
AWS
re:Invent
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ROB002

How AWS IoT empowers SEQSENSE to manage autonomous security robots

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Adapting technology in response to an aging workforce

By 2050, the working population of Japan is expected to decrease by **27 million**

Problem: Demand for security is high, with a ratio of 1 security guard for **18 available positions**

We aim to preserve our world and solve issues arising from the rapidly aging population by using our technology



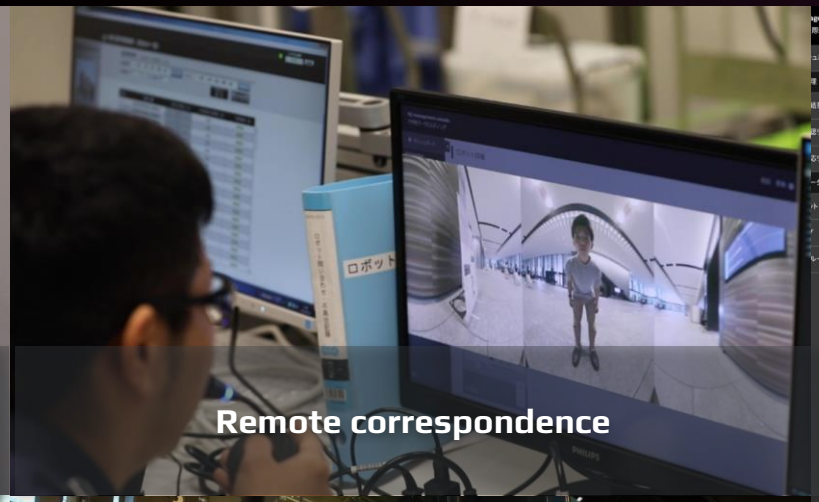
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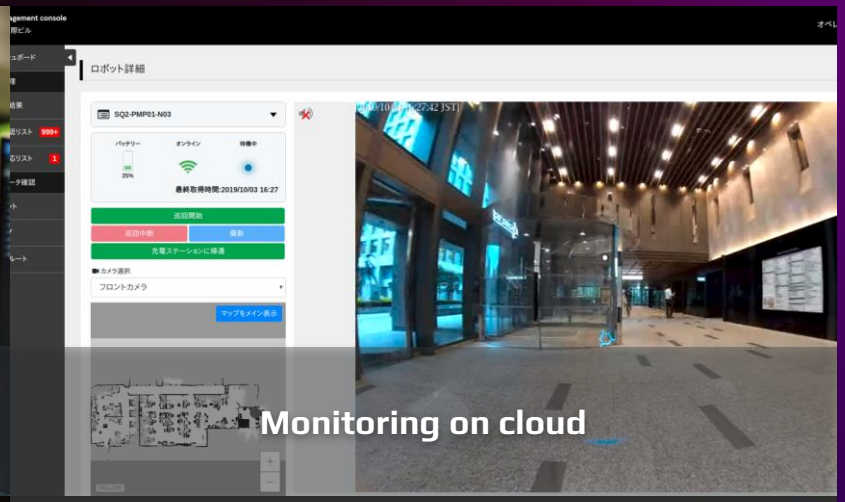
Intelligent security robot SQ-2



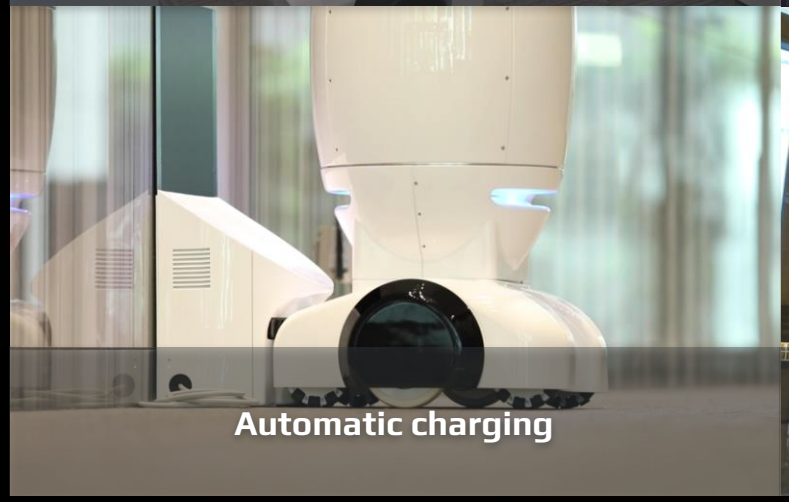
Autonomous patrol/inspection



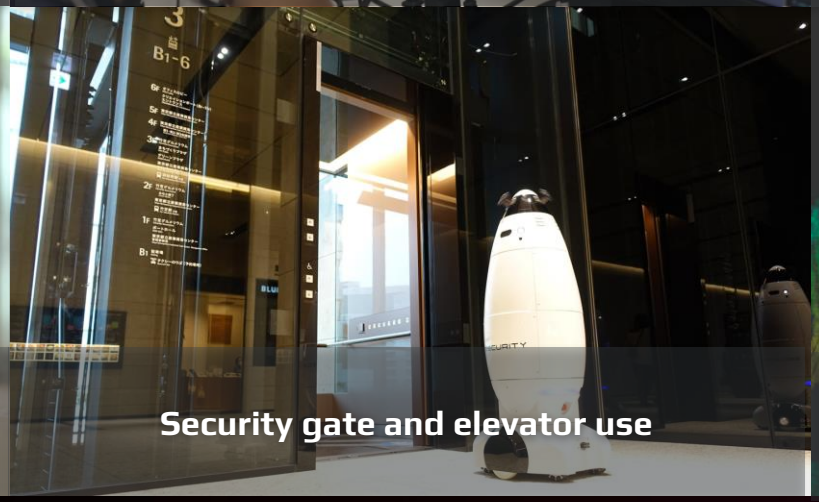
Remote correspondence



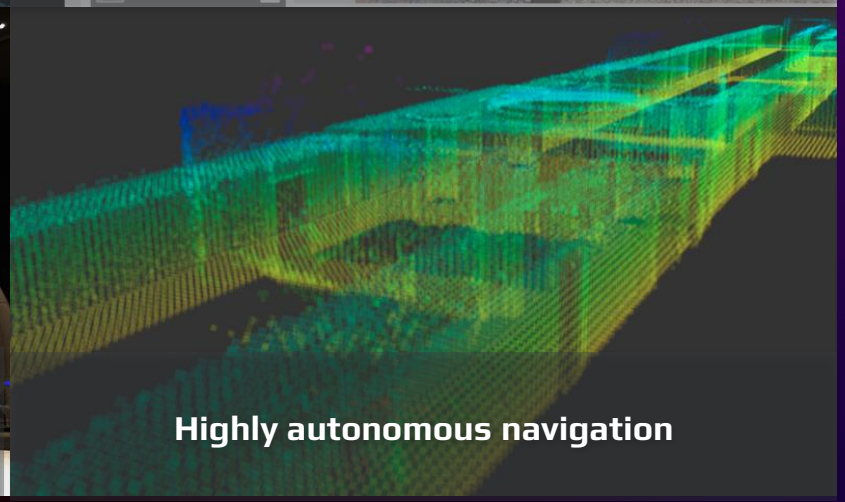
Monitoring on cloud



Automatic charging



Security gate and elevator use



Highly autonomous navigation

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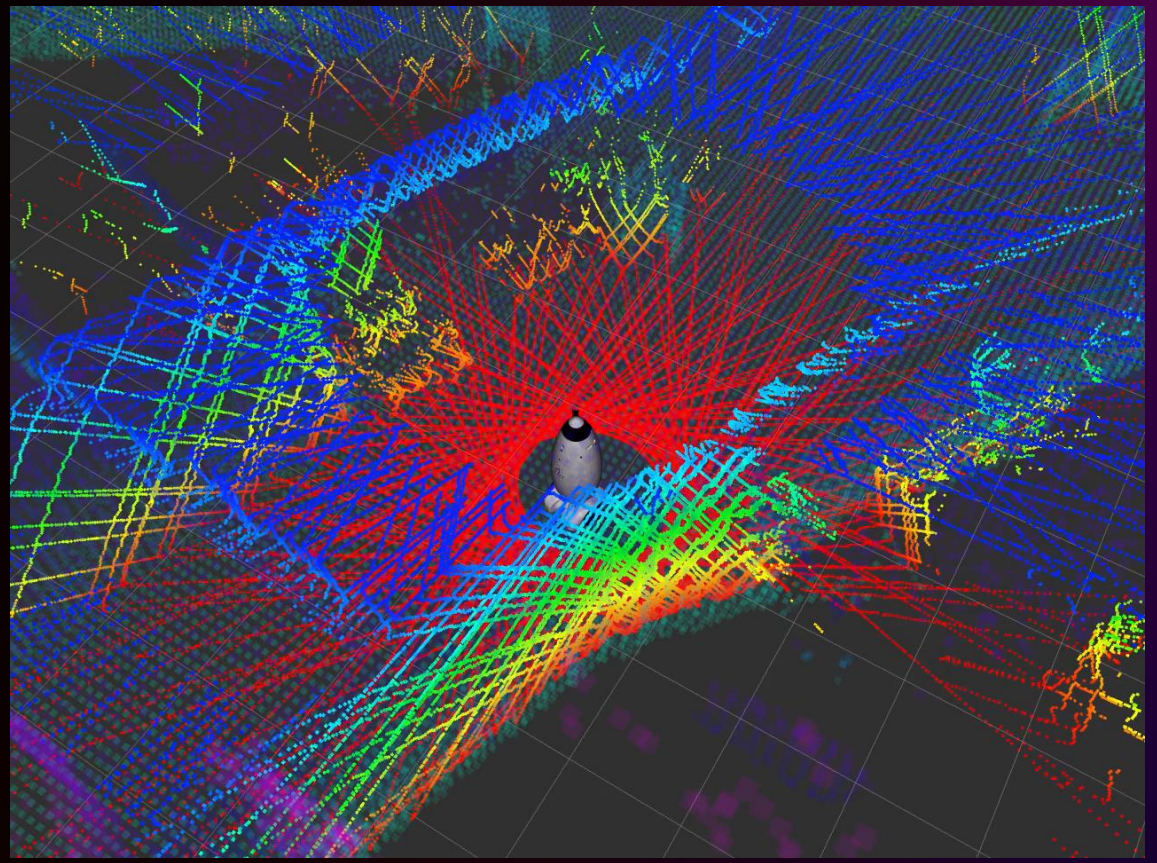
Core technology of SEQSENSE

Localization, navigation, and mapping using super-wide field-of-view LiDAR



Mobile network connectivity

~6 hrs. continuous operation



seqsense/urg_stamped
at-wat/mcl_3dl
at-wat/neonavigation

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Advantages of choosing AWS

- Pioneer of IoT cloud service
  - SEQSENSE was early adopter



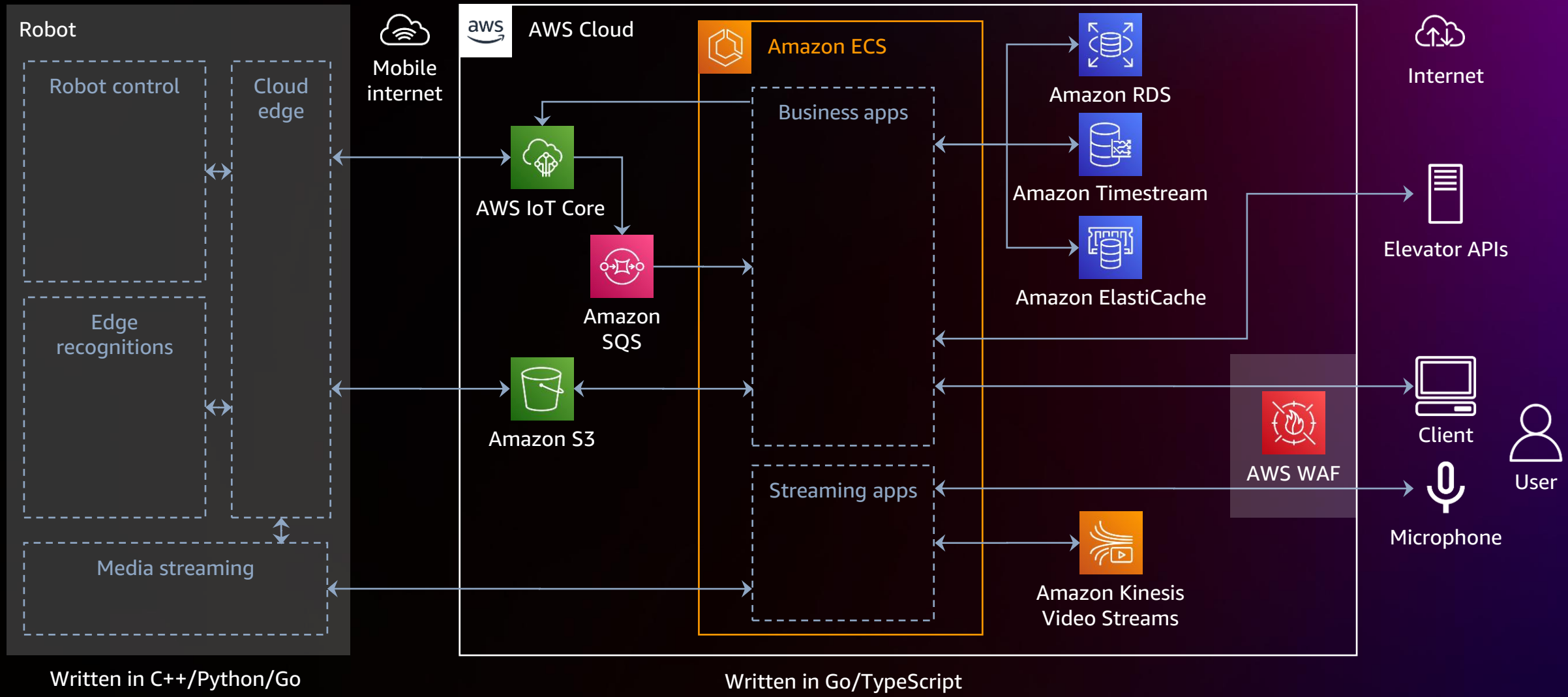
AWS IoT Core
GA on 2015

- Various managed services
  - Amazon Kinesis Video Streams: reliable and durable
  - Amazon Elastic Container Service (Amazon ECS): low management cost and high extendability
  - Amazon ElastiCache for Redis: only option available at our launch (2016)
  - And others

Best for constructing real-world applications

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Architecture summary

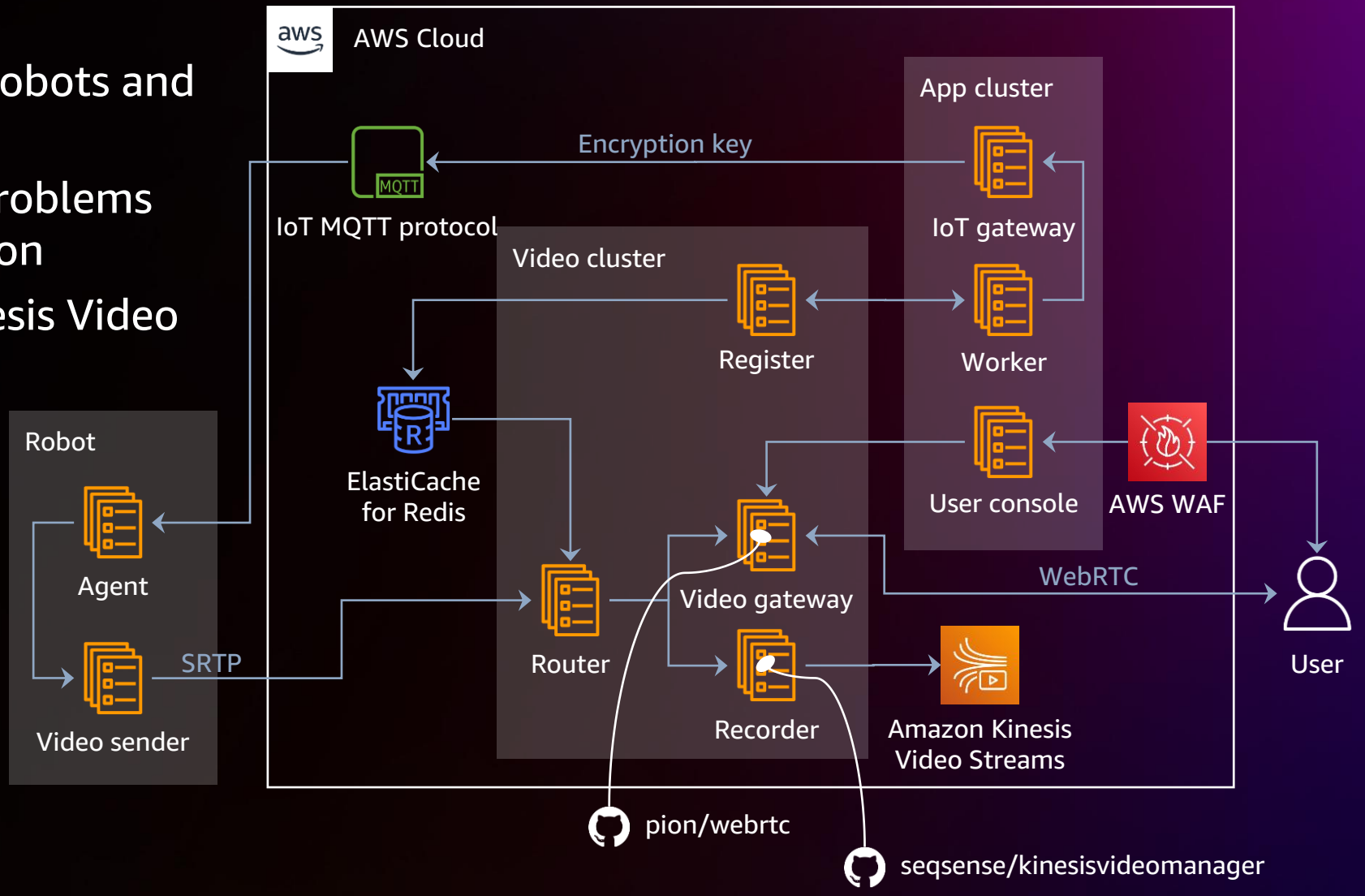


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Amazon SQS: Amazon Simple Queue Service
Amazon ECS: Amazon Elastic Container Service
Amazon S3: Amazon Simple Storage Service
Amazon RDS: Amazon Relational Database Service

Video streaming and recording

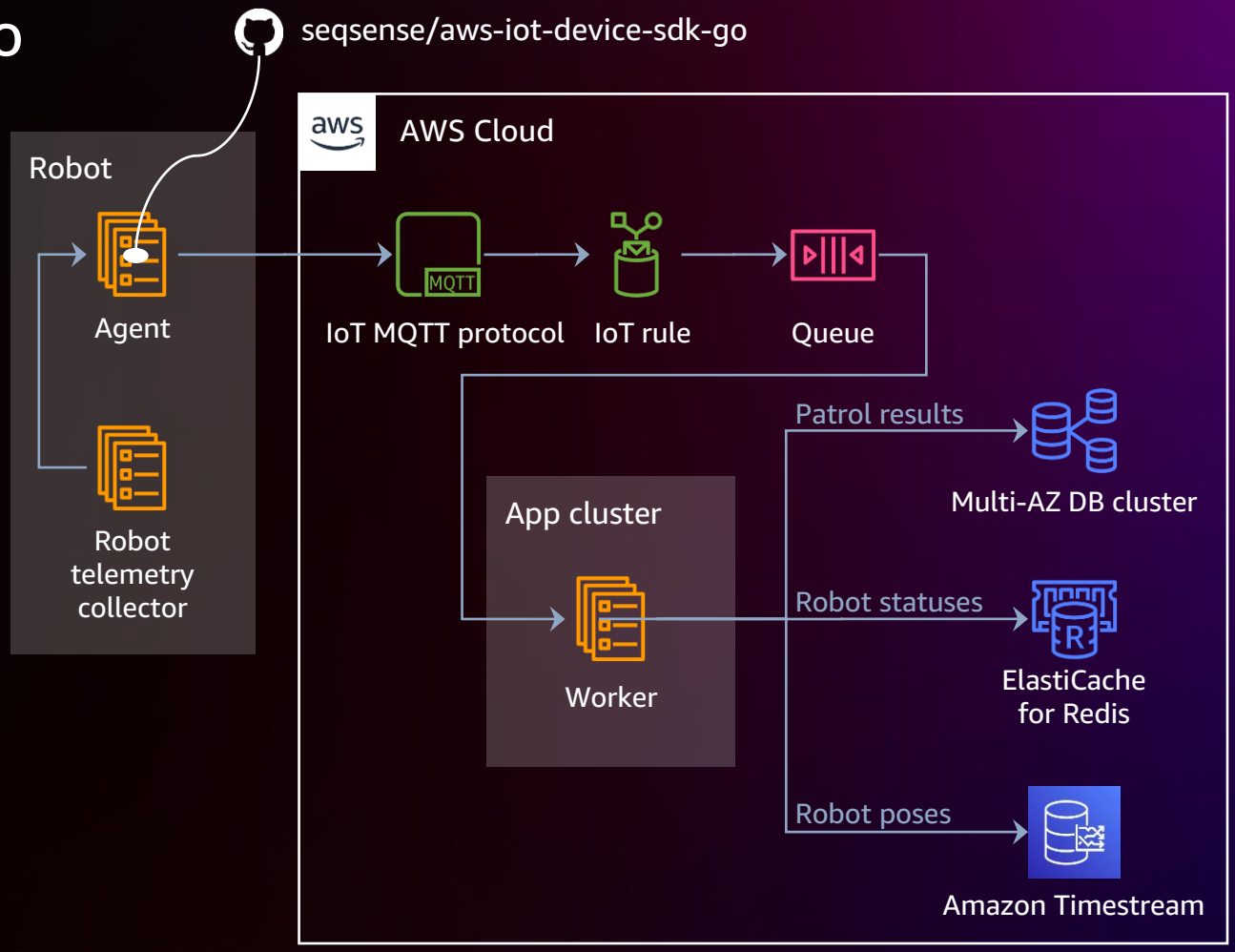
- Direct SRTP stream from robots and WebRTC SFU for users
  - Fewer NAT traversal problems
  - Less network congestion
- Recording to Amazon Kinesis Video Streams
  - Durable ingestion
  - Queryable by time
  - Easy to analyze



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Robot-Cloud Communication (Telemetry)

- Queue robot telemetry messages to Amazon SQS via IoT rule
  - Highly scalable
- Store to corresponding DB
  - Patrol results to RDB: Organized
  - Robot statuses to Redis: Low latency
  - Robot pose to Timestream: Queryable by time

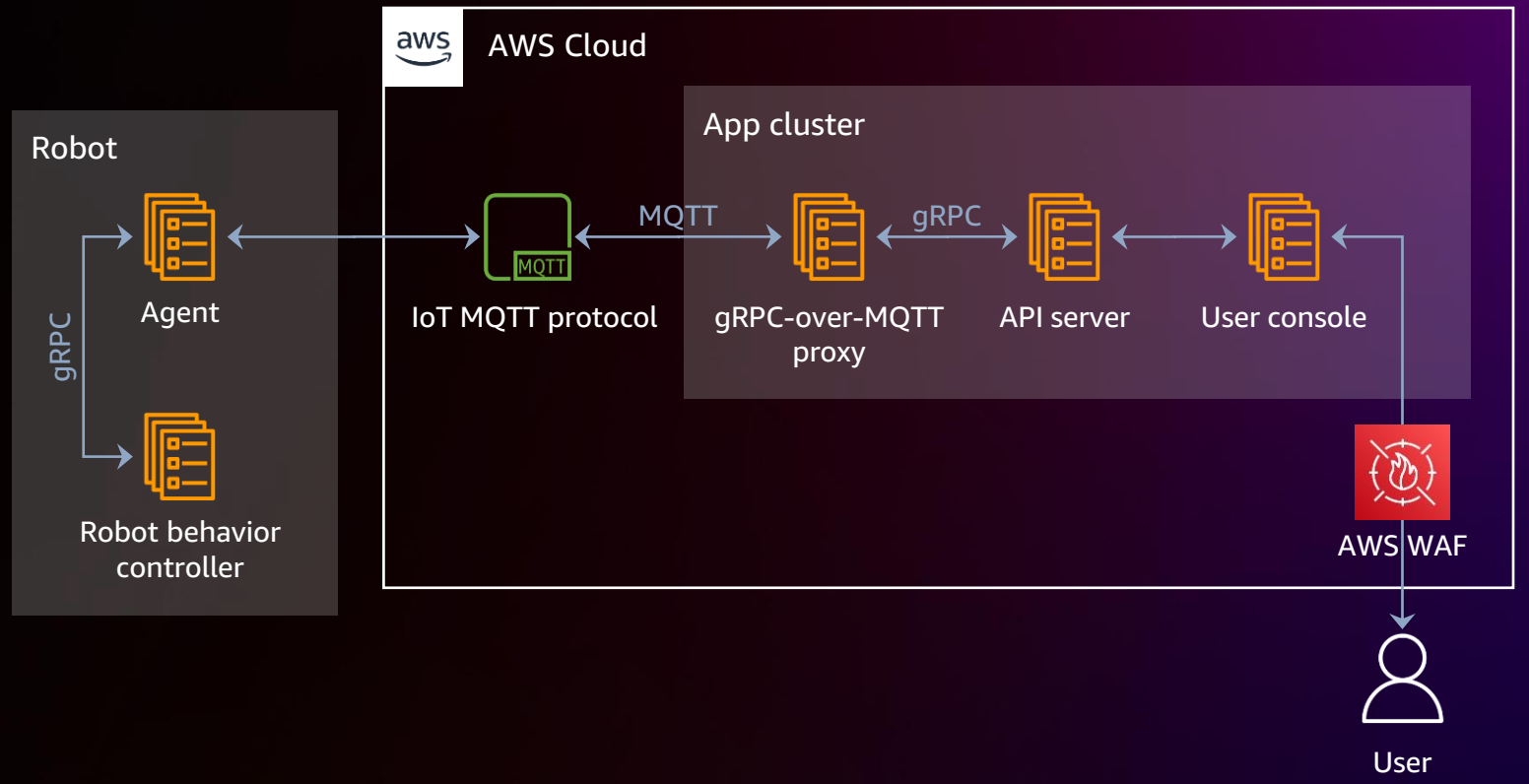


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Robot-Cloud Communication (Command)

gRPC call over IoT Core MQTT (simple RPC/streaming RPC)

- Flexible message type management
- Easy to extend



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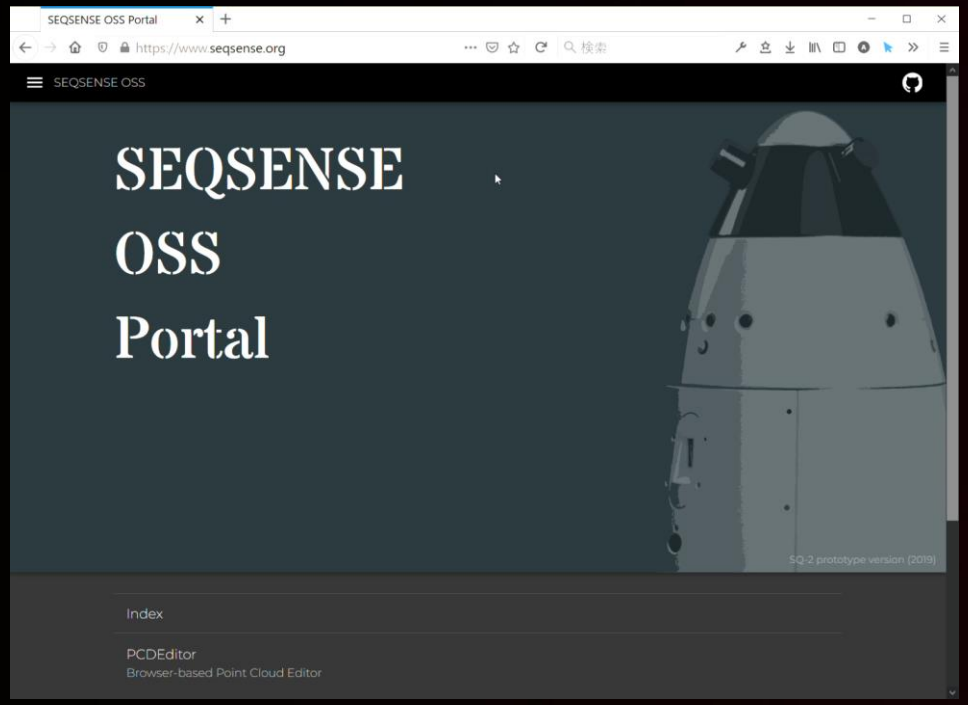
Our OSS packages

- AWS IoT Device SDK for Go
  (authentication helper, shadow, jobs, secure tunneling)
- Kinesis Video Manager SDK for Go
- Web-based point cloud editor
- And more

seqsense/aws-iot-device-sdk-go

seqsense/kinesisvideomanager

seqsense/pcdeditor



Using Go/WASM

Visit Our OSS Portal Site!
https://www.seqsense.org/

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Summary

- SEQSENSE develops intelligent security robots (SQ-2) and cloud services on AWS
- Using AWS makes our service reliable, durable, and easy to maintain, scale, and extend
  - AWS IoT and Amazon Kinesis Video Streams are especially useful for our robotics applications
- Part of our code base is open source!

OSS Portal Site
https://www.seqsense.org/



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Thank you!

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