A. What we deduce from the information provided

Info Provided	Possible Requirements	Considerations
Camera Sensors	IoT architecture	Leveraging existing IoT architectures (eg from azure) with proven solutions and best practices will ensure a smoother implementation
Streaming Data	Reliable network connectivity and robust data transmission capabilities to handle continuous data flow. High-capacity storage solutions to store large volume of video data.	On-premises solutions can be expensive and require significant maintenance, while cloud such as Azure provides scalable and managed services that can reduce both cost and complexity.
Duplicated Events	Data from camera sensors must be processed at the edge (close to where the data is generated) to remove duplicated events that occur upstream due to retries.	Deploying edge devices is necessary in reducing the volume of data transmitted to the cloud and manage preprocessing tasks efficiently, ultimately saving costs.
Build a Dashboard	This dashboard requires integrating real-time analytics, efficient storage, and seamless integration with various data sources.	OLAP (Online Analytical Processing) must be used.

B. Further questions to ask users

Category	Question	Related Considerations
Data	What is the data classification and what are the security requirements for data in transit and at rest?	The solution should allow appropriate security measures to be applied to meet the requirements for data classification, and the security of data in transit and at rest.
	How long does the user plan need to retain the raw events and processed data and what are the regulatory requirements for data storage and retention?	Longer retention periods will require substantial storage capacity and robust retrieval system, potentially leading to higher costs for hardware, maintenance, and space if on-premises solutions are used. Scalability might also be limited by the physical constraints. Cloud solutions can dynamically scale storage resources, making it easier to handle long retention periods without upfront investments in hardware.
	Are there peak times when data volume increases significantly and are there more camera sensors in the pipeline?	The solution must be scalable to handle significant increases in data volume during peak times and to accommodate additional camera sensors in the pipeline. This is hard to achieve in on-premises solutions
	What are the latency requirements for data transmission?	Frequently accessed data needs to be cached to reduce query times and improve performance. Proper indexing can also be implemented to speed up access.
	Are the camera sensors spread across multiple geographical locations, or are they concentrated in a specific area? Are there any regulatory requirements that mandate data to be stored within specific geographical boundaries?	These factors will affect whether cloud solutions is the only option and the availability zones to use.

	Does the company plan to get this architecture up and running quickly?	Cloud services must be considered for quick scalability and deployment, reducing the time needed to set up on-premises infrastructure.
Existing Resources / Technical Competencies	Whether there is a similar project being implemented. If so, we can leverage existing resources and infrastructure.	Leveraging existing resources and infrastructure can save time and reduce costs.
	Which technology stack do most of the relevant employees have experience with?	Ensuring that the team has experience with the chosen technology stack can improve project efficiency and success.

C. Tech Stacks and Storage Tech Stacks

Known Requirements

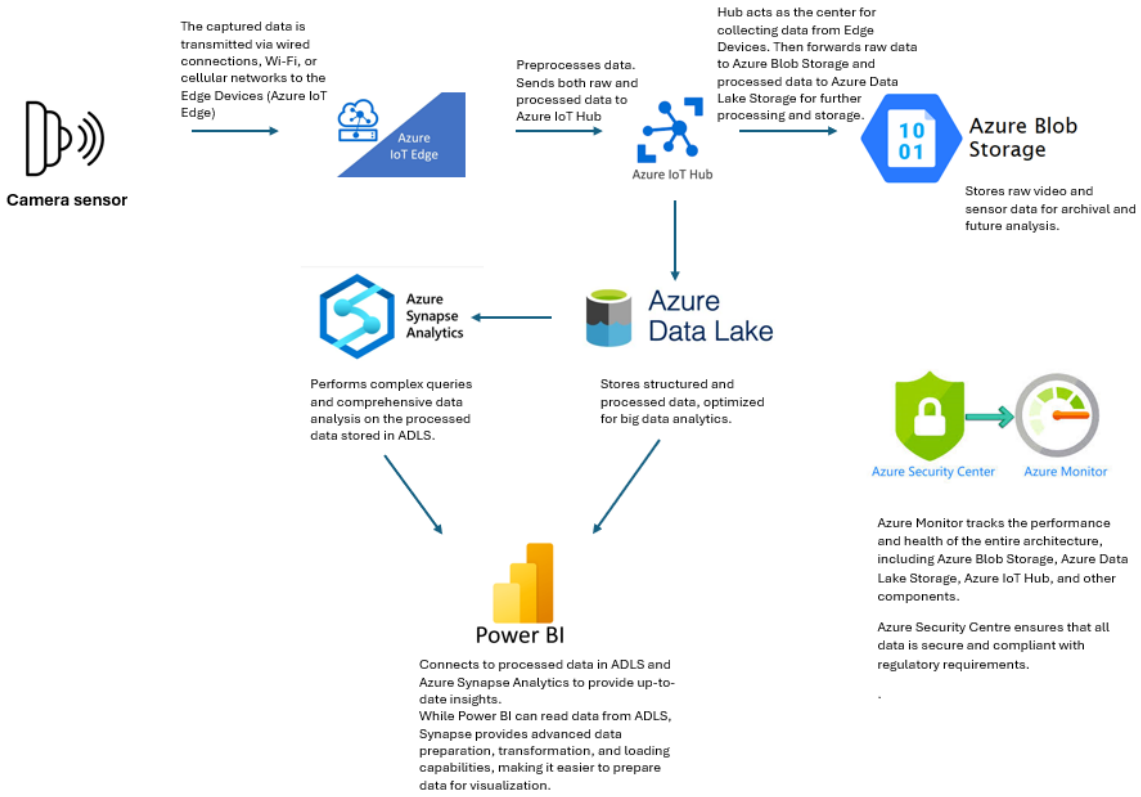
1. High-capacity storage solutions required to store large amount of data
2. Reliable network connectivity and robust data transmission are needed to manage continuous data flow.
3. Deployment of edge devices is necessary for upstream data preprocessing.
4. OLAP (Online Analytical Processing) must be used.

Assumptions made

5. The organisation does not have existing infrastructure to support IOT systems and wish to get this project ready for production within the next 2 years.
6. The organisation is already using a suite of Microsoft products and have a substantial number of employees trained in Microsoft Azure.
7. Organisation has plans to scale up by increasing the number of camera sensors.
8. There are minimal processing requirements with no event-driven processing scenarios. Hence direct integration between IoT devices and storage or analytics services (e.g., Azure Stream Analytics) might suffice. Azure Function is not required.
9. There is a need to store other forms of data in future.
10. Real time analysis of data is not required. Hence, Stream Analytics is not added to the architecture (save cost).
11. Organisation places a lot of emphasis on data security.

Based on the above requirements and assumptions, a technology stack leveraging Microsoft Azure is recommended.

Architecture



Architecture In detailed

Component	Function	Why is it required in this design?
Camera Sensors and IoT Devices	Data Capture: Continuously capture and send raw video and sensor data to edge devices for initial processing.	
Edge Devices (IoT Edge)	Deploy containerized workloads to IoT devices for local processing to perform local data preprocessing such as deduplication. Also perform basic analytics tasks such as detecting motion or anomalies in video streams.	Facilitates low-latency responses and enables efficient use of bandwidth
Azure IoT Hub	Device Management: Provision, configure, and monitor connected devices. Data Ingestion: Collect data from edge devices and transmit it to Azure cloud services for further processing.	Allows easier management of large IoT ecosystems and facilitates horizontal scaling to accommodate an increase in the number of sensors.
Azure Blob Storage	Store Raw video and sensor data for archival and future analysis. Handle large volumes of data with ease, supporting long-term storage needs.	Provides large storage needs and the option to scale up if necessary. It also offers tiered storage options (hot, cool, and archive) to optimize costs based on access patterns. Frequently accessed data can be stored in the hot tier, while infrequently accessed data can be moved to the cool or archive tier.

Azure Data Lake Storage	Store transformed and processed data, making it available for advanced analytics and machine learning tasks. It also supports hierarchical data organisation where data is organised into a structured format for efficient querying and processing.	Provides the necessary structure and performance for advanced analytics.
Azure Synapse Analytics	OLAP Workloads: Handle online analytical processing (OLAP) workloads, allowing for complex data analysis and reporting. Unified Analytics: Provide a unified experience for querying data across data warehouses and big data environments.	Enables OLAP
Power BI	Data Visualization: Provide a platform for users to interact with data, generate insights, and make data-driven decisions. Reporting: Enable comprehensive reporting capabilities for business intelligence.	Provides powerful data visualization and reporting capabilities for business intelligence.
Azure Monitor & Azure Security Center	Operational Insights: Provide real-time monitoring and alerting to ensure system health and performance. Security Management: Protect data and infrastructure by enforcing security policies and monitoring for threats.	Ensures continuous monitoring and security management for operational efficiency and compliance.