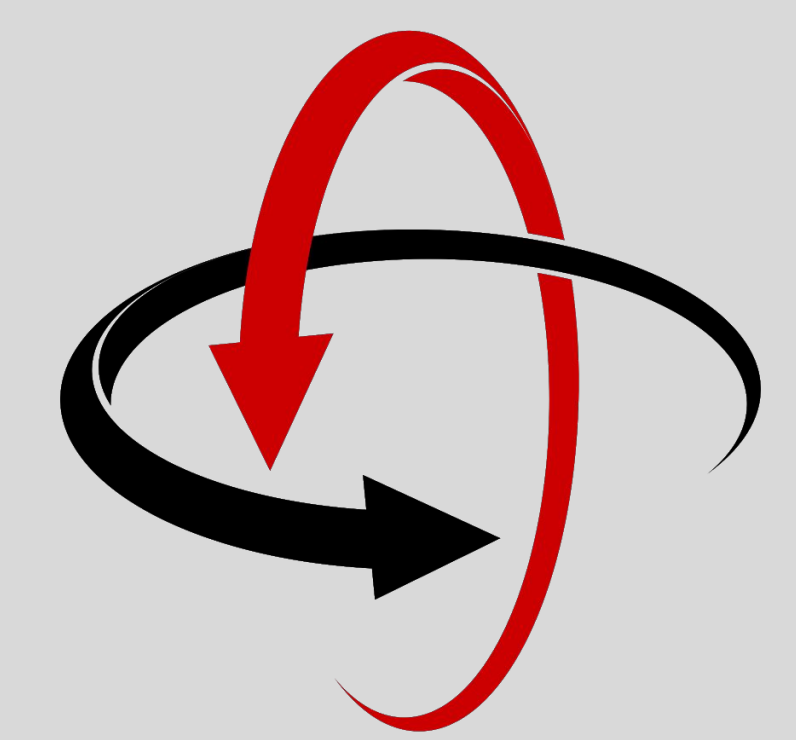


360° Webcams for Zoos and Aquariums

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TRUE 360

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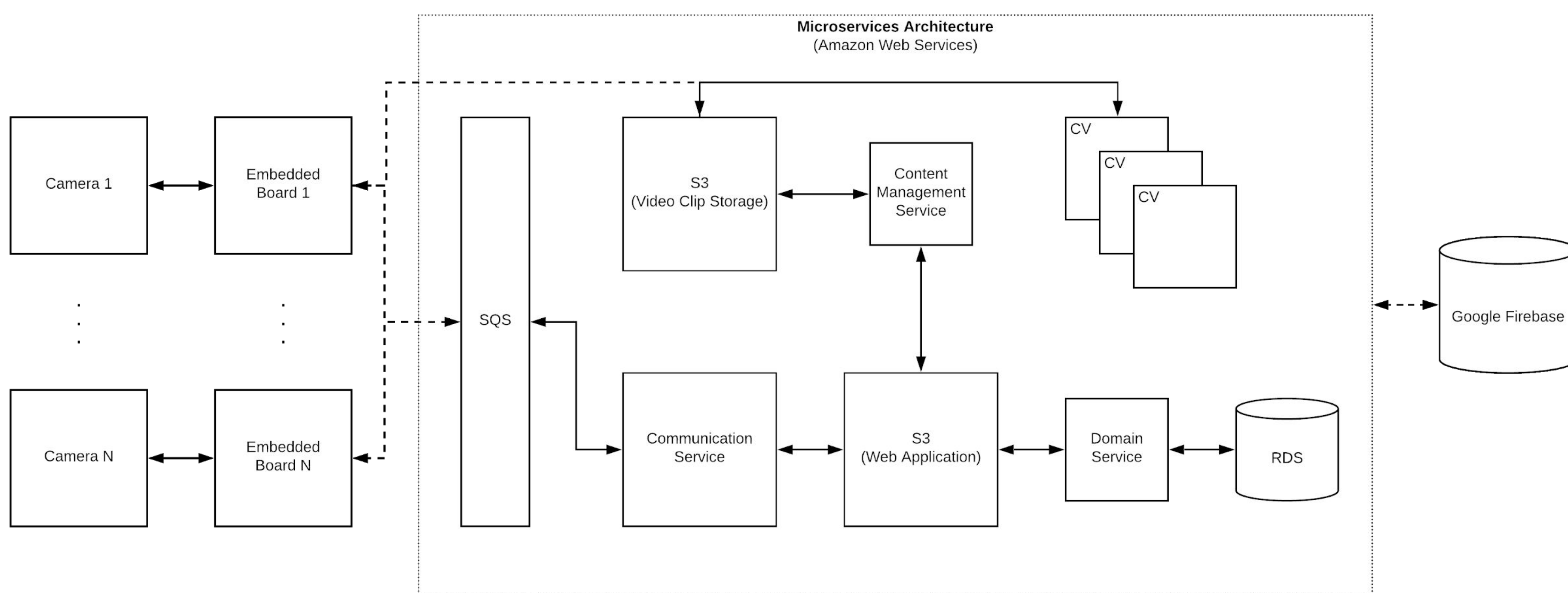
- Zoos and aquariums lack access to easy-to-use 360° cameras for their exhibits
- Zoos and aquariums are looking for ways to boost their online marketing techniques to both attract new visitors and improve public awareness of issues such as animal health and wildlife conservation
- Zookeepers, animal health professionals, and other staff members are currently required to visit each exhibit on a regular basis in order to monitor the animals

Problem

Our system enables zoos and aquariums to constantly capture 360° footage of animals in their exhibits for the purposes of:

- Using live streams for education
- Creating promotional content for their websites and/or social media accounts
- Monitoring animal health and behavior
- Archiving videos for future access

Solution



System Diagram

- Communication Service
 - Message broker between web client and board
- Content Management Service
 - Video footage archive system
- Web Application
 - User interface for the system.
- Domain Service
 - Core product support
- Embedded Services
 - Camera functionality support
- Computer Vision
 - Archive video footage processor

Microservices

- AWS (EC2, ECS, RDS, SQS, S3)
- HTML, CSS, JS
- React & Redux
- Zendesk Garden
- Google Firebase
- Flask & Python
- GitLab CI/CD
- NodeJS & Express
- OpenCV
- Garmin Camera API
- Terraform

Technologies

- The system shall be able to:
 - Capture video footage
 - Process raw video footage to extract "likeable" content clips
 - Register new users, cameras, zoos, and exhibits
 - Remotely start and stop camera recording
 - Provide user-facing access to cameras, clips, and system administration

Functional Requirements

- The system shall:
 - Be useable at exhibits across the country
 - Support multiple simultaneously-connected users
 - Support multiple simultaneously-connected cameras
 - Support footage capture at resolutions up to 4K
 - Have an attractive and intuitive user interface

Non-Functional Requirements

- Zoo and aquarium marketing staff members
 - Primary use is interacting with cameras and extracted clips
- True 360 employees
 - Primary use is system administration

Uses/Users

- Exhibit environment varies (indoor/outdoor, above/below ground, underwater)
- Exhibit climate varies (arctic, desert, tropical, etc.)
- Internet connections may not provide sufficient bandwidth to support 4K footage

Operating Environment

- Storing hundreds of hours of 4K footage is impractical
- Programmable 360° camera API availability is sparse
- Zoo and aquarium staff training may be limited
- Zoos and aquariums lack time/resources to visit/monitor every device
- Client's AWS budget did not provide much flexibility

Constraints

- IEEE Standard for Telecommunications and Information Exchange Between Systems
- IEEE Standard for System of Advanced Audio and Video Coding
- IEEE Standard Reliability Program for the Development and Production of Electronic Products

Standards

- Front-End
 - ESLint, Prettier, GitLab CI build pipeline
- Microservices (System)
 - Manual testing
- Computer Vision
 - Footage collection, processing, model training
- Embedded
 - Ran embedded program on AWS ECS for prolonged periods of time
 - Tested with different types of stream encodings and codecs

Testing Environment/Strategy

The screenshot shows the True 360 web application interface. The top navigation bar includes 'Home', 'Archives', 'Cameras', 'Exhibits', and 'Users'. The main content area displays a table titled 'Video Archives' for 'San Diego Zoo'. The table has columns for 'Device Name', 'Exhibit Name', 'Date', and 'Video Type'. There are 10 rows of data, showing various camera devices and exhibit names with their respective dates and video types (Archived or Processed).

Device Name	Exhibit Name	Date	Video Type
TestDevice	Test Exhibit 1	11-27-2018	Archived
ElephantCamera	Elephant Exhibit	11-06-2018	Archived
ElephantCamera	Elephant Exhibit	11-13-2018	Archived
ElephantCamera	Elephant Exhibit	11-13-2018	Processed
ElephantCamera	Elephant Exhibit	11-14-2018	Archived
ElephantCamera	Elephant Exhibit	11-14-2018	Processed
ElephantCamera	Elephant Exhibit	11-27-2018	Archived
ElephantCamera	Elephant Exhibit	11-27-2018	Processed
ElephantCamera	Elephant Exhibit	11-27-2018	Archived
ElephantCamera	Elephant Exhibit	11-27-2018	Processed