Smart City Controller Service Requirements

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Introduction

This document provides the requirements for the Smart City Controller Service.

Overview

The Smart City Controller Service is responsible for monitoring the devices and people within the city. Also, the Controller Service can generate actions to control the devices based on rules, in response to status updates from the devices.

Devices include sensors that are able to collect and share data. Devices can also be controlled. Please refer to the Smart City Model Service Requirements document for more information.

Smart City Controller Requirements

This section defines the requirements for the Smart City Controller Service.

The Smart City Controller Service should support the following functions:

- Monitor Devices for status updates.
- Apply rules that respond to the status updates from the device sensors and generate actions.
- Sensor input includes voice commands received via the microphones.
- In response to events, generate and send control messages to Devices.
- All payment transactions are performed using the Blockchain Ledger with the Unit currency.

The Smart City Controller Service should use the Smart City Model Service interface to monitor the status of each of the IoT devices installed within the cities. In response to inputs, the Controller Service will use rules to invoke actions on the IoT devices.

Log all rule execution and resulting actions.

Design Input:

- Follow the modularity specified in the Smart City System Architecture document.
- Apply the Observer Pattern to allow the Smart City Controller to “listen” for events emitted by the Model Service Sensors.
- Apply the Command Pattern to implement the Actions performed by the Smart City Controller Service.
- Use the Ledger Service (from assignment 1) to check account balances and submit transactions for checkout.

Sensor, Stimulus, Rule, Action

The following table defines the behavior for the Controller Service. The Controller Service will monitor all device sensors for each of the cities. For each stimulus, apply the appropriate action.

Name	Sensor or Device	Stimulus (within the context of a city <city_id>)	Action
Emergency 1	Camera	emergency <emergency_type> at lat <lat> long <long> Where <emergency_type> is one of: fire flood earthquake severe weather	action for <city> 1. announce: "There is a <emergency_type> in <city>, please find shelter immediately" 2. ½ Robots: "address <emergency_type> at lat <lat> long <long>" 3. remaining robots: "Help people find shelter"
Emergency 2	Camera	emergency <emergency_type> at lat <lat> long <long> Where <emergency_type> is one of: traffic_accident	action for <reporting_device> 1. announce: "Stay calm, help is on its way" 2. Nearest 2 Robots: "address <emergency_type> at lat <lat> long <long>"

CO2 Event	CO2 Detector	CO2 level over 1000	If reported by more than 3 devices within a city, Disable all cars in the city.
CO2 Event	CO2 Detector	CO2 level under 1000	If reported by more than 3 devices within a city, Enable all cars in the city.
Litter Event	Camera	Person <person_id> throws garbage on ground at lat <lat> long <long>	Speaker: “Plese do not litter” Robot: "clean garbage at lat <lat> long <long>" Charge person <person_id> 50 units for littering.
Broken glass	Microphone	sound of breaking glass at lat <lat> long <long>	Robot: "clean up broken glass at lat <lat> long <long>"
Person Seen	Camera	Person <person_id> seen at lat <lat> long <long>	Update person <person_id> location lat <lat> long <long>
Missing child	Microphone	can you help me find my child <person_id>?	locate person <person_id> speaker: “person <person_id> is at lat <lat> long <long>, a robot is retrieving now, stay where you are." Robot: “retrieve person <person_id> and bring to lat <lat> long <long> of microphone.
Parking Event	Parking Meter	Vehicle <vehicle_id> parked for 1 hour.	Charge the vehicle account for parking for 1 hour.
Bus Route	Microphone	Person <person_id> says, "Does this bus go to central square?"	Bus speaker: “Yes, this bus goes to Central Square.”
Board Bus	Camera	Person <person_id> boards bus.	Bus Speaker: “hello, good to see you <person_id>” If the person is a resident and has a positive account balance, charge persons account for the rate of the bus.

Movie Info	Kiosk	Person <person_id> says, “what movies are showing tonight?”	Speaker: “Casablanca is showing at 9 pm ” Display: “https://en.wikipedia.org/wiki/Casablanca_(film)#/media/File:Casablanca Poster-Gold.jpg”
Movie Reservation	Kiosk	Person <person_id> says, “reserve 2 seats for the 9 pm showing of Casablanca.”	1. Lookup Person <person_id> 2. Check for positive account balance 3. If the person is a resident and has a positive account balance, charge the person 10 units 4. Speaker: “your seats are reserved; please arrive a few minutes early.”

Feel free to experiment with other types of Rules.

Testing

Continue to use the Smart City Model Service Command Language to test your system.