Introduction to
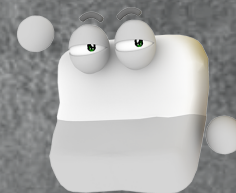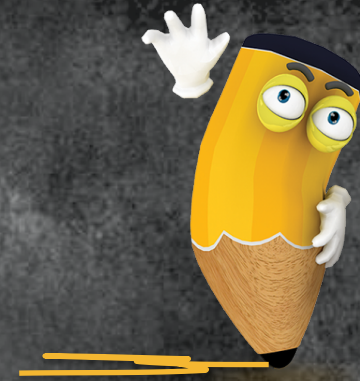
Distributed Systems

Architectural Design

User's Type: **Police Officer**

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Police Officer

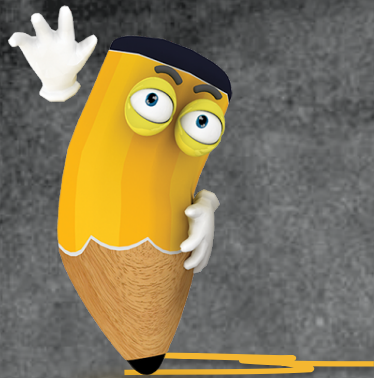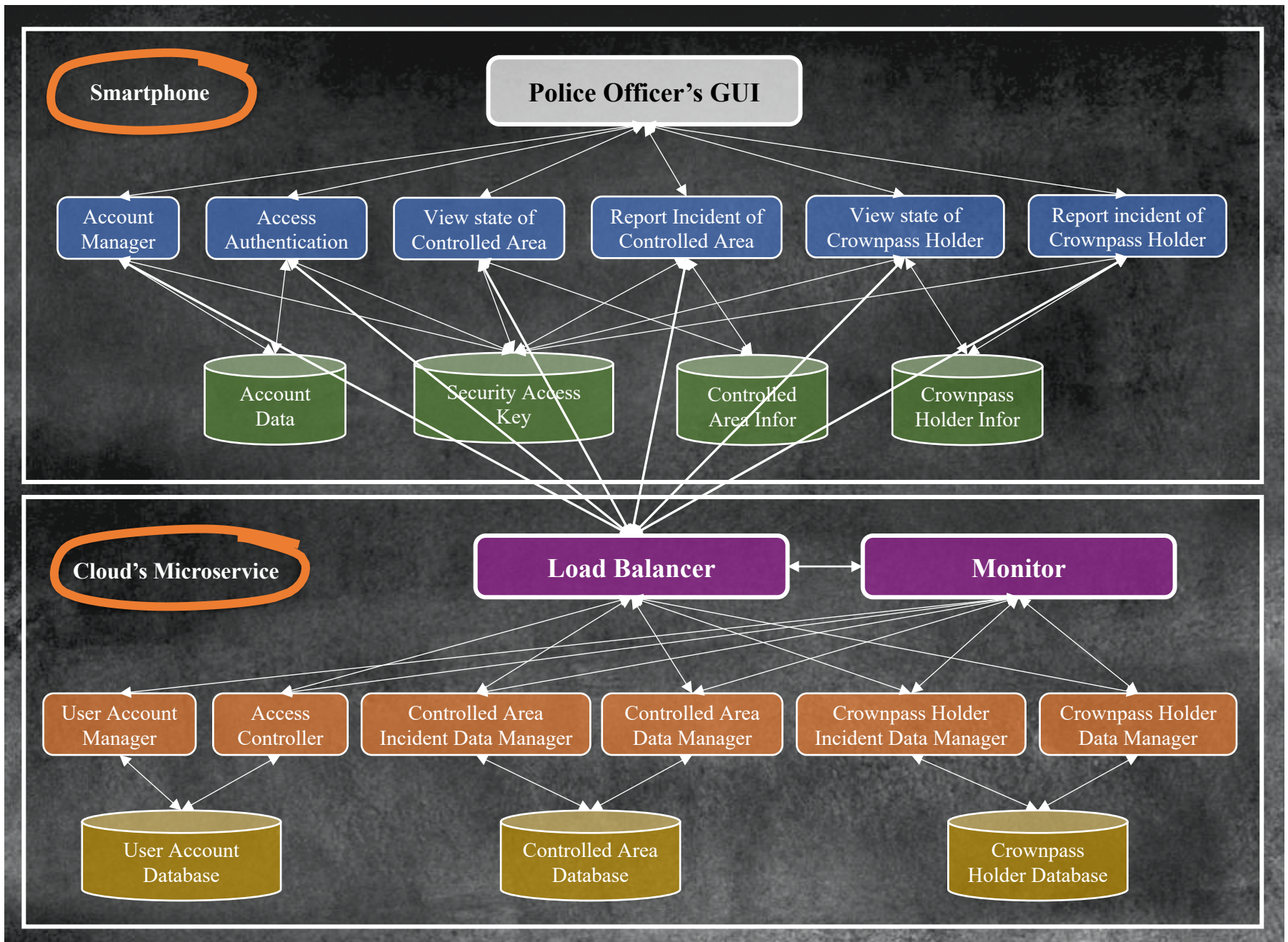*Functional Requirements of Police Officer*

FR-PO-01

FR-PO-02

FR-PO-03

FR-PO-04

View State of Controlled Area

Report Incident of A Controlled Area

View the state of Crownpass Holder

Report incident of Crownpass holder
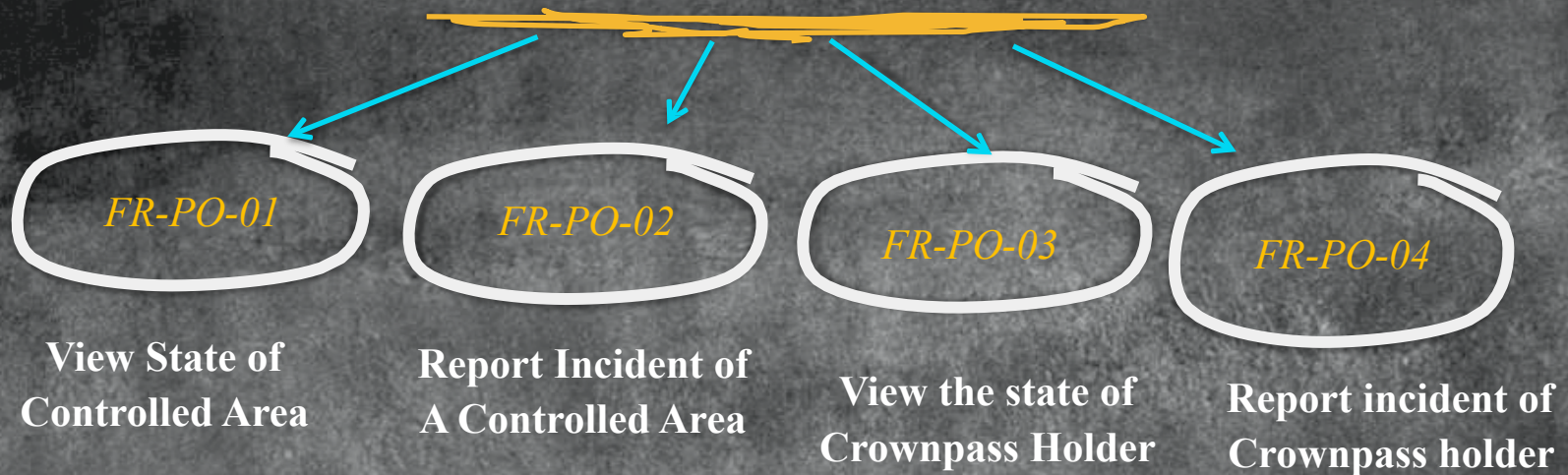
Quality Requirements

1. **Scalability:** the total number of police officers is around 30,000. The total number of incident reports to be entered to the system per day is estimated to be around 1,500 nationally.

2. **Performance:**

- QR-PF-12: Setup Police Officer Account. The response time of each operation in the process of setting up a police officer's account should be no more than 5 seconds.

- QR-PF-13: Report Incident. The response time for each operation in the process of police officer's reporting of an incident should be no more than 3 seconds.

- QR-PF-14: Inspect Controlled Area. The Response time for inspecting the data of a controlled area should be no more than 3 seconds.

3. **Reliability**

- Availability 24/7 downtime no more than 10 hours annually.

- Recovery: 1 hour over the whole year

- Mobile App Failure Rate 0.03%

- The failure rate for correctly recording the incidences reported by a police officer should lower than 0.01%

4. **Platform Compatibility:** The mobile App for each type of users must be available for top 5 smartphone operating systems (including different versions), and top 10 makes and models .

Service Name	Load Balancer
Description	The service runs on the cloud to distribute the service requests to instance
Provided Services	Function: Distribute services requests to instances, create new instances when work load higher than the capacity, terminate the. instances when workload is below necessary Parameters: CPU utilization: 70% the trigger to create a new instances on google cloud
Service Name	Monitor
Description	The service runs on the cloud to monitor the performance of the service instances
Provided Services	Function: Function: Monitor the instances' performance. When an instance fail, it informs load balancer to stop feed the request to it.

Smartphone's Microservices

1. Account Manager

2. Access Authentication

3. View state of Controlled Area

4. Report Incident of Controlled Area

5. View state of Crownpass Holder

6. Report incident of Crownpass Holder

Service Name	Account Manager
Description	The service runs on the smartphone to enable the user to login to the System
Provided Services 1	Function: Check, update the police account, password . Parameters: Username, Password, User Type
Provided Services 2	Function: Checking the Security Access key if it is available Parameters: Username, Password, User Type
Requested Services	Service: User Account Manager Operation: Checking the credentials of the police officer Parameters: Username, Password, User Type Reply: Confirmation
Service Name	Access Authentication
Description	This service runs on the smartphone to receive the security access key from the access controller and save it in the security access key database
Provided Services	Function: Checking the Security Access key if it is available Parameters: Username, Password, User Type
Requested Services	Service: Access Controller Operation: Getting the Security Access Key for a specific period. Parameters: username, password, user type, period of time Reply: generating and providing the security access key.

Service Name	View state of Controlled Area
Description	This service runs on the smartphone to enable the user to view the state of controlled areas.
Provided Services 1	Function: Checking the Security Access key if it is available and authorize the Controlled Area access key to view their state. Parameters: Controlled Area ID, state
Provided Services 2	Function: View State of Controlled Area Parameters: (a) Name, Address, Type of the controlled area; (b) The Capacity of the controlled area; (c) The current number of persons in the area as recorded in the system

Service Name	Report Incident of Controlled Area
Description	This service runs on the smartphone to enable the user to report the state of controlled areas.
Provided Services	Function: Checking the Security Access key if it is available and authorize the Controlled Area access key to change their incident state. Parameters: Controlled Area ID, incident state
Requested Services	Service: Report Incident of Controlled Area Parameters: Controlled Area ID, State Reply: Confirmation.

Service Name	View state of Crownpass Holder
Description	This service runs on the smartphone to enable police to view the state of Crownpass Holder.
Provided Services 1	Function: Checking the Security Access key if it is available and authorize the Crownpass Holder access key to view their state. Parameters: Crownpass Holder ID, state
Provided Services 2	Function: View State of Crownpass Holder Parameters: mobile phone number, email address, home address, name, gender, date of birth, state,…

Service Name	Report Incident of Crownpass Holder
Description	This service runs on the smartphone to enable police to report the state of Crownpass Holder
Provided Services	Function: Checking the Security Access key if it is available and authorize the Crownpass Holder access key to change their incident state. Parameters: Crownpass Holder ID, incident state
Requested Services	Service: Report Incident of Crownpass Holder Parameters: Crownpass Holder ID, State Reply: Confirmation.

Google Cloud's Microservices
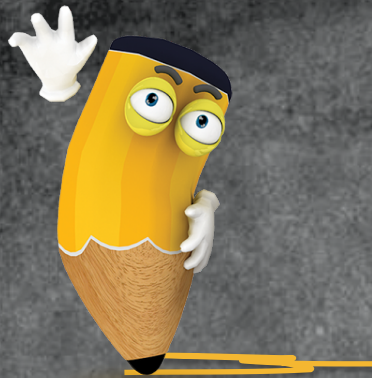
1. Police Account Manager

2. Access Controller

3. Controlled Area Incident Data Manager

4. Crownpass Holder Incident Data Manager

5. Controlled Area Data Manager

6. Crownpass Holder Data Manager

Service Name	User Account Manager
Description	The service runs on the cloud to enable the police to login to the System
Provided Services	Function: Connect to the police account manager to authorize the access to the crownpass system. Parameters: Username, Password, User Type

Service Name	Access Controller
Description	This service runs on the cloud to generate the security access key from the access controller and save it in the security access key database
Provided Services	Function: creating unique security access key and provide them Parameters: Username, Password, User Type
Requested Services	Service: Access Controller Operation: Getting the Security Access Key for a specific period Parameters: username, password, user type, period of time Reply: generating and providing the security access key.

Service Name	Controlled Area Incident Data Manager
Description	This service runs on the cloud to store the incident controlled area information.
Requested Services	Service: Report Incident of Controlled Area Parameters: Controlled Area ID, State Reply: Confirmation.

Service Name	Crownpass Holder Incident Data Manager
Description	This service runs on the cloud to enable the user to report the state of Crownpass Holder.
Requested Services	Service: Report Incident of Crownpass Holder Parameters: Crownpass Holder ID, State Reply: Confirmation.

Service Name	Controlled Area Data Manager
Description	This service runs on the cloud to view controlled area information.
Provided Services	Function: View controlled area information Parameters: (a) Name, Address, Type of the controlled area; (b) The Capacity of the controlled area; (c) The current number of persons in the area as recorded in the system
Service Name	Crownpass Holder Data Manager
Description	This service runs on the cloud to view crownpass holder information.
Provided Services	Function: View crownpass holder information Parameters: mobile phone number, email address, home address, name, gender, date of birth, state,…

Smartphone's
Database

1 Account Data

2 Security Access Key

3 Controlled Area Infor

4 Crownpass Holder Infor

Database Name	Account Data
Description	The database stores information about user account on the smart phone
Type	Semi-structured data (XML)
Design	UserId, Username, First Name, Surname, User Type, Address

Database name	Security Access Key
Description	The database stores information about security access key to ensure the access to the Crownpass resources of Police Officer
Type	Relational Database
Table	Security Access Key
Design	Key, Login Time, Logout Time

Database Name	Controlled Area Info
Description	The database stores information about controlled area on the smart phone
Type	Semi-structured data (XML)
Design	Name, ID, Address details, type of Area, Capacity, Contact Numbers, State, Incident State

Database name	Crownpass Holder Infor
Description	The database stores information about Crownpass Holder on the smart phone
Type	Semi-structured data (XML)
Design	Name, ID, Address details, State, Incident State

Google Cloud's
Database

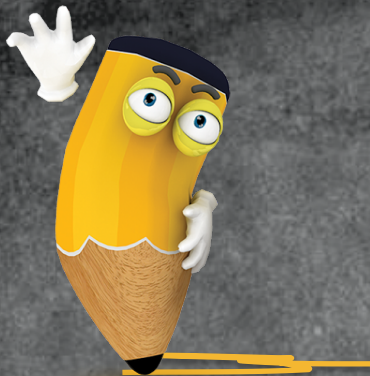1 User Account Database

2 Controlled Area Incident Database

3 Crownpass Holder Incident Database

4 Controlled Area Database

5 Crownpass Holder Database

Database Name	User Account Database
Description	The database stores information about police officer accounts on cloud
Type	Relational Database
Design	Tables: User, Address, Security
Table: User	UserId , Surname, First Name, AddressId , User Type
Table: Address	AddressId, No., Street, City, State, Country, Postcode
Table: Security	UserId, password, security key

Database Name	Controlled Area Database
Description	The database stores information about Controlled Area on the cloud
Type	Aggregate NoSQL Database
Design	Controlled Area ID, Name, Address details, type of Area, Capacity, Contact Numbers, State, Incident State
Database name	Crownpass Holder Database
Description	The database stores information about Crownpass Holder on the cloud
Type	Aggregate NoSQL Database
Design	Crownpass Holder ID, mobile phone number, email address, home address, name, gender, date of birth, state, incident state,…

Thank you

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