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Access Control Model for Virtual Objects (Shadows) Communication for AWS Internet of Things

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Outline

1. Introduction and Background.
2. Access Control Model for VO Communication for AWS IoT.
3. A Use Case Implementation
4. Performance
5. Conclusion and Future Work

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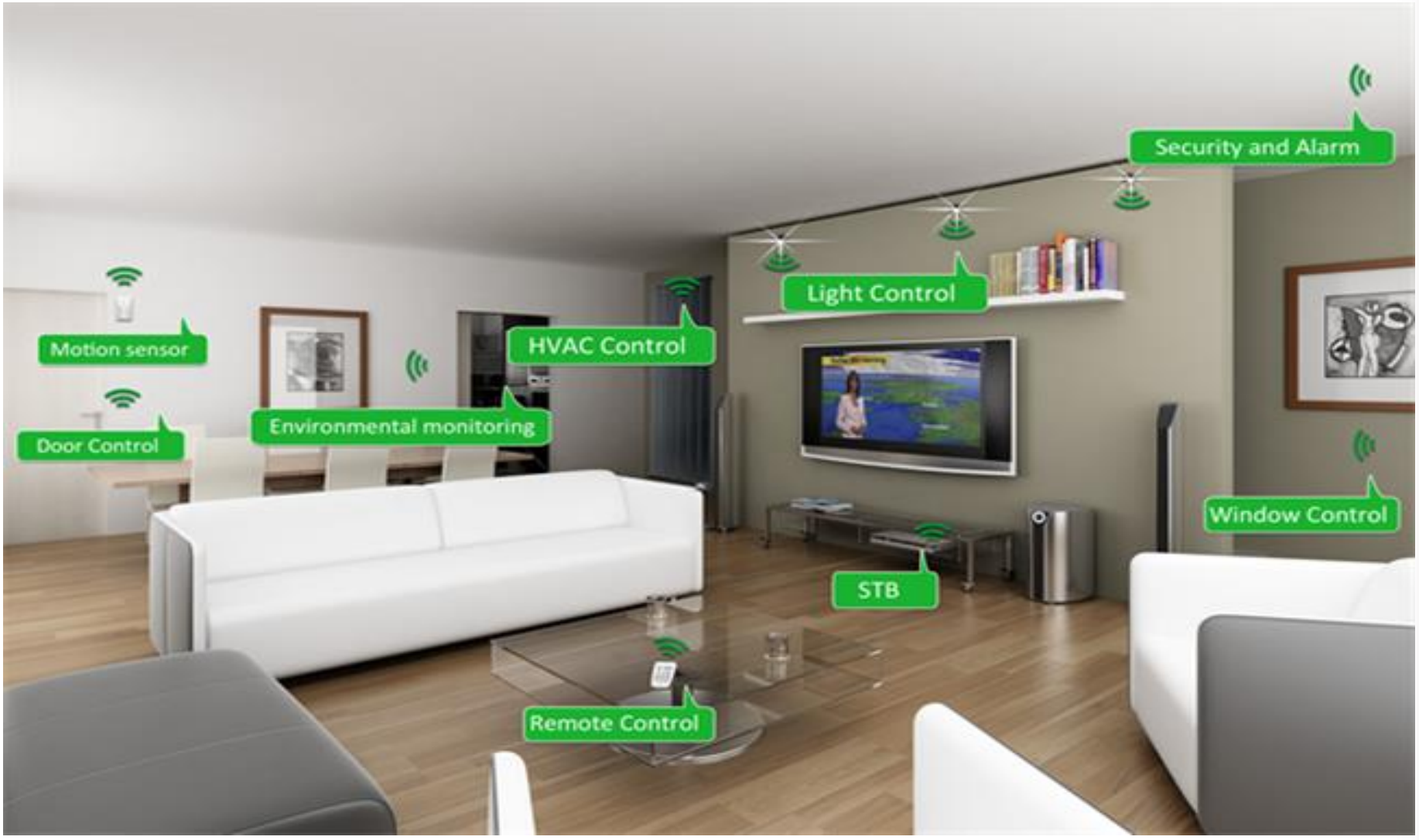
Internet of Things



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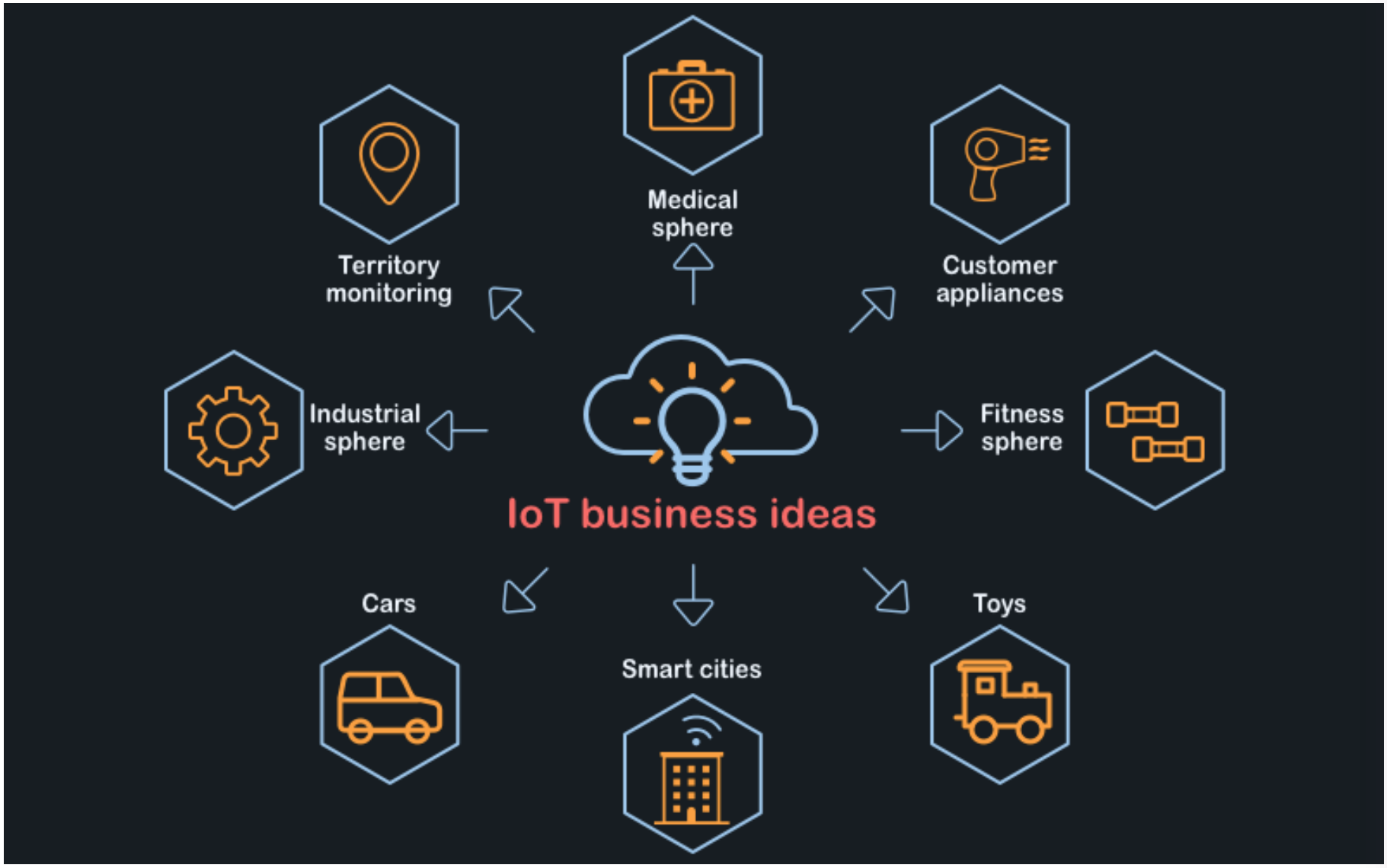
IoT Projects



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Access Control Oriented (ACO) Architecture for Cloud-Enabled IoT

Asma Alshehri and Ravi Sandhu. Access control models for cloud-enabled internet of things: A proposed architecture and research agenda. In the 2nd IEEE International Conference on Collaboration and Internet Computing (CIC), pages 530-538. IEEE, 2016.

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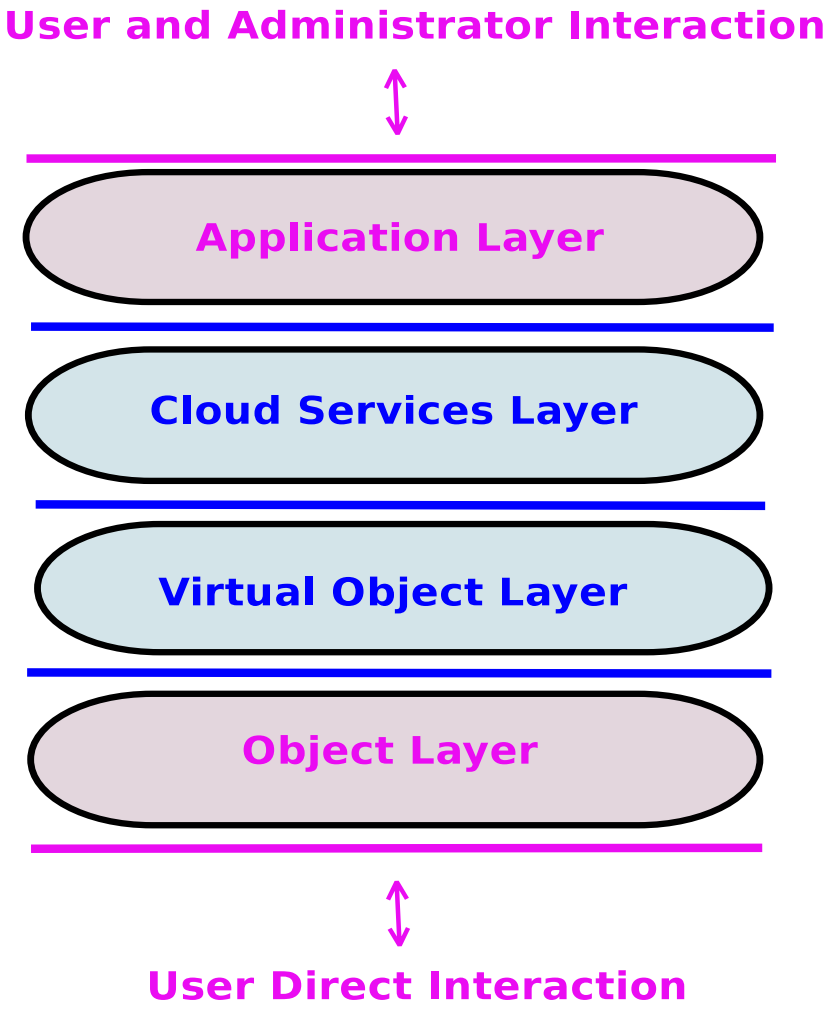
Access Control Oriented (ACO) Architecture for IoT

- **The Object layer:**
  - Physical objects
  - Collect data
  - Communication
- **The Virtual Object Layer:**
  - Presents status of objects
  - Communication
  - O-VO Association



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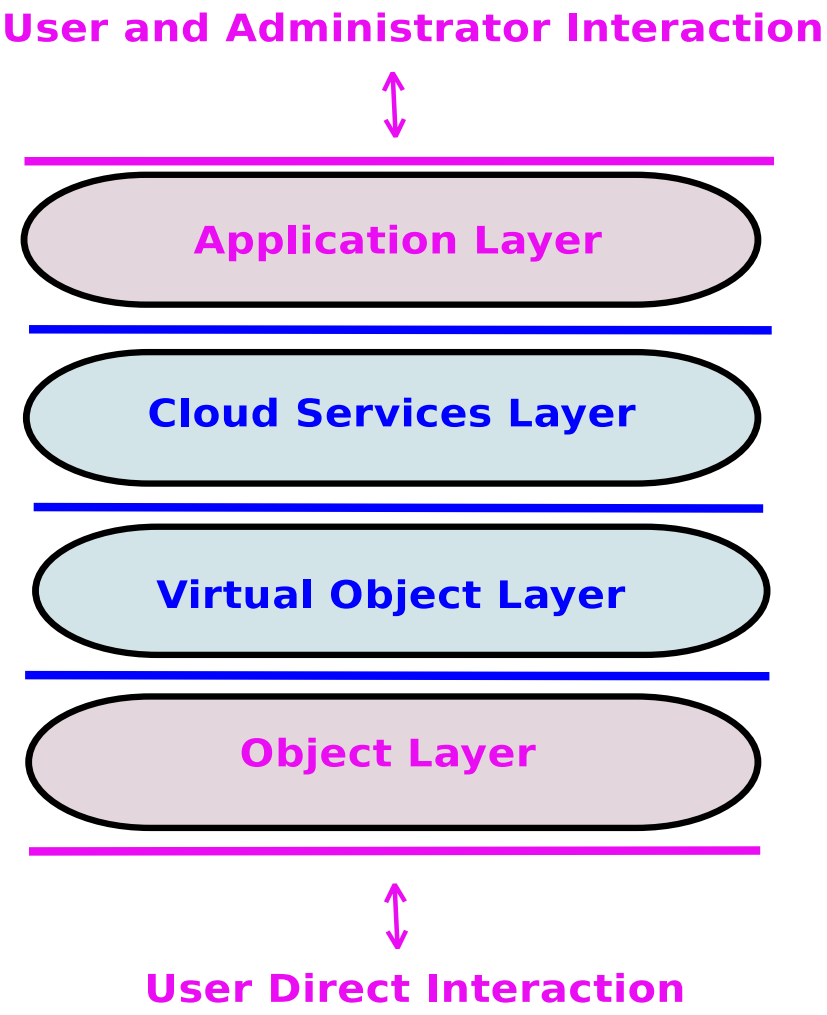
Access Control Oriented (ACO) Architecture for IoT

- **The Cloud Layer:**
  - Big data
  - Functionality
  - Communication
- **The Application Layer:**
  - Interface
  - Users and Admin
  - Generate AC policies



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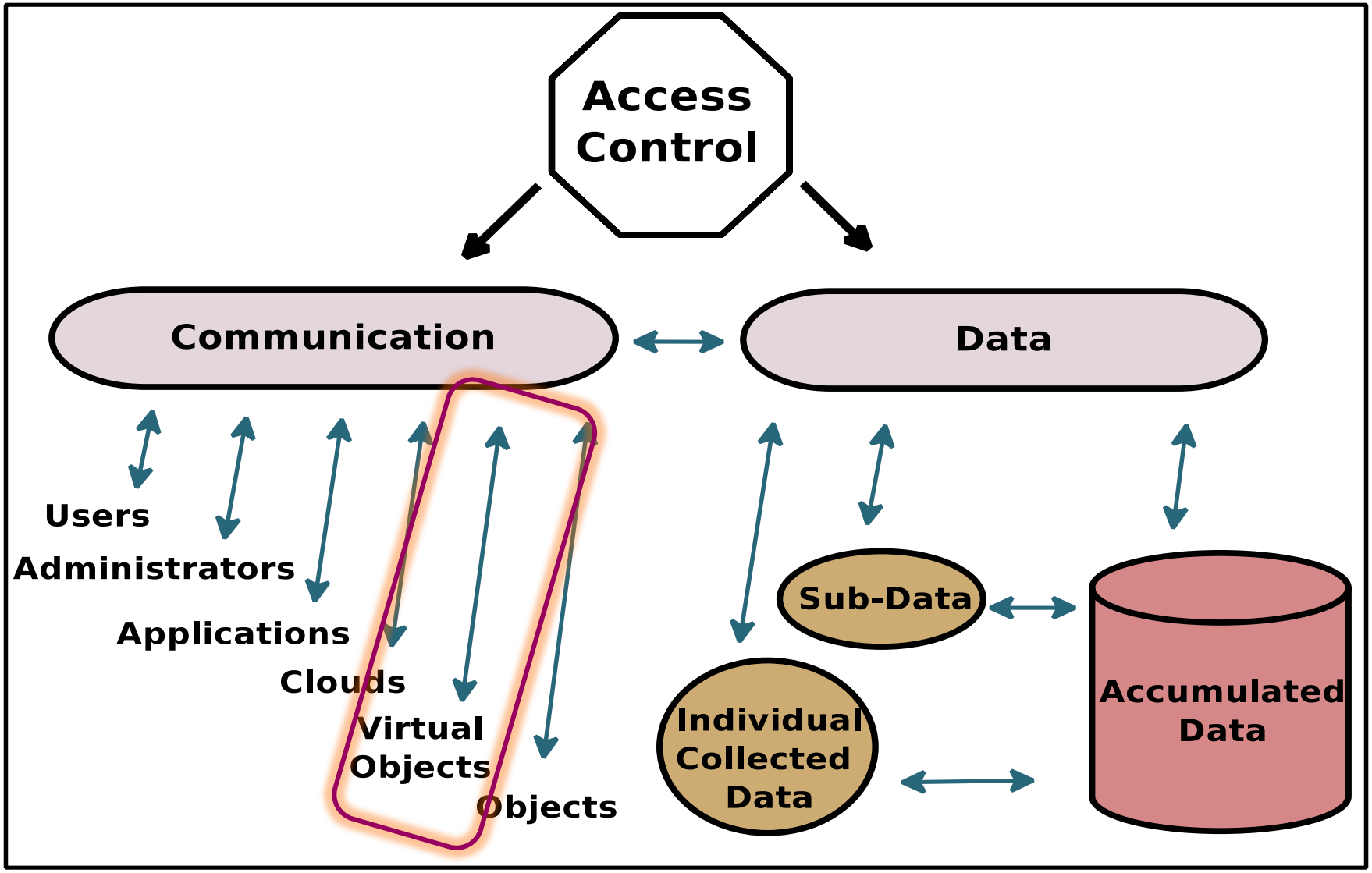
Access Control Issues in ACO Architecture for IoT



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Access Control Models for VO Communications in ACO Architecture

Asma Alshehri and Ravi Sandhu. Access control models for virtual object communication in cloud-enabled iot. In The 18th International Conference on Information Reuse and Integration (IRI). IEEE, 2017.

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Access Control Models for VO Communication

Access control models for VO communication in two layers:

A. Operational models
   A. ACL-Cap operational model
   B. ABAC operational model

B. Administrative models
   A. ACL administrative model
   B. RBAC administrative model
   C. ABAC administrative model

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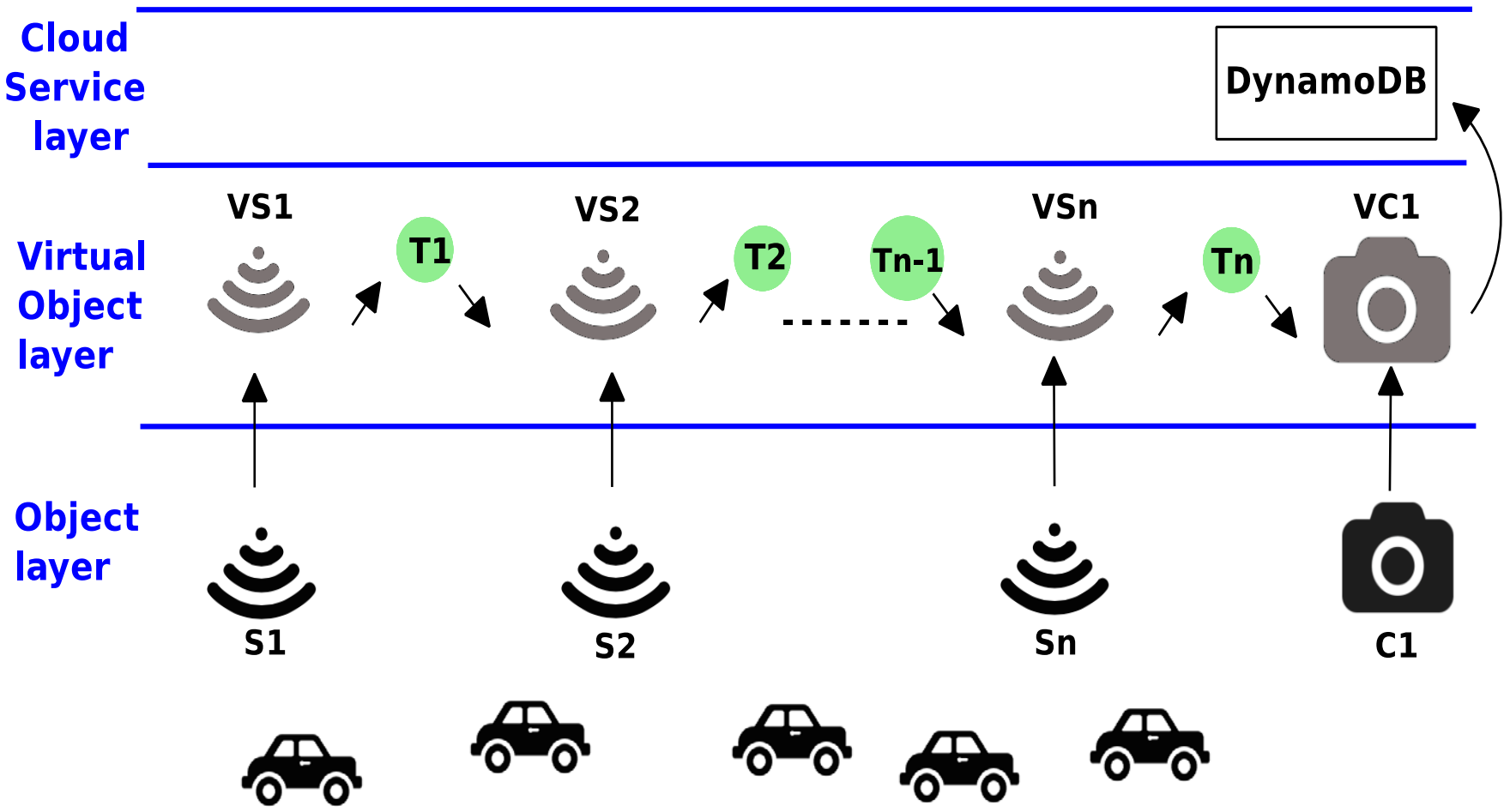
A Use Case within ACO Architecture



Access Control Model for VO Communication for AWS IoT

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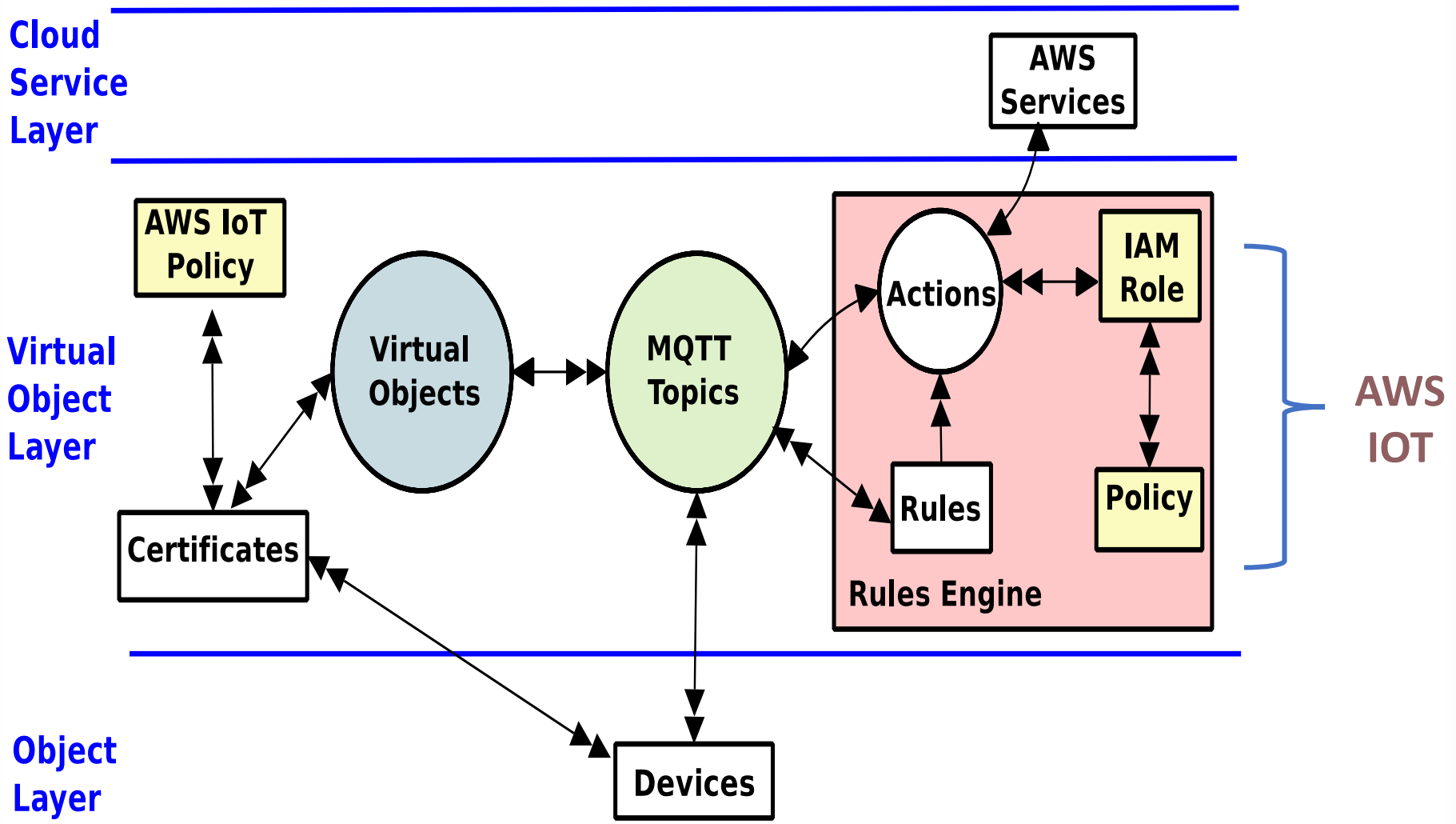
The AWS-IoT-ACMVO Model for AWS IoT



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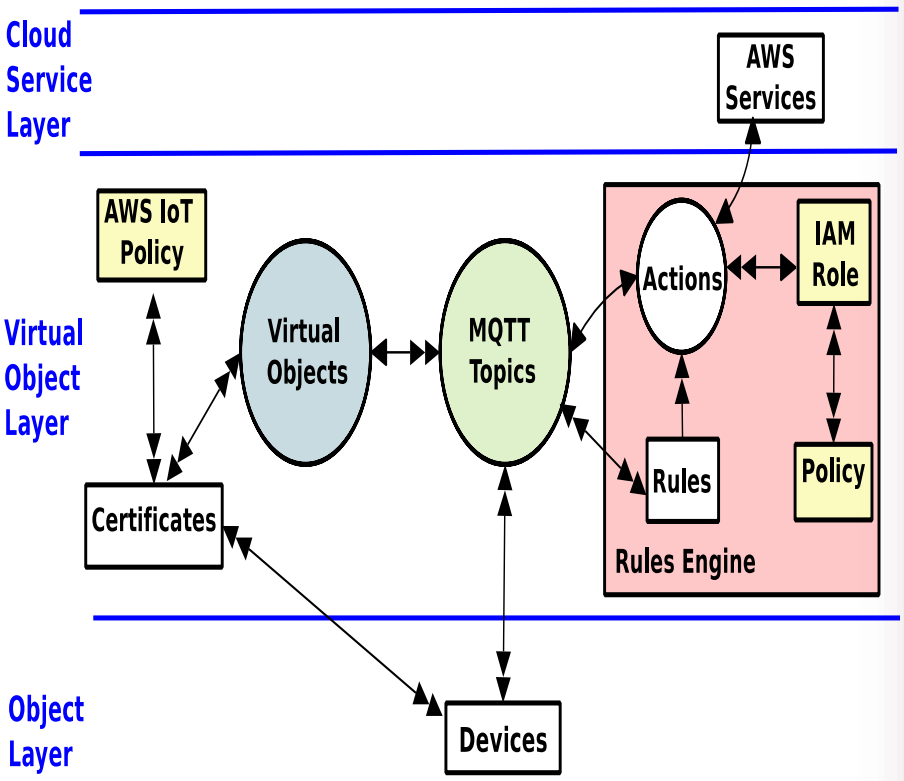
The AWS-IoT-ACMVO Model for AWS IoT

- Certificates: An identity for devices authentication
- AWS IoT policy: A policy for authorization purpose
- Virtual objects: A JSON document that stores information about the current and future status of a device.
- MQTT topics: AWS IoT service generates reserved MQTT topics for each created virtual object



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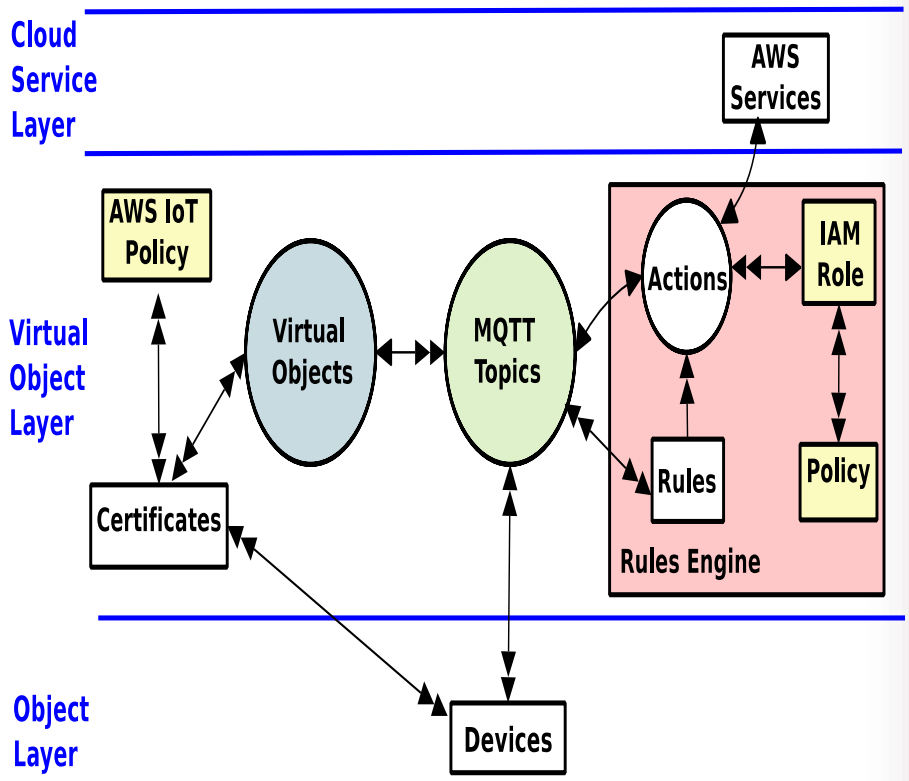
The AWS-IoT-ACMVO Model for AWS IoT

- Rules: Recognize and analyze messages that are sent to MQTT topics and trigger actions.
- Actions: There are fixed AWS actions that can be selected, such as inserting a message into a DynamoDB table, invoking a Lambda function, and republishing messages to AWS IoT topics.
- AWS identity and access management (IAM) role: Actions authorization



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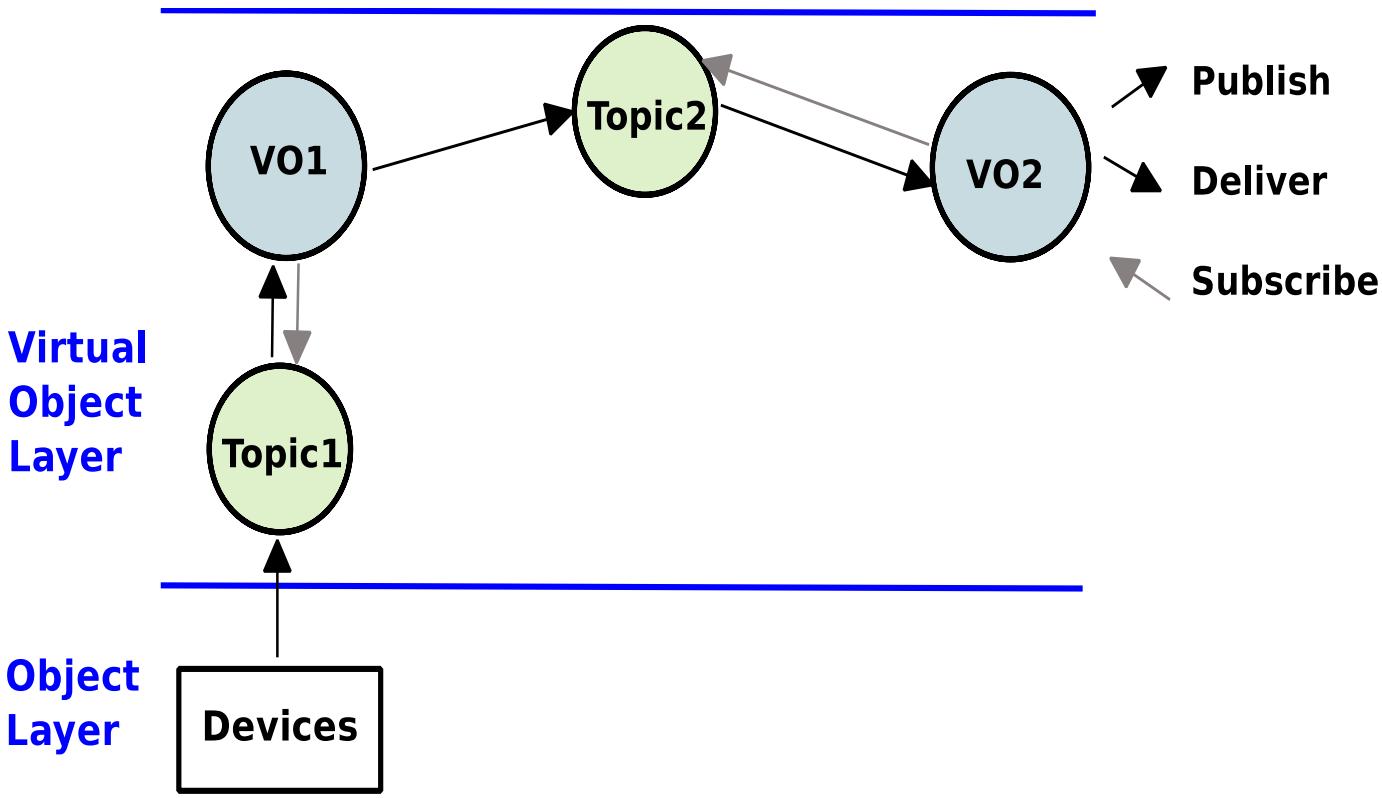
The Publish/Subscribe Topic-Based Scheme



- The communication channel between two VOs is a shared topic

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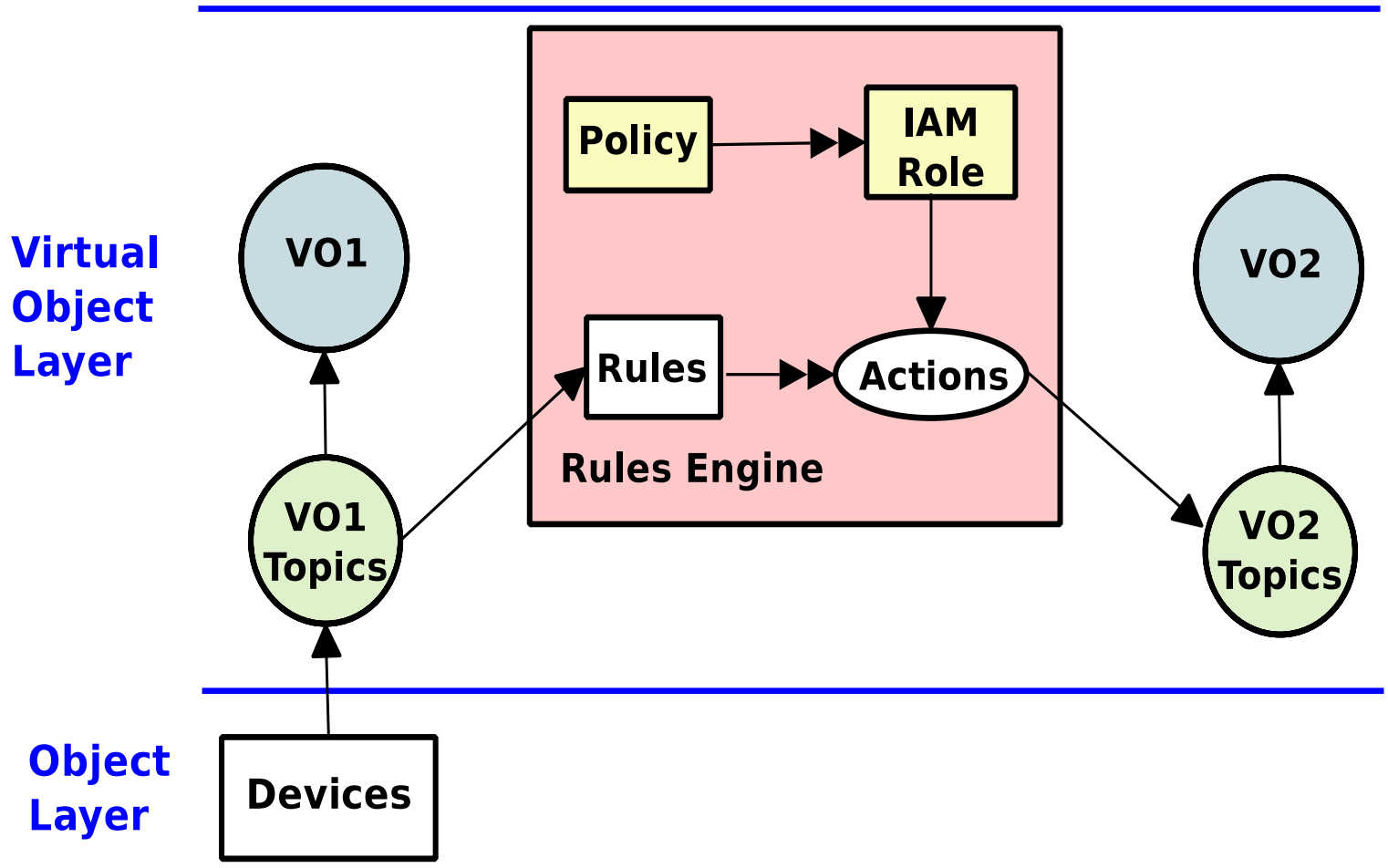
Communication Channel in AWS IoT



- The communication channel between two VO Topics is the Rules Engine

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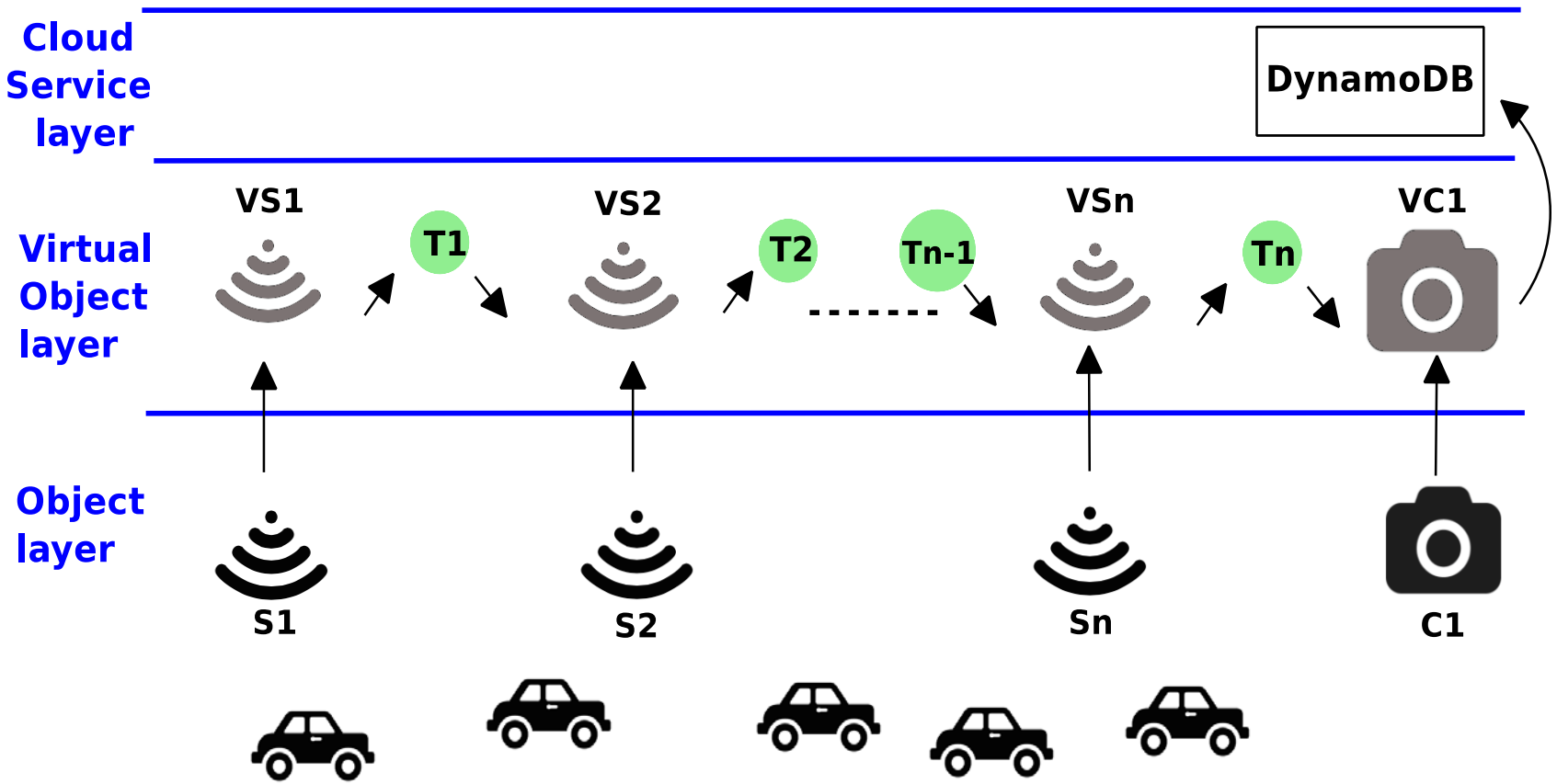
The Sensing Speeding Cars Use Case



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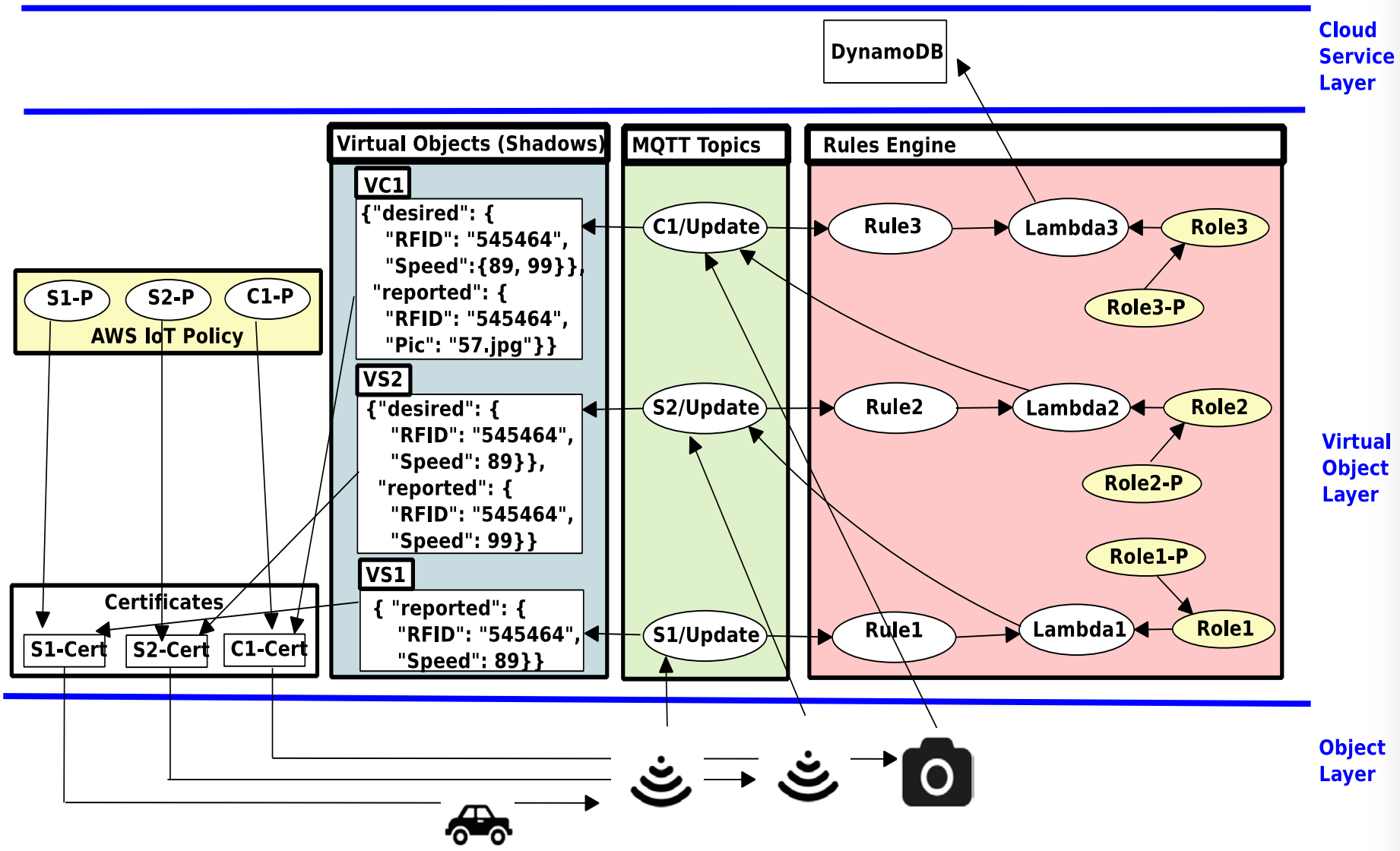
Sensing the Speed of One Car with two Sensors



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Role2 Policy that is Attached to Role2


```
{
   "Version": "2012-10-17",
   "Statement": [
      {  "Effect": "Allow",
         "Action": "iot:GetThingShadow",
         "Resource": "arn:aws:iot:us-west-2:760000000000:
          thing/Sensor2"
      },
      {  "Effect": "Allow",
         "Action": "iot:Publish",
         "Resource": "arn:aws:iot:us-west-2:760000000000:
          topic/$aws/things/Camera/shadow/update"
      }
   ]
}
```

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Sensing the Speed of Multiple Cars with Multiple sensors

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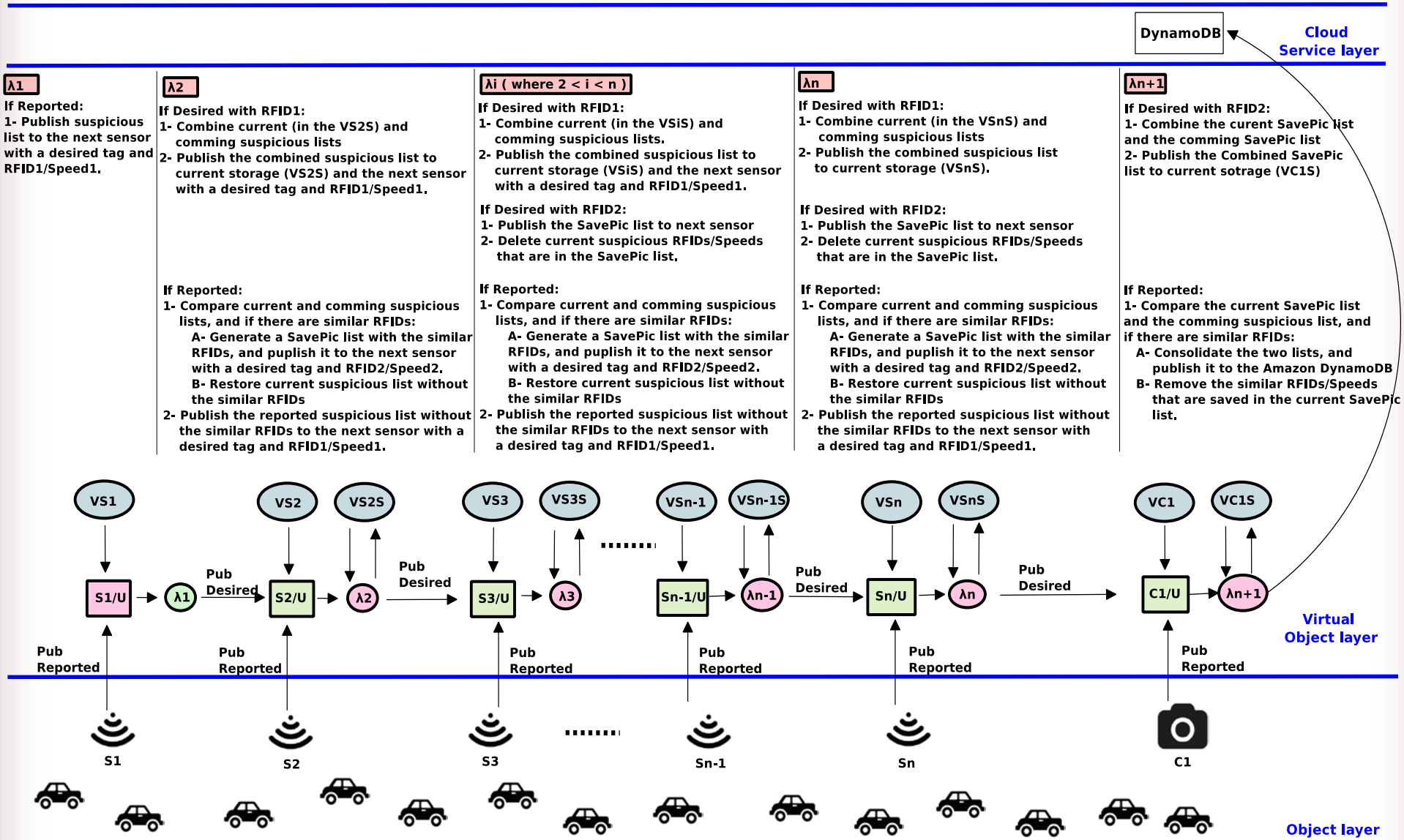

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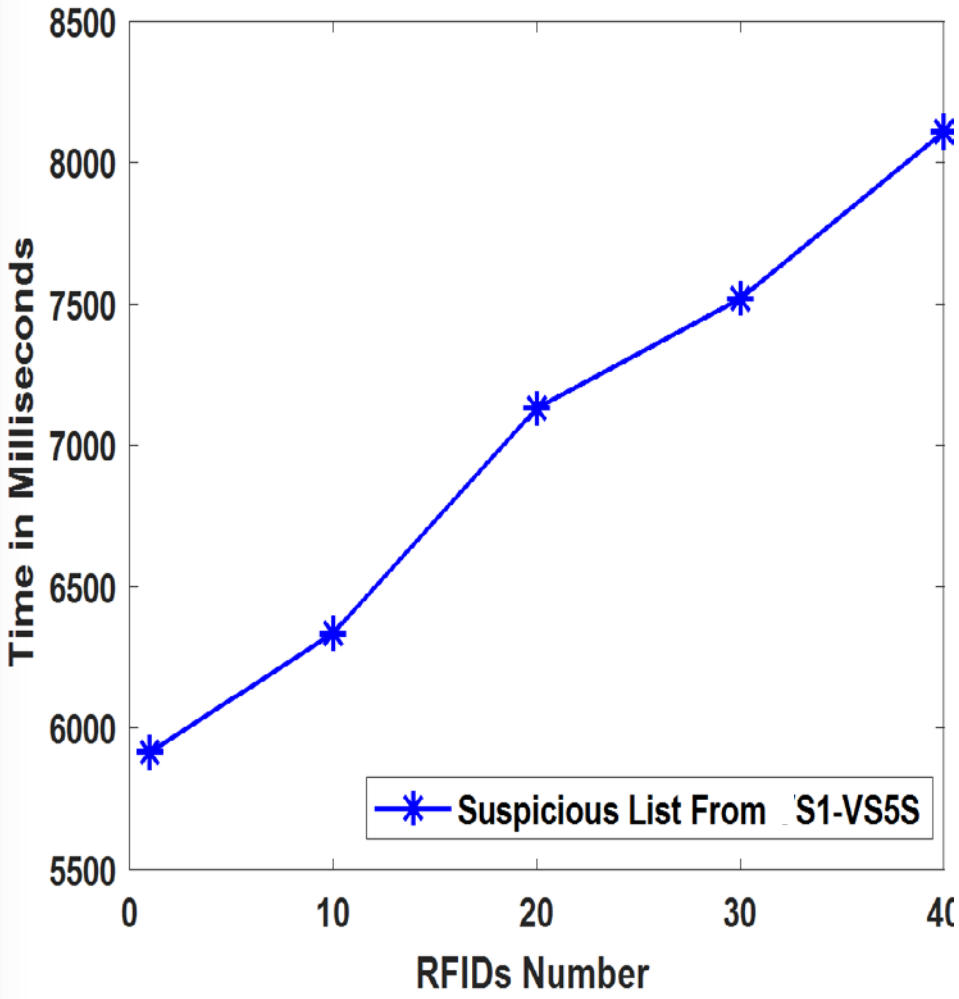
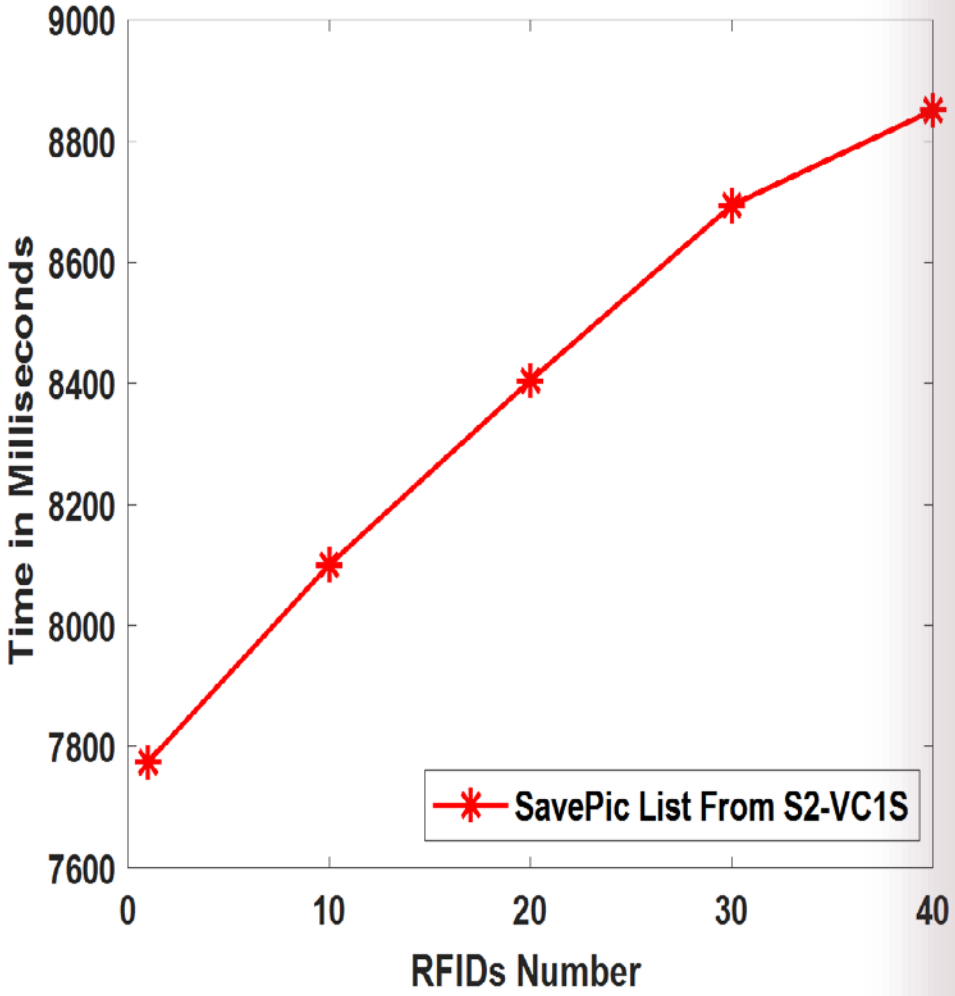
Performance





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Conclusion and Future Work

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Conclusion

1. Develop access control models for VO communications for AWS IoT
2. Reconcile the academic access control models within the AWS IoT
3. Implement the sensing speeding cars use case

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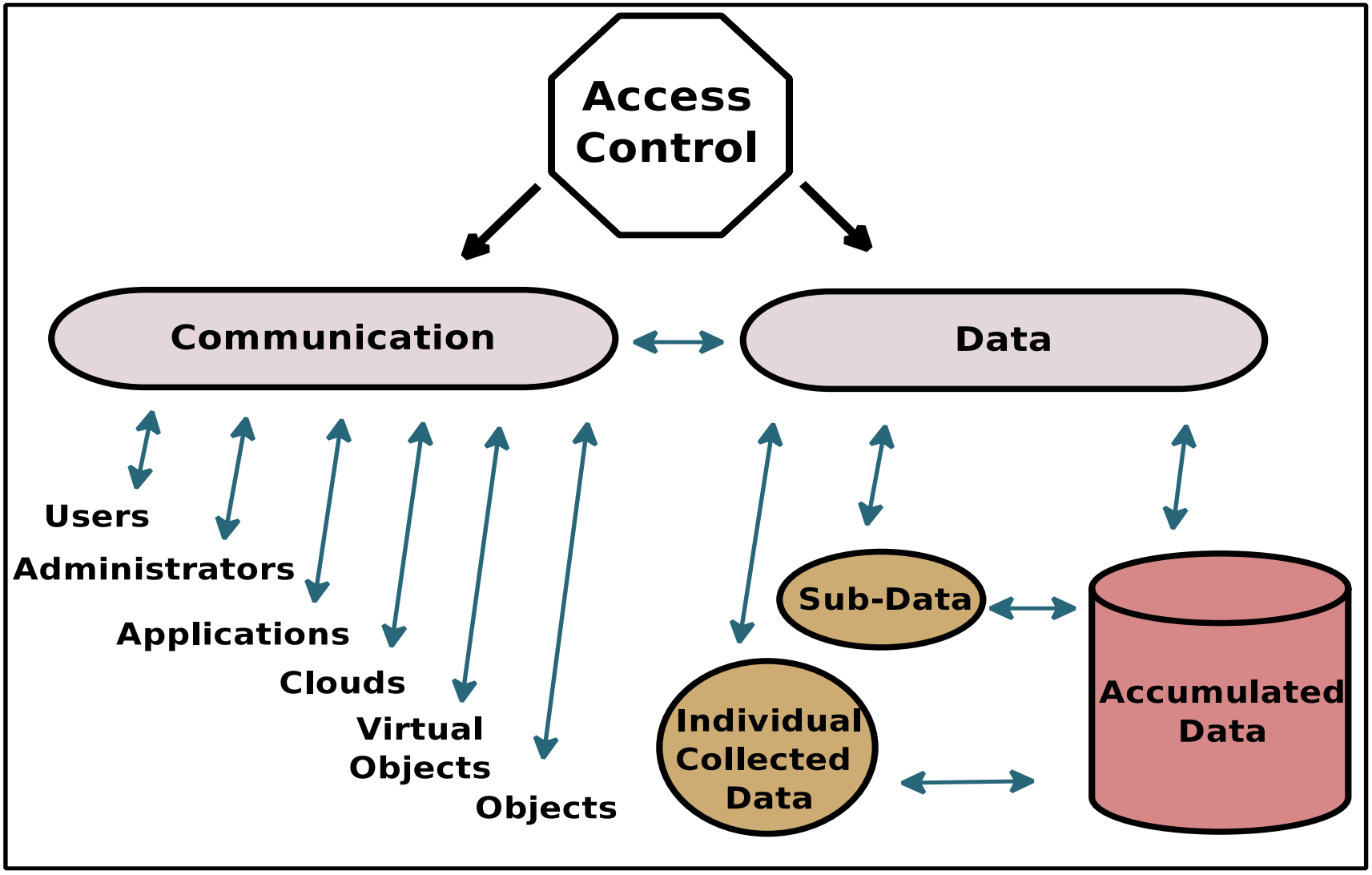
Future Work



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Questions

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