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| --- | --- | --- | --- |
| **Video Recorder Service** | | | |
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**Content**

[1 Document Overview 5](#_Toc74660200)

[1.1 Purpose & Scope 5](#_Toc74660201)

[1.2 Requirement Types 5](#_Toc74660202)

[1.3 Document Conventions 5](#_Toc74660203)

[1.4 Related Documents 6](#_Toc74660204)

[2 Revision History 7](#_Toc74660205)

[3 Service Overview 8](#_Toc74660206)

[3.1 Stakeholders 8](#_Toc74660207)

[3.2 Potential Use Cases 8](#_Toc74660208)

[3.3 Abbreviations and Definitions 9](#_Toc74660209)

[4 Architecture/Context Diagram 11](#_Toc74660210)

[4.1 Context Diagram - Integrated Security Camera Example 11](#_Toc74660211)

[5 Requirements 12](#_Toc74660212)

[5.1 Functional Requirements 12](#_Toc74660213)

[5.1.1 Recording Requirements 12](#_Toc74660214)

[5.1.1.1 F-REQ-406621/A-Record Camera View to USB Device 12](#_Toc74660215)

[5.1.1.2 F-REQ-418724/A-Record Multiple Views at the Same Time 12](#_Toc74660216)

[5.1.1.3 F-REQ-418387/A-Video Source (Consumer Determined or VRS Initiated) 12](#_Toc74660217)

[5.1.1.4 F-REQ-406306/A-Recording Duration 13](#_Toc74660218)

[5.1.1.5 F-REQ-406312/A-Recording File Creation Modes (Continuous or Loop) 13](#_Toc74660219)

[5.1.1.6 F-REQ-420904/A-Video Recording File Format 14](#_Toc74660220)

[5.1.1.7 F-REQ-420939/A-File Directory Structure and Names 14](#_Toc74660221)

[5.1.1.8 REQ-421806/A-Storage Device Not Identified 15](#_Toc74660222)

[5.1.1.9 F-REQ-410435/A-Metadata / Data Logging 16](#_Toc74660223)

[5.1.1.10 F-REQ-420183/A-List Supported Metadata and Classification 16](#_Toc74660224)

[5.1.1.11 F-REQ-420184/A-Out of Space Strategy 17](#_Toc74660225)

[5.1.1.12 F-REQ-420933/A-Loop Mode Out of Space Behavior 17](#_Toc74660226)

[5.1.1.13 F-REQ-408867/A-Pause and Resume Recording 18](#_Toc74660227)

[5.1.1.14 F-REQ-406632/A-Recording Status 19](#_Toc74660228)

[5.1.1.15 REQ-421807/A-Estimated Recording Time 19](#_Toc74660229)

[5.1.1.16 F-REQ-406776/A-Encryption 19](#_Toc74660230)

[5.1.1.17 F-REQ-421214/A-Digital Signatures 20](#_Toc74660231)

[5.1.2 Storage and File Management Requirements 20](#_Toc74660232)

[5.1.2.1 F-REQ-406307/A-List Storage Devices & Information 20](#_Toc74660233)

[5.1.2.2 F-REQ-406622/A-List Stored Recordings and Filter 20](#_Toc74660234)

[5.1.2.3 F-REQ-406317/A-Protect Recording or Segment 21](#_Toc74660235)

[5.1.2.4 F-REQ-406320/A-Unprotect Recording or Segment 21](#_Toc74660236)

[5.1.2.5 F-REQ-406625/A-Delete Stored Video File 22](#_Toc74660237)

[5.1.2.6 F-REQ-406628/A-Retrieve Stored Video File 22](#_Toc74660238)

[5.2 Non-Functional Requirements 22](#_Toc74660239)

[5.2.1 NFN-REQ-406779/A-Availability - Life Cycle 22](#_Toc74660240)

[5.2.2 NFN-REQ-406781/A-Availability - Ignition State 22](#_Toc74660241)

[5.2.3 NFN-REQ-420882/A-Availability - Valet Mode 22](#_Toc74660242)

[5.2.4 NFN-REQ-406780/A-Availability - Power 23](#_Toc74660243)

[5.2.5 NFP-REQ-406782/A-Response Time 23](#_Toc74660244)

[5.2.6 NFP-REQ-406783/A-BootUp Time 23](#_Toc74660245)

[5.2.7 NFP-REQ-408161/A-Bandwidth 23](#_Toc74660246)

[5.2.8 NFN-REQ-408162/A-Storage Expectations 23](#_Toc74660247)

[5.2.9 NFN-REQ-408163/A-Buffering 24](#_Toc74660248)

[5.2.10 NFN-REQ-410437/A-Retry and Timeout 24](#_Toc74660249)

[5.2.11 NFN-REQ-410438/A-Multiple Requests - Queuing 24](#_Toc74660250)

[5.2.12 NFN-REQ-410439/A-Multiple Requests - Max Concurrent Requests 24](#_Toc74660251)

[5.2.13 NFN-REQ-406764/A-Multiple Consumer Requests 24](#_Toc74660252)

[5.3 Future Functional Requirements: 25](#_Toc74660253)

[5.3.1 Reserve Memory 25](#_Toc74660254)

[5.3.2 Save snapshot/ image 25](#_Toc74660255)

[5.3.3 Retrieve/filter recording list by metadata 25](#_Toc74660256)

[5.3.4 End of Recording Meta Data 25](#_Toc74660257)

[6 Interface Contracts 26](#_Toc74660258)

[6.1 Data Enumerations 26](#_Toc74660259)

[6.1.1 IR-REQ-408226/A-RecordingStorageType 26](#_Toc74660260)

[6.1.2 IR-REQ-408225/A-RecordingMode 26](#_Toc74660261)

[6.1.3 REQ-421357/A-OutOfSpaceStrategy 26](#_Toc74660262)

[6.1.4 IR-REQ-408197/A-CameraView 27](#_Toc74660263)

[6.1.5 IR-REQ-408733/A-Resolution 29](#_Toc74660264)

[6.1.6 IR-REQ-408734/A-FrameRate 29](#_Toc74660265)

[6.1.7 IR-REQ-408735/A-Bitrate 29](#_Toc74660266)

[6.1.8 IR-REQ-408227/A-RecordingStatus 30](#_Toc74660267)

[6.1.9 IR-REQ-408228/A-RequestStatus 30](#_Toc74660268)

[6.1.10 IR-REQ-408229/A-ErrorDetail 30](#_Toc74660269)

[6.1.11 IR-REQ-409112/A-MetadataSource 31](#_Toc74660270)

[6.1.12 REQ-420931/A-SupportedMetadata 31](#_Toc74660271)

[6.2 Data Structures 31](#_Toc74660272)

[6.2.1 IR-REQ-408699/A-StreamRecordStatus 31](#_Toc74660273)

[6.2.2 IR-REQ-408704/A-MemoryStatuses 32](#_Toc74660274)

[6.2.3 IR-REQ-408736/A-MetaDataToRecord 32](#_Toc74660275)

[6.2.4 IR-REQ-408940/A-VideoFileList 33](#_Toc74660276)

[6.3 Provided Interface Contracts 33](#_Toc74660277)

[6.3.1 IR-REQ-408710/A-StartRecording 34](#_Toc74660278)

[6.3.2 IR-REQ-408866/A-StopRecording 35](#_Toc74660279)

[6.3.3 IR-REQ-408868/A-PauseRecording 35](#_Toc74660280)

[6.3.4 IR-REQ-408869/A-ResumeRecording 36](#_Toc74660281)

[6.3.5 IR-REQ-408870/A-ListRecordings 36](#_Toc74660282)

[6.3.6 IR-REQ-408871/A-ProtectRecording 37](#_Toc74660283)

[6.3.7 IR-REQ-408893/A-DeleteRecording 37](#_Toc74660284)

[6.3.8 IR-REQ-408894/A-MemoryConsumptionStat 38](#_Toc74660285)

[6.3.9 IR-REQ-408895/A-PublishRecordingStatus (heartbeat) 38](#_Toc74660286)

[6.3.10 IR-REQ-408941/A-PublishRecordingStatusChange 39](#_Toc74660287)

[6.4 Future Contracts 39](#_Toc74660288)

[6.4.1 Future Data Structures 39](#_Toc74660289)

[6.4.1.1 MetaDataFilter 39](#_Toc74660290)

[6.4.2 Future Provided Interfaces 40](#_Toc74660291)

[6.4.2.1 RetrieveRecording 40](#_Toc74660292)

[6.5 Required Interface Contracts 40](#_Toc74660293)

[6.5.1 Video Stream Control Interfaces 40](#_Toc74660294)

[6.5.1.1 IR-REQ-404260/C-StartStream 40](#_Toc74660295)

[6.5.1.2 IR-REQ-404261/C-StopStream 42](#_Toc74660296)

[7 Service Behavioral Diagrams 44](#_Toc74660297)

[8 GPB Files (GitHub Links) 45](#_Toc74660298)

[9 Revision History 46](#_Toc74660299)

[10 Configuration Requirements 47](#_Toc74660300)

[10.1 DCR-REQ-410444/A-General Configurations 47](#_Toc74660301)

**List of Figures**

No table of figures entries found.

**List of Tables**

No table of figures entries found.

# Document Overview

## Purpose & Scope

Platform Vehicle Control Services are software modules designed according Service Oriented Architecture (SOA) design principles. They provide consumer focused features with highly re-usable interfaces which allow the feature to interact with common vehicle resources such as doors, windows, lights, or cameras.

These interfaces abstract the feature from underlying technological implementations and changes over time, allowing the feature to work across vehicle programs and model years.

The purpose of this document is to define a specific Platform Vehicle Control Service, including its intent, context, high level architecture, and requirements, such that the document can be provided to a software development team who will then design and code the software service.

## Requirement Types

Several types of requirements are defined within this document, as described below.

|  |  |
| --- | --- |
| Requirement Type | Description |
| Functional Requirements | Requirements that directly impact consumer expectations of successful delivery. They provide the functionality that is expected by various consumers. |
| Non-Functional Requirements | Requirements that indirectly impact consumer expectations of successful delivery. They are items like performance, availability, and security that are not directly requested by the consumer yet will contribute to their perceived satisfaction with the product. |
| Interface Requirements | Requirements that help define interfaces between software modules and ECUs, including definitions for the constructs below. |
| Data Enumerations | Lists of values for interface parameters that are limited to a predetermined set of values, or enumerated list. |
| Data Structures | Definitions of data structures that are used within interfaces. |
| Provided Contracts | Interfaces that the Service will provide to consuming feature software. |
| Required Contracts | Interfaces that the Service will need, or use, in order to deliver desired functionality. |

## Document Conventions

This document is generated out of the Vehicle Software and Electrical Management System (VSEM).

The document sub-sections which define requirements will have a heading that contains the following information;

* + VSEM Object Type
  + Unique Object ID
  + Revision Level of the object

This heading will look something like;

FUR-REQ-403606/A

Which breaks down in the following Manner:

* ***FUR-REQ:*** Is the VSEM Object Type and identifies it as a Requirement (REQ) and may further describe the requirement sub-type where FUR is a Functional Requirement Object, and NFN is a non-functional requirement.
* ***404053:***is the Unique Object ID
* ***/A:***is the Revision Level of the object*.*

## Related Documents

Below is a list of documents that should be consulted in addition to this functional specification.

**Sources**

|  |  |  |  |
| --- | --- | --- | --- |
| **Item Name** | **Number** | **Document Location** | **Owner** |
| Enhanced Dash Camera (EDC) | F003751 | VSEM | Eteer, Malik (meteer) |
| Sentinel | F003417 | VSEM | Gupta, Ishan (igupta1) |
| Police Data Track Recorder (PTDR) | F004510 | VSEM | Ayala gonzalez, Hugo (hayalago) |

**Other References**

|  |  |  |  |
| --- | --- | --- | --- |
| **Item Name** | **Number** | **Document Location** | **Owner** |
| VideoPlaybackService | 768744 | VSEM | Karkare, Medha (mkarkare) |
| CameraManagerService | 754753 | VSEM | Morris, Melissa (mmorr183) |
| VRP\_Function Group Specification | 767683 | VSEM | Benhamouche, Fatima (fbenhamo) |

# Revision History

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| ENG-768637/B-VideoRecorderService | B | - Metadata for Sentinel, EDC, PTDR  - Align to latest Camera Manager APIs  - Filelist Structure  - Update all diagrams  - Add Reserved streams  - Errors, Retires, config  - Doc Formatting |  | 18-May-2021 15:40 | Morris, Melissa (mmorr183) |

# Service Overview

The Video Recorder Service is portion of an overall in vehicle camera solution that enables many user experience Features to access in vehicle cameras and stream video over Ethernet for a variety of purposes.

The Video Recorder Service will provide a common interface for features needing to record video streams from vehicle cameras to some form of in vehicle persistent storage.

It will also provide mechanisms for the management of the recorded files, like listing, retrieving, and deleting the video files from a specified storage device, as well as monitoring available storage.

Requirements for playing back video files are discussed in a separate specification for a Video Playback Service.

Initially, the storage is assumed to be a USB drive provided by the vehicle owner or operator. Storage options can be extended or changed to include onboard storage, or other forms of user provided storage, like an SD card. The type of storage used should be configurable and selectable by any consuming feature.

Cloud storage is not in scope for this service. The plan is for the video stream to be sent to the cloud via an AWS Kinesis Video Service. Storage in the cloud will be handled by cloud software / functionality.

## Stakeholders

Below is a list of individuals who are either impacted by or have influence over the content within this specification.

|  |  |  |
| --- | --- | --- |
| **Name** | **CDS ID** | **Role / Responsibility** |
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| Zuraw, Timothy (T.) | tzuraw | Feature Team – Sentinel / Integrated Security Cameras |
| Luken, Richard (R.) | rluken2 | Feature Team – Sentinel / Integrated Security Cameras |
| Nunzio DeCia | ndecia | ECG – SPSS Owner Sentinel / Integrated Security Cameras |
| Emani, Savitha (S.) | semani4 | IVI-C – SPSS Writer VRP |
| Ayala gonzalez, Hugo (H.) | [hayalago](mailto:hayalago@ford.com) | Feature Owner – Police Track Data Recorder |
| Eteer, Malik (M.) | meteer | Feature Owner – Enhanced Dash Cam |
| Benhamouche, Fatima (F.) | fbenhamo | Function Owner - Video Record and Playback (VRP)  ADAS Feature Owner - Mobile Device Viewer for Vehicle Cameras (MDVVC) |
| Raparthi, Satya (S.) | srapart1 | Cyber Security – Sentinel Rep. |
| Pohl, Sascha (S.) | spohl6 | Product Owner - Sentinel |
| Shokry Soliman, Ahmed (A.) | ashokrys | SYNC – Concept of Operations Creator |
| Mueller, Holger (H.) | hmuell62 | SYNC – Dev Team Supervisor |
| Shala, Kujtim (K.) | kshala | SYNC – Dev Team |
| Martinius, Moritz (M.) | mmart591 | SYNC – Dev Team |
| van Laak, Martin (M.) | mvanlaa1 | IVI-C - Software |
| Mahmood, Hamid (H.) | [hmahmoo3](mailto:hmahmoo3@ford.com) | SYNC Team - Infotainment and telematics |
| Ho, Colin (S.) | [cho19](mailto:cho19@ford.com) | SYNC Processing |
| Neubecker, Cynthia (C.M.) | [cneubeck](mailto:cneubeck@ford.com) | R&A Feature Owner - Enhanced Dash Camera |

## Potential Use Cases

Below is a list of potential ways that the Video Recorder Service may be utilized.

|  |  |
| --- | --- |
| **Use Case ID** | **Use Case Description** |
| UC\_FN\_VRS\_00001 | When a perimeter alarm is triggered for the vehicle, camera views from around the vehicle are recorded for a short period of time. These recordings can be viewed later while investigating the event (Sentinel / Integrated Security Camera Feature). |
| UC\_FN\_VRS\_00002 | Record video camera streams while car is in motion in order to capture any mishaps. Integrated or Enhanced Dash Cam and/or Unstructured Data Features |
| UC\_FN\_VRS\_00003 | Keep recording in loop fashion to avoid out of memory issues. Protect certain loop segments from overwrite when an event has occurred. Enhanced Dash Cam or Unstructured Data Features. |
| UC\_FN\_VRS\_00004 | Record camera stream onto user brought in device such as USB |
| UC\_FN\_VRS\_00005 | Start, stop, pause, resume recording of the camera stream as consumer wishes. |
| UC\_FN\_VRS\_00006 | Entertainment Feature end-user would like to record camera stream while on leisure trip to capture a scenic route. |
| UC\_FN\_VRS\_00007 | Feature end-user checks the recorded streams and deletes unwanted recordings to clear storage. |
| UC\_FN\_VSRS\_00008 | Feature end-user checks the recorded streams and protects particular recording files by flagging them as “Read Only”. |
| UC\_FN\_VSRS\_00009 | Feature end-user reviews recorded streams and un-protects particular recording files that are no longer of use, by removing the “Read Only” flag. |

## Abbreviations and Definitions

Below is a list of meanings for abbreviations and phrases used within this document.

|  |  |
| --- | --- |
| **Abbreviation / Phrase** | **Description** |
| ECU | Electronic Control Unit |
| EDC | Enhanced Dash CAM  A Feature that allows the vehicle operator to request certain camera views be recorded while driving and preserves certain video clips based on pre-determined triggers, or user request. |
| ISC | Integrated Security Cameras  A Feature that automatically records video from around and in the vehicle for approximately 5 minutes, after a perimeter alarm is triggered. |
| MDVVC | Mobile Device Viewer for Vehicle Cameras  A Feature that allows the vehicle Owner to view video from vehicle cameras on their phone. |
| PTDR | Police Track Data Recorder  A Feature that captured video and driving data while an officer is driving on a test track. |
| RTP | Real-time Transport Protocol  A network protocol at the application layer for delivering video and audio over IP Networks. |
| SOA | Service Oriented Architecture  A Software architecture and set of software design principles focused on delivering cohesive and highly reusable software components or “Services”. |
| UDP | User Datagram Protocol  A connectionless network protocol at the transport layer of the internet protocol suite. Frequently used for transporting time-sensitive data where package loss is preferred over delays due to retry attempts like for video or audio transmissions. |
| VRP | Video Record and Playback Function  A Function Specification derived from the Sentinel feature initially, but ideally serving the needs of several functions over time. |

# Architecture/Context Diagram

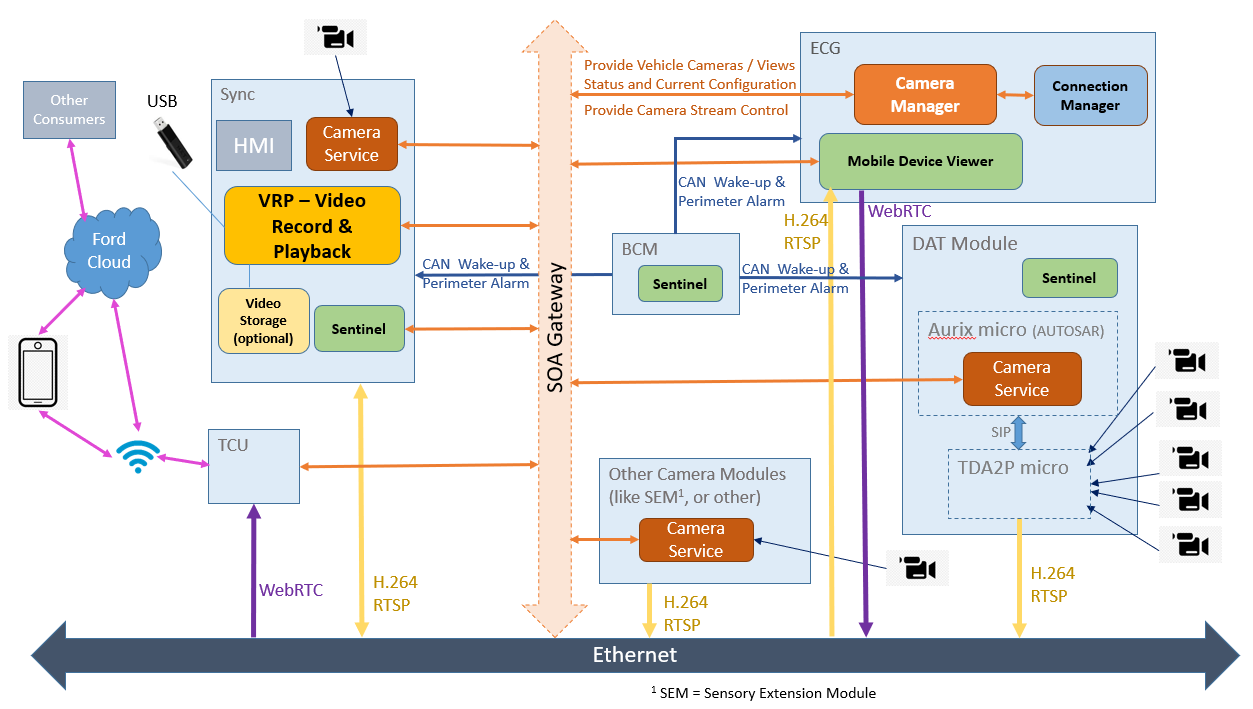
The architecture or context diagrams below are intended as visual aides to help understand the Video Recorder Service and its interactions with other software and devices.

## Context Diagram - Integrated Security Camera Example

Below is a context diagram showing possible interactions between the Video Recorder Service, and other software components in order to achieve the Sentinel or Integrated Security Cameras (ISC) Feature.

For this use case the flow is generally;

1. BCM Activates Perimeter Alarm
2. ISC feature logic on BCM wakes the DAT, SYNC, and ECG modules, communicating the perimeter alarm event
3. ISC logic on DAT activates predetermined camera views and buffers the video for a a period as the other ECUs power up.
4. ISC Feature on ECG coordinates the recording of the predetermined views to a USB within the vehicle and sends them to the Cloud for potential storage and off vehicle viewing.



# Requirements

The sections below provide the list of requirements for the Video Recording Service.

## Functional Requirements

The functional requirements below are those that directly impact consumer expectations of successful delivery. They provide the functionality expected by various consumers.

### Recording Requirements

#### F-REQ-406621/A-Record Camera View to USB Device

The Video Recording Service shall allow the consumer to request it to record a Video Stream from an in-vehicle Camera View (non-multiplexed) to a specified USB device.

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 02-Jun-2021 08:54 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Removed references to live or buffered, not relevant to VR service. |

#### F-REQ-418724/A-Record Multiple Views at the Same Time

The Video Recorder Service shall allow a consumer to request multiple camera views to be recorded at the same time, providing it does not exceed bandwidth or CPU Load thresholds.

Notes:

* The initial release of video streaming over ethernet will not support multiplexing, so each Camera View will be on a separate “stream” on a separate network address.
* Initial ISC feature requirement is to record 3 views at one time. As of DAT 221, the ADAS Module can only provide 3 streams, and the AR Module plans to provide 2. In the future there may be cameras available from other modules, and modules may expand the number of streams they can support.

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 18-May-2021 15:48 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added Requirement |

#### F-REQ-418387/A-Video Source (Consumer Determined or VRS Initiated)

The Video Recorder Service shall facilitate two mechanisms for identifying the video source:

1. Consumer Determined Multicast Address (Consumer Reserves the stream)
2. Video Stream Initiated by the Video Recorder Service using the Camera Manager Service.

**Determined by Consumer:**

The Video Recorder Service shall allow the consumer to provide a pre-determined multicast address and port, as the source for the video to be recorded.

This is done to support features like Integrated Security Cameras that must coordinate the beginning of the video recording and stream between multiple recipients to ensure that all recipients capture the full video stream.

The Video Recorder Service shall prepare for the recording and join the multicast group. When it is ready to record, it will provide a ready indication back to the requester, and that requester will ensure that the video stream is started, when all recipients of the stream are ready.

**Initiated by Video Recorder Service:**

If the consumer does not provide a pre-determined multicast address for the video stream, then the Video Recorder Service shall be responsible for starting the video stream.

This is done via the Camera Manager Service, using the start stream interface and supplying the view name and view configuration information as provided by the consumer. For information on the Camera Manager Interfaces and specification see the required interfaces and related documents sections within this specification.

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 02-Jun-2021 09:00 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added Requirement |

#### F-REQ-406306/A-Recording Duration

The Video Recording Service shall allow the consumer to specify the amount of time (duration) of the video recording.

If the consumer does not specify a recording duration, then the Video Recorder Service will continue recording until either the consumer requests it to stop, or an error occurs.

Note: Please see the requirement in this document for File Creation Modes for special use of the duration when recording in a “loop mode”.

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
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| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed from paragraph to requirement object. Updated properties. Combined specified and unspecified into one requirement. |

#### F-REQ-406312/A-Recording File Creation Modes (Continuous or Loop)

The Video Recorder Service shall allow the consumer to specify one of two possible file creation modes when starting a recording. The two available modes are;

1. Continuous Mode
2. Loop Mode

**Continuous Mode**: For this recording mode, the Video Recorder shall create a single video file per camera view, and a single associated metadata file. The recording of video and metadata continues to those files until either:

1. The total recording duration is reached
2. The consumer stops or pauses the recording
3. The storage device is out of available space

**Loop:** This mode is used by consumers that wish to collect data in a rolling storage method, where older files from the recording session are overwritten with newer files, when a specified recording duration is reached.

In loop mode, the Video Recorder will create multiple video and associated metadata files, each of a specified segment duration. When the overall recording duration is reached, it will delete the oldest segment files of the recording session and replace them with new video and metadata segment files. It will continue this process until one of the following occurs;

1. The consumer stops or pauses the recording
2. The storage device is out of space

Example:

If a consumer requests a Loop Mode recording with a total duration of 5 minutes and a segment duration of 1 minute, then the Video Recorder Service will:

1. Create segment files of 1-minute duration
2. At the end of Minute 5, it will delete the files corresponding to segment 1, and replace them with files for the 6th minute. Thus, when played back the total length of the recording will always 5 minutes, representing the last 5 minutes before the recording was stopped.

Note:

File naming, folder directory structure, and out of space behaviors are detailed in separate requirements in this document.

Sample Loop Mode duration = 5 minutes, segment size = 1 minute

|  |  |
| --- | --- |
| **Minute of Recording** | **Segments on storage device** |
| First | 1 |
| Second | 1, 2 |
| Third | 1, 2, 3 |
| Fourth | 1, 2, 3, 4 |
| Fifth | 1, 2, 3, 4, 5 |
| Sixth | 2, 3, 4, 5, 6 |
| Seventh | 3, 4, 5, 6, 7 |
| Eighth | 4, 5, 6, 7, 8 |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 26-May-2021 11:20 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed from paragraph to requirement object. Updated properties. Combined details for continuous and loop into one requirement. |

#### F-REQ-420904/A-Video Recording File Format

The Video Recording Service shall record video into an MP4 standard format.

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 25-May-2021 12:12 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

#### F-REQ-420939/A-File Directory Structure and Names

When recording video and metadata files, at the start of each recording session, the Video Recorder Service shall:

1. Find or create a file directory called “Ford Videos”
2. Find or create a folder beneath that directory for the feature name as provided in the start recording request
3. Create a new folder beneath the feature directory that consists of
   1. date and time the start recording request was received in a format like 2021-05-25\_093005 using military time
   2. An optional “Recording Name” as provided by the consumer as part of the start recording request.
4. Create files beneath the above sub-folder using the following naming pattern:

Date\_Time\_Feature\_Segment#\_CameraView

Note: Metadata files will not include the camera\_view name as there could be several camera views but only one metadata file.

1. If the file is encrypted, append “\_enc” to the file name
2. Add an appropriate file extension based on the file type, either MP4 for a video file, or TXT for a metadata file.

Note:

* There will be a signature file for every video or metadata segment file.
* For continuous mode recordings the segment # will normally be 0001, only. However, the Video Recorder Service may add additional segments as required by file system and recording requirements (like a maximum file size, or needed due to changing bitrate, etc.)

**Sample directory structure and file names:**



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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 09-Jun-2021 13:09 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

#### REQ-421806/A-Storage Device Not Identified

If a storage device is not provided by the consumer, then the Video Recorder Service shall default to an available USB device that has a Ford Video Directory and sufficient space is available.

If no available USB has a Ford Video Directory, or if there is not sufficient space on the USB with the Ford Video Directory, then it will default to the available USB with the most space available, if another is available.

If there is no USB or none with sufficient space, and no other storage type is available, then Video Recorder will provide a failure message indicating there is not sufficient storage space.

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| **Requirement Information** | |
| **Requirement Type** |  |
| **Requirement Revision** | A |
| **Revision Date** | 02-Jun-2021 09:40 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

#### F-REQ-410435/A-Metadata / Data Logging

The Video Recorder Service shall allow the consumer to specify a set of data attributes that are to be recorded and synchronized with the video recording (recorded along with each frame at the video framerate).

The consumer has several options on how to specify what data shall be recorded:

1. Select from a predefined list of supported metadata (one or more)
2. Provide the name/names of CAN Signals
3. Provide name/value pairs that will be single value, and not change over the course of the video recording.

If any single metadata element is classified as Personally Identifiable Information (PII) or sensitive data by the Ford Privacy Team, or regional regulations, then the metadata files must be encrypted.

If the metadata is chosen from the Video Recorder supported list, Video Recorder will enforce the encryption of the metadata, based on the selected data elements classification (see the list supported metadata requirement and configuration section of this document for more details).

For CAN Signal data or any provided name/value pairs, it is the responsibility of the Feature Owner to go through a DPIA process or consult the Ford Privacy Team in order to determine if the Feature must request the metadata to be encrypted when making a start recording request.

Notes:

* For the list of supported metadata and its classification please see the data enumeration defined in the interface section of this document.
* For information on how the Video Recorder Service will obtain the metadata values during recording, please see the Configuration Section in this document.
* As of the initial Video Recorder Service release, any encrypted metadata will only be available for playback within the vehicle.
* Feature teams can contact the individuals below for more info on data privacy classification and the DPIA process.
  + Kanous, Elizabeth (E.K.) [EKANOUS@ford.com](mailto:EKANOUS@ford.com)
  + Gallagher, Brian (B. P.) [BGALLA15@ford.com](mailto:BGALLA15@ford.com)

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 25-May-2021 12:24 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added requirement. |

#### F-REQ-420183/A-List Supported Metadata and Classification

The Video Recorder Service shall allow the consumer to request a list of the supported metadata and a flag indicating if it is classified as Personally Identifiable Information (PII) or sensitive data that could reveal information about a person’s behavior.

Note:

* For the list of supported metadata and its classification please see the data enumeration defined in the interface section of this document.
* For information on how the Video Recorder Service will obtain the metadata values during recording, please see the Configuration Section in this document.

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 25-May-2021 12:24 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

#### F-REQ-420184/A-Out of Space Strategy

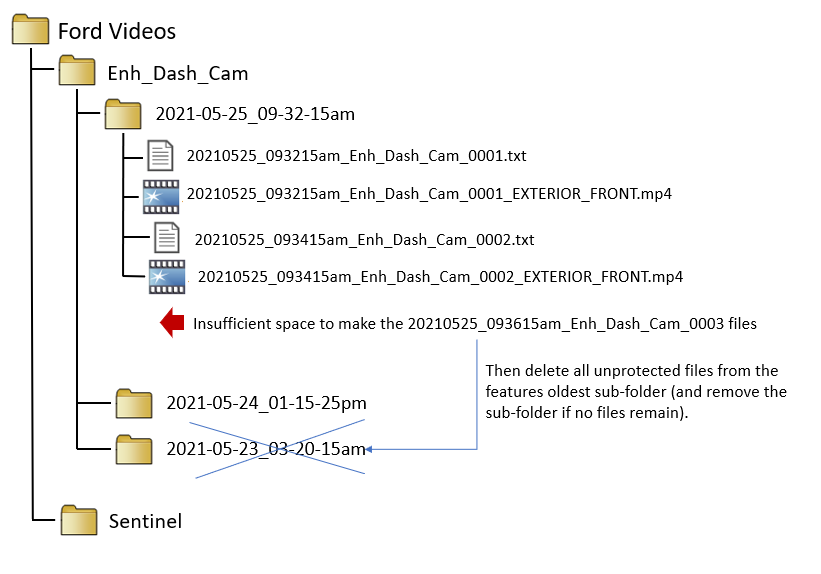
When recording in Loop Mode, the Video Recorder Service shall allow the consumer to specify the out of space strategy to enact when reaching the end of available storage space during a recording session.

The out of space strategies are:

1. Delete the features oldest sub-folder, all unprotected (read/write) files, and delete the sub-folder if no files remain.
2. Terminate the recording

Example for Strategy 1:

If we had the file structure shown below, and there was insufficient space to make the segment 0003 files for the Enhanced Dash Cam feature on 2021-05-25\_09-36-15am, then all unprotected files in the oldest sub-folder for the Enhanced Dash Cam feature would be deleted. If no files remained in that sub-folder the sub-folder would be deleted as well.



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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 25-May-2021 17:04 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

#### F-REQ-420933/A-Loop Mode Out of Space Behavior

While recording in Loop Mode, the Video Recorder Service shall determine the approximate amount of space required for each loop segment.

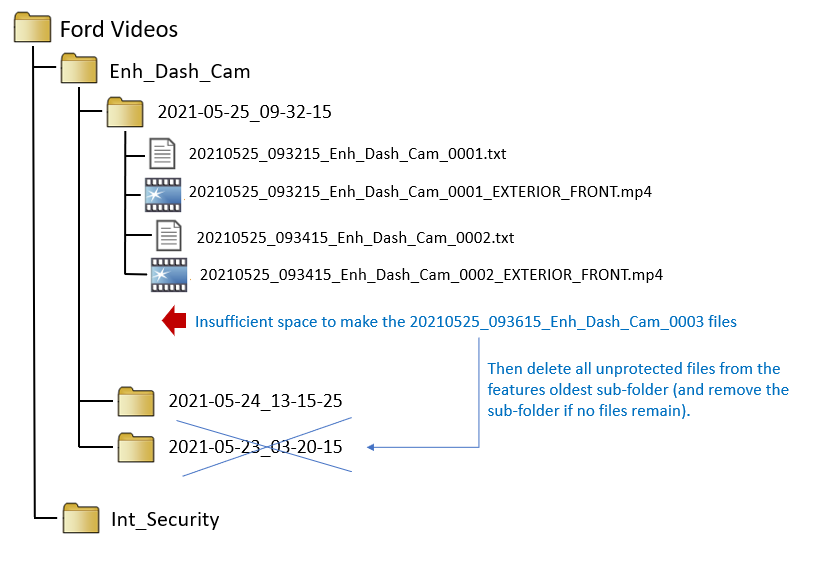
Prior to starting the next segment, the Video Recorder Service shall determine if sufficient space is available on the storage device.

If there is sufficient space, it will proceed with creating the next segment with no additional action.

If there is not sufficient space available, then it must implement the out of space strategy specified as part of the start recording request by either:

1. Terminating the recording
2. Deleting the oldest unprotected recording files for the feature and continue with the recording of the next segments files.

Sample Out of Space action when deleting oldest recording:



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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 09-Jun-2021 13:11 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

#### F-REQ-408867/A-Pause and Resume Recording

The Video Recording Service shall allow a consumer to pause and then resume the video recording. When paused the service will;

* Suspend recording of video stream
* Suspend recording of metadata
* Suspend duration timers (total duration and segment duration if applicable)
* The video stream should stay active

When the consumer later sends a resume request the service will

* Resume recording the video stream
* Resume recording metadata
* Resume and duration timers (total duration and segment duration if applicable)

Note: This will result in a “gap” in the recording, where events are not recorded for a period of time.

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 21-May-2021 15:07 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added this functional requirement in order to align with the interface requirements. |

#### F-REQ-406632/A-Recording Status

The Video Recording Service shall provide a status for all in progress video recording sessions as well as a heartbeat recording indication. The statuses reported should represent both normal processing and expected error conditions like;

* Ready: Video Recorder Service is prepared to start recording on a pre-reserved Video Stream.
* Recording: Video Recorder Service is actively recording
* Completed: Requested recording session has completed (for duration-based recording)
* Paused: Recording has paused
* Out of Space: Recording terminated due to storage space limit.
* Failed: Recording has terminated due to an unanticipated error

The status reported should be updated as it changes during the recording process (an on change broadcast).

The status shall be provided by camera view as well as for metadata recording. In theory one camera view could fail, while others continue for the same session. The consumer could choose to try and restart the failed view.

The heartbeat should provide a periodic broadcast that indicates a recording is in progress. This recording heartbeat would be used to drive a recording indicator to the end user, like a pulsing red LED (similar to what you might find on a camera).

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 02-Jun-2021 10:28 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed from paragraph to requirement object. Updated properties. |

#### REQ-421807/A-Estimated Recording Time

If the recording request is continuous and does not include a duration, then the Video Recorder Service shall provide an estimated recording duration based on the bitrare of the video, amount of metadata, and the available Storage space.

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| **Requirement Information** | |
| **Requirement Type** |  |
| **Requirement Revision** | A |
| **Revision Date** | 02-Jun-2021 08:28 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

#### F-REQ-406776/A-Encryption

The Video Recorder Service shall allow the consumer to specify if the video and/or metadata should be encrypted while recording.

As stated earlier, if the consumer selects metadata from the Video Recorder Service’s list of supported metadata, and any one of the selected data elements is classified as PII or Sensitive, then the Video Recorder Service shall force the metadata to be encrypted, regardless of consumer request.

As of the initial release of the Video Recorder Service, playback of any encrypted video or metadata file will only be available within the vehicle, since there is no plan or requirement to share the encryption key outside of the vehicle.

In the future this may be changed to allow encrypted files to be used outside the vehicle, but the mechanism for this has not yet been determined.

The mechanism of encryption and source of the key is still being finalized, for more information please consult the Sentinel Cyber Security Specification which is attached to the VRP Functional Specification within VSEM (or contact the Cyber Security, or Functional Spec owner identified in the stakeholder list of this document).

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:59 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed from paragraph to requirement object. Updated properties. |

#### F-REQ-421214/A-Digital Signatures

The Video Recorder Service shall apply a digital signature to all files (video and metadata) such that the signature can be verified during playback within the vehicle, to ensure the files were not altered. The digital signature shall not interfere with playback outside of the vehicle.

This digital signature shall consist of first generating a SHA-256 Hash of the file, then signing that hash using RSA 2048 with PSS padding.

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:20 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### Storage and File Management Requirements

#### F-REQ-406307/A-List Storage Devices & Information

The Video Recording Service shall provide the consumer with a list of available (connected) storage devices with information about the space available on each. That information shall include but not be limited to;

* Device ID
* Available Storage (memory)
* Used Storage (memory)
* Total amount of storage (memory)

Note: For USB Devices, available means presently connected within the vehicle. Ideally the device ID should be either the Hardware Device ID of the USB stick, or of the storage partition on it.

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:02 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed from paragraph to requirement object. Updated properties. |

#### F-REQ-406622/A-List Stored Recordings and Filter

The Video Recorder Service shall allow the consumer to retrieve a list of video recordings from an available storage device. The returned list will be made up of only recordings made by the vehicle to the Ford Videos Directory on the storage device.

The returned list will show the recordings by feature and sub-folder name (Feature, Date/Time and optional recording name).

The user should be able to optionally expand the recording sub-folder in order to see how many video segments are present in the sub-folder, the camera views present, and whether any segments are protected (metadata only or both video and metadata).

When requesting a list of recordings, the consumer may request all recordings or filter the returned list by certain criteria.

The filter criteria shall include;

1. Feature name
2. Recording Name
3. Date Range (creation date of the recording)
4. File Protection Status (protected or unprotected)
5. Encryption Status (Metadata only or all)

The filter criteria may also include;

1. Metadata values associated with the video recording.

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:08 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed from paragraph to requirement object. Updated properties. |

#### F-REQ-406317/A-Protect Recording or Segment

The Video Recorder Service shall allow the consumer to flag a stored video recording or recording segment, along with its associated metadata, as protected (made read only) in order to prevent it from being deleted from the storage device.

The files may be protected as part of an end user reviewing a list of recordings during file management.

Alternatively, the consumer may issue a request to protect all the files for an active recording or recording segment, due to the occurrence of some triggering event (like an accident, or perceived problem with the vehicle).

When protecting an active recording, during loop mode recording, all files associated with the active recording segment shall be marked as protected (read only). This means the metadata files, and the video files for all camera views with the same date, time, and segment number within the recording sub-folder.

When protecting an active recording, during continuous mode recording), all files associated with the recording will be protected (all files within the sub-folder).

Note: In continuous mode there is only one segment, and therefore all files will have a segment number of 0001.

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:09 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed from paragraph to requirement object. Updated properties. |

#### F-REQ-406320/A-Unprotect Recording or Segment

The Video Recorder Service shall allow the consumer to unprotect a stored or in progress recording or recording segment, so that it can be deleted (make the files read / write).

This may be done as part of reviewing a listing of recordings on a storage device, or as a request during an active recording session.

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:10 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed from paragraph to requirement object. Updated properties. |

#### F-REQ-406625/A-Delete Stored Video File

The Video Recorder Service shall allow the consumer to delete an unprotected recording or recording segment.

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:11 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed from paragraph to requirement object. Updated properties. |

#### F-REQ-406628/A-Retrieve Stored Video File

The Video Recorder Service shall allow the consumer to retrieve a stored video file in order to play back the video and any associated metadata within the vehicle.

The primary (and possibly only) consumer of this would be the video playback service.

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| **Requirement Information** | |
| **Requirement Type** | F - Functional |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:13 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed from paragraph to requirement object. Updated properties. |

## Non-Functional Requirements

The non-functional requirements below are those that indirectly impact consumer expectations of successful delivery. They are items like performance and security that are not directly requested by the consumer yet will contribute to their perceived satisfaction with the product.

### NFN-REQ-406779/A-Availability - Life Cycle

The Video Recorder Service shall be available in the normal vehicle life cycle mode, it may be available, but is not required, in other modes like factory or transport.

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| **Requirement Information** | |
| **Requirement Type** | NFN - Non-Functional-N/A |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:14 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### NFN-REQ-406781/A-Availability - Ignition State

The Video Recorder Service Shall be available in all ignition states, including off, provided available battery charge is not low.

Note: The Sentinel Feature requires video recording in an ignition off state, while features like Enhanced Dash Cam will require recording while ignition is on and vehicle is moving.

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| **Requirement Information** | |
| **Requirement Type** | NFN - Non-Functional-N/A |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:15 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### NFN-REQ-420882/A-Availability - Valet Mode

The Video Recorder Service shall prevent use of any recording file management or video retrieval when the vehicle is in “Valet mode”.

It should not be possible for someone acting as a valet to see a list of recordings, delete recordings, alter recordings, or play any recordings.

Any In progress, or automatic recording of videos shall continue in valet mode.

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| **Requirement Information** | |
| **Requirement Type** | NFN - Non-Functional-N/A |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:35 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### NFN-REQ-406780/A-Availability - Power

The Vehicle Recorder Service can be shut down to conserve battery charge. It should only be utilized or woken up via cloud request when the Battery State is Normal (or above). It should not be made available if battery state is low or insufficient.

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| **Requirement Information** | |
| **Requirement Type** | NFN - Non-Functional-N/A |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:45 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### NFP-REQ-406782/A-Response Time

Below are estimated response time expectations from feature teams.

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| --- | --- |
| **Feature** | **Response time Expectation** |
| Enhanced Dash Cam | < 2 Seconds |
| Sentinel | TBD |

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| **Requirement Information** | |
| **Requirement Type** | NFP - Non-Functional-Performance |
| **Requirement Revision** | A |
| **Revision Date** | 11-Feb-2021 14:25 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### NFP-REQ-406783/A-BootUp Time

The Sentinel feature requires video recording to start in under 2 seconds from the perimeter alarm being triggered. It is recognized that ECG and SYNC cannot boot up in the required amount of time, Therefore the ADAS Module will implement video buffering in order to capture the initial few seconds, while other ECUs are woken and activated. This may impact the design for streaming or recording from those buffered video streams.

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| **Requirement Information** | |
| **Requirement Type** | NFP - Non-Functional-Performance |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:47 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### NFP-REQ-408161/A-Bandwidth

The Video Recorder Service shall support a bandwidth of at least a 1 to 4 Mbps.

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| **Requirement Information** | |
| **Requirement Type** | NFP - Non-Functional-Performance |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:47 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### NFN-REQ-408162/A-Storage Expectations

The Video Recorder Service should support the following storage expectations at a minimum;

* USB provided by the user: may be greater than 1GB
* In Vehicle Storage (ECU): amount of storage possible is yet to be determined

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| **Requirement Information** | |
| **Requirement Type** | NFN - Non-Functional-N/A |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:48 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### NFN-REQ-408163/A-Buffering

The Video Recorder Service may have to establish buffers for video streams in order to support recording multiple camera views, or handling requests from multiple consuming features.

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| **Requirement Information** | |
| **Requirement Type** | NFN - Non-Functional-N/A |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:48 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### NFN-REQ-410437/A-Retry and Timeout

When establishing a video stream, The Video Recorder Service shall wait a configurable amount of time (see configuration section) for the Camera Manager to respond to a request.

If the Camera Manager fails to respond in that time, the Video Recorder Service shall retry the request a configurable number of times (see configuration section). If there still is no acknowledgement after the last retry, then it shall send a failure response to the consumer with a reason of CAMERA\_VIEW\_NOT\_RESPONDING.

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| **Requirement Information** | |
| **Requirement Type** | NFN - Non-Functional-N/A |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:49 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added requirement, based on ECG dev team request |

### NFN-REQ-410438/A-Multiple Requests - Queuing

The Video Recorder Service shall queue incoming requests and process them in the order received.

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| **Requirement Information** | |
| **Requirement Type** | NFN - Non-Functional-N/A |
| **Requirement Revision** | A |
| **Revision Date** | 02-Mar-2021 15:00 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added requirement, based on ECG dev team request |

### NFN-REQ-410439/A-Multiple Requests - Max Concurrent Requests

The Video Recorder Service shall queue up to 10 incoming requests, after which incoming requests will be denied. When the Queue is full, the Video Recorder Service will respond to the consumer with a failure status and an error description of "QUEUE\_FULL".

Rationale: Unlimited requests cannot be supported. There are upcoming features like Enhanced Dash Cam, that wish to request 5 Camera Views to stream at the same time. The current number of multicast ports planned is 10, so that is currently the maximum number of concurrent video streams possible within the vehicle.

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| **Requirement Information** | |
| **Requirement Type** | NFN - Non-Functional-N/A |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:54 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added requirement, based on ECG dev team request |

### NFN-REQ-406764/A-Multiple Consumer Requests

The Video Recorder Service *should* support multiple consumers making recording requests at the same time. This could be achieved by establishing a request queue, then limiting the number of active recordings based on processing, bandwidth, or buffering limitations.

If these limitations are exceeded, and additional requests cannot be accommodated, then an appropriate error message must be returned.

Hardware limitations may force the number of concurrent requests to be limited initially, but ideally expanded over time.

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| **Requirement Information** | |
| **Requirement Type** | NFN - Non-Functional-N/A |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 16:55 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Clarified wording. Changed from paragraph to requirement object. Updated properties. |

## Future Functional Requirements:

The requirements below are anticipated needs of upcoming features. They are provided as information only; in the event they may impact design and implementation considerations.

### Reserve Memory

Ability to allocate memory, if recording is scheduled (Adventure Camera).

### Save snapshot/ image

Ability to record a snapshot/ picture in persistent storage with timestamp and camera id (expected by Aspire Photos Feature).

### Retrieve/filter recording list by metadata

The consumer shall be able to filter the recordings list based on the metadata they chose to store with it.

### End of Recording Meta Data

The ability for the consumer to supply additional metadata values to be stored along with the video file when stopping a recording or at the end of the specified recording duration.

# Interface Contracts

This section provides information on the interface requirements for this service.

## Data Enumerations

Below are definitions for the data enumerations used within the Video Recorder Service interfaces, to provide known lists of values.

### IR-REQ-408226/A-RecordingStorageType

**Description:** This data enumeration is used to indicate the desired type of storage for requests to list recording files, available storage information and start recording requests.

|  |  |
| --- | --- |
| **Value** | **Description** |
| ANY | Provide information for ANY available video recording storage within the vehicle. |
| ANY\_USB | Provide information for any USB(s) available within the vehicle. These are provided by the vehicle owner / operator and connected to a vehicle USB data port. |
| USB | Provide information for a specific USB within the vehicle (as identified by the Device ID). |
| INTERNAL | Possible Future Value used to store the recording files within the vehicle, on the host ECU. |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 17:59 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed to VSEM Requirement Object. Added Type to name to differentiate from Storage ID. |

### IR-REQ-408225/A-RecordingMode

**Description:** This data enumeration is used to indicate the Mode of file creation used during recording and how out of memory errors will be handled.

|  |  |
| --- | --- |
| **Value** | **Description** |
| CONTINUOUS | Recording is performed continuously in a single file. The file size is determined by the memory available. If an out of memory error occurs, the recording will terminate. |
| LOOP | Recording is performed in a loop mode. Multiple files are created, each of a specified segment duration. When the total duration is reached, the system will “loop” back and delete or record over the oldest video segment. |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 18:01 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed to VSEM Requirement Object |

### REQ-421357/A-OutOfSpaceStrategy

**Description:** This data enumeration is used to indicate the desired behavior when there is insufficient space on the storage device to continue recording (only applies to loop mode recording).

|  |  |
| --- | --- |
| **Value** | **Description** |
| TERMINATE | The recording will terminate and an out of space error will be provided. |
| DELETE\_OLD\_RECORDING | The oldest unprotected recording, for the requesting Feature will be deleted in order to create space for the active recording. |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** |  |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 18:07 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

### IR-REQ-408197/A-CameraView

**Description:** This enumeration provides the list of views provided by cameras within the vehicle. This list represents the possible views across all vehicles. Some views may not be available in a specific target vehicle.

As more cameras and views are added to the vehicles, this list will grow.

For sample views please see; <https://wiki.ford.com/display/CS/Cameras%2C+Views%2C+and+Configurations+Available>

The list below is grouped by Camera location, or area covered, for convenience only.

|  |  |  |
| --- | --- | --- |
| Location | Value | Description |
| Exterior Rear Views | REAR\_NORMAL | View of the area behind the vehicle, from the rear camera under the license plate in center of back bumper. |
| REAR\_NORMAL\_WITH\_ZOOM | Same as above, but zoomed in. |
| REAR\_360 | Multiple rear cameras are utilized to give a “360” view. |
| REAR\_SPLIT |  |
| REAR\_ROCK\_CRAWL | Close up view of rear tires, split to show both sides |
| REAR\_CAMERA | Raw fisheye data from the rear camera |
| CHMSL | View from near the Center High Mounted Stop Lamp (CHMSL) using RearCamera2.  For a pick-up truck it looks on to the bed of the truck.  For Transit vehicles, this will be replaced by the Interior Cargo View. |
| CHMSL\_ZOOM | Same as CHMSL above but zoomed in. |
| Exterior Front Views | FRONT\_NORMAL | View of the area in front of the vehicle, from a camera located on the front bumper. |
| FRONT\_360 | Multiple front cameras are utilized to give a “360” view. |
| FRONT\_SPLIT |  |
| FRONT\_ROCK\_CRAWL | Close up view of front tires, split to show both sides |
| FRONT\_CAMERA | Raw fisheye data from the front camera |
| AR\_RGB\_CAMERA | Augmented Reality, Red, Green, Blue (RGB) Camera View. Shows the area to the front of the vehicle from a front windshield perspective.  Available only at following resolutions:  1080p (1920x1080)  720p (1280x720)  Contacts for more information = ulangkam; cvootkur; dnachte1 |
| AR\_FIR\_CAMERA | Augmented Reality, Far InfraRed (FIR) Camera View.  Shows the area to the front of the vehicle from a front windshield perspective.  Available only at:  640 x 480  Contacts for more information = ulangkam; cvootkur; dnachte1 |
| Exterior Left Views | FRONT\_LEFT\_CORNER | Zoomed into the front left corner of the vehicle |
| REAR\_LEFT\_CORNER | Zoomed into the rear left corner of the vehicle |
| SIDE\_LEFT\_CAMERA | Raw fisheye data from the left side camera |
| Exterior Right Views | FRONT\_RIGHT\_CORNER | Zoomed into the front right corner of the vehicle |
| REAR\_RIGHT\_CORNER | Zoomed into the rear right corner of the vehicle |
| SIDE\_RIGHT\_CAMERA | Raw fisheye data from the right-side camera |
| Exterior Hitch Views | HITCH\_VIEW | View of hitch mechanism for a trailer. |
| TRG\_50\_50 | Trailer Reverse Guidance View normal 50/50 split |
| TRG\_LEFT | Trailer Reverse Guidance View normal 75/25 split showing more towards the left. |
| TRG\_RIGHT | Trailer Reverse Guidance View normal 25/75 split showing more towards the right. |
| Trailer Views | AUX\_1 | After Market Camera installed to the rear of vehicle for use with trailers.  For the Transit vehicle this may be replaced by the Interior Cabin View (below). |
| AUX\_CAMERA | Raw fisheye data from the above Aux camera |
| Exterior 360-degree views | NORMAL\_360 | A 360-degree view of the exterior of the vehicle. This is created by stitching together views from the Front, Rear, Left, and Right cameras. Resulting image has 4 separate panels, one for each camera embedded into one video image.  Can only stream at Res of 1280x800 (with each of the 4 camera frames at 640x400)  This is one of the default views recorded for the Integrated Security Camera (ICS) Feature.  For ICS it will stream at;  Framerate: 30 fps  Bitrate: 10,000 kps |
| FOREWARD\_OFFSET\_360 | A 360-degree view of the exterior of the vehicle with a larger area to the front of the vehicle covered. This is created by utilizing Front, Rear, Left, and Right cameras. |
| REARWARD\_OFFSET\_360 | A 360-degree view of the exterior of the vehicle with a larger area to the rear of the vehicle covered. This is created by utilizing Front, Rear, Left, and Right cameras. |
| Interior Views  (Currently for Transit vehicles only) | INTERIOR\_CABIN | In Transit as of MY23, the CHMSL Camera is placed and configured to show the Interior of the cargo area.  This is one of the default views recorded for the Integrated Security Camera (ISC) Feature.  For ICS it will stream at;  Res: 720x480  Framerate: 30 fps  Bitrate: 10,000 kps |
| INTERIOR\_CARGO | In Transit as of MY23, the AUX\_1 Camera is optionally located and configured to show the Interior of the passenger cabin area.  This is one of the default views recorded for the Integrated Security Cameras (ICS) Feature.  For ICS it will stream at;  Res: 720x480  Framerate: 30 fps  Bitrate: 10,000 kps |
|  |  |  |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 17:51 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Name changed to remain consistent with the same enum in Camera Manager. |

### IR-REQ-408733/A-Resolution

**Description:** This enumeration provides the list of available resolutions for the camera views. The desired resolution should be specified when starting a recording, else the current camera setting will be used.

Video Recorder Service will pass the desired resolution to Camera Manager when initiating the video stream.

|  |  |
| --- | --- |
| **Value** | **Description** |
| RES\_1280\_BY\_800 | This is a high-resolution setting |
| RES\_640\_BY\_480 | This is a medium resolution setting |
| RES\_480\_BY\_360 | This is a low-resolution setting |
| RES\_1920\_BY\_1080 | 1080p Only supported by the AR Module RGB View |
| RES\_1280\_BY\_720 | 720p – Only supported by the AR Module Views |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 17:52 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added since config must be sent to Camera Manager when initiating the video stream. |

### IR-REQ-408734/A-FrameRate

**Description:** This enumeration provides the list of supported Frame rates for camera configurations. The desired framerate should be specified when starting a recording, else the current camera setting will be used.

|  |  |
| --- | --- |
| **Value** | **Description** |
| FPS\_30 | 30 Frames per second |
| FPS\_15 | 15 frames per second |
| FPS\_10 | 10 frames per second |
| FPS\_60 | 60 Frames Per Second, only supported by AR Views |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 27-May-2021 17:53 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added since config must be sent to Camera Manager when initiating the video stream. |

### IR-REQ-408735/A-Bitrate

**Description:** This enumeration provides the list of supported Bitrates for camera configurations. The desired Bitrate should be provided when starting a recording, else the camera’s current setting will be used.

|  |  |
| --- | --- |
| **Value** | **Description** |
| KBPS\_10000 |  |
| KBPS\_5000 |  |
| KBPS\_1000 |  |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 12-Feb-2021 10:50 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added since config must be sent to Camera Manager when initiating the video stream. |

### IR-REQ-408227/A-RecordingStatus

**Description:** This data enumeration is used to provide the consumer with the status of a recording while it is in progress.

|  |  |
| --- | --- |
| **Value** | **Description** |
| READY | Video Recorder Service is Ready to record a pre-reserved video stream. |
| RECORDING | Recording is in progress |
| COMPLETE | Recording session has completed |
| PAUSED | Recording is paused |
| OUT\_OF\_SPACE | Recording terminated due to insufficient available storage Space |
| FAILED | Recording terminated for an unanticipated reason |

* Ready: Video Recorder Service is prepared to start recording on a pre-reserved Video Stream.
* Recording: Video Recorder Service is actively recording
* Complete: Requested recording session has completed (for duration-based recording)
* Paused: Recording has paused
* Out of Space: Recording terminated due to storage space limit.

Failed:

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 21-May-2021 15:17 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed to VSEM Requirement Object |

### IR-REQ-408228/A-RequestStatus

**Description:** This enumeration is used when replying to the consumer with the status of a request like start recording, stop recording, or list video recording files.

|  |  |
| --- | --- |
| **Value** | **Description** |
| SUCCESS | Request execution was successful, there are no errors. |
| FAIL | Provider failed to fulfill request. Error details should be checked to get more information about the failure. |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 11-Feb-2021 15:30 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed to VSEM Requirement Object |

### IR-REQ-408229/A-ErrorDetail

**Description:** This enumeration is used to indicate the type of error that occurred when attempting to process a request.

|  |  |
| --- | --- |
| **Value** | **Description** |
| NONE |  |
| COMMAND\_NOT\_RECOGNIZED | Unknown command in SOA request |
| UNKNOWN\_ERROR | Failed due to an unexpected error |
| INVALID\_REQUEST | Invalid request structure or parameters |
| NOT\_SUPPORTED | Request cannot be supported by the particular camera view requested, for instance specifying a resolution that is not supported by the camera for that view. |
| STORAGE\_FULL | Desired Storage device is full |
| STORAGE\_DEVICE\_NOT\_FOUND | Requested Storage Device cannot be found. |
| CAMERA\_VIEW\_NOT\_AVAILABLE | Requested Camera View is not available for streaming. |
| CAMERA\_VIEW\_NOT\_RESPONDING | Camera Controller is not responding. |
| QUEUE\_FULL | Request queue is full, try request again later. |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 02-Mar-2021 17:06 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added none, storage full, storage not found, camera view not available, camera not responding, and Queu Full. Changed to VSEM Requirement Object |

### IR-REQ-409112/A-MetadataSource

**Description:** This enumeration is used to indicate the source of the metadata to be recorded with the video.

|  |  |
| --- | --- |
| **Value** | **Description** |
| CAN | The information is available as a CAN signal and can be received directly through CAN, or from VIM, over Ethernet. |
| PROVIDED\_VALUE | The consumer is providing a value when making the recording request. |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 11-Feb-2021 16:01 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added to fulfill new metadata requirements. |

### REQ-420931/A-SupportedMetadata

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** |  |
| **Requirement Revision** | A |
| **Revision Date** | 25-May-2021 12:22 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** |  |

## Data Structures

Below are definitions for any data structures used to create arrays within the Video Recorder Service Interfaces.

### IR-REQ-408699/A-StreamRecordStatus

**Description:** The following data structure, or nested message, is used by the Video Recorder Service in order to provide status information for multiple recording requests at the same time.

|  |  |  |
| --- | --- | --- |
| **Name** | **Data Type** | **Description** |
| session\_id | integer | Identifies the recording request session. |
| recording\_stat | Enumeration RecordingStatus | Status of the video recording |
| camera\_view\_id | Enumeration CamerView | Camera View being recorded |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 11-Feb-2021 15:36 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added recording session ID. Changed parameter name to align with Camera Manager use of Views rather than streams. Changed to VSEM requirement object. |

### IR-REQ-408704/A-MemoryStatuses

**Description:** This structure, or nested message, is used by the Video Recorder Service to report memory statistics for a specified storage device.

|  |  |  |
| --- | --- | --- |
| **Name** | **Data Type** | **Description** |
| recording\_storage\_type | Enumeration RECORDING\_STORAGE | Type of Storage Device |
| MemoryAvailable | Integer | Memory available for additional recording. |
| MemoryUsed | Integer | Memory used for existing video file recordings. |
| TotalMemory | Integer | Total Memory of the storage Device |
| TempMemory | Integer |  |
| archiveMemory | Integer |  |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 12-Feb-2021 11:07 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed to VSEM Requirement Object |

### IR-REQ-408736/A-MetaDataToRecord

**Description:** This structure, or nested message, is used by the consumer to inform the Video Recorder Service what additional metadata should be recorded along with the Video File.

This is a recommended, generic approach that will manner allow each consumer to record different metadata, that is available either available over CAN, or provided as a onetime value. This should allow the Video Recorder Service to fulfill the Police Data Tracker expectations for pre-defined metadata and allow future consumers to specify new metadata without additional coding.

|  |  |  |
| --- | --- | --- |
| **Parameter Name** | **Data Type** | **Description** |
| metadata\_field\_name | String | This is the name that will be displayed to identify the data in the metadata file, and on playback. |
| metadata\_source | Enumeration  MetadataSource | Identifies if the data is to come from a CAN signal, or if it is a single value provided by the consumer when making a recording request. |
| CAN\_signal\_source | String | Actual CAN Signal name if data is available from CAN / VIM. |
| CAN\_signal\_frequency | integer | The frequency in milliseconds at which the CAN Signal Source should be recorded.  Note: there may be a lower limit to this value based on CAN broadcast frequency, and system latency, yet to be determined. |
| Metadata\_string\_value | String | Single value provided by the consumer when that value is a string. |
| Metadata\_integer\_value | integer | Single value provided by the consumer when that value is an integer. |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 25-May-2021 12:24 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added to clarify how a consumer might specify meta data that is not predefined to be recorded with the video. |

### IR-REQ-408940/A-VideoFileList

**Description:** This structure, or nested message, is used by the Video Recorder Service to return a list of recorded video files along with file properties.

|  |  |  |
| --- | --- | --- |
| **Parameter Name** | **Data Type** | **Description** |
| storage\_device | Enumeration RecordingStorage | Identifies the storage device |
| folder\_id | String | Name of file folder housing the recording file. |
| file\_id | String | File Id |
| file\_name | String | Name of file. |
| file\_type | String |  |
| file\_size | integer |  |
| protected | Boolean | Indicates if file is read only, protected from deletion. |
| date\_time | String | Date and time when the file was created. |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 12-Feb-2021 11:10 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added to align with the VRP Functional Specification provided by Fatima Benhamouche. |

## Provided Interface Contracts

Below are the interfaces that the Video Recorder Service will provide to its consumers (other feature software or software modules) on the same or other ECUs.

### IR-REQ-408710/A-StartRecording

***Purpose***: This interface is used by the consumer to request the Video Recording Service to record a video stream for one or more Camera Views.

***Pre-Condition***: The persistent storage device is specified and available. Enough memory is available for recording to begin.

***Message Pattern:***  Request/Response

***Request Topic:*** SERVICES/REQUEST/VIDEO\_RECORDER

***Response Topic:***  Consumer Provided

|  |  |  |  |
| --- | --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** | **Description** |
| StartRecordingRqst | Array / Repeated Values of  the Enumeration for Camera Views | camera\_view\_ids | List of Camera Views to be recorded. |
|  | Enumeration RecordingMode | recording\_mode | Mode to use for files creation and out of memory conditions. Continuous or loop. |
|  | Enumeration  RecordingDuration | recording\_duration\_type | Type of duration, limited or unlimited. |
|  | Integer | duration\_time | Amount of time to record the camera view(s). |
|  | Integer | segment\_duration | Duration of each video segment, if using loop mode. |
|  | String | file\_name |  |
|  | Enumeration  Resolution | resolution | Resolution of the video stream to record. |
|  | Enumeration  FrameRate | framerate | Framerate of the video stream to record. |
|  | Enumeration  Bitrate | bitrate | Bitrate of the video stream to record. |
|  | boolean | encrypt | Should the recording be encrypted or not. |
|  | Enumeration RecordingStorageType | storage\_type | Type of storage to be utilized |
|  | string | storage\_id | Id of the storage location where the video file should be placed. |
|  | Enumeration  VideoTimeFrame | Video\_time\_frame | Used to indicate if stream should be live, or if buffered video should be captured. |
|  | Array / repeating  Structure of MetadataToRecord | metadata | List of metadata to be captured along with the recording. |
| StartRecordingResp | Enumeration RequestStatus | req\_stat |  |
|  | Enumeration  ErrorDetail | error\_detail |  |
|  | Integer | session\_id | Unique ID for this recording request, used to link to published status, and/or later stop the recording, if duration was not specified. |

**Note:** The Video Recorder Servicewill initiate the video stream via the Camera Manager Service and will receive the source port and/or IP address from it.

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 24-Feb-2021 13:39 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Updated for camera view configuration, allow consumer to specify the metadata to record, and whether they want video from camera buffer or live. |

### IR-REQ-408866/A-StopRecording

***Purpose***: Used by consumer to Stop an in-progress video recording, when a recording duration was not specified as part of the start request

***Message Pattern***: Request / Response

***Request Topic***: SERVICES/REQUEST/VIDEO\_RECORDER

***Response Topic***: Consumer provided

|  |  |  |
| --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** |
| StopRecordingRqst | Integer | session\_id |
| StopRecordingResp | Integer | session\_id |
|  | Enumeration  RequestStatus | req\_stat |
|  | Enumeration  ErrorDetail | error\_detail |
|  |  |  |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 24-Feb-2021 13:42 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added Session\_id to response. Changed to VSEM Requirement Object. |

### IR-REQ-408868/A-PauseRecording

***Purpose***: Used by consumer to Pause an in-progress video recording. Note this will create a gap in both the video and the metadata being recorded.

***Message Pattern***: Request / Response

***Request Topic***: SERVICES/REQUEST/VIDEO\_RECORDER

***Response Topic***: Consumer provided

|  |  |  |
| --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** |
| PauseRecordingRqst | Integer | session\_id |
| PauseRecordingResp | Integer | session\_id |
|  | Enumeration  RequestStatus | req\_stat |
|  | Enumeration  ErrorDetail | error\_detail |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 24-Feb-2021 13:44 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added session id to response. Changed to VSEM Requirement Object |

### IR-REQ-408869/A-ResumeRecording

***Purpose***: Used by consumer to Resume an in-progress video recording, that was previously paused.

***Message Pattern***: Request / Response

***Request Topic***: SERVICES/REQUEST/VIDEO\_RECORDER

***Response Topic***: Consumer provided

|  |  |  |
| --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** |
| ResumeRecordingRqst | Integer | session\_id |
| ResumeRecordingResp | Integer | session\_id |
|  | Enumeration  RequestStatus | req\_stat |
|  | Enumeration  ErrorDetail | error\_detail |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 24-Feb-2021 13:44 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added session id to response. Changed to VSEM Requirement Object |

### IR-REQ-408870/A-ListRecordings

***Purpose***: Used by the consumer to request a list of recorded video files on a storage device.

***Message Pattern***: Request / Response

***Request Topic***: SERVICES/REQUEST/VIDEO\_RECORDER

***Response Topic***: Consumer provided

|  |  |  |  |
| --- | --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** | **Description** |
| ListRecordingsRqst | Enumeration  RecordingStorageType | storage\_device | Indicates the type of storage device |
|  | string | storage\_id | Unique identifier of the storage device, like a USB device id. |
|  | (optional) string | Folder\_name | Filter the returned list to just those files in the specified folder. |
|  | (optional) Date | start\_date | Filter the returned list to just those files recorded on or after this date. |
|  | (optional) Date | end\_date | Filter the returned list to just those files recorded on or before this date. |
|  | Boolean | Protected | If true filter the returned list to only protected files, else include files regardless of protected status. |
| ListRecordingsResp | Enumeration RequestStatus | req\_stat |  |
|  | Enumeration  ErrorDetail | error\_detail |  |
|  | Array Structure  VideoFileList | recordings | List of recording files and their properties |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 24-Feb-2021 13:49 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Updated message structure to include storage device, and standard filter fields. Moved metadata filter structure to a future requirement. Added response structure reference. Changed to VSEM Requirement Object. |

### IR-REQ-408871/A-ProtectRecording

***Purpose***: Used by consumer to protect or unprotect video recording files.

***Message Pattern***: Request / Response

***Request Topic***: SERVICES/REQUEST/VIDEO\_RECORDER

***Response Topic***: Consumer provided

|  |  |  |
| --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** |
| ProtectRecordingRqst | Integer | session\_id |
|  | String | file\_name |
|  | Boolean | protect |
| ProtectRecordingResp | Enumeration RequestStatus | req\_stat |
|  | Enumeration ErrorDetail | error\_detail |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 15-Feb-2021 15:27 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed to VSEM Requirement Object |

### IR-REQ-408893/A-DeleteRecording

***Purpose***: Used by consumer to delete an unprotected video recording file.

***Message Pattern***: Request / Response

***Request Topic***: SERVICES/REQUEST/VIDEO\_RECORDER

***Response Topic***: Consumer provided

|  |  |  |
| --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** |
| DeleteRecordingRqst | String | file\_name |
|  | String | file\_id |
| DeleteRecordingResp | Enumeration RequestStatus | req\_stat |
|  | Enumeration ErrorDetail | error\_detail |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 24-Feb-2021 13:51 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed to VSEM Requirement Object |

### IR-REQ-408894/A-MemoryConsumptionStat

***Purpose***: Used by consumer to request available memory statistics for a specified storage device.

***Message Pattern***: Request / Response

***Request Topic***: SERVICES/REQUEST/VIDEO\_RECORDER

***Response Topic***: Consumer provided

|  |  |  |
| --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** |
| MemoryConsumptionStatRqst | Enumeration RecordingStorageType | storage\_type |
|  | string | storage\_id |
| MemoryConsumptionStatResp | Enumeration RequestStatus | req\_stat |
|  | Enumeration ErrorDetail | error\_detail |
|  | Structure  MemoryStatus | memory\_status |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 18-Mar-2021 14:05 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Differentiated storage type and storage id. Changed to VSEM Requirement Object |

### IR-REQ-408895/A-PublishRecordingStatus (heartbeat)

***Purpose***: Every 500 ms while a recording is in progress, the service will broadcast a heartbeat message to indicate that recording is active.

**Note:** This serves as a recording “heartbeat” indicating a recording is in progress. The Sync/ HMI module will subscribe to this data broadcast in order to update a display on HMI.

MVP requirement is only to indicate if any recording is in progress (ON/OFF). There is no need to identify which camera view is getting recorded.

***Message Pattern:*** Broadcast - Periodic

***Data Topic:*** SERVICES/DATA/VIDEO\_RECORDER

|  |  |  |
| --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** |
| PublishRecordingStatus | Boolean | recording\_state |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 12-Feb-2021 13:11 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Changed to VSEM Requirement Object |

### IR-REQ-408941/A-PublishRecordingStatusChange

***Purpose:*** Broadcast the status of any in-progress recording requests as the status changes. Statuses may change from in-progress, to paused, back to in-progress, to completed, or may go into one of several failed states.

***Message Pattern:*** Broadcast On Change

***Data Topic:*** SERVICES/DATA/VIDEO\_RECORDER

|  |  |  |
| --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** |
| PublishRecordingStatusChange | Array, Repeating Structure  StreamRecordStatus | stream\_status |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 24-Feb-2021 13:50 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Moved recording session id into repeating structure so that mulitple recording requests could be supported. |

## Future Contracts

Listed below are Interface requirements that may be added to the Video Recorder Service in the future, in order to fulfill nice to have requirements, or those of Features coming in later vehicle programs.

These are provided as information only; in case they might impact some current design or implementation considerations.

### Future Data Structures

Below are data structures that may be needed in the future.

#### MetaDataFilter

**Description:** The data structure, or nested message, would be used to restrict the returned list of video recording file based on supplied Metadata elements. This is set up to generically allow the consumer to specify a name and value for the metadata to be used as the filter. This structure would be added to the List Recordings Interface.

|  |  |  |
| --- | --- | --- |
| **Data Type** | **Name** | **Description** |
| String | field\_name | Name of the metadata field to be used as a filter. |
| String | value\_1 | If the metadata field is a String, then this will hold the value of the string for filtering, else it will be left blank. |
| int32 | value\_2 | If the metadata field is an integer, then this will hold the value to be used for filtering, else it will be left blank. |

### Future Provided Interfaces

Below are interfaces that the Video Recorder Service may need to provide in the future.

#### RetrieveRecording

***Purpose***: Retrieve stream of specified video file (encrypted).

***Message Pattern:*** Request/Response

|  |  |  |
| --- | --- | --- |
| **Message Name** | **Message Element Data Type** | **Message Element Name** |
| RetrieveRecording | String | file\_name |
| RetrieveRecordingResp | Enumeration REQUEST\_STATUS | req\_stat |
| Enumeration ERROR\_DETAIL | error\_detail |
| String | ip-address |

**Note:** ip-address that can be used to get file back as over SFTP (if file transfer).

## Required Interface Contracts

The Video Recorder Service will need to utilize the following interfaces that are provided by other Software or ECUs.

### Video Stream Control Interfaces

The Video Recorder Service will utilize the following interfaces which are provided by the Camera Manager on ECG in order to start and stop the video stream of the desired Camera View or Views.

#### IR-REQ-404260/C-StartStream

***Purpose:*** This API will allow the consumer to start a video stream of a single camera view. The consumer can coordinate the start to ensure that all recipients are ready in advance of the stream starting by setting the “reserve\_for\_coordinated\_start” parameter to True. The consumer will receive the intended multicast address, allowing all recipients to connect to the address, and join the multicast group prior to the stream starting.

If a stream is reserved, then the consumer that reserved it must send a Commence Reserved Stream request in order to start the video streaming. If a commence request is not received in a reasonable amount of time, the reservation will be canceled. The view status will be updated to available, and the address may be used for other streaming purposes.

***Message Pattern:*** Request / Response

***Request Topic:*** SERVICE/REQUEST/CAMERA\_MANAGER/STREAM\_CONTROL

***Response Topic:*** < Consumer Provided >

Note: Subsequent requests for an already streaming view will be directed to the in-progress stream, with the existing configuration (resolution, framerate, and bitrate).

|  |  |  |  |
| --- | --- | --- | --- |
| **Message Name** | **Data Type** | **Message Element Name** | **Description** |
| StartStreamReq | Enum  CameraViews  Repeating | camera\_view | The view requested. |
|  | String  Repeating | view\_name | As an alternative to the enum above, the consumer can provide the view name, as listed in the view status broadcast. This is done so that other platform services like Video Recorder, do not have to keep a camera view enum in synch with that of Camera Manager. Instead it can receive a view name from its consumer, and pass that on in this parameter. |
|  | Enum  Resolution | resolution | Desired resolution for the stream |
|  | Enum  FrameRate | frame\_rate | Desired frame rate for the stream |
|  | Enum  BitRate | bit\_rate | Desired but rate for the stream |
|  | uint32 | power\_severity\_level | Power severity of the feature or function for use when voting to power the camera controllers with VPSM.  NOTE: all key off activities need to be evaluated by power supply team, Hussein Berry or Z Deljevic, in order to get severity assigned. |
|  | string | client\_id | Client Id of the consumer, for use in power requests to VPSM in order to power the camera controller. |
|  | bool | reserve\_for\_coordinated\_start | When set to true Camera Manager will reserve a multicast port for the stream request, but not initiate the stream until it receives a commence reserved stream request.  Default will be False |
| StartStreamRsp | Enum  RespStatus | resp\_status | Status of request. |
|  | uint32 | stream\_id | Stream\_id is an auto generated uid by Camera Manager for each video stream. This is used later to change or stop the stream. |
|  | string | ip\_address | Multicast IP Address where the stream can be received (recipient must bind and join the multicast group). |
|  | uint32 | port | Multicast port where the stream can be received. |
|  | Enum  StreamType | stream\_type | Type of stream the consumer will be joining.  This can help the consumer determine if the stream is already in progress or a reserved stream that will not start until the reserving client sends a commence request. |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | C |
| **Revision Date** | 20-May-2021 14:18 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** | Released |
| **Revision Comments** | Clarified definition for repeating camera views for multiplexing only.  Added handling of subsequent requests.  Added Client ID for VPSM & powering controllers.  Added Reserve stream parameter. |

#### IR-REQ-404261/C-StopStream

***Purpose:*** This API will allow the consumer to stop a particular video stream. If there is more than one recipient of the stream, then Camera Manager will only send the stop request to the video source when the last recipient sends a stop request.

***Message Pattern:*** Request / Response

***Request Topic:*** SERVICE/REQUEST/CAMERA\_MANAGER/STREAM\_CONTROL

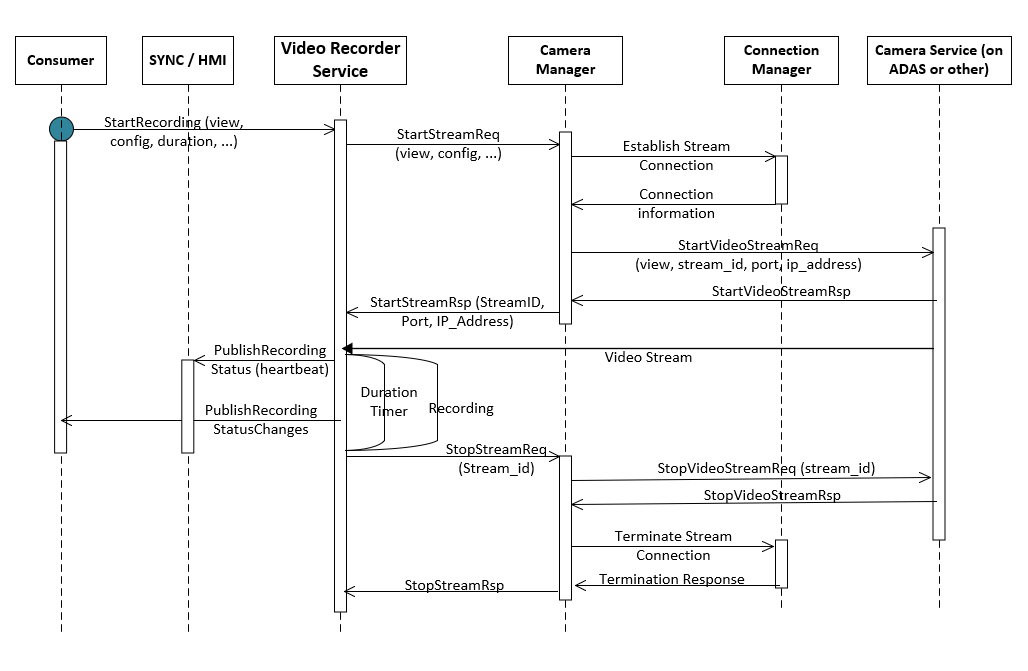
***Response Topic:*** < Consumer Provided >

|  |  |  |  |
| --- | --- | --- | --- |
| **Message Name** | **Data Type** | **Message Element Name** | **Description** |
| StopStreamReq | uint32 | stream\_id | Stream Id that is to be stopped. |
|  | string | client\_id | Client Id of the consumer, for use in power requests to VPSM in order to appropriately remove vote to power the camera controller. |
|  | bool | lazy\_power\_off | When set to true Camera Manager will delay powering off the Camera Controller in case the feature is simply switching between views from the same camera controller. This prevents the camera controller from powering down and back up, and unnecessary delays in providing video streams for the consumer. |
| CameraCommandRsp | enum | resp\_status | Status of request, see RespStatus enum. |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | IR - Interface Requirement |
| **Requirement Revision** | C |
| **Revision Date** | 20-May-2021 14:18 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** | Released |
| **Revision Comments** | Remove reference that protocol might handle. Add sending to video source only after last recipient ends. Added Client ID for use with VPSM and powering controllers.  Added Lazy Off |

# Service Behavioral Diagrams

Below is a sample sequence diagram depicting a video recording request happy path.



# GPB Files (GitHub Links)

Links to GPB Files : [VideoRecorderService.proto](https://github.ford.com/sw-architecture/idl/blob/master/VideoRecorderService/VideoRecorderService)

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision** | **Description of Changes** | **Author CDS ID** | **Date** |
| A | Initial Creation | MKARKARE | 26-May-2020 |
| B | - Metadata for Police Track Data & other  - Clarifications on starting stream with Camera Manager & send config.  - Doc Format improvements per Software Requirement Catalog Project (Rev Hist, intros, VSEM Req Objects, etc.) | MMORR183 | 11-Feb-2021 |

# Configuration Requirements

The Video Recorder Service will require the configuration information listed below to be stored in non-volatile memory or in configuration DIDs.

## DCR-REQ-410444/A-General Configurations

Below is a list of general data configurations that must be maintained in order for   
Video Recorder Service to fulfil the functional and non-functional requirements.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name / Purpose** | **Data Type** | **Size** | **Initial / Default Value** | **Units** |
| Camera\_Time\_Out  The amount of time Video Recorder should wait for a response from Camera Manager. | int | 4 digits | 0800 | milliseconds |
| Camera\_Retry  The number of times Video Recorder should retry sending a request to the camera manager when no response is received back. | int | 1 digit | 0 | N/A |

|  |  |
| --- | --- |
| **Requirement Information** | |
| **Requirement Type** | DCR - Diagnostic Configuration Requirement |
| **Requirement Revision** | A |
| **Revision Date** | 02-Mar-2021 16:06 |
| **Revised By** | Morris, Melissa (mmorr183) |
| **Revision Status** |  |
| **Revision Comments** | Added per ECG Dev Team's request that configuration info. be identified in Spec |