

## Motivation

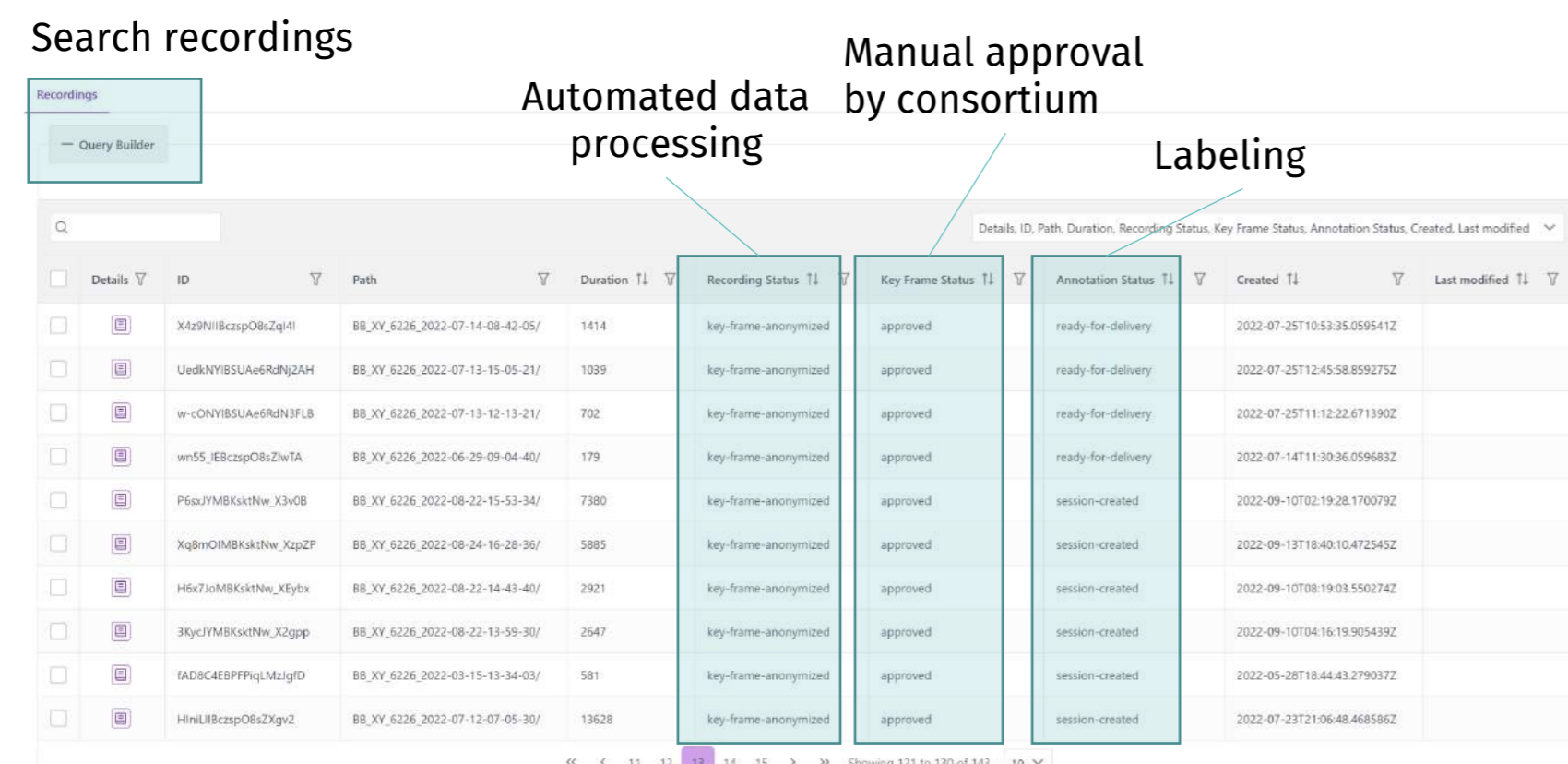
The sensor data that is acquired in the test vehicle must be processed so that it can be labelled and used for training algorithms which are developed in KI Delta Learning. Furthermore, it is required by the GDPR to anonymize data before any further processing can take place. The anonymization therefore also has to take place automatically.

## Overview

The tools for processing the sensor data consist of two parts; the *user interface* allows interacting with the data, while the *pipeline* runs automatically in the background.

## User interface

- Recordings of sensor data shall be available to users for manual approval of keyframes.
- The key features of the user interface are:
  - web-based
  - Convenient browsing of recordings
  - Preview of front-camera
  - Automatic pre-selection of key-frames
  - Approval, deletion and manual selection of key-frames
  - Management of user-groups
  - Sorting and filtering of recordings



ID	Path	Duration [s]	Recording Status	Key Frame Status	Approval Status	Created [s]	Last modified [s]
1414	...	1414	Key Frame unapproved	approved	ready for delivery	2022-07-20T15:03:05Z	
1039	...	1039	Key Frame unapproved	approved	ready for delivery	2022-07-20T15:03:05Z	
176	...	176	Key Frame unapproved	approved	ready for delivery	2022-07-20T15:03:05Z	
1380	...	1380	Key Frame unapproved	approved	ready for delivery	2022-07-20T15:03:05Z	
1385	...	1385	Key Frame unapproved	approved	ready for delivery	2022-07-20T15:03:05Z	
2071	...	2071	Key Frame unapproved	approved	ready for delivery	2022-07-20T15:03:05Z	
2047	...	2047	Key Frame unapproved	approved	ready for delivery	2022-07-20T15:03:05Z	
1341	...	1341	Key Frame unapproved	approved	ready for delivery	2022-07-20T15:03:05Z	
13024	...	13024	Key Frame unapproved	approved	ready for delivery	2022-07-20T15:03:05Z	

Figure 1: Overview of the recordings metadata (© Luxoft)

The overview of sensor data with related metadata is shown in Figure 1. It shows for every recording its duration, date of creation and states of processing.

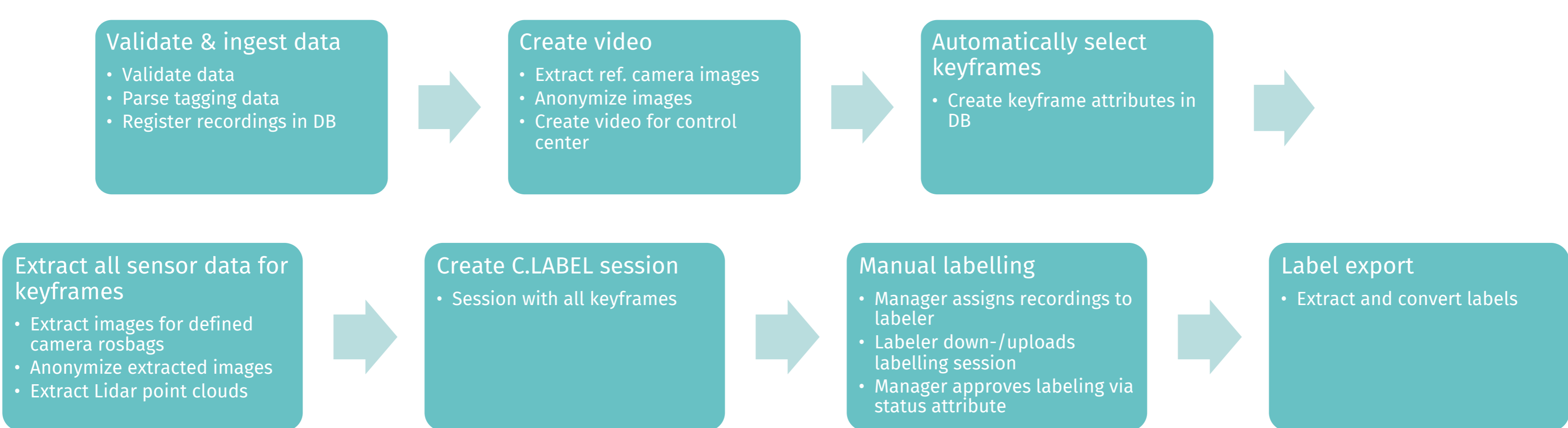


Figure 3: Pipeline for automatic processing of sensor data (© Luxoft)

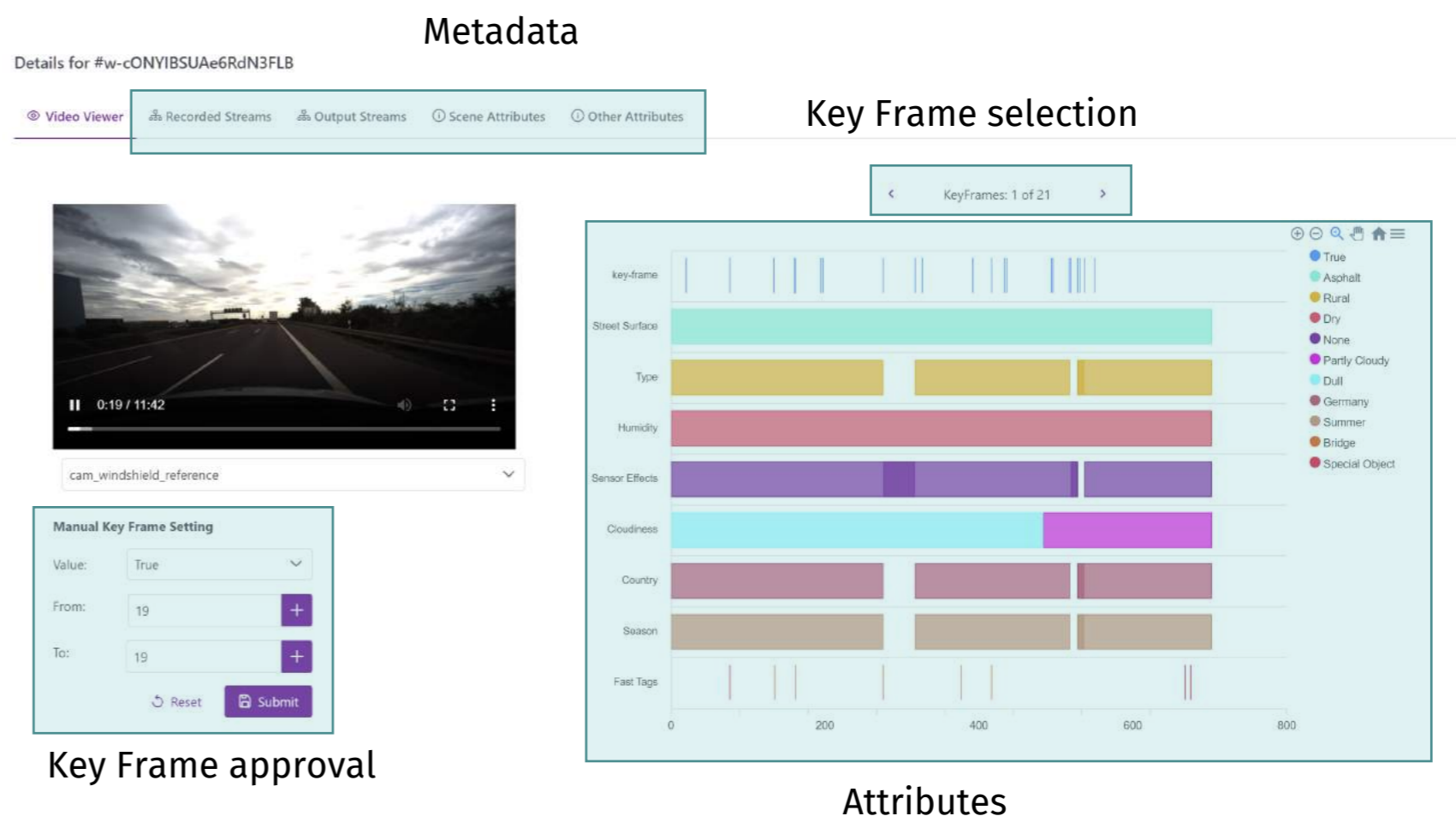


Figure 2: User Interface for the keyframe approval (© Luxoft)

The keyframe selection & approval section shows the preview of the front camera and an overview of attributes over time. This allows the user to quickly evaluate the recording, browse through the key frames, and approve them. This is shown in Figure 2.

## Pipeline

The pipeline for data processing contains the following sequential operations, which are shown in more detail in Figure 3.

- Validation and ingestion of data
- Video creation, including anonymization
- Automatic keyframe selection
- Extraction of all sensor data for selected keyframes

Anonymization with a Gaussian filter is applied to vehicle number plates and human faces, to blur the image without distorting it.

The keyframes are then made available in a proprietary tool (C.LABEL) for manual labelling by experts.

On the technical level, the pipeline is using Docker containers for each processing step, which are deployed on a Kubernetes cluster.

## Partners



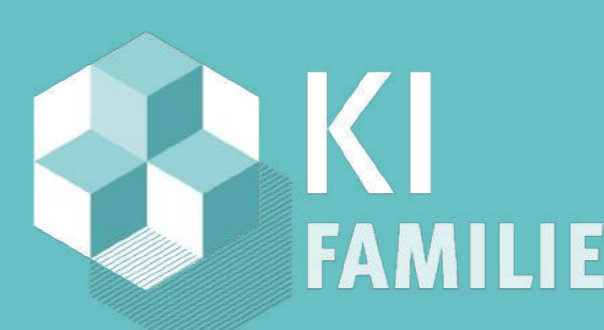
## External partners



## For more information contact:

dennis.neumann@dx.com  
christian.koenig@dx.com

KI Delta Learning is a project of the KI Familie. It was initiated and developed by the VDA Leitinitiative autonomous and connected driving and is funded by the Federal Ministry for Economic Affairs and Climate Action.



Supported by:



on the basis of a decision by the German Bundestag