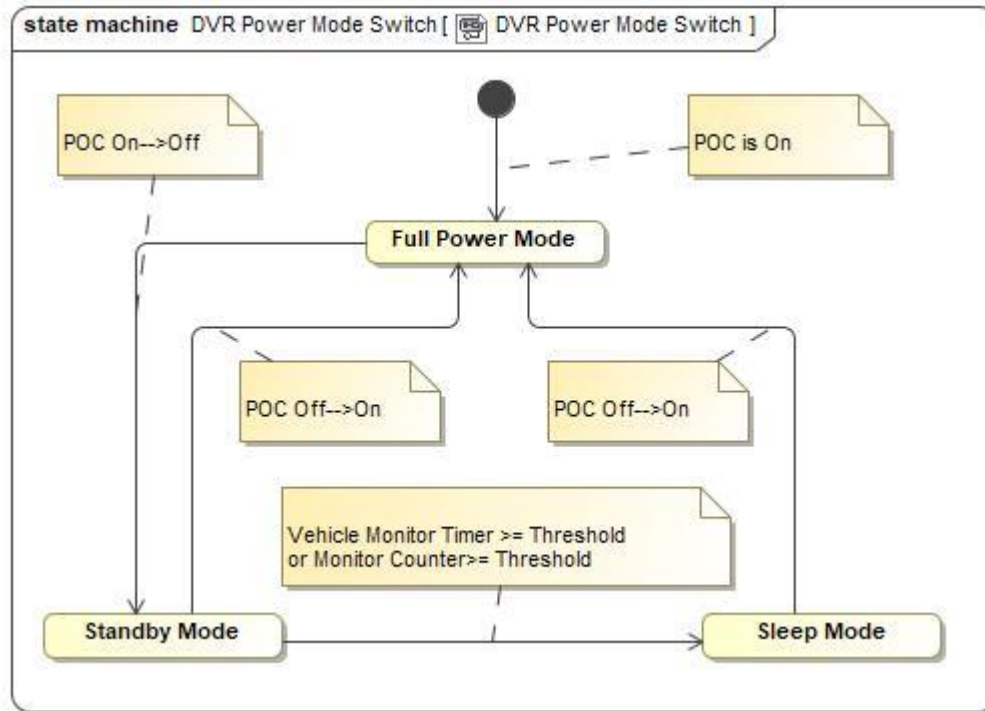


Figure 3-1.1 DVR Power Mode State Machine

Power mode timing control if no IVI load shed happens:

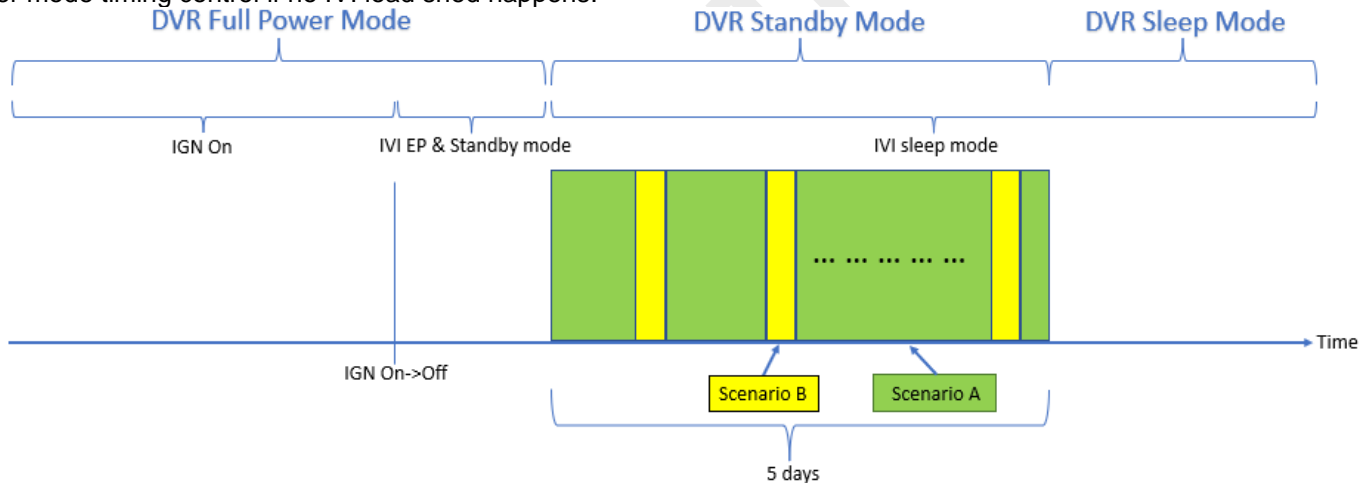


Figure 3-1.2 DVR Power Mode Description

- * Scenario A: No collision is detected by DVRServer, DVRServer will keep in lowest power consumption.
- * Scenario B: Vehicle collision is detected, DVRServer is waked up by internal G-Sensor, this status will continue 30s by default and could be changed via DVR setting. At the same time, scenario B could only happen less than 10 times to avoid battery drain.

3.2 XXXXX-REQ-xxxxxx/A-Preconditions of Recording

DVR shall only start recording when internal (eMMC) or external (TF Card) memory device is available, if memory device is not available or broken, error reminder should be sent to DVRUser.

3.3 XXXXX-REQ- xxxxxx /A-AR Camera Integration

The camera in DVRServer will also serve for AR Navigation or AR HUD feature, the format of the video captured by this camera should also meet the requirement of AR, video should be sent form DVRServer to DVROnboardClient via LVDS.



Specially, when DVROnboardClient HMI is in video/photo playback list page or replaying, AR feature will not be supported.

3.4 XXXXX-REQ- xxxxxx /A-Legal Regulation

The DVR system should meet <GB/T 38892-2020> requirement, the validation and feature sign-off should follow GB/T definition.

3.5 XXXXX-REQ- xxxxxx /A-DVR System Communication

DVRServer should support two-way communication with DVROnboardClient via UART over FPD-Link, the HW connection is LVDS cable.

DVRServer should also support two-way communication with DVROffboardClient via Wi-Fi connection, DVRServer will work as a Wi-Fi hotspot, DVROffboardClient will work as Wi-Fi station.

3.6 XXXXX-REQ- xxxxxx /A-EOL Requirement

1. All video or photo captured during EOL at Ford plant should be deleted via DVROnboardClient HMI before vehicle goes to dealer side.
2. There should be an on demand self-test DTC in DVROnboardClient to confirm if any DVRServer system error existing at Ford plant EOL.

3.7 XXXXX-REQ- xxxxxx /A-Vehicle Data Collection

DVROnboardClient should collect vehicle data from CAN bus, and share the data to DVRServer to support video watermark and collision detection, there are two kinds of vehicle data: mandatory data and optional data:

- Mandatory data is defined by GB/T 38892.
- Optional data is defined by Ford.

Name	RX Mode	Interval (ms)	Latency	Comments
Mandatory Data				
VIN	Event	/	/	Support watermark
System Date & Time	Periodic	/	/	
Optional Data				
Brake status	Event + Periodic	200	<=200	Support collision detection
Vehicle Speed	Periodic	20	<=100	Support watermark and collision detection
Cornering Lamp Status	Periodic	500	<=500	Support watermark
Seat belt status	Periodic	500	<=500	
Gear position	Periodic	500	<=500	

Table 3-2 DVR Vehicle Data Collection Definition



4 Functional Definition

4.1 XXXXX-FUN-REQ-xxxxxx/A-Enable/Disable Normal Video Record

4.1.1 Requirements

Normal Video (aka cycle video) Record function should be disabled before user enable normal video record option through DVR setting.

4.1.1.1 XXXXX-REQ-xxxxxx/A-First Time Usage

A popup message should be shown on DVROnboardClient when the first-time ignition on, ask customer to choose if enable DVR video record function, if the feedback is YES, normal video record defined in 4.2.2.1 should be enabled.

4.1.1.2 XXXXX-REQ-xxxxxx/A-Normal Video Record Enable/Disable Switch

DVR could be switched between Enabled and Disabled via the DVR setting menu on DVROnboardClient, DVRServer and DVROnboardClient shall save the enable/disable setting result in memory, and ask customer if keep disabled when next 3 times ignition on, DVROnboardClient shall provide a reminder icon (Recording Status Icon) to show normal video recording enable or disable status.

The status of normal video recording should not impact video capture for AR Navigation feature, for example, Video recording is disabled and AR feature is enabled on DVROnboardClient, DVRServer shall still capture the video and send it to DVROnboardClient, however the normal video will not be captured and saved.

When DVRUser login Ford account successfully on DVROnboardClient and normal video recording is disabled, DVROnboardClient should try to ask customer to open recording again.

4.1.2 Use Cases

4.1.2.1 XXXXX-UC-REQ-xxxxxx/A-User enable/disable normal video record via DVROnboardClient successfully

Actors	User, DVRServer, DVROnboardClient
Pre-conditions	DVRServer is at full power mode DVROnboardClient HMI is active DVRServer memory device is available
Scenario Description	User enters DVR setting menu on DVROnboardClient User selects to enable/disable video record
Post-conditions	Video record switches to enabled/disabled successfully If enable: <ul style="list-style-type: none">• Video record should be available• The Recording Status Icon on DVROnboardClient HMI main page should be Green if disable: <ul style="list-style-type: none">• Video record should be disabled• The Recording Status Icon on DVROnboardClient HMI main page should be Grey DVR Server should synchronize the status to DVROffboardClient
List of Exception Use Cases	User enable/disable normal video record via DVROnboardClient failed.
Interfaces	UART, Wi-Fi, HMI

Table 4-1 Enable/Disable Normal Video Record Successfully

4.1.2.2 XXXXX-UC-REQ-xxxxxx/A-User enable/disable normal video record via DVROnboardClient failed

Actors	User, DVRServer, DVROnboardClient
Pre-conditions	DVRServer is at full power mode DVROnboardClient HMI is active DVRServer memory device is available



Scenario Description	User enters DVR menu on DVROnboardClient User selects to enable/disable video record
Post-conditions	Failed to switch normal video record: <ul style="list-style-type: none">An error message is displayed to the userThe Recording Status Icon on DVROnboardClient HMI main page should keep no change
List of Exception Use Cases	
Interfaces	UART, HMI

Table 4-2 Enable/Disable Normal Video Record Failed

4.1.3 White Box View

4.1.3.1 Activity Diagrams

4.1.3.1.1 XXXXX-ACT-REQ-xxxxxx/A-User enable/disable normal video record via DVROnboardClient

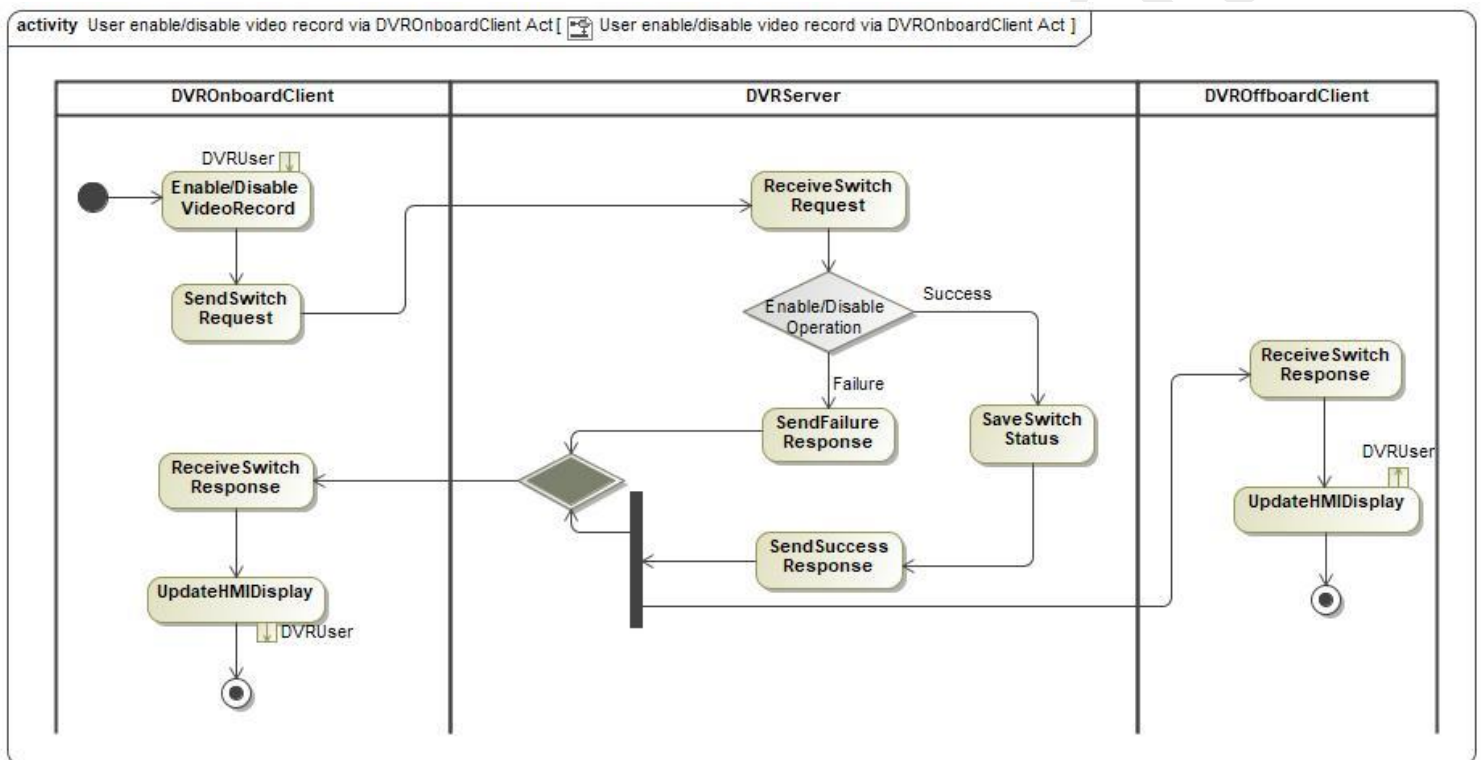


Figure 4-1 Enable/Disable Normal Video Record via DVROnboardClient



4.1.3.2 Sequence Diagrams

4.1.3.2.1 XXXXX-SD-REQ-xxxxxx/A-User enable/disable normal video record via DVROnboardClient

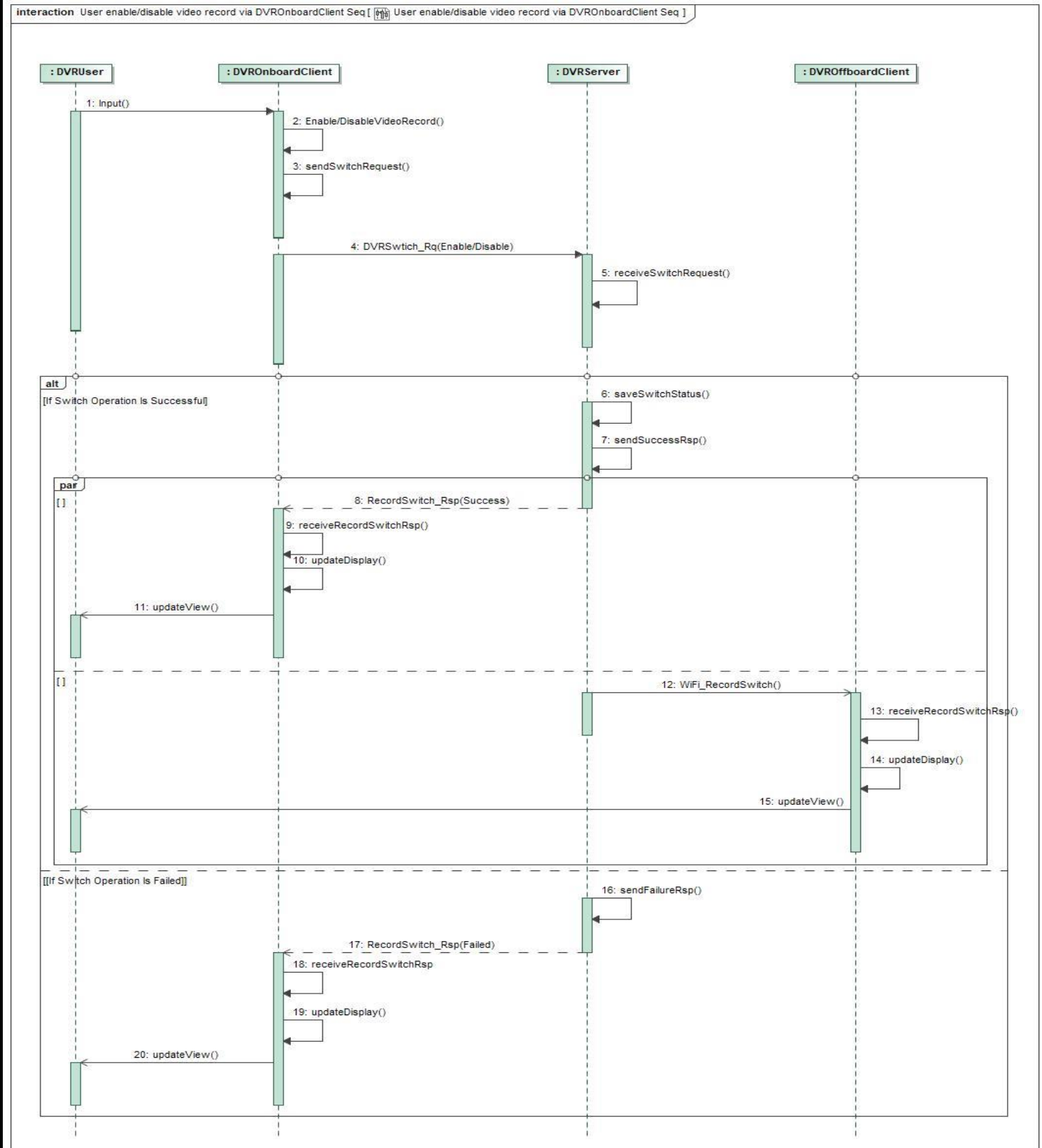


Figure 4-2 Enable/Disable Normal Video Record via DVROnboardClient



4.2 XXXXX-FUN-REQ-xxxxxx/A-Video/Photo Data Record and Save

4.2.1 Requirements

DVRServer should have ability to save video/photo into local memory or external memory.

4.2.1.1 XXXXX-REQ-xxxxx/A-Data Saving Location

There are four kinds of data could be recorded into DVRServer local memory (eMMC).

File Type	Resolution	Format	Default Save Location	Data Size
Normal Video	1080P	MP4	"Normal Data" folder in eMMC	At least support 4 hours video
Emergency Video	1080P	MP4	"Key Data" folder in eMMC	At least support 1 hour video
Manual Video	1080P	MP4		At least support 0.5 hours video
Manual Photo	1920*1080	JPG		At least support 400 pics photo

Table 4-3 DVR File System

DVRServer should follow FIFO design to make sure the newest data could cover the oldest one when memory is full, all videos should be encoded by H.264 and save as MP4 format, and photos should be saved in JPG format. File system in eMMC should include:

1. "Normal Data" folder
2. "Key Data" folder

File system in TF card should **have one folder to contain all copied files**, DVRServer should support 8~128GB TF card.

There are three file storage location:

1. **eMMC**: All data must be saved into an DVRServer internal eMMC, the size of eMMC should support at least 4 hours video data storage according to GB/T 38892 requirement.
2. **TF Card**: If User inserts TF card into DVRServer, all data could be saved into TF card manually via DVROnboardClient.
3. **Smart Phone**: User could copy files to smart phone local file system via Wi-Fi connection between DVROffboardClient and DVRServer.

4.2.1.2 XXXXX-REQ-xxxxx/A-Data Naming

All data should be saved with below naming rule:

YYYYMTDD_HHMNSS_FF_FT.mp4
or
YYYYMTDD_HHMNSS_FF_FT.jpg

- YYYY --Year Data
- MT --Month Data
- DD --Day Data
- HH --Hour Data
- MN --Minute Data
- SS --Seconds Data
- FF --File Folder
 - NF --Normal Data Folder
 - KF --Key Data Folder
- FT --File Type
 - NV --Normal video
 - EV --Emergency video or vehicle monitor video
 - MV --Manual video
 - MP --Manual Photo

For example, if a manual video is captured at 2031.01.15 14:44:08, it should be named:

- 20310115_144408_KF_MV.mp4



4.2.1.3 XXXXX-REQ-xxxxxx/A-Normal Video Record

Once normal video record is enabled and memory device is available, DVRServer should keep normal video recording automatically, according to GB/T 38892, all normal video must be saved into eMMC without modification. The default normal video duration is 3 minutes and should be saved into "Normal Data" folder.

4.2.1.4 XXXXX-REQ-xxxxxx/A-Emergency Video Record

DVRServer should have the ability to detect the vehicle collision via internal G-Sensor detection, then trigger emergency video record, video should be saved into "Key Data" folder.

If normal video record is enabled, emergency video should contain 15 seconds before and 30 seconds after collision detected. If normal video record is disabled, emergency video should only contain 30 seconds after collision detected.

*The 30 seconds is a default value which could be changed through DVR setting.

4.2.1.5 XXXXX-REQ-xxxxxx/A-Manual Video/Photo Record

There are several ways to trigger manual video record:

1. Soft button on DVROnboardClient
2. Voice control via DVROnboardClient if available
3. Gesture control via DVROnboardClient if available (optional)
4. Hard button on steering wheel (optional)

Manual video should be saved into "Key Data" folder. If normal video record is enabled, manual video should contain 15 seconds before and max to 45 seconds after manual video triggered. If normal video record is disabled, manual video should only contain max to 45 seconds after manual video triggered, customer could stop manual recording at any time before video capture end.

There are five ways to trigger manual photo record:

1. Soft button on DVROnboardClient menu
2. Voice control via DVROnboardClient if available
3. Gesture control via DVROnboardClient if available (optional)
4. Hard button on steering wheel (optional)
5. Screenshot button when video play back*

Screenshot during video play will help to save the key frame of a video.

4.2.1.6 XXXXX-REQ-xxxxxx/A-Manual Recording Voice Control Command List

Below is the voice control list to support trigger manual video and photo request:

ID	Voice Command	Key Words	IVI TTS Feedback	HMI UE/UI Feedback
1	Enter DVR APP	Open DVR	Already enter DVR	Enter DVR HMI main page
2	Leave DVR APP	Close DVR	Already leave DVR	Leave DVR HMI main page
3	Manual Photo	I'd like to take a photo	Photo successfully or failed	NA.
4	Start Manual Video	I'd like to take a video	Start recording	Display the status of recording
5	Stop Manual Video	Stop taking video	Pls start recording firstly(if video record not started) or Video recording stopped	Display the result of recording
6	Other Potential Command	For example: play video X.	DVR not support currently voice control	NA.

Table 4-4 Voice Control Command List

4.2.1.7 XXXXX-REQ-xxxxxx/A- Vehicle Information Watermark

DVRServer should have the ability to overlay the necessary vehicle and DVR work status information on the saved video, watermark information is defined in section 3.7, All DVR video should support watermark.

Below is an example of water mark:



Figure 4-3 Video Watermark Example

4.2.2 Use Cases

4.2.2.1 XXXXX-UC-REQ-xxxxxx/A-Normal Video Record

Actors	DVRServer
Pre-conditions	Video record is enabled DVRServer is in full power mode DVRServer memory device is available, and no error detected
Scenario Description	DVRServer continues to do video recording periodically
Post-conditions	Video should be saved into eMMC normal data folder with same naming rule
List of Exception Use Cases	Failed to Video/Photo Record
Interfaces	

Table 4-5 Normal Video Record

4.2.2.2 XXXXX-UC-REQ- xxxxxx/A-Emergency Video Record

Actors	DVRServer, DVROnboardClient
Pre-conditions	Video record is enabled DVRServer is in full power mode DVRServer memory device is available, and no error detected Vehicle collision event is detected by DVRServer
Scenario Description	DVRServer should trigger an emergency video recording
Post-conditions	The emergency video should be saved into key data folder with same naming rule Notify user that a new emergency Video is captured through DVROnboardClient HMI.
List of Exception Use Cases	Failed to Video/Photo Record
Interfaces	UART, HMI

Table 4-6 Emergency Video Record

4.2.2.3 XXXXX-UC-REQ- xxxxxx/A-Manual Video/Photo Record

Actors	User, DVRServer, DVROnboardClient, DVROffboardClient
---------------	--



Pre-conditions	Video record is enabled DVRSERVER is in full power mode DVRSERVER memory device is available, and no error detected Soft button or voice control or gesture control is triggered by user on DVROnboardClient or soft button is triggered by user on DVROffboardClient
Scenario Description	DVRSERVER should trigger a manual video recording
Post-conditions	The manual video/photo should be saved into key data folder with same naming rule Notify user that a new manual video/photo is saved successfully
List of Exception Use Cases	Failed to Video/Photo Record
Interfaces	UART, Wi-Fi, HMI

Table 4-7 Manual Video/Photo Record

4.2.2.4 XXXXX-UC-REQ- xxxxxx/A-Failed to Video/Photo Record

Actors	User, DVRSERVER, DVROnboardClient, DVROffboardClient
Pre-conditions	Video record is enabled DVRSERVER is in full power mode When normal or emergency or manual video/photo record is triggered
Scenario Description	DVRSERVER detects there is an internal issue, includes memory(eMMC) broken, camera HW failure, etc.
Post-conditions	An error message should be displayed to user via DVROnboardClient HMI. An error message should be displayed to user via DVROffboardClient HMI if Wi-Fi connection enabled. Related error info should be saved
List of Exception Use Cases	
Interfaces	UART, Wi-Fi, HMI

Table 4-8 Video/Photo Record Failed

4.2.3 White Box View

4.2.3.1 Activity Diagrams

4.2.3.1.1 XXXXX-ACT-REQ- xxxxxx/A-Normal Video Record

*DVROffboardClient related logic is optional, will not be supported on FNV2.1.

activity Normal Video Record Act [Normal Video Record Act]

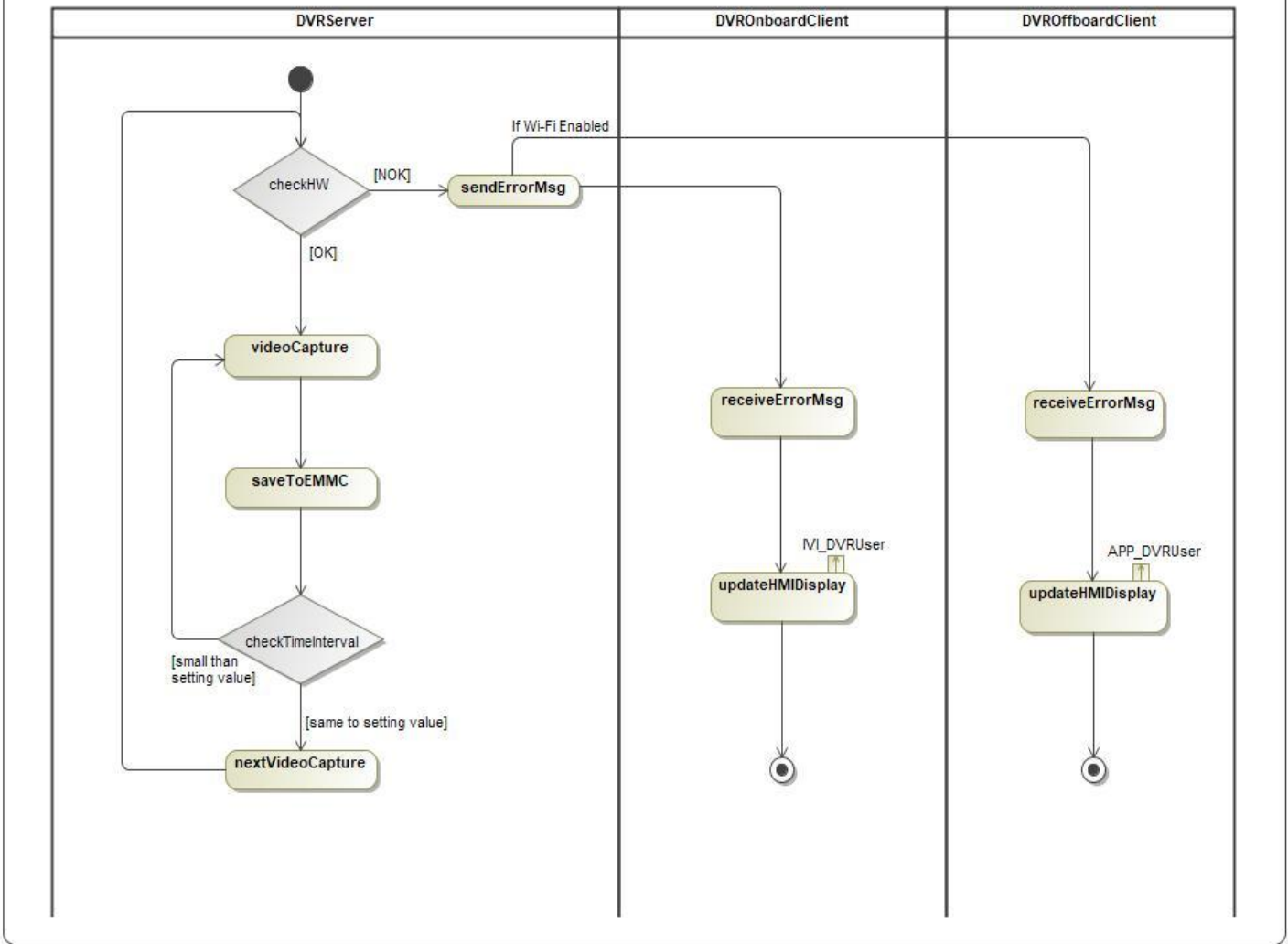


Figure 4-4 Normal Video Record

4.2.3.1.2 XXXXX-ACT-REQ- xxxxxx/A-Emergency Video Record

*DVROffboardClient related logic is optional, will not be supported on FNV2.1.



activity Emergency Video Record Act [Emergency Video Record Act]

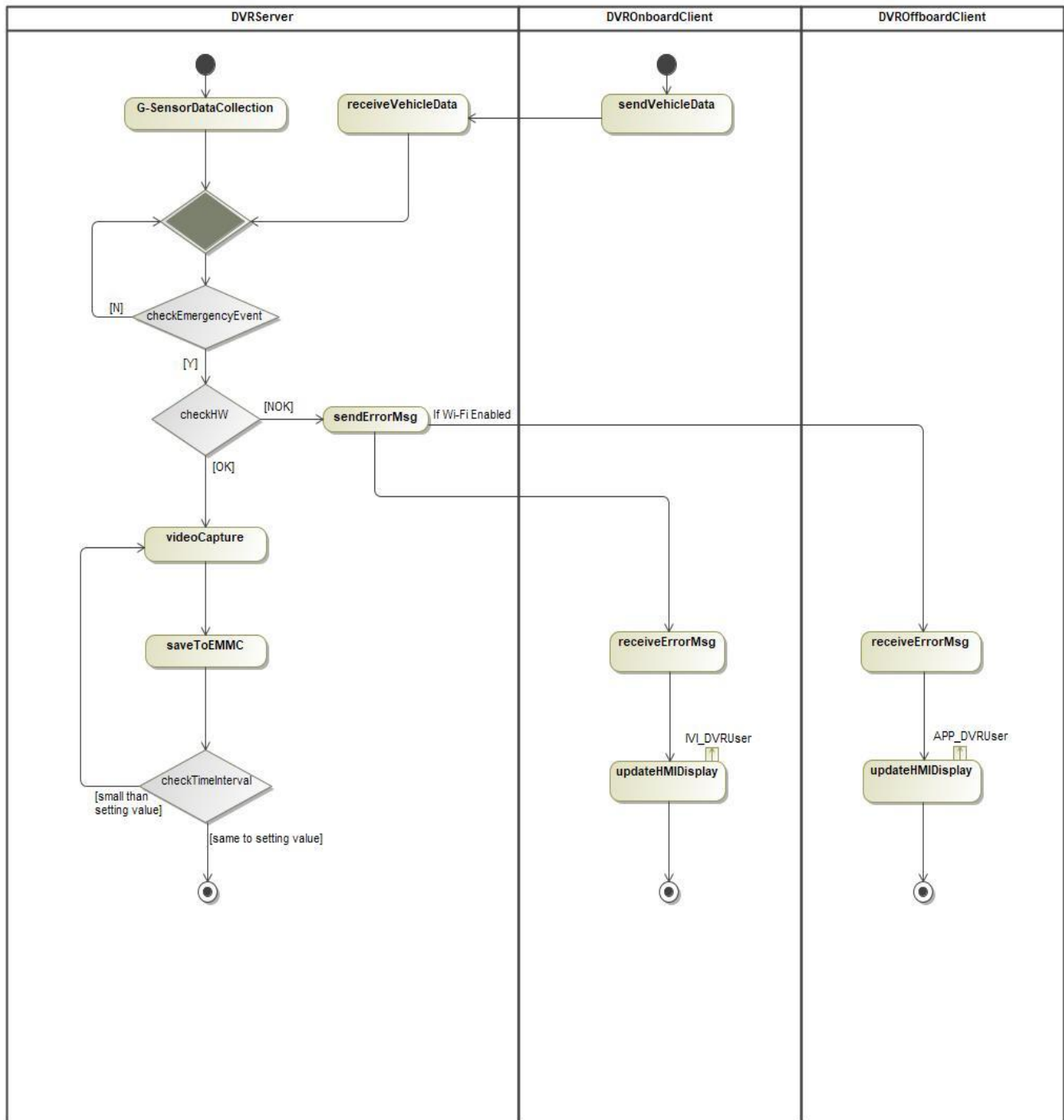


Figure 4-5 Emergency Video Record

4.2.3.1.3 XXXXX-ACT-REQ- xxxxxx/A-Manual Video or Photo Record

*DVROffboardClient related logic is optional, will not be supported on FNV2.1.



activity Manual Video/Photo Record Act [Manual Video/Photo Record Act]

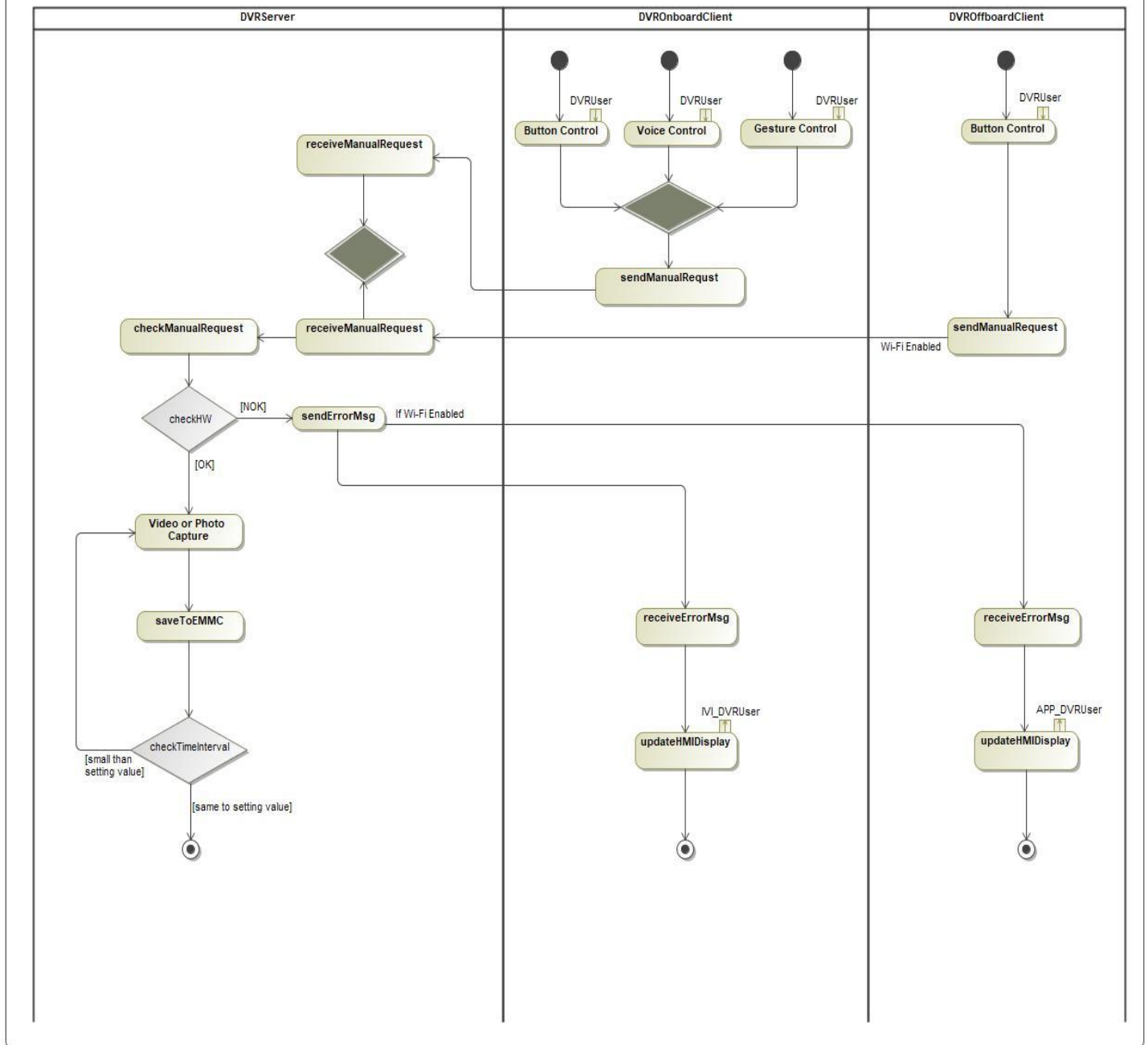


Figure 4-6 Manual Video Record

4.2.3.2 Sequence Diagrams

4.2.3.2.1 XXXXX-SD-REQ- xxxxxx/A-Normal Video Record

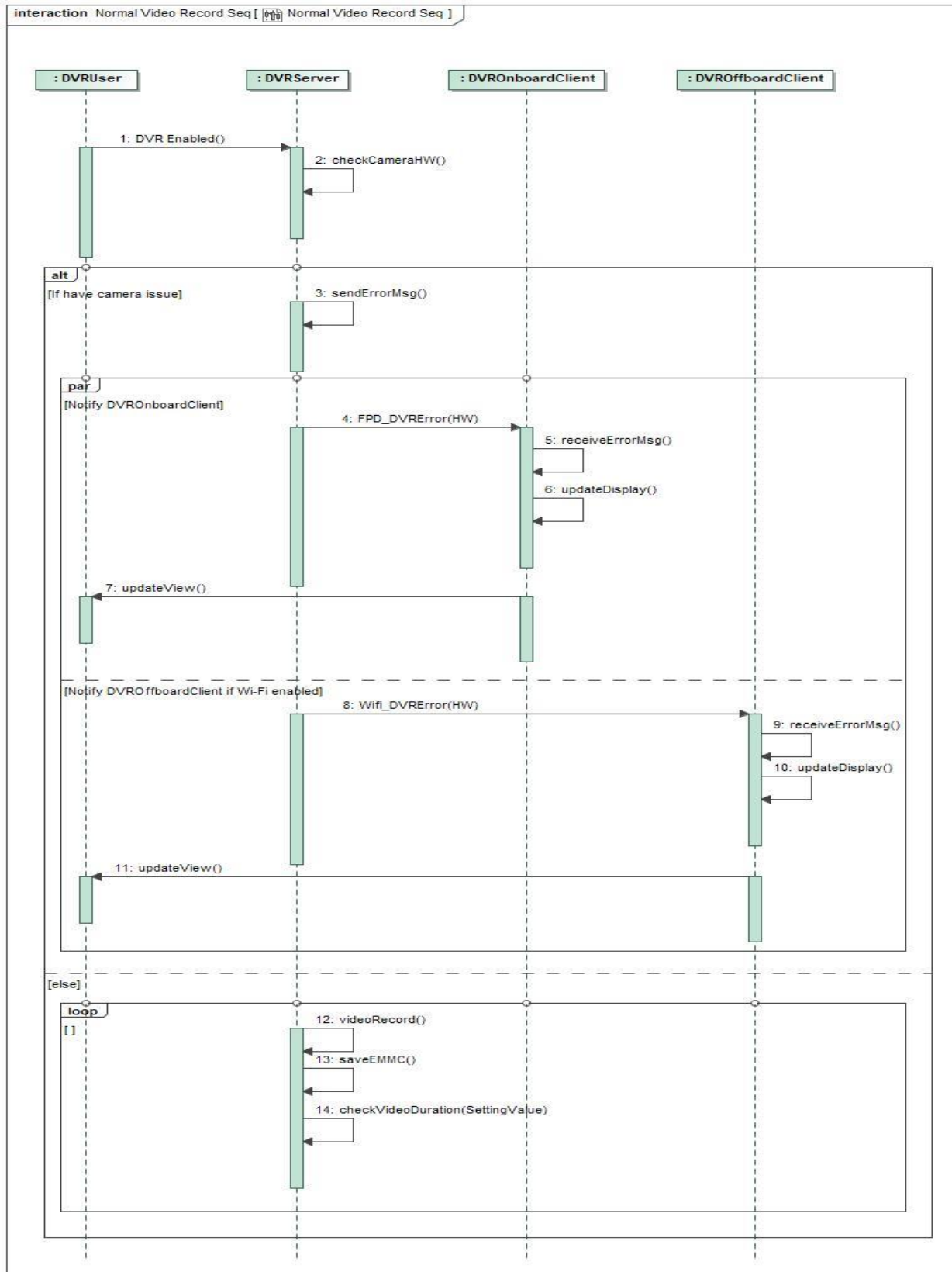


Figure 4-7 Normal Video Record



4.2.3.2.2 XXXXX-SD-REQ- xxxxxx/A-Emergency Video Record

*DVROffboardClient related logic is optional, will not be supported on FNV2.1.

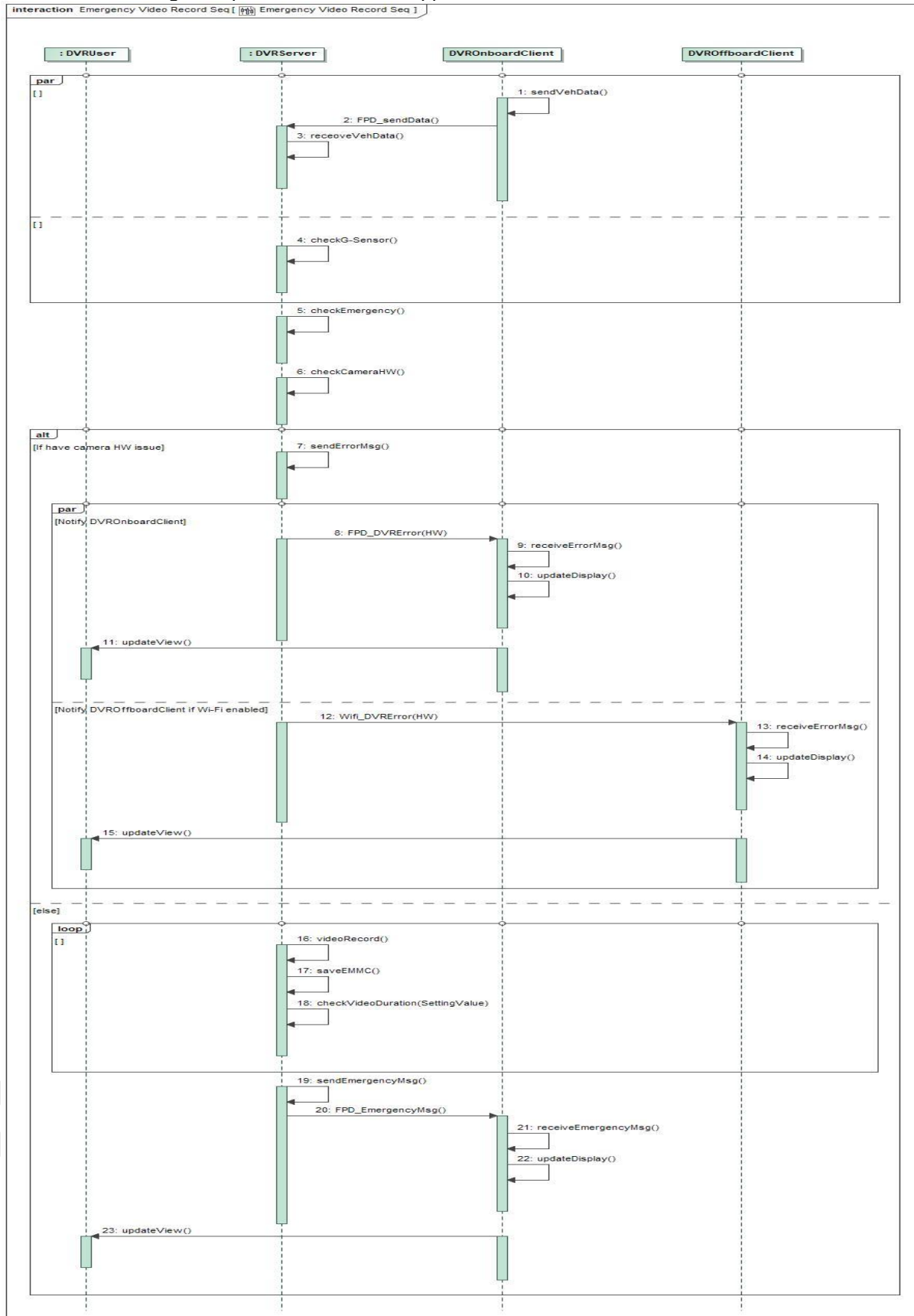




Figure 4-8 Emergency Video Record

4.2.3.2.3 XXXXX-SD-REQ- xxxxxx/A-Manual Video Record

*DVROffboardClient related logic is optional, will not be supported on FNV2.1.

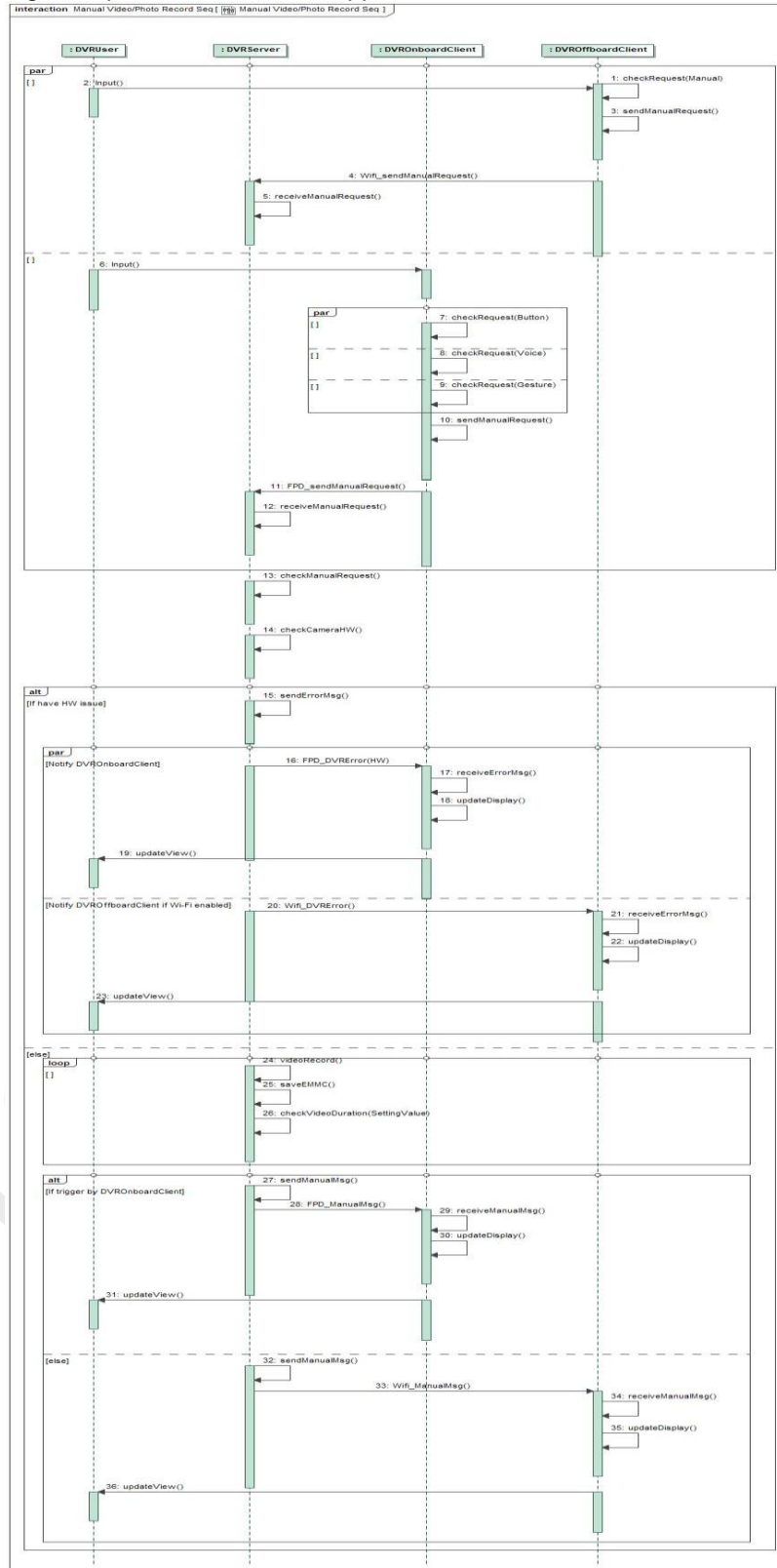


Figure 4-9 Manual Video Record

4.3 XXXXX-FUN-REQ-xxxxxx/A-Video/Photo Display

4.3.1 Requirements

DVROnboardClient and DVROffboardClient should provide video display HMI for DVR user.

4.3.1.1 XXXXX-REQ-xxxxxx/A-Video Liveview

DVR system shall support video live view for user to preview the video, liveview should be active once DVR user enters DVR main page on DVROnboardClient or DVROffboardClient.

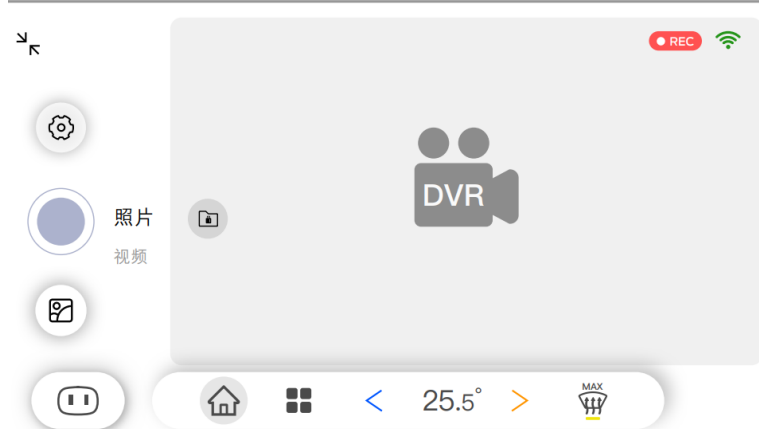


Figure 4-10 DVROnboardClient DVR Main Page

The delay between video is captured and displayed should less than 200ms, this requirement both apply for LVDS connection to DVROnboardClient and Wi-Fi connection to DVROffboardClient.

4.3.1.2 XXXXX-REQ-xxxxxx/A-Video/Photo Playback List

DVR system shall support video/photo playback function for user to easy replay the video/photo. When user enter Video/Photo playback sub-menu on DVROnboardClient or DVROffboardClient, video list should be shown for user to select, if one of the video is chosen, corresponding video should be played immediately:

1. The newest video should be highlight in the playback list.
2. All files should be sorted by date.
3. The totally video/photo number in one day should be displayed.

below is the HMI example on DVROnboardClient:

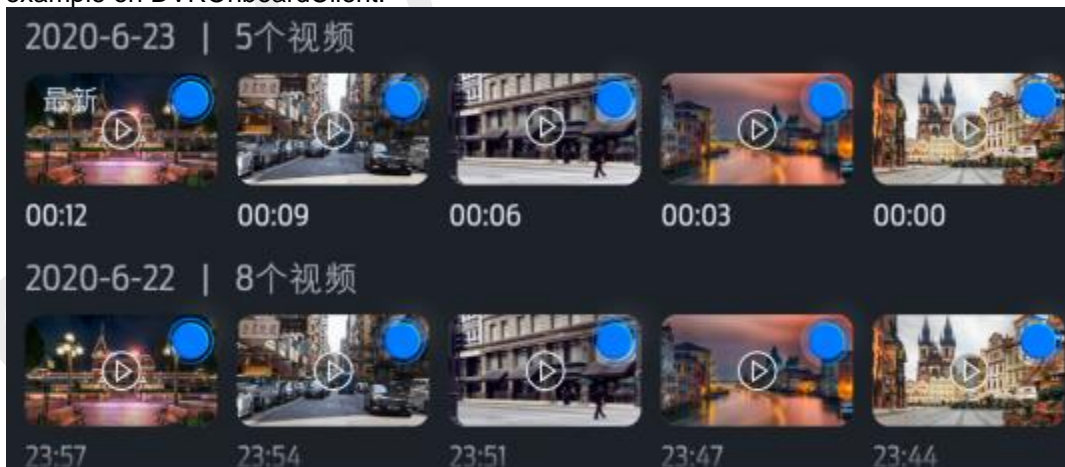


Figure 4-11 DVROnboardClient Video Playback List Page

When video playback function is active, AR HUD or AR Navigation function should be disabled in DVROnboardClient.

4.3.1.3 XXXXX-REQ-xxxxxx/A-Video/Photo Playback Control

Video playback only could be available when vehicle gear position is at "P", DVRServer should decode data in EMMC or read data from TF card to show it on DVROnboardClient or DVROffboardClient, User could do start/stop/forward/backward



operation on DVROnboardClient or DVROffboardClient. A progress bar is preferred to support video forward and backward easily.

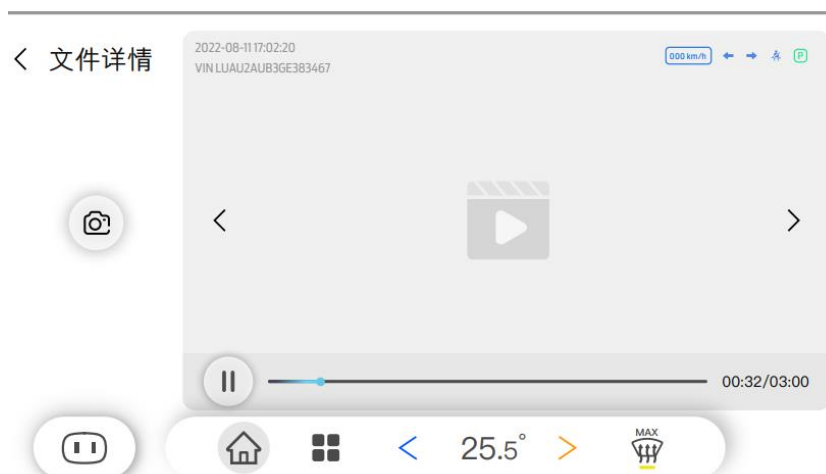


Figure 4-12 DVROnboardClient DVR Playback Control Page

4.3.2 Use Cases

4.3.2.1 XXXXX-UC-REQ-xxxxxx/A-Video Liveview on DVROnboardClient or DVROffboardClient

Actors	User, DVRSERVER, DVROnboardClient, DVROffboardClient
Pre-conditions	DVR is in full power mode
Scenario Description	User enters DVR main page menu on DVROnboardClient or DVROffboardClient
Post-conditions	Live view is displayed on DVROnboardClient or DVROffboardClient
List of Exception Use Cases	
Interfaces	HMI, LVDS, Wi-Fi

Table 4-9 Video Live View Use Case

4.3.2.2 XXXXX-UC-REQ-422181/A-Video/Photo Playback on DVROnboardClient or DVROffboardClient

Actors	User, DVRSERVER, DVROnboardClient, DVROffboardClient
Pre-conditions	DVR is in full power mode No memory issue is detected Vehicle gear position is at "P"
Scenario Description	User enters one of DVR video/photo playback folder: <ul style="list-style-type: none">Local(eMMC) "Normal Data" folderLocal(eMMC) "Key Data" folderTF card "Key Data" folder And one of the video or photo is chosen.
Post-conditions	Video or photo is displayed on DVROnboardClient or DVROffboardClient
List of Exception Use Cases	
Interfaces	HMI, LVDS, Wi-Fi

Table 4-10 Video Playback List Use Case

4.3.2.3 XXXXX-UC-REQ-422182/A-Video Playback Control

Actors	User, DVRSERVER, DVROnboardClient, DVROffboardClient
Pre-conditions	Video playback is active on DVROnboardClient or DVROffboardClient
Scenario Description	User selects video start/stop/forward/backward
Post-conditions	One of the operations is performed by DVRSERVER according to user selection: start/stop/forward/backward.

**List of Exception
Use Cases****Interfaces** HMI, LVDS, Wi-Fi

Table 4-11 Video Playback Control Use Case

4.3.2.4 XXXXX-UC-REQ-422182/A- DVROnboardClient Video Playback Page Display Timeout

Actors	User, DVRSERVER, DVROnboardClient
Pre-conditions	HMI keep in video playback list page Or Video playback is happening
Scenario Description	HMI keeps in video playback list page more than 1 minute Or User stops video play and keep more than 1 minute
Post-conditions	Should go back to DVR live view main page.
List of Exception Use Cases	
Interfaces	HMI, LVDS, Wi-Fi

Table 4-12 Video Playback Timeout Use Case

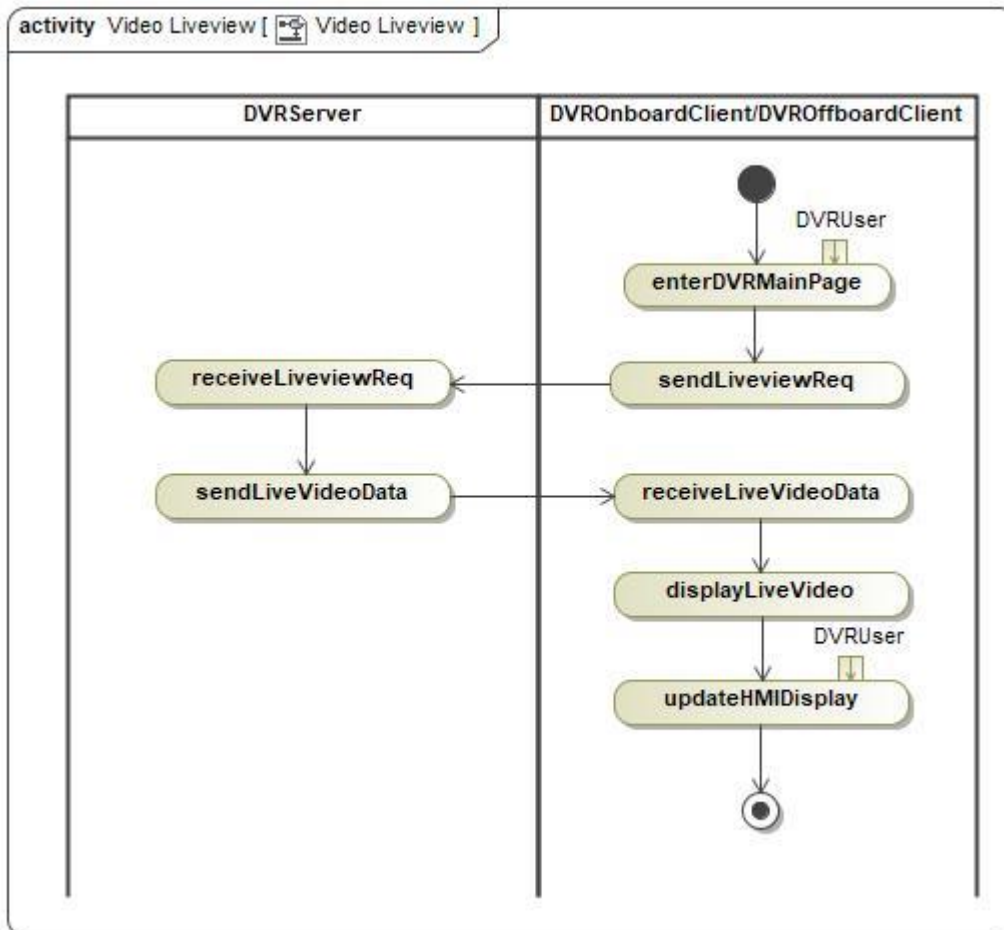
4.3.3 White Box View**4.3.3.1 Activity Diagrams****4.3.3.1.1 XXXXX-ACT-REQ-xxxxxx/A-Video Liveview**

Figure 4-13 Video Liveview

4.3.3.1.2 XXXXX-ACT-REQ-xxxxxx/A-Video Playback

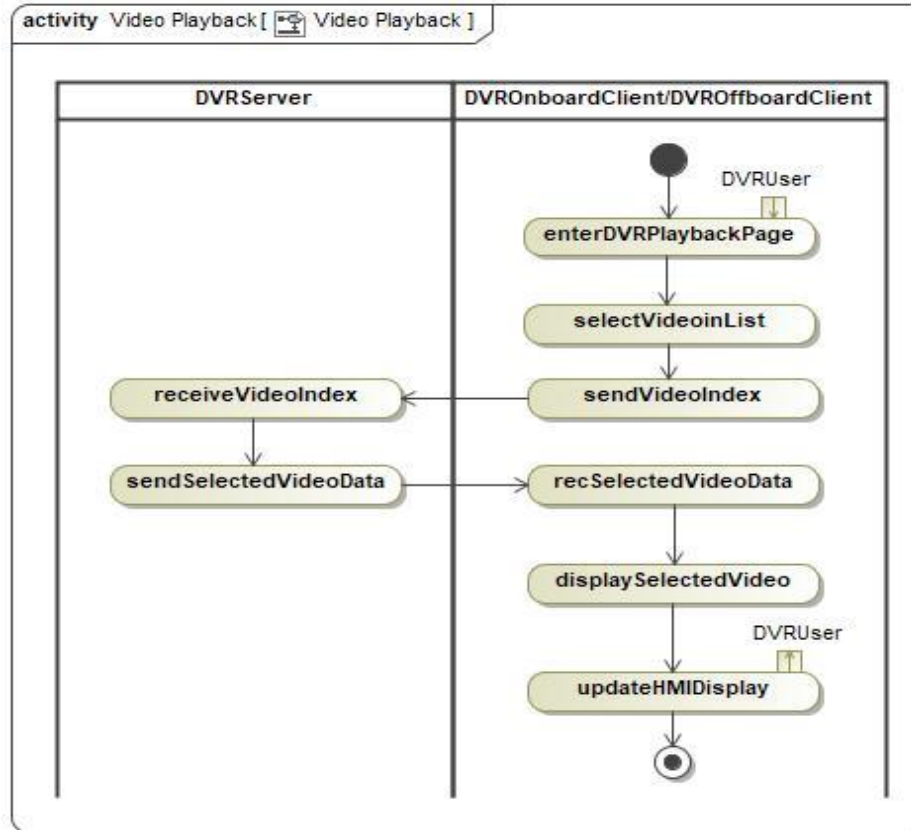


Figure 4-14 Video Playback List

4.3.3.1.3 XXXXX-ACT-REQ-xxxxxx/A-Video Playback Start/Stop/Forward/Backward Control

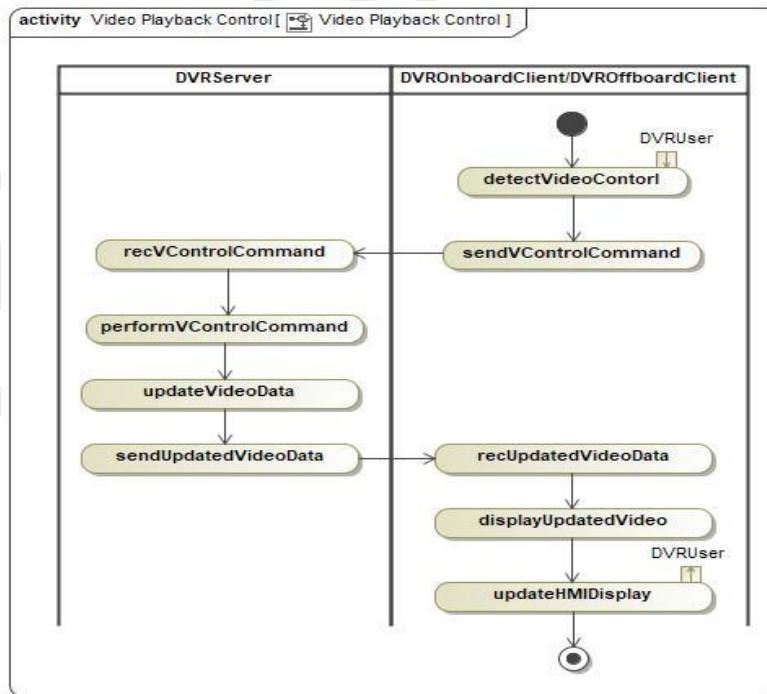


Figure 4-15 Video Playback Control



4.3.3.1.4 XXXXX-ACT-REQ-xxxxxx/A- DVROnboardClient Video Playback Page Display Timeout

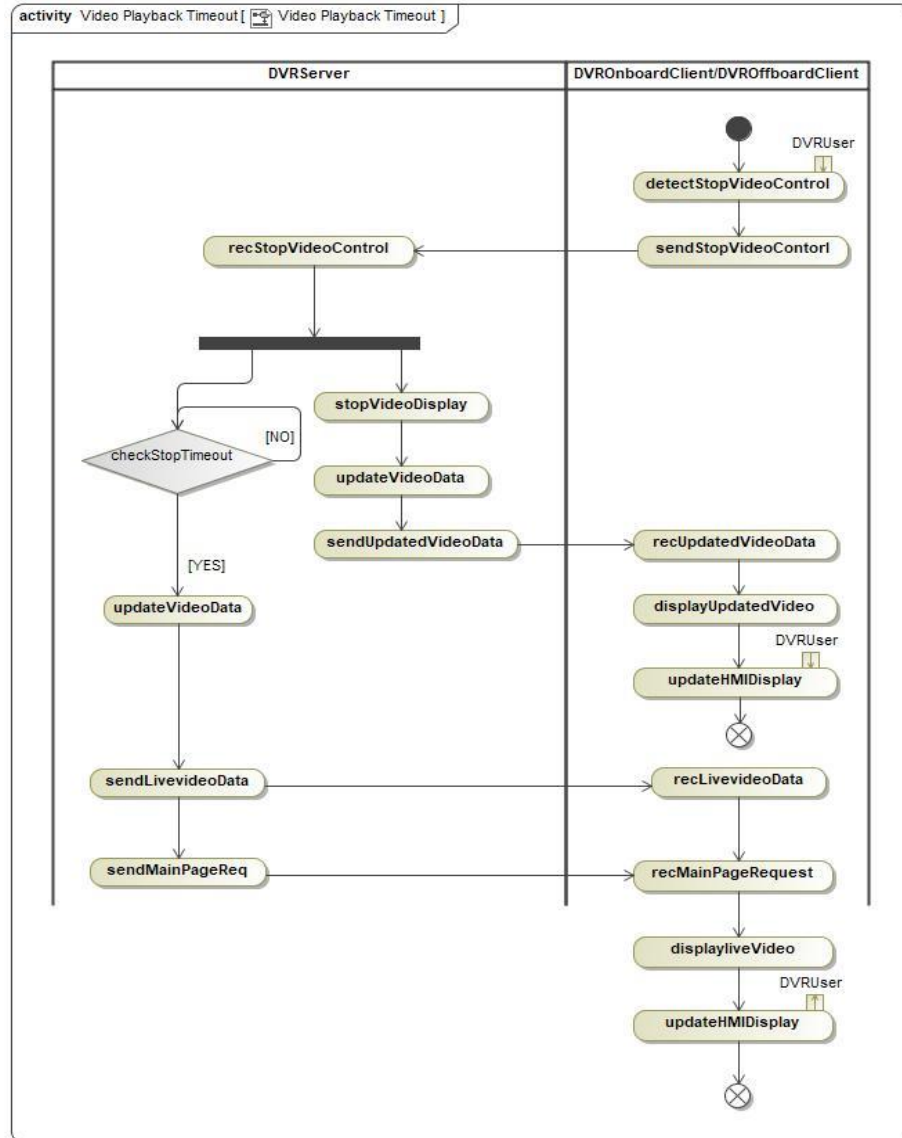


Figure 4-16 Video Playback Timeout

4.4 XXXXX-FUN-REQ-xxxxxx/A-DVR Setting & Information Display

4.4.1 Requirements

All DVR setting and necessary information should be provided to user via DVROnboardClient.



Figure 4-17 DVR Setting Example

4.4.1.1 XXXXX-REQ-xxxxxx/A-DVR Setting Content

The DVROnboardClient and DVROffboardClient(Optional) should provide below setting option to DVR user:

ID	Classification	Setting Name	Optional Value	Default Value	Function Description
1	Record Setting	Normal Video Record	Enable/Disable	Disable	Choose if normal video record enabled
2		Vehicle Monitor Switch	Enable/Disable	Disable	Enable or Disable vehicle monitor function
3		Emergency Video Duration	15 / 30 / 45 seconds	30	Choose the duration of emergency video and vehicle monitor video
4		Collision Detection Sensitivity	High / Middle / Low	Middle	Choose the sensitivity of the G-Sensor in DVRServer
5	Connection Setting	Wi-Fi Hotspot Switch	Enable/Disable	Disable	Enable or Disable Wi-Fi hotspot function
6		DVR Wi-Fi SSID	SSID	/	For user to modify the SSID of the DVR Wi-Fi connection
7		DVR Wi-Fi Password	Password	/	For user to modify the password of the DVR Wi-Fi connection
8	System Setting	Restore to Factory Defaults Setting	Yes/No	No	Allow user to rollback all the setting value to factory defaults
9		Format TF Card	Yes/No	No	Erase all TF data

Table 4-13 DVR Setting Summary

4.4.1.2 XXXXX-REQ-xxxxxx/A-DVR Information Display

The DVROnboardClient should display below information to DVR user:

ID	Classification	Information Name	Example Value	Description
1	DVR Information	DVR Firmware Version	3.6.9.4v	DVRServer SW version
2		DVR Internal Memory Status	70%	EMMC usage status
3		TF Card Memory Status	16%	TF card usage status

Table 4-14 DVR Information Display Summary

4.4.1.3 XXXXX-REQ-xxxxxx /A-Setting Change when Recording is Active

If recording is already active and a setting change (Resolution, Recording time, etc.) occurs through DVROnboardClient/ DVROffboardClient, DVROnboardClient/ DVROffboardClient shall send StopRecording_Rq to DVRServer to end the current recording, and send StartRecording_Rq to DVRServer to start a new recording once the new settings take effect.



4.4.1.4 XXXXX-REQ-xxxxxx /A-Settings Storage

The IDCMServer and DVROnboardClient shall be capable to store settings option from DVRUser.

4.4.2 Use Cases

4.4.2.1 XXXXX-UC-REQ-xxxxxx/A-Modify DVR Setting via DVROnboardClient

Actors	User, DVRSERVER, DVROnboardClient, DVROffboardClient
Pre-conditions	DVRSERVER is at full power mode DVROnboardClient HMI is active
Scenario Description	User changes the setting value via DVROnboardClient or DVROffboardClient menu.
Post-conditions	DVRSERVER accepts the new setting value and send the same value back to DVROnboardClient and DVROffboardClient to update HMI display.
List of Exception Use Cases	Failed to Modify DVR setting or read DVR Information
Interfaces	HMI, UART, Wi-Fi

Table 4-15 DVR Setting Change

4.4.2.2 XXXXX-UC-REQ-xxxxxx/A-DVR Information Update via DVROnboardClient or DVROffboardClient

Actors	User, DVRSERVER, DVROnboardClient, DVROffboardClient
Pre-conditions	DVRSERVER is at full power mode DVROnboardClient HMI is active
Scenario Description	User tries to read the DVR information via DVROnboardClient or DVROffboardClient menu
Post-conditions	DVRSERVER sends the request information to DVROnboardClient or DVROffboardClient to display
List of Exception Use Cases	Failed to Modify DVR setting or read DVR Information
Interfaces	HMI, UART, Wi-Fi

Table 4-16 DVR Information Update

4.4.2.3 XXXXX-UC-REQ-xxxxxx/A-Failed to Modify DVR setting or read DVR Information

Actors	User, DVRSERVER, DVROnboardClient, DVROffboardClient
Pre-conditions	DVRSERVER is at full power mode DVROnboardClient HMI is active DVRSERVER memory device is available
Scenario Description	User tries to modify DVR setting or ready DVR system information via DVROnboardClient or DVROffboardClient menu
Post-conditions	DVRSERVER could not feedback right setting value or information DVROnboardClient or DVROffboardClient pops up error message to User "Failed to Set DVR" or "Failed to Read DVR Information"
List of Exception Use Cases	
Interfaces	HMI, UART, Wi-Fi

Table 4-17 DVR Setting and Information Update Failed

4.4.3 White Box View

4.4.3.1 Activity Diagrams

4.4.3.1.1 XXXXX-ACT-REQ-xxxxxx/A- Modify DVR Setting via DVROnboardClient

*DVROffboardClient related logic is optional, will not be supported on FNV2.1.

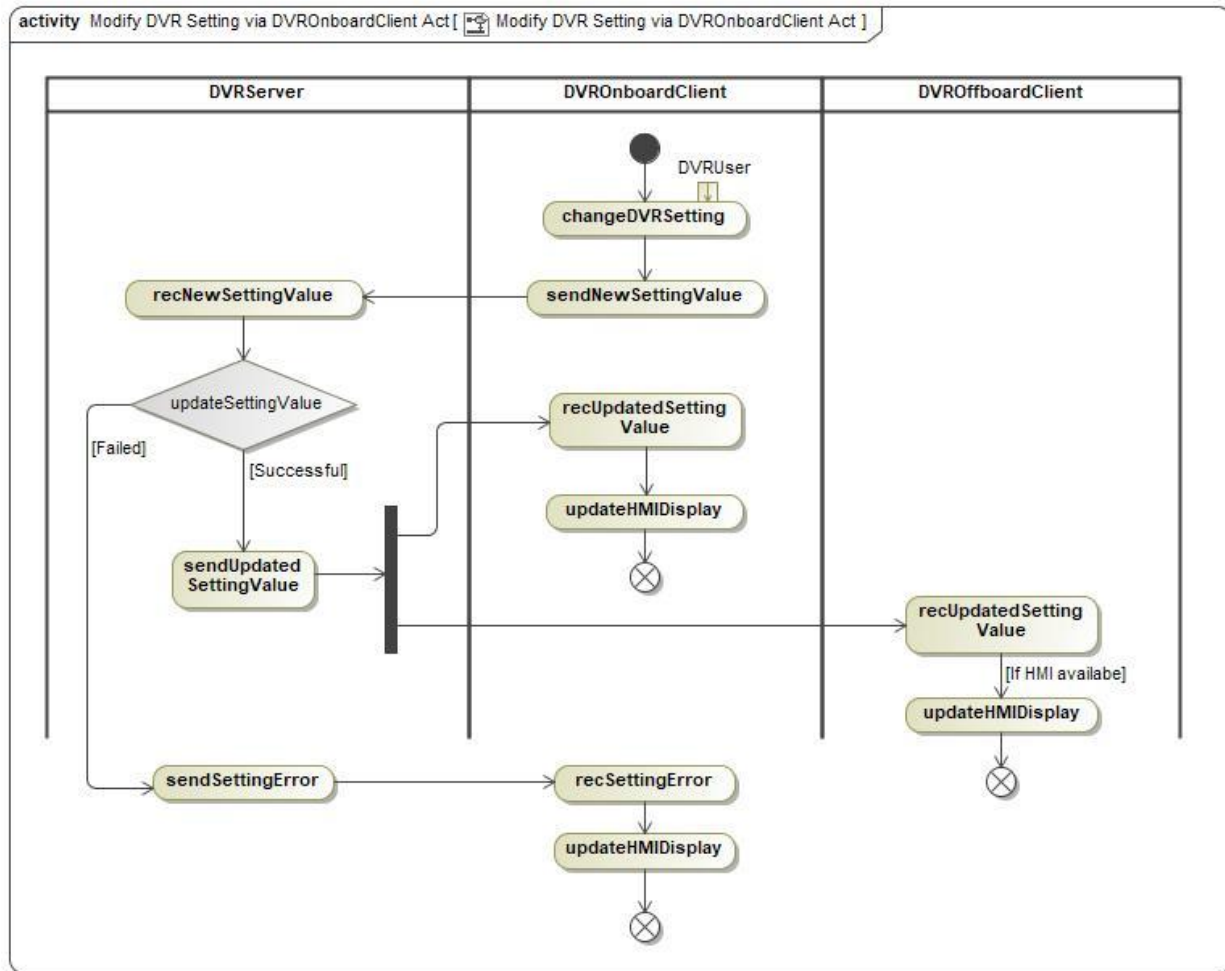


Figure 4-18 DVR Setting

4.4.3.1.2 XXXXX-ACT-REQ-xxxxxx/A- DVR Information Update via DVROnboardClient

*DVROffboardClient related logic is optional, will not be supported on FNV2.1.

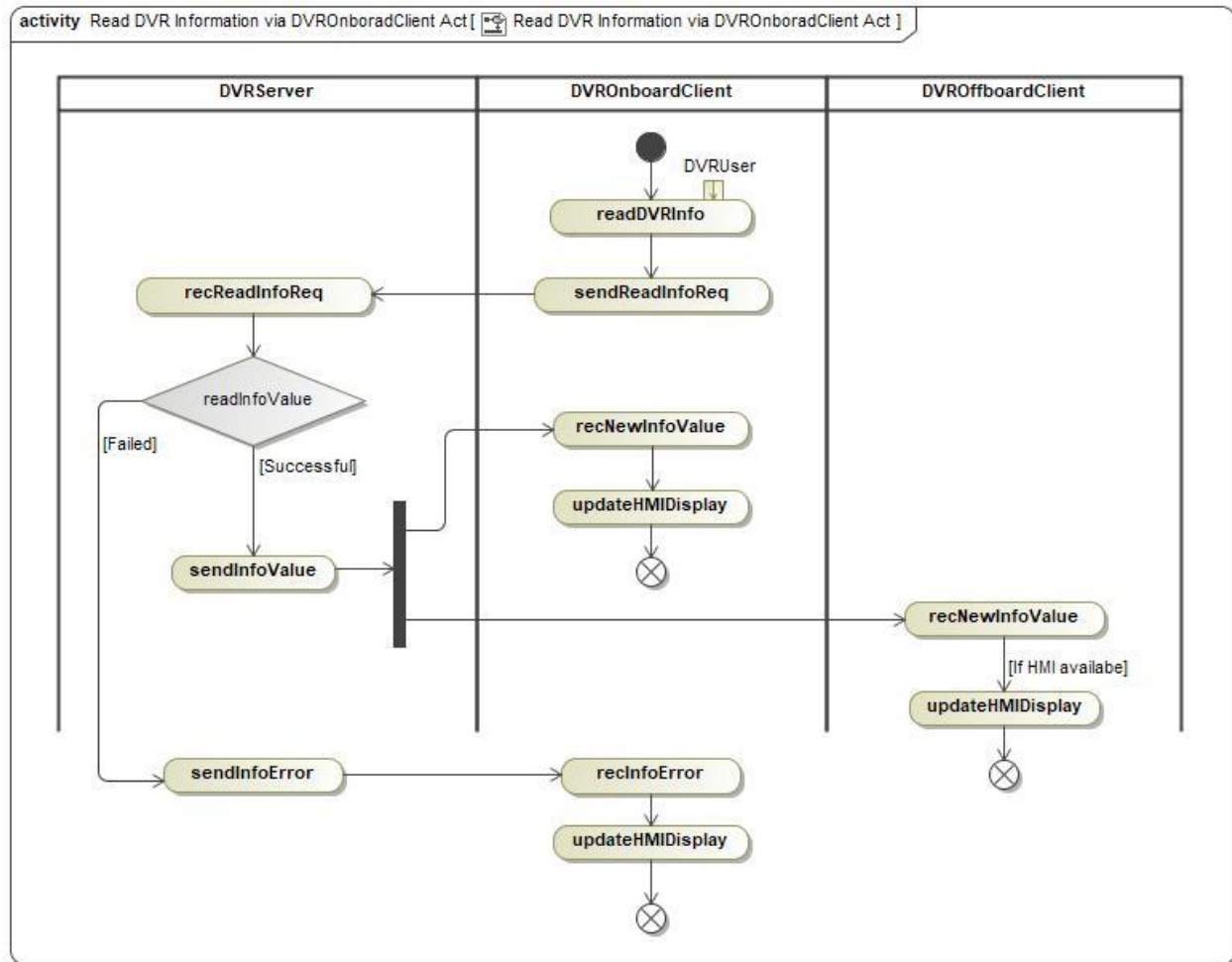


Figure 4-19 DVR Information Update

4.5 XXXXX-FUN-REQ-xxxxxx/A-Data Copy and Deletion

4.5.1 Requirements

All video/photo data must be saved into eMMC in DVRSer, DVR system support below use cases:

1. Copy data from eMMC to TF card via DVROnboardClient.
2. Copy data from eMMC to smartphone via DVROffboardClient.
3. Delete data in TF card via DVROnboardClient.

Data in eMMC could not be deleted according to GB/T 38892-2020 section 5.3.4.1.

4.5.1.1 XXXXX-REQ-xxxxxx/A- Precondition of Data Copy and Deletion

TF card should be insert into DVRSer as the precondition for TF card copy and deletion.

Wi-Fi connection should be setup as the precondition for data copy to DVROffboardClient.

4.5.1.2 XXXXX-REQ-xxxxxx/A- Data Copy to TF Card via DVROnboardClient

In DVROnboardClient playback menu, user could choose one or more data to be copied into TF card.



Figure 4-20 Data Copy Example

4.5.1.3 XXXXXX-REQ-xxxxxx/A- Smart Copy to TF Card

For better user experience, DVR user could click the “Smart Copy” button on DVR main page to quickly copy the latest two normal videos from eMMC to TF card.

4.5.1.4 XXXXXX-REQ-xxxxxx/A- Data Copy to Smartphone

In video/photo playback menu of DVROffboardClient, user could choose one or more data to be copied to smartphone.

4.5.1.5 XXXXXX-REQ-xxxxxx/A- Data Copy Special Scenario

If power of DVRServer is cut off suddenly during copy, DVRServer will not save the copy status.
If same data is chosen to copy again, the new data will overwrite the old data.

4.5.1.6 XXXXXX-REQ-xxxxxx/A- Memory Full Notification

If TF card or smartphone local memory is near to full, warning message should be showed to customer.

4.5.1.7 XXXXXX-REQ-xxxxxx/A- Data Deletion in TF card

In TF card folder playback menu, user could choose one or more data to be deleted via DVROnboardClient.

4.5.2 Use Cases

4.5.2.1 XXXXXX-UC-REQ-xxxxxx/A- Data Copy to TF Card via DVROnboardClient

Actors	User, DVRServer, DVROnboardClient
Pre-conditions	DVRServer is in full power mode
Scenario Description	User selects one or more videos/photos in playback menu, and click “Copy to TF card” button
Post-conditions	Selected videos or photos are copied form DVRServer eMMC to TF card folder A “successfully copy” message should be display on DVROnboardClient HMI
List of Exception Use Cases	Failed to Data copy and deletion
Interfaces	HMI, UART

Table 4-18 Data Copy to TF Card

**4.5.2.2 XXXXX-UC-REQ-xxxxxx/A- One-Click Smart Copy Video to TF Card**

Actors	User, DVRServer, DVROnboardClient
Pre-conditions	DVRServer is in full power mode
Scenario Description	User chooses "One-Click Copy" button on DVR main page
Post-conditions	The latest two normal video in DVRServer eMMC is copied into TF card folder A "successfully copy" message should be display on DVROnboardClient HMI
List of Exception Use Cases	Failed to Data copy and deletion
Interfaces	HMI, UART

Table 4-19 Smart Copy to TF Card

4.5.2.3 XXXXX-UC-REQ-xxxxxx/A- Data Copy to Smartphone

Actors	User, DVRServer, DVROffboardClient
Pre-conditions	DVRServer is in full power mode Wi-Fi connection is setup between DVRServer and DVROffboardClient
Scenario Description	User selects one or more videos/photos in playback menu, and click "Copy to Smart Phone" button
Post-conditions	Selected videos or photos is copied form DVRServer eMMC to smartphone local memory A "successfully copy" message should be display on DVROffboardClient HMI
List of Exception Use Cases	Failed to Data copy and deletion
Interfaces	HMI, Wi-Fi

Table 4-20 Data Copy to Smartphone

4.5.2.4 XXXXX-UC-REQ-xxxxxx/A- TF Card Data Deletion via DVROnboardClient

Actors	User, DVRServer, DVROnboardClient
Pre-conditions	DVRServer is in full power mode
Scenario Description	User selects one or more videos/photos in TF card folder, and click "Delete" button
Post-conditions	Selected videos or photos is deleted from TF card A "successfully deletion" message should be display on DVROnboardClient HMI
List of Exception Use Cases	Failed to Data copy and deletion
Interfaces	HMI, UART

Table 4-21 TF Card Data Deletion

4.5.2.5 XXXXX-UC-REQ-xxxxxx/A- Failed to Data Copy and Deletion

Actors	User, DVRServer, DVROnboardClient, DVROffboardClient
Pre-conditions	DVRServer is in full power mode eMMC or TF card or Wi-Fi connection is not available
Scenario Description	User try to perform any data copy or deletion action
Post-conditions	Failed to do data copy or deletion operation A "Operation Fail" message should be display on DVROnboardClient or DVROffboardClient HMI
List of Exception Use Cases	
Interfaces	HMI, UART, Wi-Fi

Table 4-22 Data Copy and Deletion Failed



4.5.3 White Box View

4.5.3.1 Activity Diagrams

4.5.3.1.1 XXXXX-ACT-REQ-xxxxxx/A- Data Copy to TF Card via DVROnboardClient

*DVROffboardClient related logic is optional, will not be supported on FNV2.1.

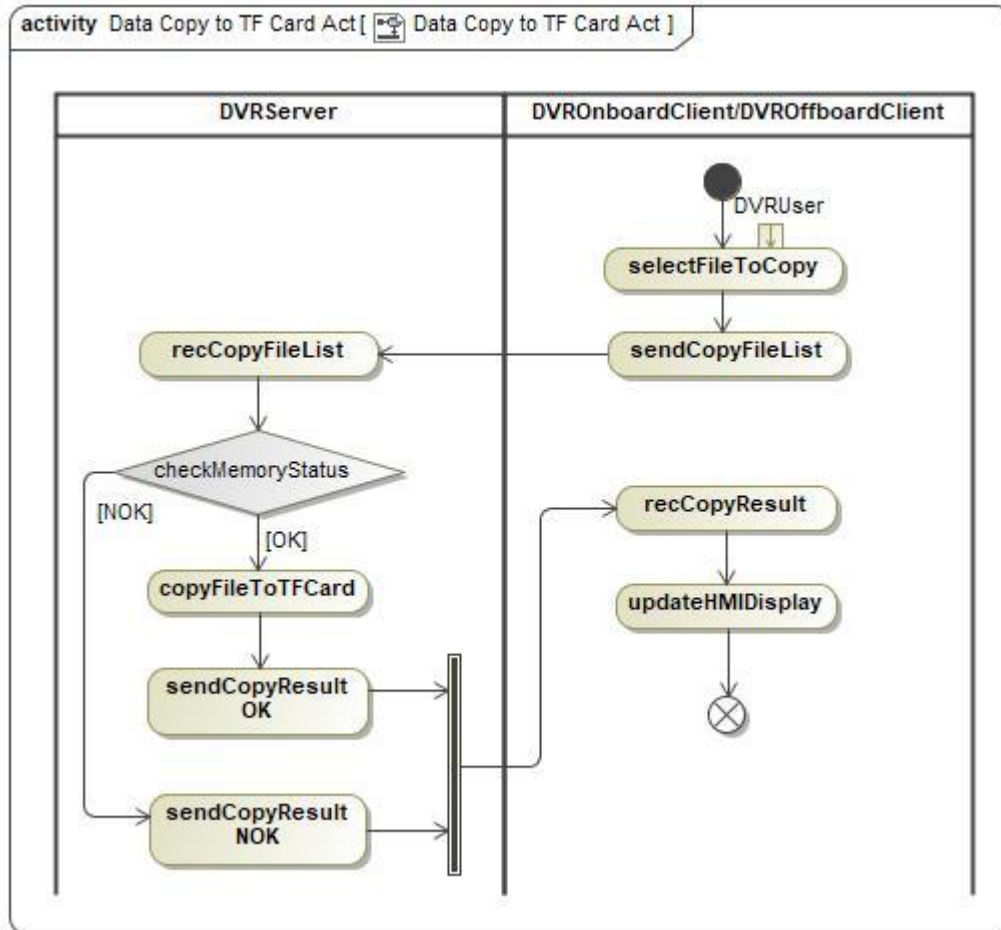


Figure 4-21 Data Copy to TF Card

4.5.3.1.2 XXXXX-ACT-REQ-xxxxxx/A- Data Copy to Smartphone via DVROffboardClient

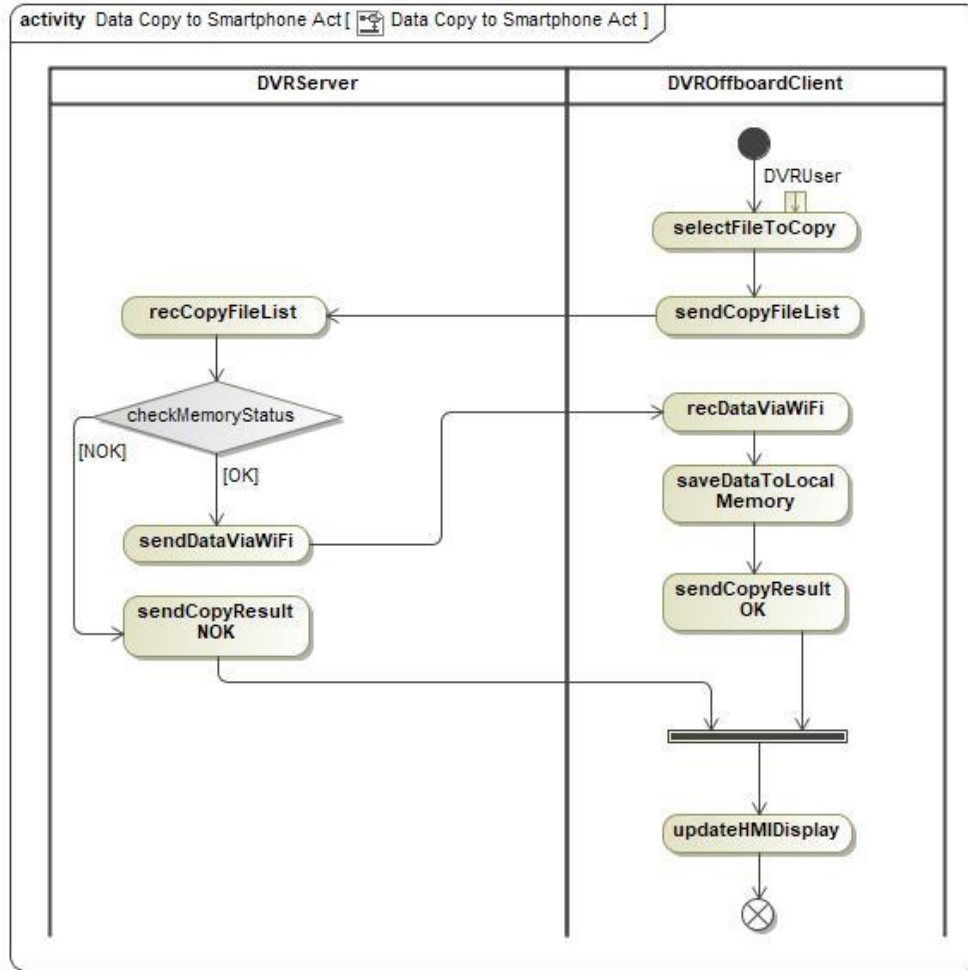


Figure 4-22 Data Copy to Smartphone

4.5.3.1.3 XXXXX-ACT-REQ-xxxxxx/A- Delete data in TF Card via DVROnboardClient

*DVROffboardClient related logic is optional, will not be supported on FNV2.1.

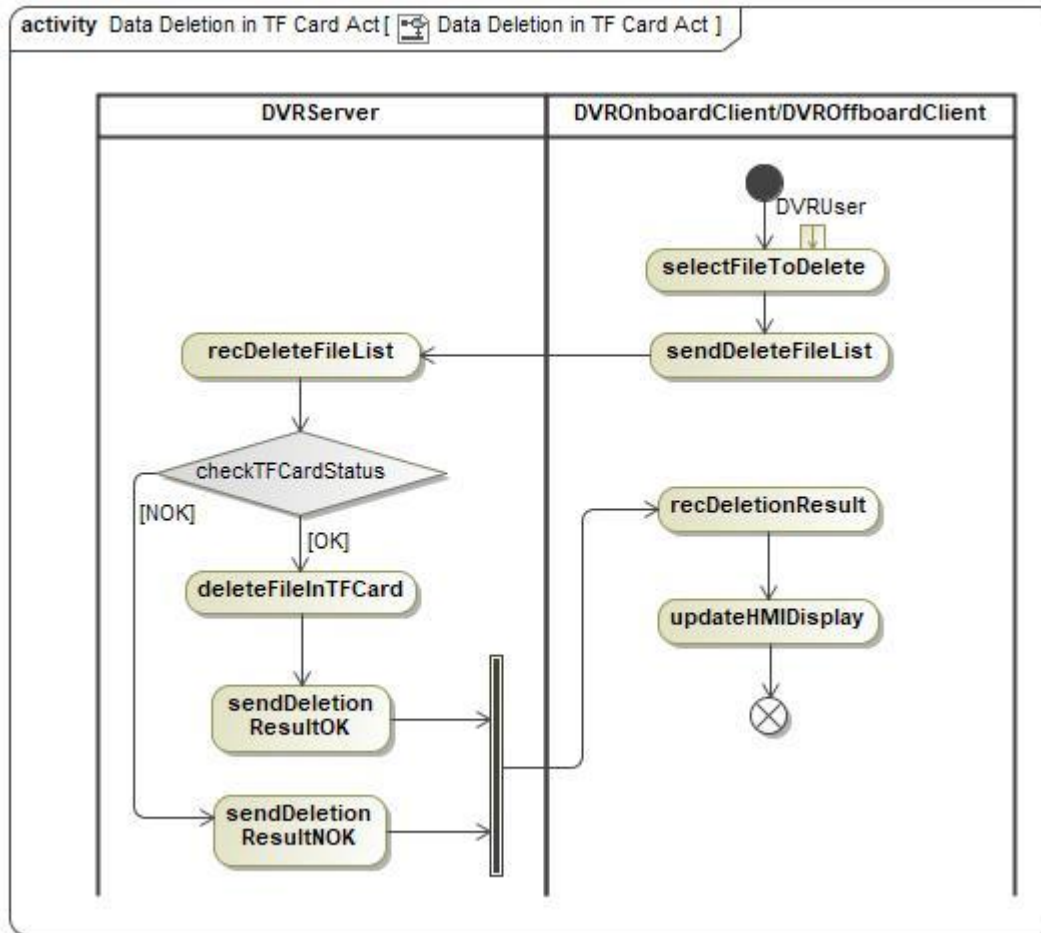


Figure 4-23 TF Card Data Deletion

4.6 XXXXX-FUN-REQ-xxxxxx/A-Vehicle Monitoring

4.6.1 Requirements

DVR system shall provide vehicle monitor function after user left the vehicle, when DVR system is in standby power mode, DVRServer shall provide the ability to detect external collision and wakeup itself to do video recording, the monitor duration is controlled by Vehicle Monitor Timer.

4.6.1.1 XXXXX-REQ-xxxxxx/A-Collision Detection

The G-Sensor in DVRServer works as acceleration transducer, if acceleration test result is more than a threshold, vehicle monitor video record should be triggered, the threshold should be set via vehicle level calibration and configurable.

4.6.1.2 XXXXX-REQ-xxxxxx/A- Video Record When Vehicle Monitoring

The DVRServer shall wake up and take a video when vehicle monitor triggered, the video should contain 30 seconds (default value which could be changed through DVR setting) after collision detected with default watermark, and during one standby mode cycle, max to 10 videos could be recorded and saved into DVRServer eMMC "Key Data" folder,

4.6.1.3 XXXXX-REQ-422219/A- Wakeup Strategy

DVRServer shall only wake up itself in 2 seconds after collision detected, and should not send out any UART message to DVROnboardClient or Wi-Fi message to DVROffboardClient.



4.6.1.4 XXXXX-REQ-xxxxxx/A- User Notification

When DVRServer goes into full power mode on next ignition cycle, if vehicle monitor video record happened in last standby mode, a warning message should be displayed on DVROnboardClient to notify user that vehicle collision happened.

4.6.2 Use Cases

4.6.2.1 XXXXX-UC-REQ-xxxxxx/A-Video Record When Vehicle Monitoring Successfully

Actors	User, DVRServer, DVROnboardClient
Pre-conditions	Video record is enabled DVRServer is in standby mode DVRServer memory device is available, and no error detected Vehicle collision is detected
Scenario Description	DVRServer wakes up and perform video record
Post-conditions	The new video is saved into eMMC "Critical Video" folder DVRServer shall send message to DVROnboardClient to highlight this event when goes to full power mode next time.
List of Exception Use Cases	Failed to Video Record When Vehicle Monitoring
Interfaces	HMI, UART

Table 4-23 Vehicle Monitoring Video Capture Successfully

4.6.2.2 XXXXX-UC-REQ-xxxxxx/A- Failed to Video Record When Vehicle Monitoring

Actors	User, DVRServer, DVROnboardClient
Pre-conditions	Video record is enabled DVRServer is in standby mode Vehicle collision is detected
Scenario Description	DVRServer wakes up but failed to perform video record
Post-conditions	DVRServer shall send message to DVROnboardClient to highlight this event when goes to full power mode next time.
List of Exception Use Cases	
Interfaces	HMI, UART

Table 4-24 Vehicle Monitoring Video Capture Failed

4.6.3 White Box View

4.6.3.1 Activity Diagrams

4.6.3.1.1 XXXXX-ACT-REQ-xxxxxx/A- Video Record When Vehicle Monitoring

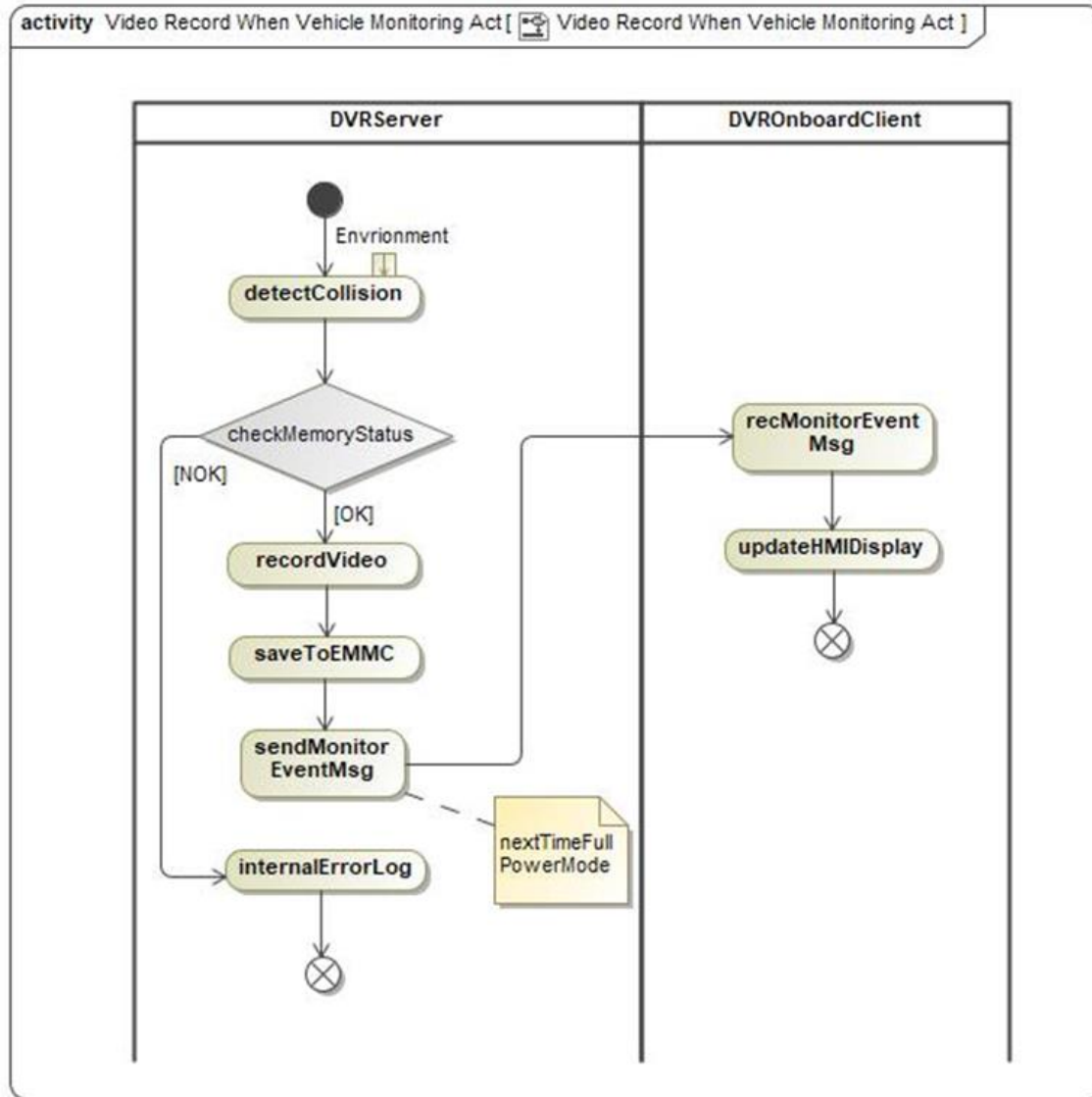


Figure 4-24 Vehicle Monitoring Video Capture



5 Appendix: Reference Documents

Reference #	Document Title
1	F006930_Drive Video Record Feature B-Diagram
2	F006930_Drive Video Record Feature Implementation Spec
3	F006930_Drive Video Record Feature UART Protocol
4	Integrated Dash Camera Module Specification
5	【CX771&CX821】UE_行车记录仪
6	GBT 38892-2020 CN

Table 4-25 Reference Documents