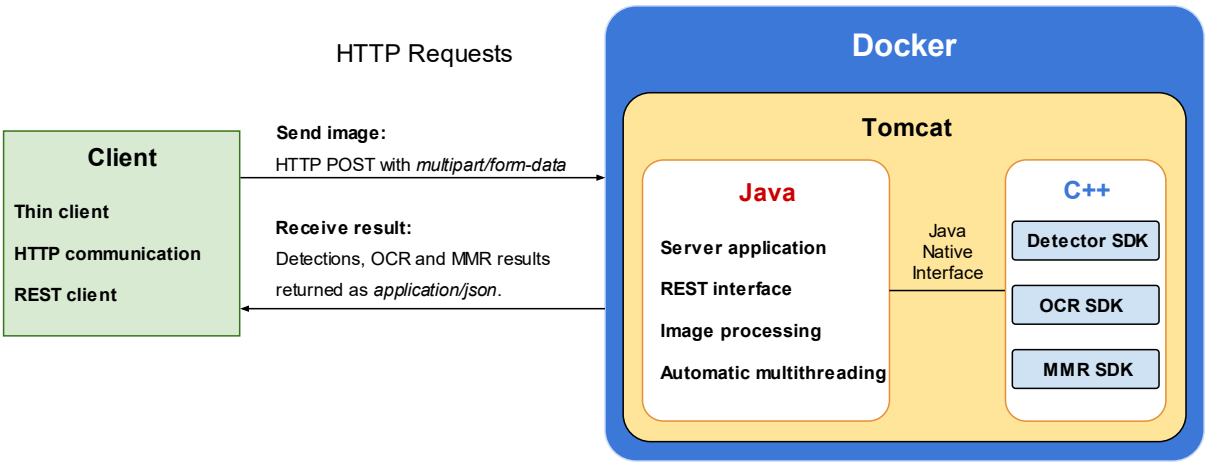
MMR+ANPR REST Server 4.1

Technical Specification



Description

- **Client-Server** architecture with **REST API** written in **Java**.
- The server accepts input images (**JPG**, **PNG**, **BMP**) and returns processing results:
  - Detected road users and their components (bounding boxes, plates, windshields)
  - Type and text of detected plates (OCR)
  - Vehicle classifications (MMR)
- **Input** image is supplied to the server using **HTTP POST** request:
  - The content type is ***multipart/form-data***
    and the image file data is contained as a parameter.
  - Optionally, the request may contain positions of road users (manual detections)
    and the specification of the requested analyses.
- **Output** road user detections, OCR texts and vehicle classifications:
  - Returned as ***application/json*** media type.

Technologies

- System running as **Docker** image allows scalability.
- Application running on **Tomcat** web server.
- Application itself is written in **Java** and uses **JNI** (Java Native Interface)
  for communication with image processing SDKs.
- Image processing SDKs are written in **C/C++**.

Contained SDKs

- **LPM SDK**
  - Box (vehicle), plate and windshield detector running on input images.
  - Plate OCR running on detected plates.
- **MMR SDK**
  - Vehicle classification (view, category, make, model, generation, variation, color, and tags recognition) running on detected license plates or vehicle boxes.
- All current SDKs support GPU computation.

Supported Operating Systems

- **Linux**
  - Ubuntu 18.04 and higher – x86_64 platform

Minimal Hardware Requirements

- Processor: 2 GHz, 2 cores (e.g., Intel Core i5)
- RAM: 4 GB
- Hard disk: 8 GB free space
- GPU (optional): NVIDIA Driver version >= 410.48 compatible (e.g., GeForce GTX 1050 Ti)

Performance

For the performance test, the following configuration was used:

- CPU – processor Intel® Core™ i5-9400F @ 2.90 GHz, 32 GB RAM
- GPU – graphical card NVIDIA® GeForce® RTX 3090 Ti, 24 GB GDDR6X
- 1000 images, Full HD resolution (1920 x 1080 pixels)
  - 1000 detection tasks, 1040 OCR tasks, 1102 MMR tasks
  - Detections: 1102 road users (1037 boxes, 1040 plates)
- Parallel processing
- Default SDK configuration
  - Fast Detector: LPM module 802 (802-generic.gen-gen-v7.9, all object types)
  - Precise Detector: LPM module 803 (803-generic.gen-none-v7.3, all object types)
  - OCR: LPM module 801 (801-generic.gen-gen-v7.11, global)
  - MMR: precise VCMMGVCT with BOX preference (MMRBOX_VCMMGVCT_PREC_2024Q2.dat / MMR_VCMMGVCT_PREC_2024Q2.dat)
  - 1 processing thread per SDK

The following table summarizes the average processing time of the input file depending on the requested tasks and the processing unit.

Tasks	GPU [ms]	CPU [ms]
Fast Detection	9.9	45
Fast Detection + OCR	10.2	52
Fast Detection + MMR	11.7	790
Fast Detection + OCR + MMR	12.9	791
Precise Detection	14.1	330
Precise Detection + OCR	14.3	335
Precise Detection + MMR	16.7	794
Precise Detection + OCR + MMR	18.7	799
OCR	5.3	36
MMR	8.4	772
OCR + MMR	9.7	773