

IUDX: Serving Video Data

High Level Requirements and Architectural Issues

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Motivation

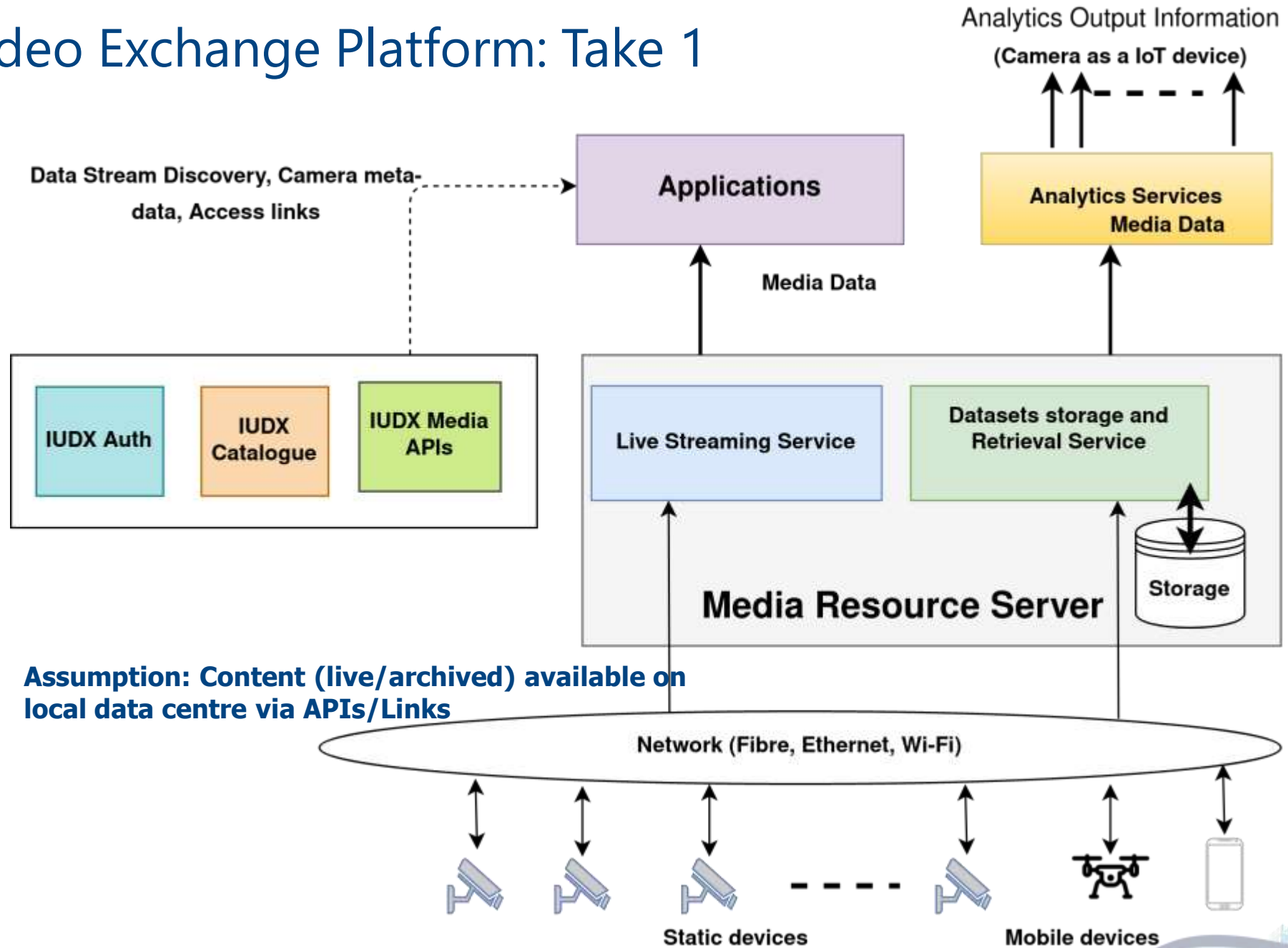
- Cameras are key data resources for smart cities
- Potential to touch all the aspects of daily urban life
 - Automated Surveillance, Intelligent transport management systems, Traffic management systems, Smart parking systems
- No framework for video data sharing
 - Application developers
 - Other public/private entities

Enable diverse new applications by adopting an API based platform approach towards exchanging and consuming video and video metadata

Video Exchange: High Level Requirements

- Ability to serve live video streams to consuming applications
- Ability to serve offline video content (files)
 - Training and learning
- Framework to serve derived meta-data/semantic summaries for the available video content
 - Indexing information, annotations for video and image files
 - IoT type feeds providing analytic outputs for a given live stream (IoTifying Video)
- Authorized and authenticated access mechanisms
- Video data secured in transit
- In-built mechanisms for privacy preserving data exchange
 - Anonymizations
 - Mechanisms to enable applications without serving raw data

Open Video Exchange Platform: Take 1



Video Exchange Platform: Some questions

- Where should the media server be located ?
 - Cloud vs Local Data Center ?
 - Minimize infrastructural involvement from the cities ?
- Strategies for what offline data should be made available ?
 - Sampled live streams ?
 - Annotated video datasets ?
- Should stream processing capabilities (multiple bit rate streams, multiple frame rates, multiple formats etc.) be part of the exchange framework ?
- Scalable ways to index video files ?
- Should compute be provisioned on video exchange platform ?
 - To be able to locate it close to the server

Serving Video Datasets

- Make available files corresponding to data from live sources
 - Sufficiently representative
 - Sufficiently latest
- Key to enable video analytics development
 - Diverse video data for training
 - Good quality
 - No losses due to network
- Enable powerful supporting frameworks
 - Anonymization
 - Automated indexing

Serving Video Datasets (1)

- Cloud hosted
 - Infra scalability and Management (as opposed to local-data-centre hosting)
- IUDX file serving APIs
 - Provisions to store and search meta data for each file
- Key challenges
 - Data privacy issues
 - Searching and discovering the right data files
 - Generating associated meta-data (annotations, indexing etc.)

Serving Live Video Streams

- Stream live video from a chosen resource
 - Discover live cameras from catalogue
 - Subscribe to streams of interest
- Enables applications on live data
 - Derive real-time insights using video data
 - E.g., Real-time information about traffic congestion, flooding on the roads, surveillance etc.
 - Viewing applications
- IoTifying video
 - Push back the insights from analytics back into IUDX

Serving Live Video Streams (1)

- Key Challenges

- High B/W and compute requirements leading to higher deployment costs
- Cloud Vs Local Data Center deployment ?
 - Cloud deployments (Server is deployed in cloud)
 - Scalability is easy though the compute costs in general will be high
 - B/W or network provisioning is required to ingest streams
 - How to pull the video streams into cloud ?
 - Local data centre (Server and Applications are located locally)
 - Scalability and maintenance will be an issue
 - Compute provisioning for local analytics is an issue
- Security and Privacy

Serving Live Video Streams (2): Possible First steps

- Pass through server for limited number of cameras
 - For example
 - RTSP/RTMP In, RTMP/RTSP/HLS out
 - Integrate basic auth mechanisms for privacy
 - Cloud hosted for limited number of streams
- Add more features
 - Add Secure protocols
 - RTSPS, HLS over https etc., WebRTC
 - Integrate basic data metering mechanisms
 - Scalability to handle stream processing
 - Enable frame rate changes
 - Variable bit rate transcoding

Additional open issues

- How to enable additional meta-data available ?
 - For example, Calibrations etc.
- Synchronizing real-time associated data streams ?
 - For example, analytics output stream associated with a live stream
- How to enable privacy preserving learning frameworks ?
 - Anonymization of video data ?
 - Not share raw data

Thank You

Media Exchange Platform

- Media Data Exchange
 - Scalable, media data exchange platform
 - Authorized, authenticated and accountable access/publish for **archived** and **live** media data
 - Provisions for secure data access (support such protocols for live data serving)
 - Easy **discovery** of media resources (video datasets and live streams)
 - Provisions for privacy preserving data exchange
- Media Meta-Data
 - Framework to associate additional semantic information to raw media streams and files
 - Indexing, searching, IoTifying video etc.