VCA-Bridge

Using GStreamer for Video Analytics

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Who I am

- Software Developer
- From Galicia (Spain)
- Working at VCA Technology (London)

- Video Analytics Software for Video Surveillance
Video Analytics Software (VCA5)

Focused on **Intrusion Detection** and **Counting**

- Intrusion detection
- Shake cancellation
- Tamper detection
- Enter & exit filters
- Appear & disappear filters
- Stopping filter
- Tailgating filter

- Dwell filter
- Direction filter
- Object counting
- Intrusion & occupancy filters
- Speed filter
- 3D calibration for consistent classification
● Home-made device that provides an **all-in-one solution** for analysing video streams from different sources.
Use Cases

VCA-Bridge

- Video in (RTSP)
- Video with metadata out (HLS)
- Video with metadata out (RTSP)
- Alerts with snapshots out (SMTP)
Firmware

● Build with:
  ○ Linux Kernel
  ○ Busybox
  ○ Glibc
  ○ Systemd
  ○ Gstreamer 1.8.3 (with VA-API plugins)

● Analytics Software:
  ○ VCA-Core (home-made video analytics web server)
Hardware

● Specifications:
  ○ 4GB of RAM
  ○ CPU Intel Core i3-5010U
    ■ 2 Cores
    ■ 3M Cache
    ■ 2.10 GHz
  ○ GPU Intel HD Graphics 5500

● Limitations
  ○ 4 channels @ 1080p 30fps
  ○ 8 channels @ 720p 30fps
  ○ 16 channels @ D1 30fps
Third Party Devices

- Porting the firmware to many different devices:
  - Ambrella S2
  - HiSilicon 3516
  - Raspberry Pi
  - TI Davinci series
  - Qualcomm Snapdragon

- Need to write hardware encoding/decoding gstreamer plugins for those devices
Web UI

- Polymer framework
- HLS for video streaming
- No plugins needed
- Supported on multiple browsers:
  - Chrome
  - Firefox
  - Safari
  - Edge
  - Internet Explorer
Demo
Gstreamer Pipeline

Input section:
- Input
- Decodebin

Analytics section:
- VCA5
- BIA

Output section:
- HLS
- RTSP
- Snapshot
Input Section

- Decoders (Decodebin):
  - RTSP (H264 and Jpeg)
  - File (AVI, MP4, MKV...)

- Gstreamer VA-API plugins for hardware acceleration
Analytics Section

- **VCA5 element**
  - Reads video frame
  - Adds metadata using the libvca5 library

- **BIA element**
  - Reads the metadata from the coming frame
  - Draws metadata in the frame
● Encoders (on-demand):
  ○ H264 (HLS and RTSP server)
  ○ JPEG (Snapshots)

● Gstreamer VA-API plugins for hardware acceleration
Issues we faced

- HLS stops generating segments when seeking
  - Something wrong with the keyframes and multifilesink
  - Solved by stopping and playing again the pipeline
- RTSP Deadlock (metadata?)
  - Seems to only happen with RTSP sources coming from VLM with metadata
- Pipeline might not play again (decodebin?)
  - Playing -> Null -> Playing -> Null -> Playing ...
  - Only with RTSP sources
  - Solved by destroying decodebin and creating it again
Future plans

- TCP events
- Logic rules
- Multi-channel rules
- Improve latency (Use webRTC instead of HLS)
- Improve performance
  - Split VCA5 plugin into different plugins (1 per algorithm)
  - Share encoders
- Desktop notifications
- Improve stability