OPEN AI + DATA FORUM @ THE LINUX FOUNDATION OPEN SOURCE SUMMIT NORTH AMERICA

Computer Vision to Secure your Surroundings with AI/ML Solution Built using Open-Source Tools at the Edge

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Speakers & Team

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Introduction

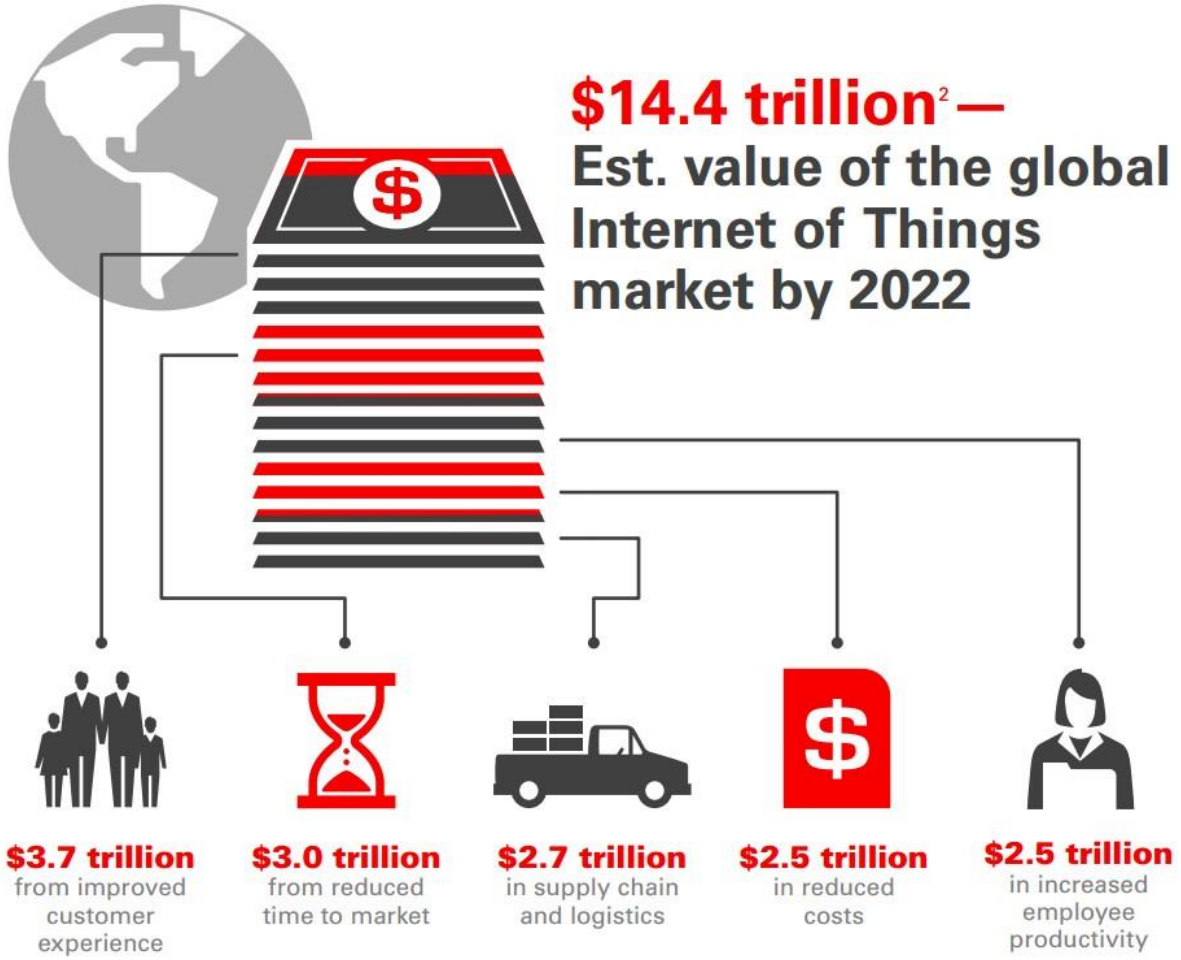
Internet of Things (IoT)

INTERNET OF THINGS IS A GROWING WEB OF NUMEROUS DEVICES THAT ARE INTERCONNECTED AND INTERACTING

NUMBER OF "THINGS" GETTING INSTALLED AND CONNECTED IS GROWING

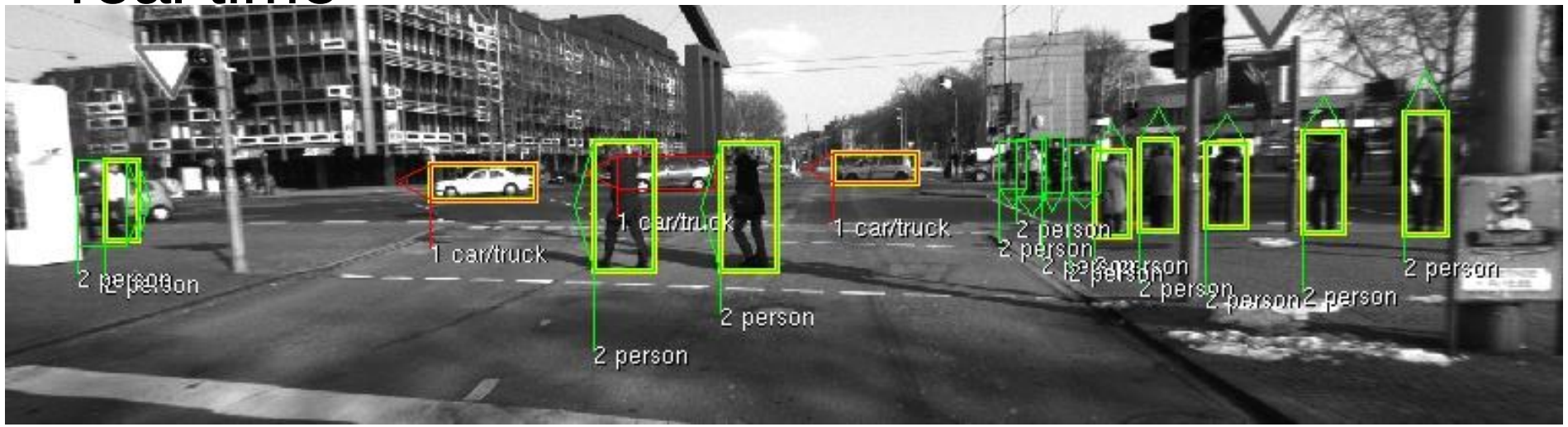
Growth of IoT

- New and innovative markets
- Increasing industry support
- Strong drivers:
  - Cheaper and fast processors and wireless networks



Growth of Computer Vision (CV) Applications

- Camera is the ultimate “Thing”
- CV + AI = “Eye of IoT”
- Smart city/home require the Smart Eye
  - System to detect, track, and analyze objects in real time



Smart City Use Case

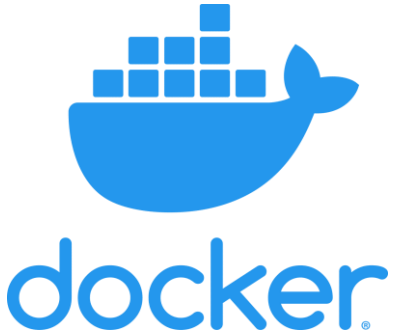
- Focus on improved city safety
  - Reduction in crime
  - Engaged safety officials
  - Edge analytics for better AI performance
- Deployment pain points:
  - Poor AI performance
  - Robustness of architecture
  - High Capex / maintenance

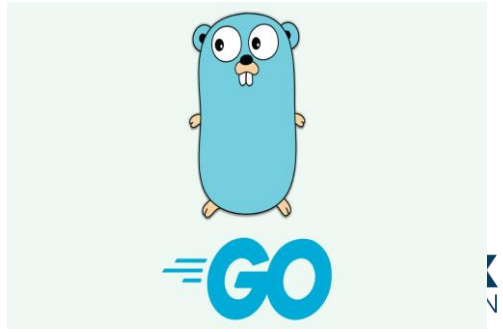
Project Objective

Project Objective

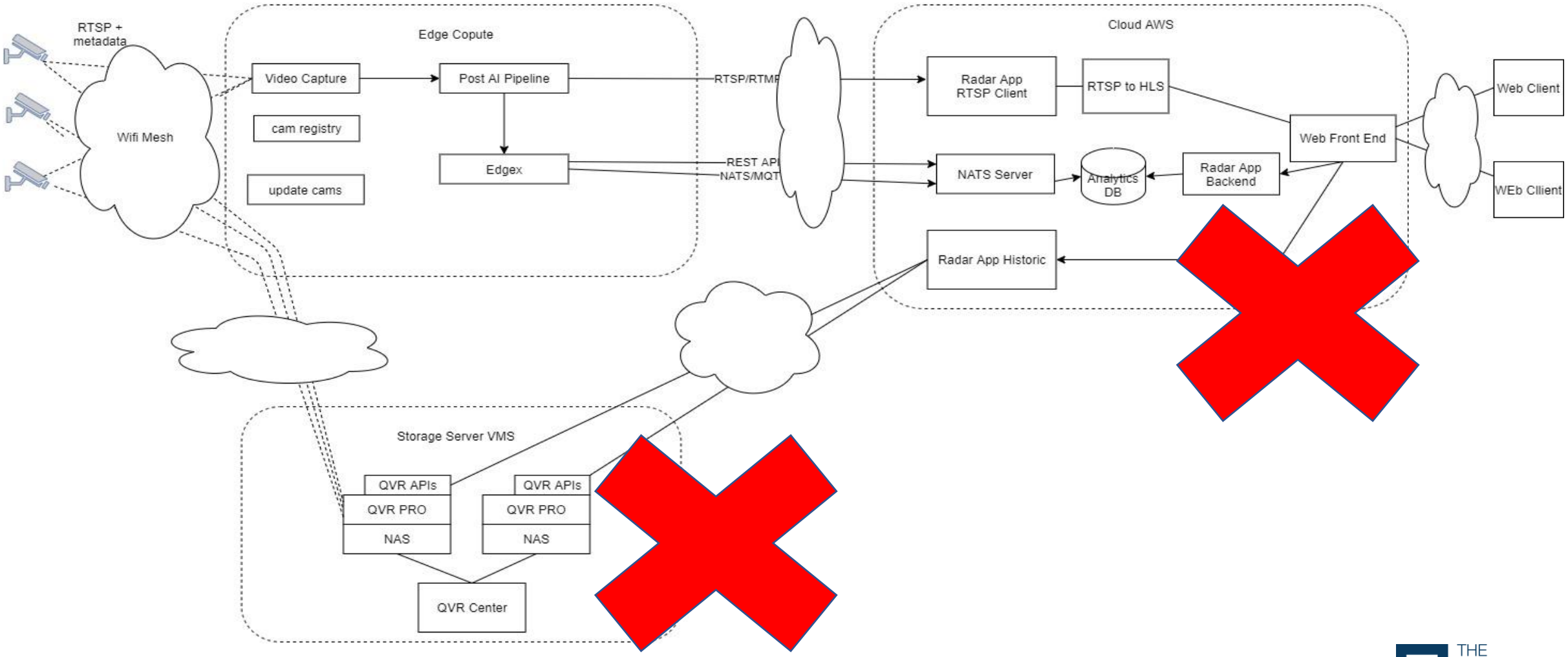
- Security as a Service Reference Implementation using Open-Source Software
- Situational awareness, property security and management
- AI-Assisted, Multi-Camera Solution of vehicular and walkway traffic
- Microservices & Containerized

https://intel.com/edgesoftwarehub



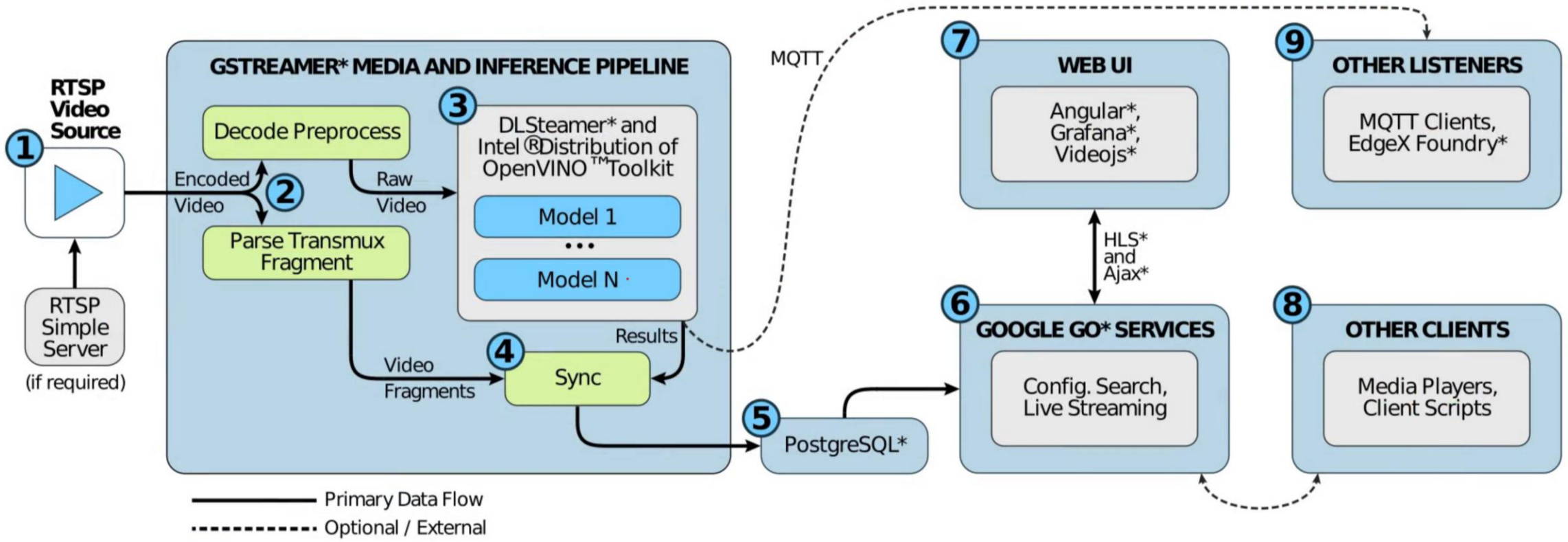


Smart City Solution using AI/ML



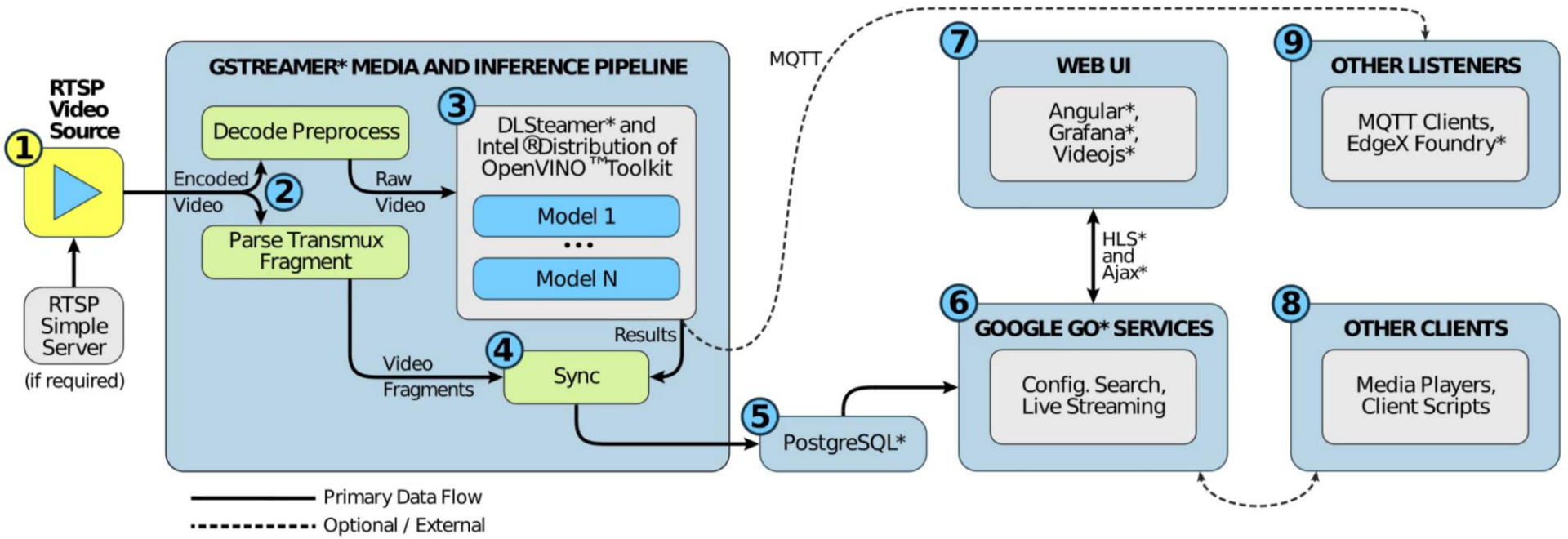
Architecture

Smart City Architecture



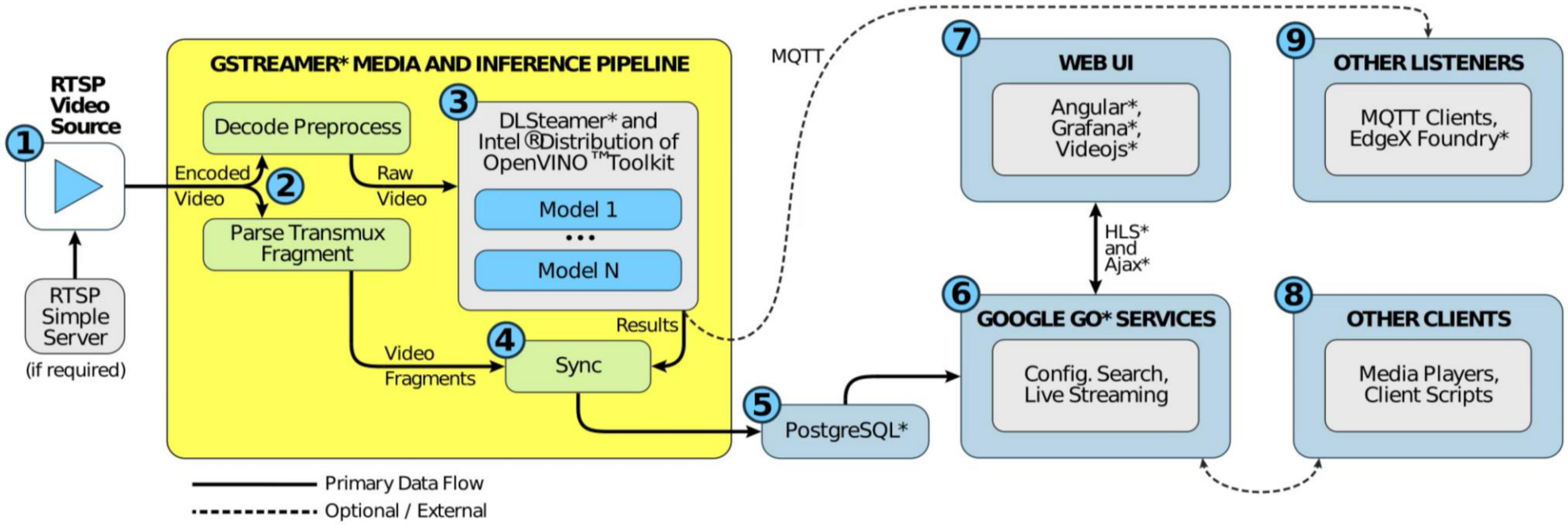
Architecture – Video Source

- RTSP Simple Server:
  - Ready-to-use RTSP server and proxy for video/audio streams
  - Handles, processes, and publishes multiple video streams
  - Serves prerecorded video clips to demonstrate E2E functionality



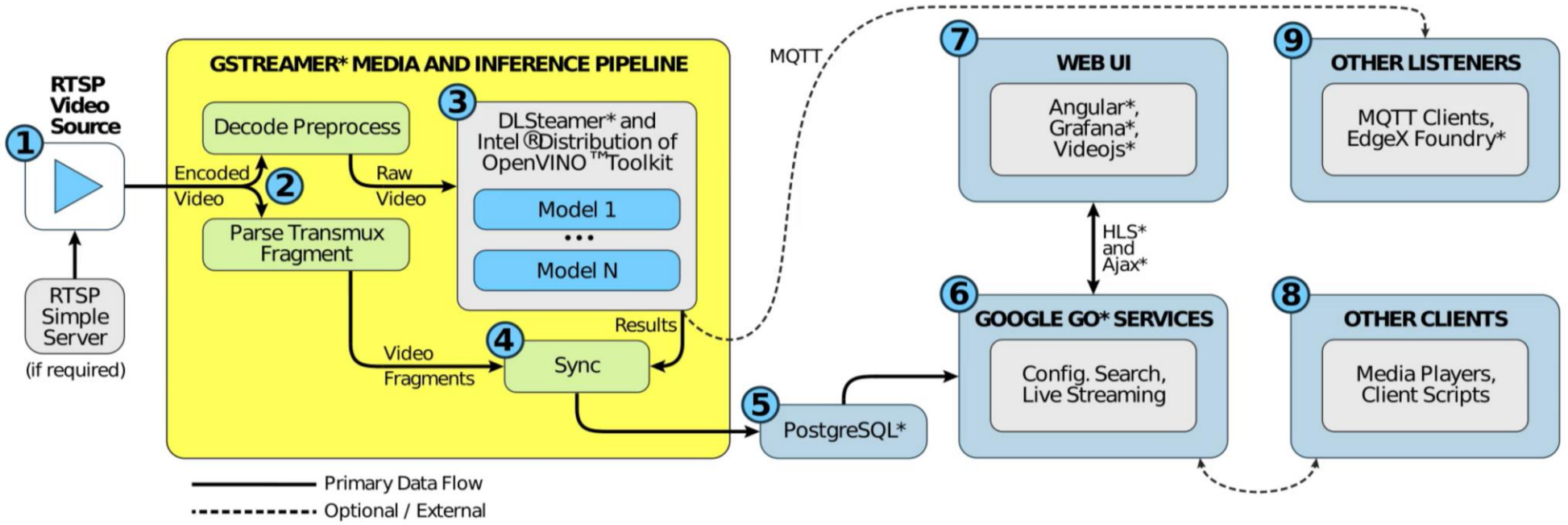
Architecture – Multimedia Framework

- GStreamer Multimedia Framework:
  - Handles file format conversions, processes, and workflows
  - DLStreamer: GStreamer plugin for OpenVINO Inference Engine



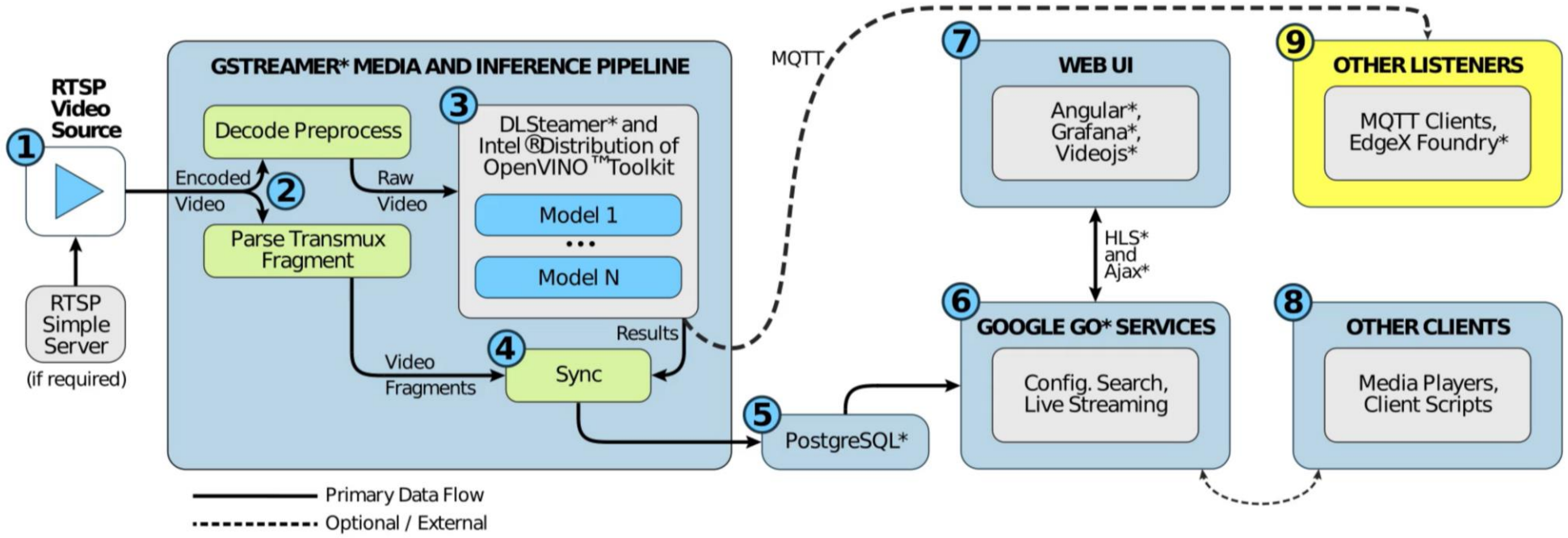
Architecture – OpenVINO Toolkit

- OpenVINO Inference Engine:
  - Create ROI for inference output
  - Configure pre/post processing steps
  - DLStreamer tells IE to load weights / models into IR format



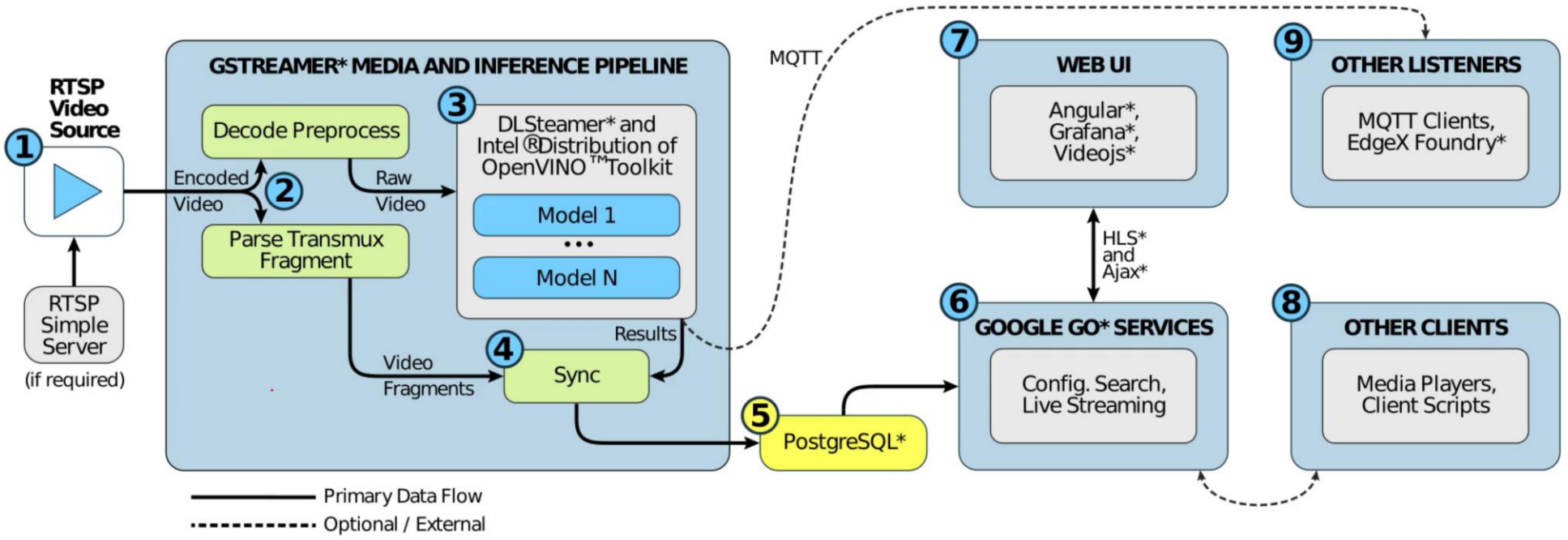
Architecture – Additional Listeners

- EdgeX Foundry:
  - Hosted by LF
  - Framework for industrial IoT edge compute
  - EdgeX instance and MQTT broker



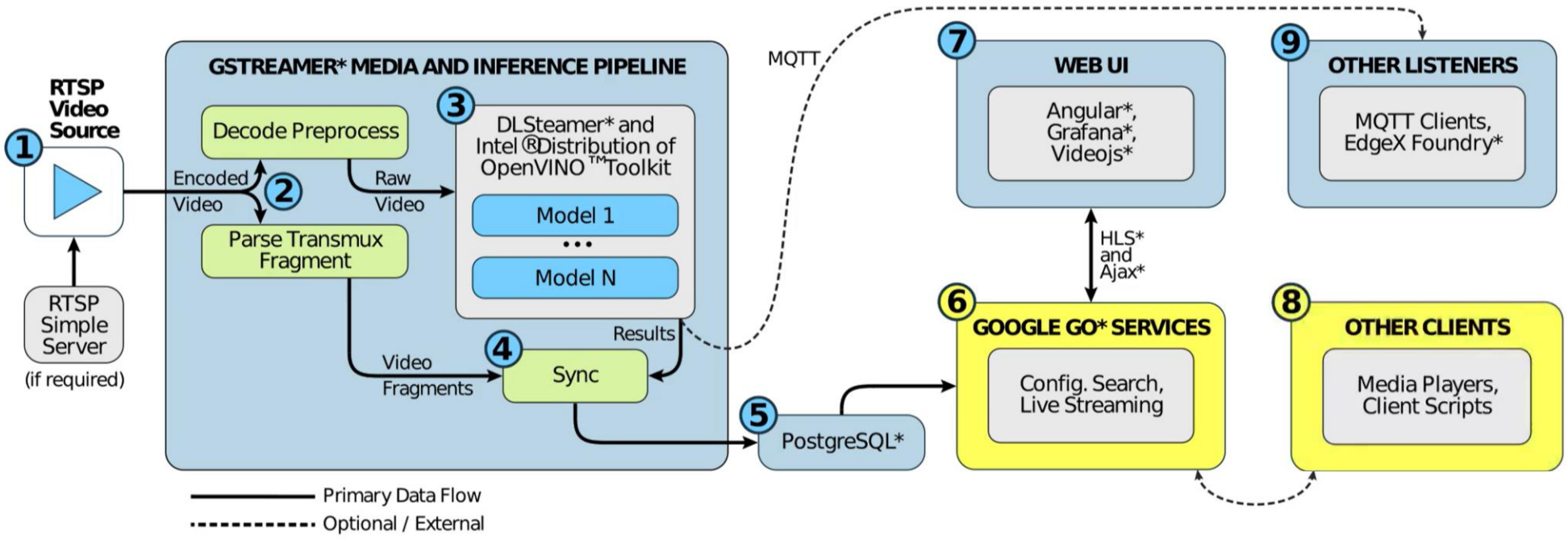
Architecture – Data Management

- PostgreSQL Database:
  - Store both video feeds and related metadata
  - Declarative Partitioning = performance benefits + simplified admin tasks



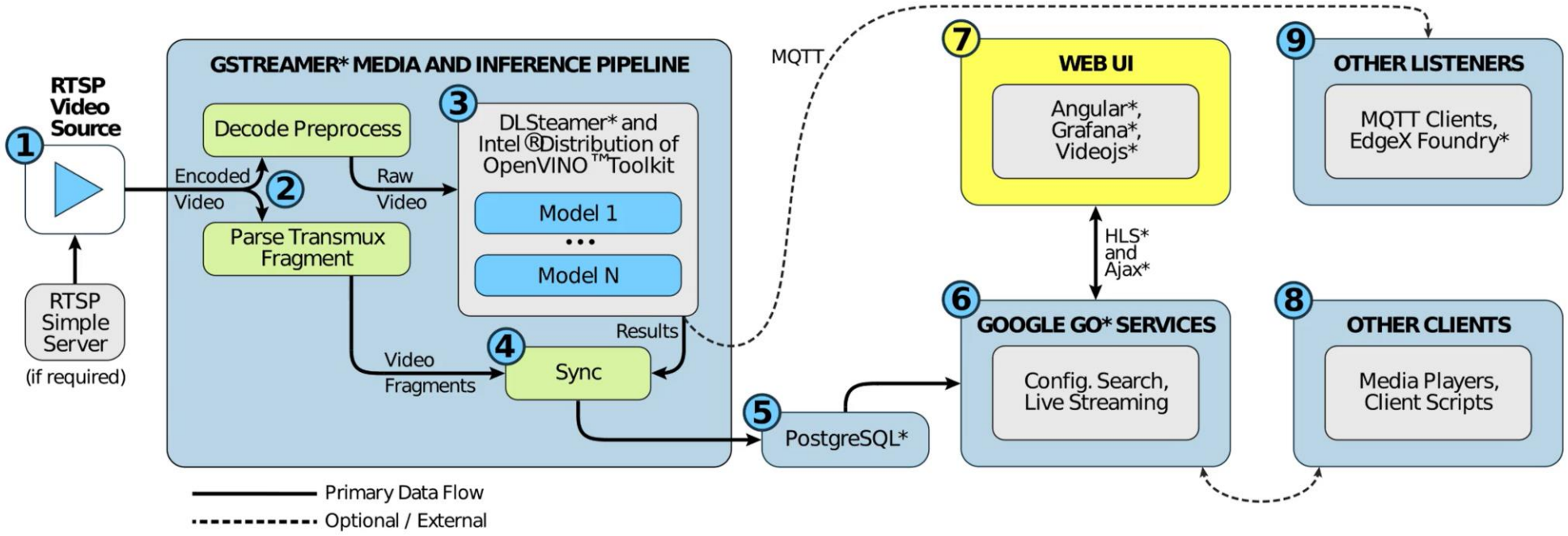
Architecture – Backend APIs

- Go Microservices:
  - Consumed primarily by web UI
  - Configure cameras, search inference results, perform live streaming operations



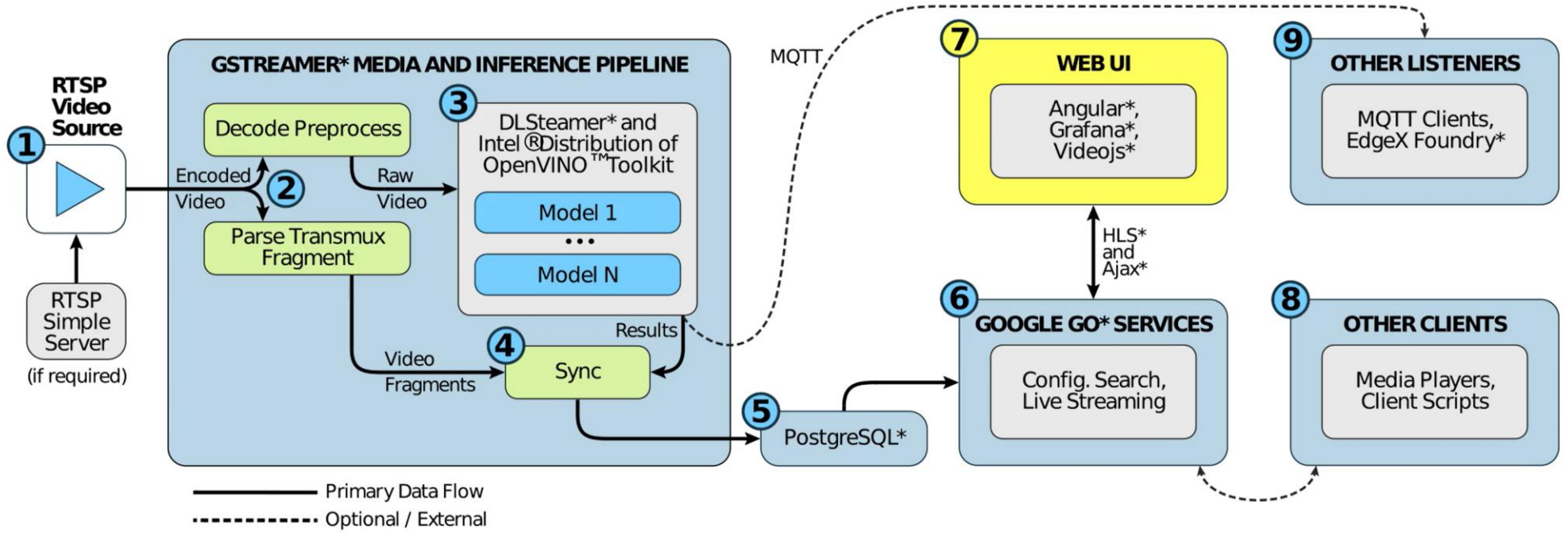
Architecture – UI

- Angular UI:
  - Live and recorded videos displayed using VideoJS
  - Multiple UX features to customize inference results

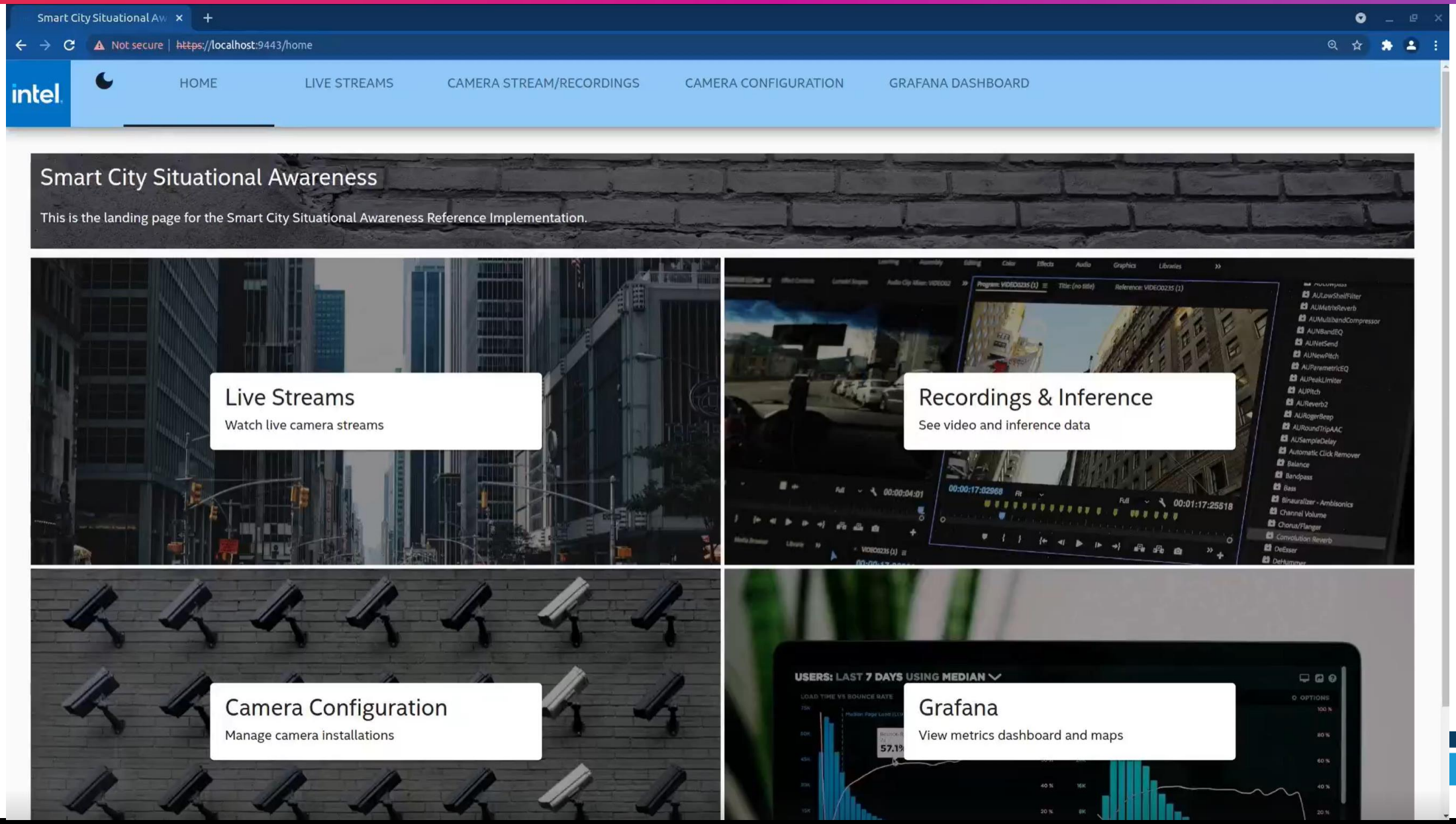


Architecture – Edge Device Display

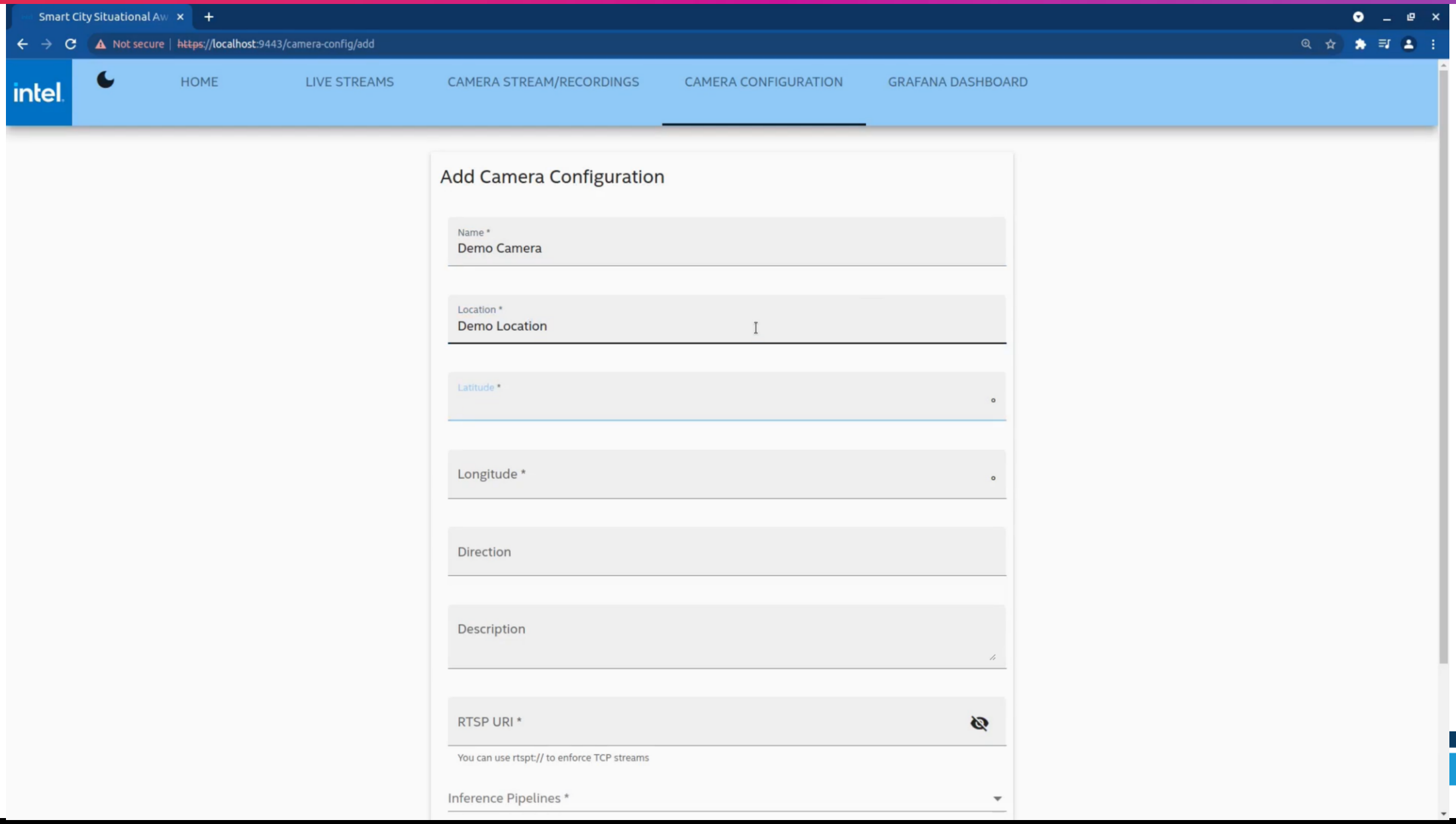
- Grafana Dashboard:
  - Data visualizations, insights, and metrics
  - Preconfigured dashboards and plugins



Smart City UI – Landing



Smart City UI – Camera Configuration



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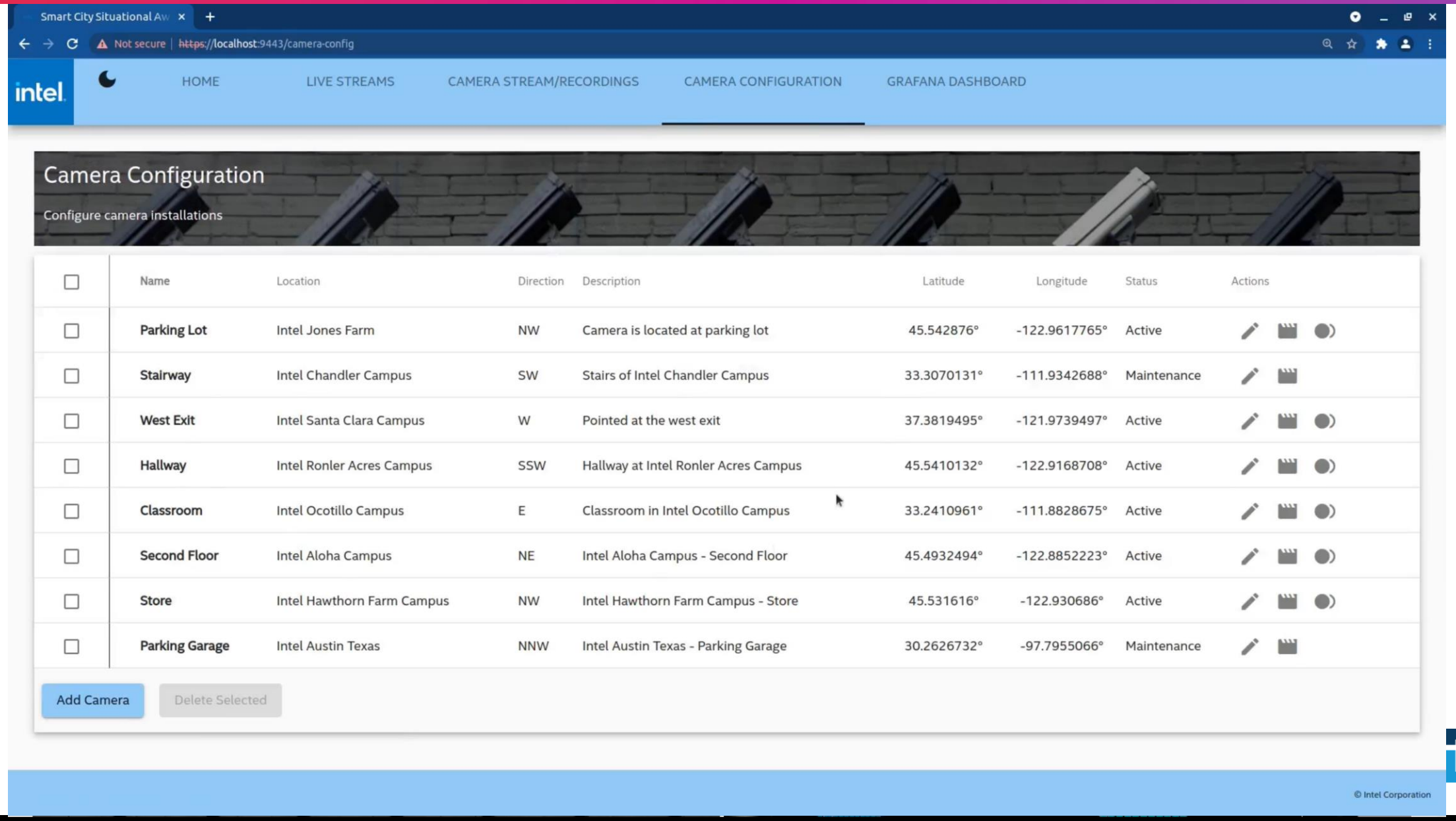
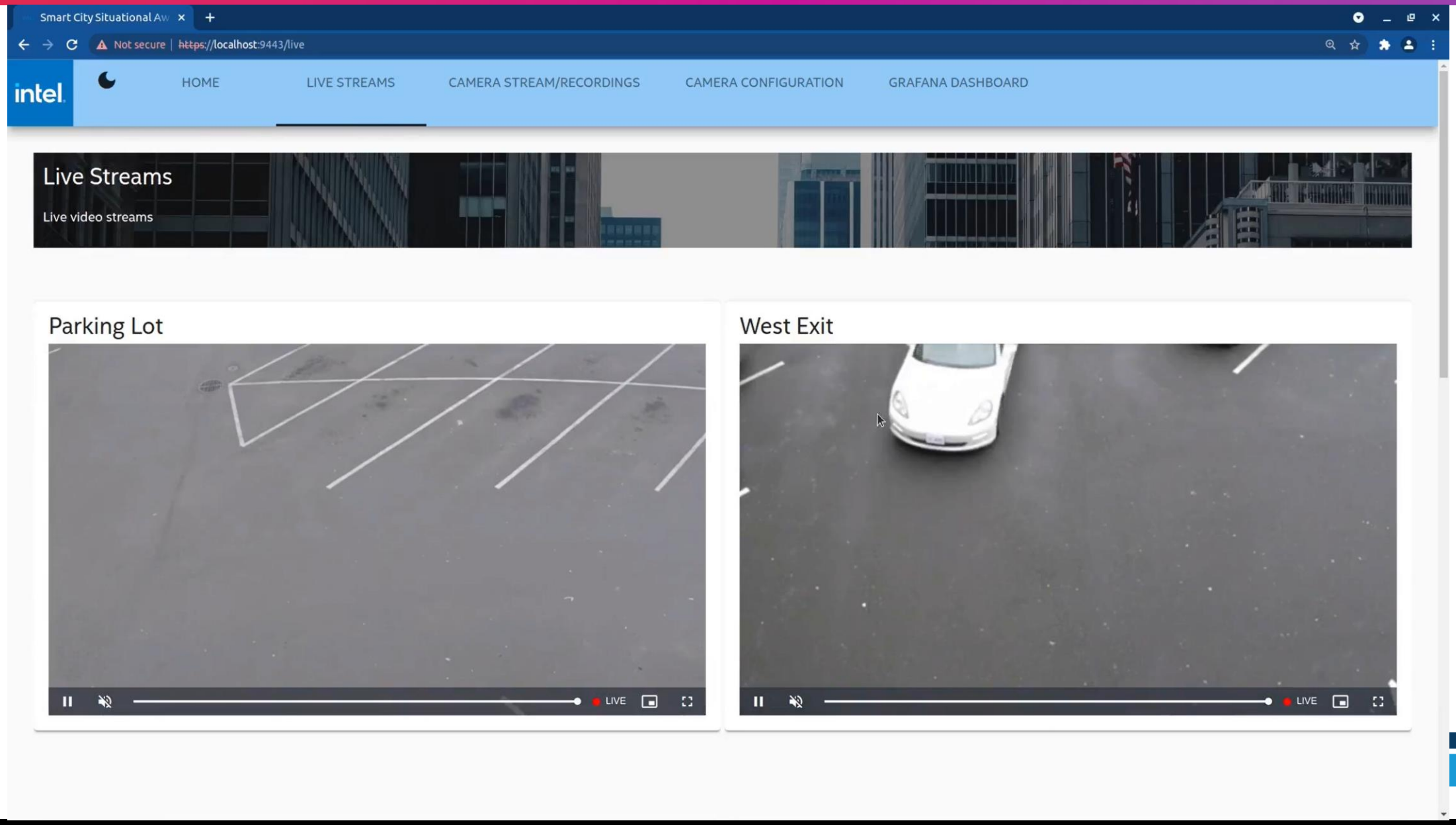
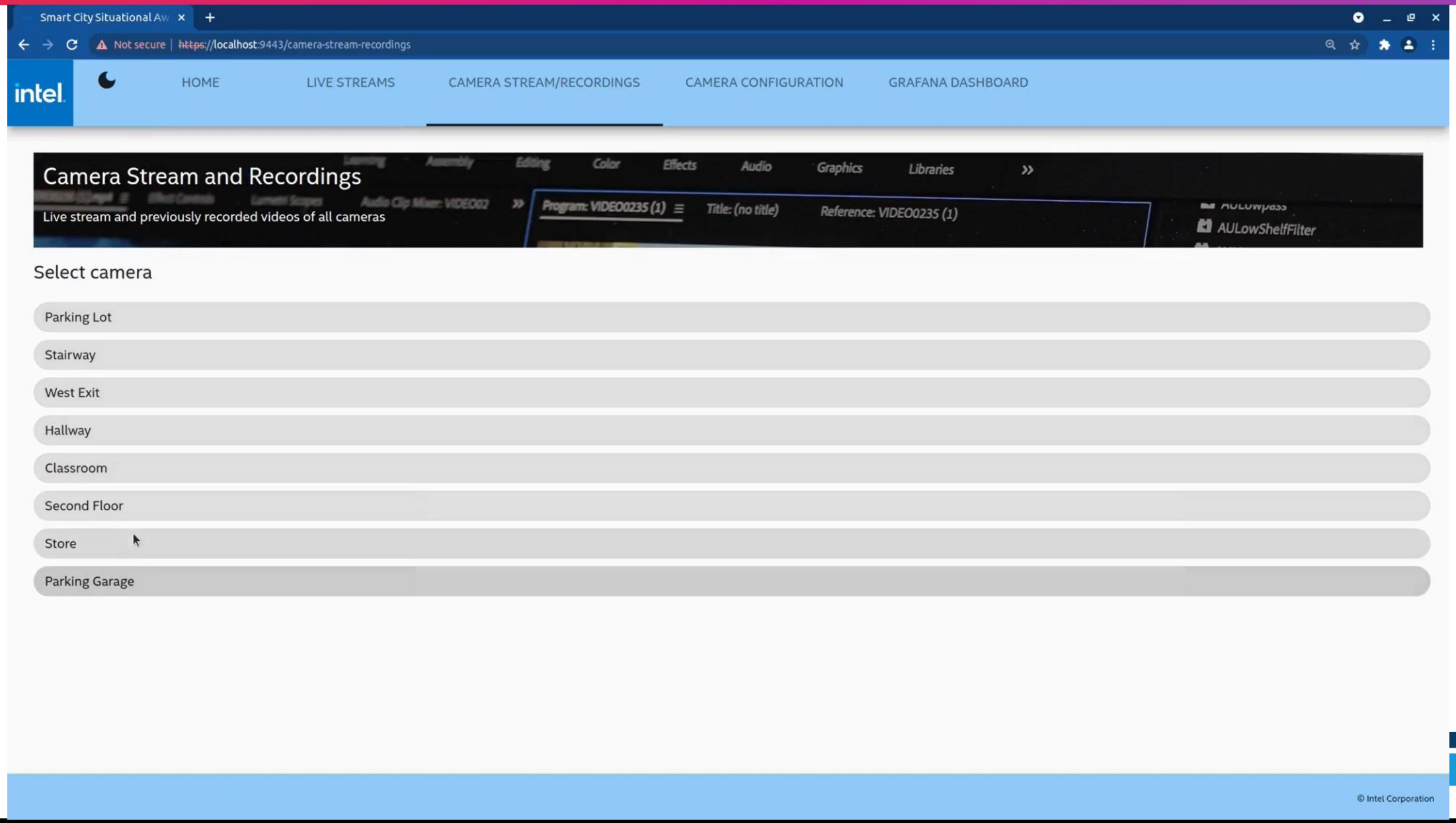


Smart City UI – Live Streams



Smart City UI – Recordings



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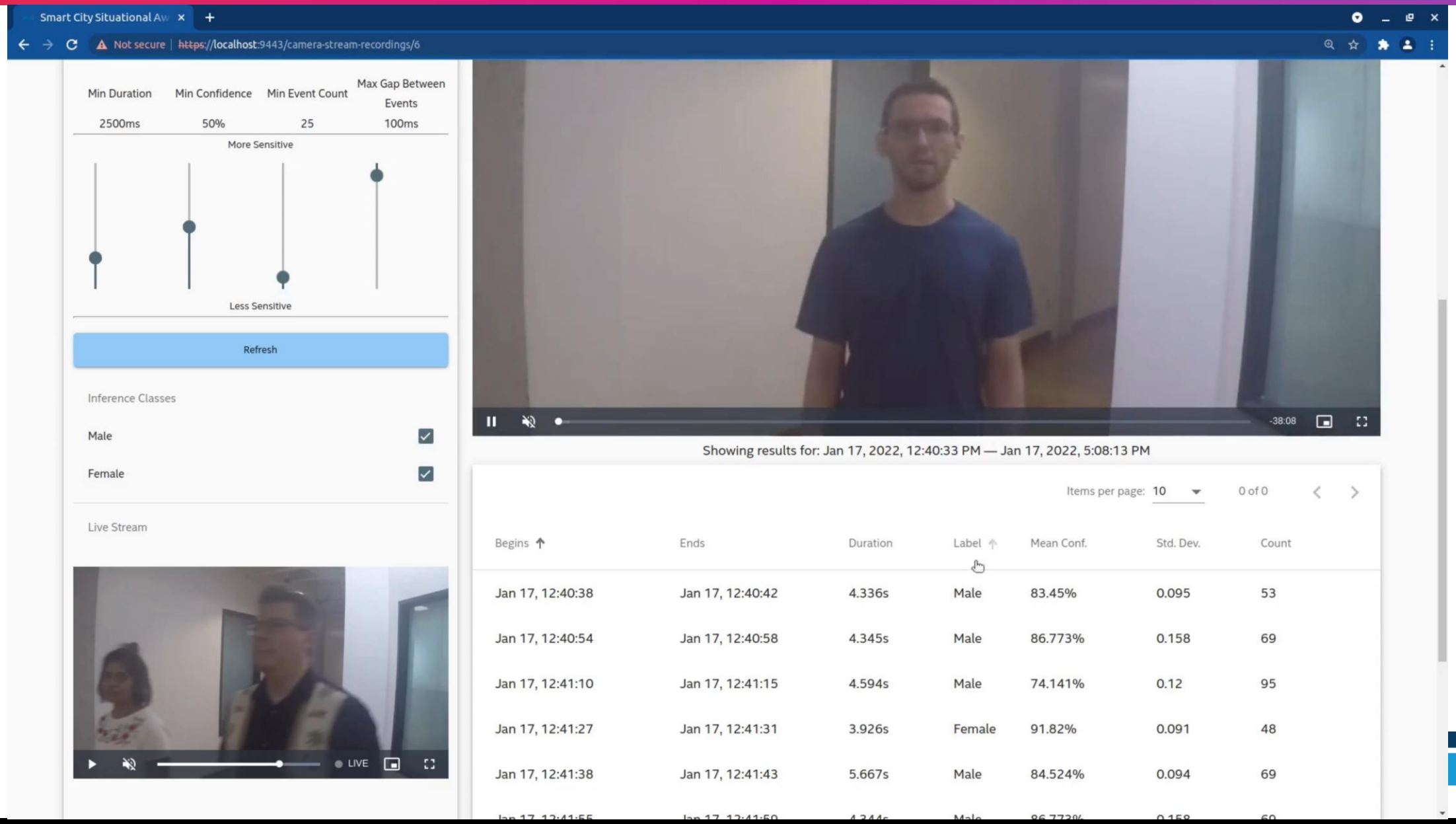
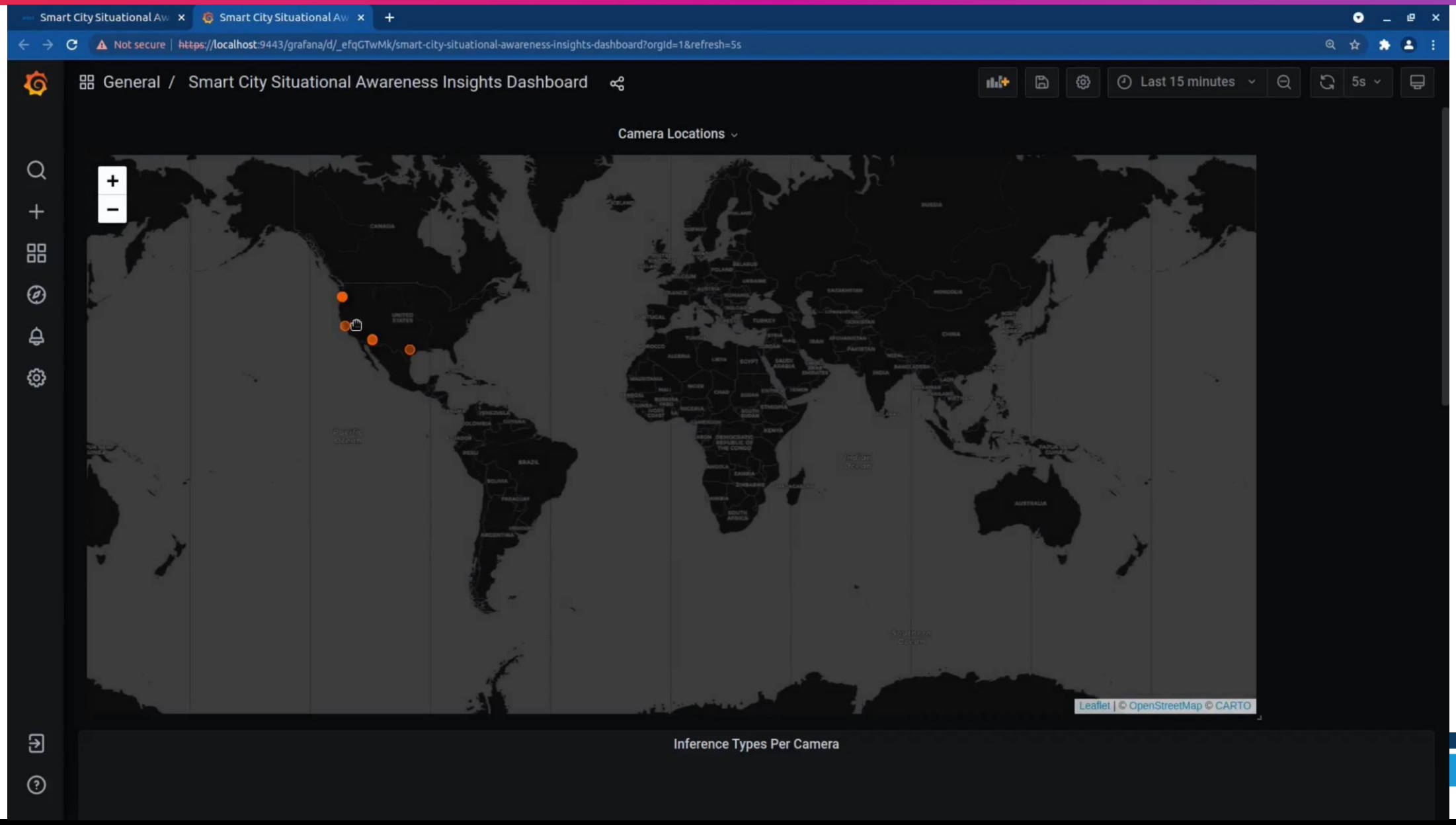


Smart City UI – Grafana



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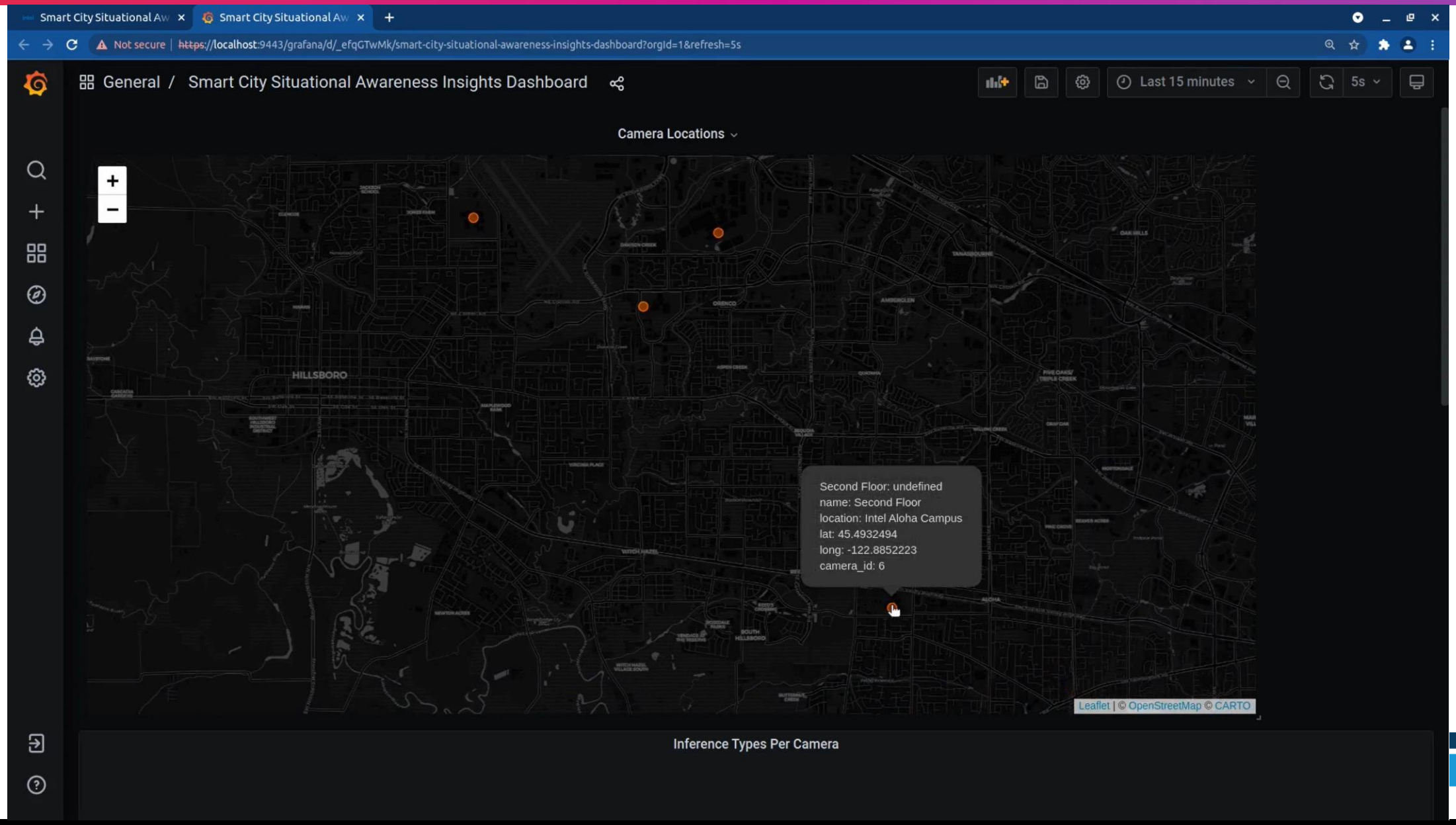

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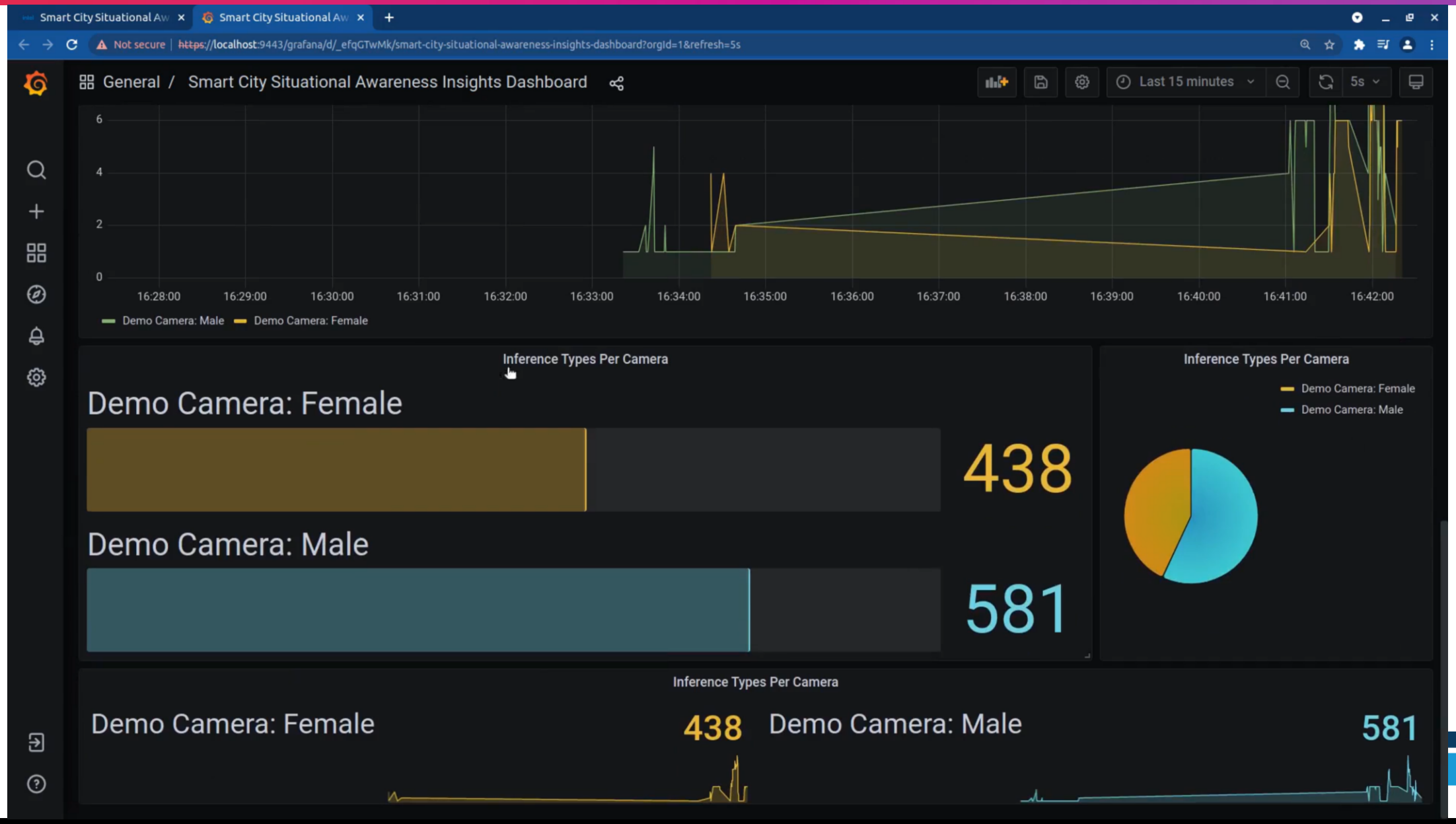

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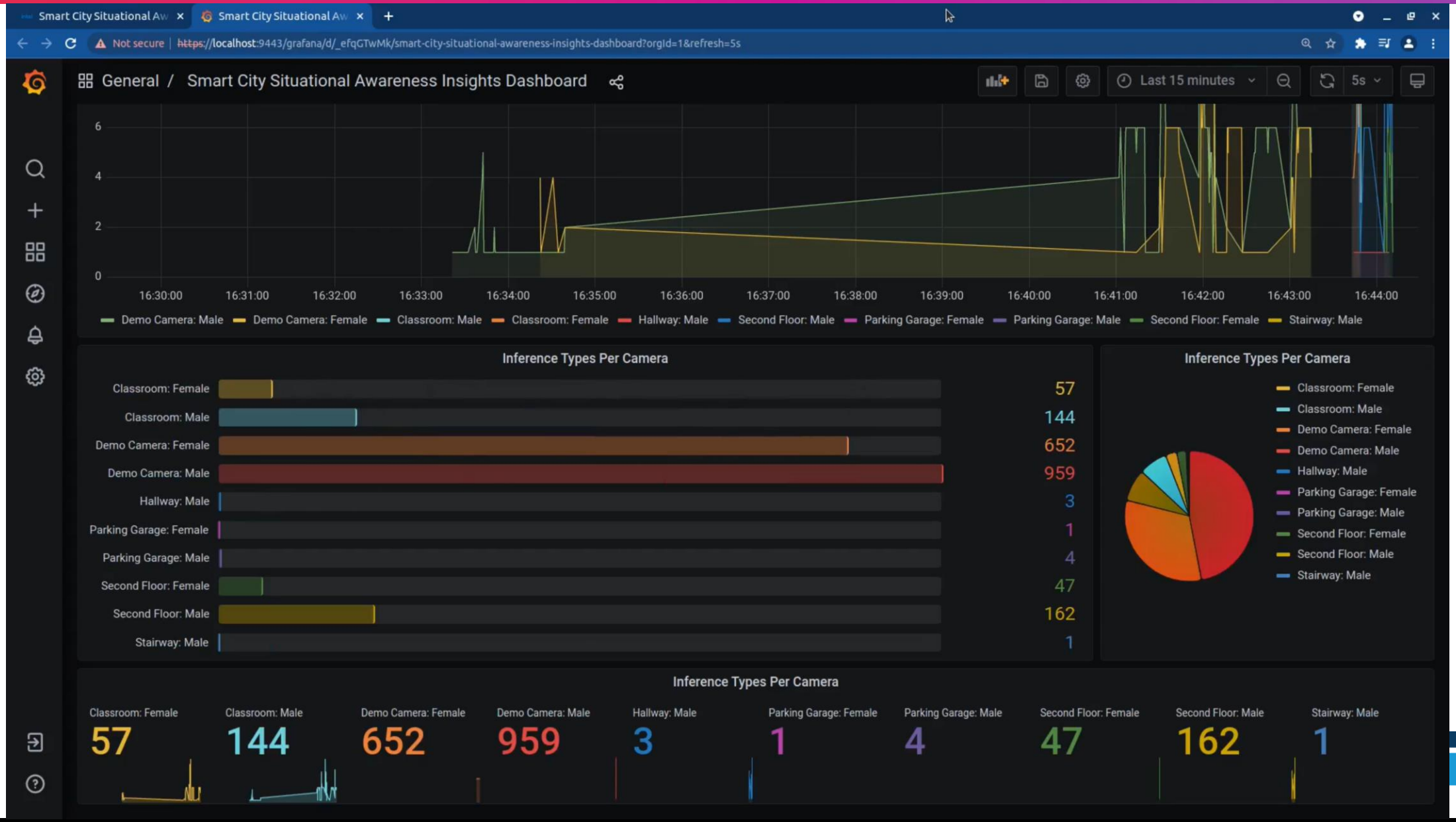
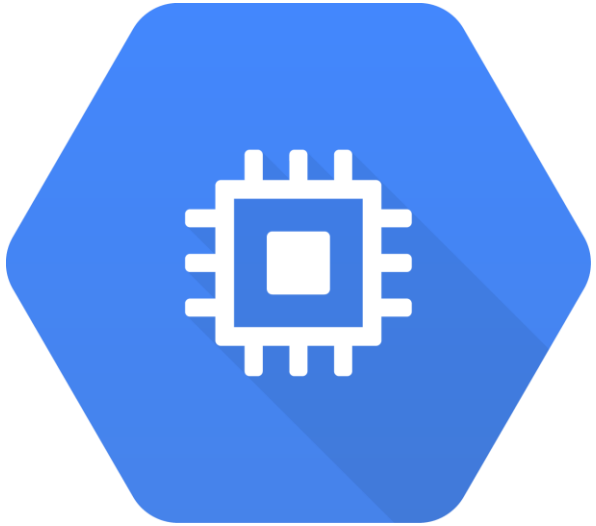


Challenges & Learnings

Challenges at the Edge

- Resource Constraints
  - Storage & Compute
  - Frequent Backup from Edge to Cloud/On-Prem Storage
  - Hardware Benchmarking



Challenges at the Edge

- Data Management
  - Record incoming data streams
  - Inference the video frames and store the results
  - Recorded data availability via a web browser/HTTP
  - Support maintenance tasks

VS

Challenges at the Edge

- Security Hardening
  - Resource Authorization
  - Service Authentication
  - TLS Encryption
  - RTSP URI Encryption
  - Vault Provisioning
  - Obscure sensitive information on UI

Ethical Considerations

Ethical Considerations

Thank You

Questions ?

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