Elevator Control System

Software Architecture Design

SAD Version 2.0

Team #3
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CS 460 Software Engineering

Contents

1 Introduction

Good software is identified by the end user for its features and functionality, by the client for its profitability and maintainability, and by the programmer for its legibility and clarity. It should be clear that all three pillars ultimately characterize good software, but more importantly that the three are interdependent. The developer must then guarantee all of the above for the sake of all entities involved. A top down approach has been taken up to this point. The feasibility study asked answered the fundamental question: Can it be done? The requirements definition document was then passed the baton and answered the next logical question: Within what parameters can it be done? The software specification document then answered: What is the desired behavior of the system? Now we may answer: How will ensure the desired behavior?

The ultimate goal is to ensure an efficient, safe, and maintainable implementation of the Cretaceous Gardens Controller (CGC) software[1]. To that end, all objects are illustrated in their proper contexts, and their crucial functions have been delineated as clearly as possible while simultaneously allowing the programmer enough flexibility so as to not stifle his or her creative process.

This is a road map for the eventual implementation of the system. It details the most relevant objects and their relationships in the form of diagrams. Explanations accompany all diagrams for the sake of clarity.

2 Design Overview

The class architecture presented here [2] *aims to maximize efficiency, maintainability, and safety. Without an efficient system, its safety may be compromised due to unnecessary delays between components. Maintainability can impact a safe implementation of the system if the system is permeable to programmer errors. The decoupling of concerns and a solid hierarchy are paramount. The design has been color-coded to increase readability. The colors are only for the sake of distinguishing one component from another.*

[1] Introduction by Zeke.

[2] Diagrams by Siri, Anas, Santi, and Zeke.

The component specification diagrams in the following section inherit these colors. Small red arrows point to objects that may be triggered by an event. Said objects are virtual devices and iconifications of their physical triggers have been connected to them with bidirectional blue arrows.

3 Component Specifications

Here are the class specifications[3] *for objects found in Section 2. The most important attributes and functions are given and where appropriate, any expected preconditions, parameters, return values, and post conditions are included. Explanations are given for each component, but it should be noted that helper functions are not shown, as they are entrusted with the programmer. Important fields and helper fields are treated analogously.*

Electric Fence Class	
Attributes	
currentMode	indicates whether or not which mode is detected.
Electric Fence Sensor	object that senses any distortions in the fence.
Maintainer	object that checks for health status of the fence.
Functions	
checkStatus()	→ checks the status of the fence.
switchMode(mode)	→ switches the mode based on the specification by CGC.
reportHealthToCGC()	→ reports the health of the fence.

[3] Component specifications by Anas and Siri

Electric Fence Sensor Class	
Attributes	
electric conductance	senses electricity in the fence.
Functions	
checkElectricConductance()	→ check possible distortions in thefence.

Maintainer Class	
Attributes	
health status	indicates the health of the electric fence.
Functions	
maintainanceMode()	→ goes into maintainance mode.

Camera Network Class	
Attributes	
Camera	software that is responsible for streaming video.
DVR	software that is responsible for storing/retain video.
Maintainer	object that checks for health status of the fence.
Functions	
checkCameraStatus(cameraID)	→ checks the status of the camera.
deleteRecording(cameraID, date range)	→ delete the recording from a given camera from specified range.
activateRecording(cameraID)	→ begin recording the given camera.
monitor(cameraID)	→ view the associated camera.
reportOutage()	→ report for any possible camera outage upon CGC request.

Camera Class	
Attributes	
cameraID	The camera number.
status	The camera status.
Functions	
getID()	→ gives the id of the camera.
play()	→ starts streaming the video.
getStatus()	→ gives the status of the camera.
getStream()	→ view camera.

DVR Class	
Attributes	
streamRecord	keeps track of video streams.
Functions	
start(cameraID)	→ begin recording of the camera.
delete(cameraID, range)	→ delete video stream.

Maintainer Class	
Attributes	
health status	indicates the health of the camera network.
Functions	
maintainanceMode()	→ goes into maintainance mode.

4 Sample Use Cases

A broad overview of use cases begins this section and it is followed by detailed case descriptions. Human actors are denoted by small stick figures and have the same color scheme as the box that contains their labels. The section later features use case diagrams for each actor and a detailed sample of use cases. sectionSample Use Cases

The CGC lends itself for a substantial amount of uses. Some notable uses include financial, official, managerial, medical, and technical connotations.

4.1 CGC Station Operator

The CGC Station Operator (GSO)is the actor responsible for monitoring the central CGC system that controls all other components. This individual may communicate with guests or other employees through the car intercom, may place vehicles into manual mode, and has access to the camera network.

Use Case: ReprimandTroublesomeGuest

Primary Actor: CGC Station Operator

Goal in Context: To reprimand a guest that is causing trouble by incremental warnings ranging from casual notice, to threats of banishment from the resort.

Preconditions: The system and all components are functioning properly.

Trigger: A guest is caught throwing rocks into the enclosure.

Scenario:

1. The GSO reviews an alert from the electric fence interface.
2. The GSO reads that small voltage spikes have been detected.
3. The GSO heads to the surveillance camera that corresponds to the panel in question.

4. The GSO observes a guest hurling rocks at the enclosure, which explains the voltage spikes.
5. The GSO immediately and firmly tells the guest to stop throwing rocks through the PA system near the site.
6. The GSO is ignored by the guest who gives the finger to the camera.
7. The GSO dispatches the nearest patrol vehicle to the location.
8. The GSO explains the situation to the security guard that happens to be in the patrol vehicle at the time.
9. The GSO firmly alerts the unruly guest that a security guard has been sent.
10. The security guard arrives and reprimands the guest.
11. The guest become violent and gets tased and pepper sprayed.
12. The guest is apprehended and placed in the patrol vehicle.
13. The GSO dismisses the electric fence alerts.

Exceptions:

The system is triggered into emergency mode.

Priority: Moderate, not necessary, but can be useful.

When Available: On demand.

Frequency of Use: More frequent with higher volumes of visits.

Channel to Primary Actor: Electric fence panel, CGC Station GUI, camera

Secondary Actors: Patrol Vehicle, Security Guard, Electric Fence, Guest

Channels to Secondary Actors:

Patrol Vehicle: direct

Security Guard: car intercom

Electric Fence: direct

Guest: PA system, electric fence

Open Issues:

None known.

4.2 Emergency Personnel

Emergency Personnel (EP) may be police officers, federal agents, paramedics, and in certain contexts even security guards. Among the many actions that may be taken by such an actor are search and rescue, arrest, perform CPR, and many more.

Use Case: SearchAndRescue

Primary Actor: Emergency Personnel

Goal in Context: To find any potentially remaining guests after a disaster has occurred on the island.

Preconditions: Emergency mode may or may not be currently active, but it has definitely been triggered prior to the arrival of the actor.

Trigger: A distress signal has been received from Cretaceous Gardens (from Isla Trueno).

Scenario:

1. The platoon has received orders to address an emergency on Isla Trueno.
2. The troops arrive to the island littered with debris and corpses.
3. Some Pay kiosks remain active with an eerie glow coming from an uncannily cheerful welcome screen.
4. Screams of terror can be heard in the distance, followed by tremendous roars.
5. The Emergency Personnel head to the kiosks and enter special codes that provide them with an enormous supply of token devices.
6. The EP diffuse throughout the island as they sweep for survivors.

7. Several helicopters can be heard swarming overhead and small group is sent to the CGC Station.
8. As the troops move inland they find severely injured, but alive, guests.
9. The troops give the injured new tokens which may be detected by the team at the station.
10. A second group arrives at the island, and is directed by the team at the station (via walkie talkies) to the injured.
11. The team notices the T-Rex Monitor signal moving toward the sweeping group of soldiers and they alert them immediately to get into offensive positions.
12. The helicopters overhead lower themselves to wait for the animal.
13. Permission to engage is granted and the beast is taken down.
14. The troops continue their operation until sunrise as teams of paramedics are shipped to the island.

Exceptions:

The T.Rex destroys the CGC Station.

Priority: Essential, must be implemented.

When Available: On demand.

Frequency of Use: Hopefully never.

Channel to Primary Actor: Token GPS

Secondary Actors: Guests, Tokens, Pay Kiosks

Channels to Secondary Actors:

Guests: tokens

Tokens: pay kiosks

Pay Kiosks: direct

Open Issues:

None known.

4.3 Guest

The guest is the primary benefactor of many to the system's features. The primary role of this actor is to safely indulge in what the resort has to offer. The most common use for a guest is to see the main exhibit but there may be several prerequisite uses that lead up to that.

Use Case: ViewTRex

Primary Actor: Guest

Goal in Context: To see a live dinosaur.

Preconditions: The system and all components are functioning normally.

Trigger: The guest wishes to see a dinosaur since the age of five.

Scenario:

1. Upon hearing of the grand opening of Cretaceous Gardens, the guest immediately heads to the island by whatever means possible.
2. On arrival, the guest witnesses tremendous lines formed at many pay kiosks near the entrance of the resort.
3. After what seems like an eternity, the it is the guest's turn to purchase entry to the resort.
4. The guest is welcomed through a pleasant graphical display.
5. The guest is asked a series of questions in order verify compliance with the park policies (e.g. How old are you? Do you consent to having your picture taken? Do you accept full responsibility for any injuries sustained due to personal choices? Do you accept the risks of seeing a live Tyrannosaurus Rex and free Cretaceous Gardens of any and all consequences of doing so?)
6. After ignoring all the fine print and zipping through the legal stuff, the guest finally arrives at the screen that will allow the rental of an access token.
7. The guest enters the amount of time he or she plans to stay and is given the total price.

8. The guest is prompted to enter payment.
9. The guest pays after confirmation and receives the rental token device.
10. Instructions on what to do next are displayed on the kiosk screen.
11. The guest uses the token device to enter the resort via a small gate.
12. The guest eventually arrives at a parked car, into which others may or may not be entering.
13. The guest enters the token device into the seatbelt buckle and secures the seatbelt.
14. The guest lets the car do its job (see section 4.4).
15. The guest arrives at the exhibit and exits the car, taking the token device along.
16. The guest heads toward another gate which scans the token device to provide access.
17. The guest sprints toward the enclosure.
18. The guest is lucky and gets to see the mighty T.Rex sniffing around.

Exceptions:

Guest changes his or her mind anywhere in the scenario and decides to leave.

The system is triggered into emergency mode.

Priority: *level of implementation importance (e.g. correct change is a must)*

When Available: *when or during which interval of time the action is to supported by the system*

Frequency of Use: *number of uses per unit of time (e.g. annually, billions per second, etc)*

Channel to Primary Actor: *means through which the system interacts with actor*

Channels to Secondary Actors: *means through which the primary and secondary actors interact*

some channel

some other channel

...

Secondary Actors: *intermediary or auxillary actors required to complete the goal*

Open Issues: *itemization of current problems with any of the above*

some issue

some other issue

...

Use Case: Evacuate

Primary Actor: Guest

Goal in Context: To leave the island as quickly and as safely as possible.

Preconditions: There exists some imminent threat to the guest (it may be an enclosure failure, inclement weather, or any other emergency of similar caliber). Sudden guest death (unrelated to the island or system) may also be the case.

Trigger: Something horrible occurs. For simplicity, the following scenario assumes the T.Rex destroys its enclosure and is now on the loose.

Scenario:

1. The T.Rex destroys the enclosure (see subsection 4.10).
2. Emergency mode is activated.
3. 22 All guests are alerted via the car intercom, the token devices, and an island wide speaker system, the Global Alarm System.

4. Guests receive instructions via the above means with interleaved reassurances that extra vehicles are on the way to pick them up.
5. Guests are also informed that they may enter any vehicle, with or without tokens.
6. Once in the vehicle, guests are asked (via the token device) whether or not they would like to depart.
7. If at least one individual submits a yes, the car transmits a message to indicate imminent departure with a warning that doors will soon close.
8. Once in motion, the guest in the driver seat is offered the option to place the vehicle into manual mode.
9. If the individual chooses to do so, then he or she may now pilot the vehicle as he or she wishes.
10. Otherwise, the car will head south as quickly and as safely as possible.
11. Once at the south end, the car will park and wait for guests to exit.
12. After it has been confirmed that no guests remain in the vehicle (seat weight sensors indicate all seats are empty), the guests are given another warning to stand back.
13. As the guests head toward the exit, the car closes its doors and speeds north to collect more guests.

Exceptions:

The car suffers damage that causes it to malfunction.

Priority: Essential, must be implemented.

When Available: On demand.

Frequency of Use: Hopefully never, but at least once in reality.

Channel to Primary Actor: Car doors, tokens, interior car components (if manual mode is enabled)

Channels to Secondary Actors:

T.Rex: breached enclosure

Token: device display and speaker

Emergency Personnel: directly at any stage during the evacuation.

Secondary Actors: T.Rex, Tokens, Emergency Personnel

Open Issues:

None known.

4.4 Guest Vehicle

The guest vehicle (GV) plays a vital role in facilitating the guest experience. The actor primarily moves guests to and from the exhibit, but may exhibit other functions when the system is in maintenance or emergency mode.

Use Case: ShuttleGuestsToExhibit

Primary Actor: Guest Vehicle

Goal in Context: To transport guests to the northern part of the island so they may visit the exhibit.

Preconditions: The system is in normal mode and all components are functioning properly.

Trigger: A transaction is confirmed and a tokens are provided to guests.

Scenario:

1. The guests are directed to the parked GV.
2. The guests enter the GV.
3. The GV instructs guests to enter their token devices into their belt buckles.
4. The GV detects all token-containing buckles have been used to fasten corresponding seatbelts.

5. The GV locks its doors and unlocks window functionality for guests.
6. The GV performs a quick system check.
7. The GV heads toward the exhibit.
8. The GV arrives and parks in front of a gate that leads to the exhibit.
9. The GV reminds the guests to take their tokens with them as it grants them access through the gate.
10. The guests exit the vehicle and make their way toward the gate.
11. The GV parks itself nearby and starts a timer.

Exceptions:

A guest loses his or her token device, thus preventing seatbelt access, which necessitates staff intervention.

Priority: Essential, must be implemented.

When Available: On Demand.

Frequency of Use: Up to thousands of times per day.

Channel to Primary Actor: Direct.

Secondary Actors: Guests, CGC Station Operator, Tokens

Channels to Secondary Actors:

Guests: doors, seatbelts, speakers

CGC Station Operator: direct

Tokens: seatbelt buckles

Open Issues:

None known.

Use Case: ShuttleGuestsFromExhibit

Primary Actor: Guest Vehicle

Goal in Context: To transport guests to the southern part of the island so they may leave the island.

Preconditions: The system is in normal mode and all components are functioning properly.

Trigger: The guests' time is up at the exhibit.

Scenario:

1. The car alerts the guests it shuttled to the exhibit that time is up.
2. The guests hear the alert from the car and from their token devices.
3. Some of the guests immediately head to the car while others delay.
4. The guests that head to the car enter it and fasten their seat belts.
5. The GV sends another alert to those remaining.
6. The rest of the guests finally arrive and enter the GV.
7. The GV locks its doors after everyone has fastened their seatbelts.
8. The GV heads south.
9. The GV arrives to the southern part of the island where it parks.
10. The guests release their seatbelts.
11. The GV unlocks its doors and allows the guests to exit.
12. The GV is dispatched elsewhere.

Exceptions:

A guest happens to be injured and requires another type of transportation.

A guest loses his or her token device, thus preventing seatbelt access.

Priority: Essential, must be implemented.

When Available: On Demand.

Frequency of Use: Up to thousands of times per day.

Channel to Primary Actor: Direct.

Secondary Actors: Guests, CGC Station Operator, Tokens

Channels to Secondary Actors:

Guests: doors, seatbelts, speakers

CGC Station Operator: direct

Tokens: seatbelt buckles

Open Issues:

None known.

4.5 Maintenance Personnel

Maintenance Personnel (MP) is responsible for the physical connections and addressing any issues with the physical components used with by the CGC (e.g cameras, kiosks, cars, enclosure panels, etc.). This individual would be in charge of responding to nodal failures.

Use Case: RepairExternalEnclosureCamera

Primary Actor: Network Maintenance Personnel

Goal in Context: To fix or replace a malfunctioning or broken camera that has been detected to be in such a state by the CGC. The camera in question resides outside the exhibit enclosure.

Preconditions: The CGC is not in emergency mode but may be in either normal or maintenance mode, and the issue has already been diagnosed (i.e. it is known with certainty that the problem is the camera and not the link to the camera).

Trigger: The CGC reports an error in some camera within the Camera Network after failing to make contact via alternate paths.

Scenario:

1. NMP is dispatched and transported in an self-driving car to the location of the problem by the CGC Station Operator (CSO).
2. NMP arrives and performs a repair, exchanges the broken camera for a new one, or attaches a new one if it happens to be gone all together.
3. The CSO and NMP perform tests to ensure proper function.
4. The maintenance is concluded.
5. The NMP is dispatched to any other components that may need servicing.

OR

6. The NMP returns any removed parts (e.g. the broken camera) to a stock room.

Exceptions:

Maintenance materials are out of stock.

Emergency mode interrupts the procedure.

Priority: Moderate, should be implemented.

When Available: On Demand.

Frequency of Use: It may vary with respect to the average lifetime of the cameras in the network.

Channel to Primary Actor: CGC Station, Car, Camera, Camera Network

Secondary Actors: CGC Station Operator, Camera Network

Channels to Secondary Actors:

CGC Station Operator: Car Intercom

Camera Network: Camera

Open Issues:

None known

4.6 Patrol Vehicle

This actor is a special type of autonomous vehicle that patrols the island for an added layer of protection and in the interest of guest welfare.

Use Case: PatrolIsland

Primary Actor: Patrol Vehicle

Goal in Context: To provide a means via which security personnel may patrol the island. The vehicles are to be on a mostly predetermined route, so the security guards (in this context) are mostly passive agents.

Preconditions: The system is in normal mode and all components are functioning properly.

Trigger: The resort opens for business.

Scenario:

1. Cretaceous Gardens opens to employees before opening for the business day.
2. The Patrol Vehicle (PV) is dispatched via a routine protocol.
3. The PV performs a test run around the island before picking up the security guard of the shift.
4. The security guard enters the PV, after which the PV performs another test trip.
5. The security guard double checks state of the route.
6. Anything out of the ordinary is reported to the relevant parties (maintenance for example).
7. The PV returns to the southern part of the island.
8. The security guard confirms an all clear with other employees.
9. The rest of the employees continue their setup as the security guard enters the PV.
10. The PV begins its daily patrolling routine (one or more simple circuits around the island).

Exceptions:

The system is triggered into emergency mode.

Priority: Low, not necessary but may be useful.

When Available: During business hours.

Frequency of Use: Daily.

Channel to Primary Actor: Direct.

Secondary Actors: CGC Station Operator, Security Guard

Channels to Secondary Actors:

Security Guard: Car door, inner components of car

CGC Station Operator: CGC station interface

Open Issues:

None known.

4.7 Sales department

The sales department (SD) is, for the sake of simplicity, is the actor interested in maximizing ticket sales and profits. The SD is interested in any financial trends for the sake of such aims. They may also be interested in finding efficiency bottle necks that incur unnecessary costs.

Use Case: VisualizeSalesData

Primary Actor: Sale Department

Goal in Context: To acquire and study data related to sales within some given period of time.

Preconditions: The system is not in emergency mode nor maintenance mode and all components are functioning properly.

Trigger: It is about time to wrap up a fiscal quarter to plan for the next one.

Scenario:

1. A meeting is scheduled in order to plan for the next quarter.
2. The SD gathers all sales data provided by the CGC.
3. The SD uses a provided interface to organize the data into meaningful visualizations.
4. The SD exports the visualizations for a presentation at the meeting.
5. The meeting is held and the SD presents their findings.
6. The SD contribution helps guide the conversation for what to do next.
7. The meeting concludes.

Exceptions:

The system enter emergency mode.

Priority: Extremely low, need not be implemented.

When Available: On demand.

Frequency of Use: May be used continuously (as a live data feed), or any number of snapshots may be taken hourly, daily, weekly, etc.

Channel to Primary Actor: An auxiliary interface specialized for financial data visualization.

Secondary Actors: CGC Control Station

Channels to Secondary Actors:

CGC Control Station: some network link to forward relevant data

Open Issues:

An interface separate from the Control Station interface would have to be developed as it would reside elsewhere on the island.

4.8 System Administrator

The this actor (SA) specializes in addressing hardware issues with the CGC Station. This individual is responsible for repairing disk drives, monitors, redundancy elements within the station, updating machine operating systems, etc.

Use Case: UpgradeSystemMemory

Primary Actor: CGC System Technician

Goal in Context: To upgrade the memory of the machines within at CGC Control Station (e.g. add 16 GB RAM).

Preconditions: The CGC is not in emergency mode but may be in either maintenance or normal mode.

Trigger: Cretaceous Gardens experiences an increase in demand, which (if the trend continues) will require more computational resources to handle more guests, more efficiently.

Scenario:

1. The Sales Department notices a distinct upward trend in sales.
2. The findings percolate through the relevant business entities within the company.
3. The CST is dispatched to the Control Station.
4. The CST enables maintenance mode.
5. The CST upgrades machines that are currently being used for redundancy.
6. The CST enables maintenance mode on the redundant machines.
7. The redundant machines and active machines, switch roles.
8. The CST upgrades the now-redundant machines.
9. The CST performs tests.
10. The CST disables maintenance mode in both active, and redundant machines.

Exceptions:

The trend is ignored by management.

Priority: Moderate, should be implemented.

When Available: On demand.

Frequency of Use: Every two or three fiscal years.

Channel to Primary Actor: Control station hardware.

Secondary Actors: Sales Department, CGC Control Station, Pay Kiosk

Channels to Secondary Actors:

Sales Department: pay kiosk transaction logs

CGC Control Station: direct access

Pay Kiosk: direct connection

Open Issues:

None known.

4.9 System Auditor

This actor (SA) may be an external individual that may either be hired by Cretaceous Gardens to test the robustness of the system, or whose inspection may be mandated by law.

Use Case: SimulateProtocols

Primary Actor: System Auditor

Goal in Context: To observe currently implemented protocols within the system and provide an analysis regarding their safety.

Preconditions: The system is not in emergency mode nor maintenance mode, but may be put into such modes for testing purposes (presumably outside business hours).

Trigger: The time for a system audit has arrived, either after being scheduled or at random.

Scenario:

1. The SA arrives to the CGC Control Station outside of business hours.
2. The SA requests to observe a simulation of the currently used functions of the system.
3. The SA is provided with a set of protocols that may be simulated.
4. For each protocol, the SA runs a simulation.
5. The system passes the audit and the SA leaves.
6. OR
7. The system fails while simulating one or more protocols and the auditor presents a deadline to fix the issue lest a fine is incurred.

Exceptions:

An audit occurs in the middle of a system upgrade.

The system is triggered into emergency mode (due to an actual emergency)

Priority: Low, not explicitly required, but may be useful for legal robustness.

When Available: On demand.

Frequency of Use: Annually or less frequently.

Channel to Primary Actor: CGC Control Station interface

Secondary Actors: CGC Control Station, Pay Kiosks, Cars, Electric Fence, T.Rex, T.Rex Monitor, Camera Network

Channels to Secondary Actors:

CGC Control Station: simulation

Pay Kiosks: simulation

Cars: simulation

Electric Fence: simulation

T.Rex: simulation

T.Rex Monitor: simulation

Camera Network: simulation

Open Issues:

What factors should be relevant in a simulation?

4.10 Tyrannosaurus Rex

It may be argued that this is not a legitimate actor, but despite its unconscious interaction with the system, the T.Rex can act on the system in a variety of - possibly unpredictable - ways.

Use Case: LeaveEnclosure

Primary Actor: T.Rex

Goal in Context: To get somewhere that happens to be outside the enclosure.

Preconditions: Actor is not sedated, the system is not in maintenance mode nor emergency mode, and all components are functioning properly.

Trigger: The T.Rex sees or smells something outside the enclosure.

Scenario:

1. The actor looks through the enclosure, toward an imagined near-future destination beyond the enclosure.
2. The actor walks toward the target destination.
3. The actor is impeded by the electric fence.
4. The actor becomes fearful.
   (a) The actor retreats from the fence.

OR

(b) The actor attacks the fence.

5. The electric fence increases its voltage.
6. The scenario may repeat from either act 1, from act 3, or continues such that:
   (a) the actor is sedated to prevent further damage to self or enclosure, and maintenance mode is triggered

   OR

   (b) the enclosure is breached, the actor heads toward the target destination, and emergency mode is triggered.

   OR

   (c) the actor relinquishes the desire to head toward the target destination, no significant damage is incurred, and the normal mode of operation continues.

Exceptions:

Actor Perishes.

Priority: Essential, must be implemented.

When Available: At random.

Frequency of Use: Preferably never, but less likely with time (ideally)

Channels to Primary Actor:

Electric Enclosure Panel

T.Rex Monitor

Secondary Actors: CGC Station Operator, Global Alarm System

Channels to Secondary Actors:

CGC Station Operator: Camera Network, T.Rex Monitor

Global Alarm System: Electric Enclosure Panel

Open Issues:

None known.

4.11 Veterinarian

The veterinarian role includes uses such as routine checkups or medical treatment for the T.Rex.

Use Case: RoutineCheckup

Primary Actor: Veterinarian

Goal in Context: To perform a regular physical exam on the T.Rex.

Preconditions: The T.Rex has been successfully sedated, the veterinarian is completely prepared, the CGC is not in emergency mode, and all components are functioning properly.

Trigger: The time for a physical has arrived.

Scenario:

1. The CGC Station Operator dispatches the veterinarian in a self driving car to the edge of the enclosure closest to the current location of the T.Rex.
2. The veterinarian requests an all-clear confirmation from the operator.
3. The CGC Station Operator confirms sedated state of the T.Rex.
4. The operator disengages the electricity of the panel to provide access.
5. The veterinarian enters and travels toward the animal.
6. The operator starts a timer.
7. The veterinarian arrives at the location of the animal.
8. The operator stops the timer.
9. The veterinarian performs a physical exam while the operator provided updates on the sedative state of the T.Rex.
10. The operator alerts the veterinarian when the previously recorded elapsed time is approaching the approximated amount of time until the T.Rex wakes up.

11. The veterinarian concludes the exam.
12. The veterinarian replenishes the sedative reservoir in the T.Rex Monitor.
13. The veterinarian travels toward the point of entry.
14. The veterinarian exits the enclosure.
15. The Operator confirms successful exit.
16. The Operator reengages the electricity of the panel.

Exceptions:

The T.Rex is found to be in poor health.

The sedative lasts less time than expected.

Priority: Essential, must be implemented.

When Available: On Demand.

Frequency of Use: As little as once a year.

Channel to Primary Actor:

Enclosure Panel, T.Rex Monitor

Secondary Actors: CGC Station Operator, T.Rex, Car

Channels to Secondary Actors:

CGC Station Operator: Car Intercom, Camera Network

T.Rex: Enclosure Panel, T.Rex Monitor

Open Issues:

Should the panel remain inactive while the veterinarian is inside?

Should the veterinarian simply wear an electric safety suit to avoid disengagement all together?

4.12 Zookeeper

A zookeeper may interact with the CGC in a variety of ways, but some of the major roles of such an actor (as with any zookeeper) are to prepare the diet of the T-Rex, feed the T.Rex, to observe its behavior, or groom it.

Use Case: FeedTRex

Primary Actor: Zookeeper

Goal in Context: To safely provide food for the T.Rex, whether it be live, frozen, thawed, or prepared prey.

Preconditions: The CGC is not in emergency mode, and all components are fully functional.

Trigger: It is time to feed the T.Rex.

Scenario:

1. The CGC Station Operator dispatches the zookeeper in a self driving car to the edge of the enclosure furthest from the current location of the T.Rex.
2. The Zookeeper requests an all-clear confirmation from the operator.
3. The operator disengages the electricity of the panel to provide access.
4. The Zookeeper enters and travels a significant distance into the enclosure.
5. The Zookeeper drops off the food.
6. The Zookeeper travels back the point of entry.
7. The Zookeeper exits the enclosure.
8. The Operator confirms successful exit.
9. The Operator reengages the electricity of the panel.

Exceptions:

There is a shortage of food on the island.

The T.Rex is sick or injured and does not want to eat.

The T.Rex reaches the zookeeper before the zookeeper exits the enclosure.

Priority: Essential, must be implemented

When Available: On demand and via operator-zookeeper protocol

Frequency of Use: Periodically (it can be daily, weekly, or monthly for example)

Channel to Primary Actor:

Enclosure Panel

Secondary Actors: CGC Station Operator, T.Rex, Car

Channels to Secondary Actors:

CGC Station Operator: Car Intercom, Camera Network

T.Rex: Enclosure Panel

Open Issues:

Should the panel remain inactive while the zookeeper is inside?

Should the zookeeper simply wear an electric safety suit to avoid disengagement all together?

5 Design Constraints

Due to the real-time nature of the system, there exist some additional constraints[4]*. Namely, it must be the case that all data structures concerning the safety controls are as fast as possible but also that they are capable of prioritizing all signals in the best way possible.*

[4]Design Constraints by Anas.

5.1 Safety

The safety is highly prioritized in our design of the ECS. We have considered associating the fire alarm directly with the ECS because in the case of the fire alarm triggering, this event has a very high priority and the ECS should immediately react to this event. When it comes to elevator and bay safety, each elevator and bay will have set of Safety Controls that they can communicate through and the ECS monitors the situation from the top. By ensuring safety for both bays and the elevators, the ECS operation will be carried smoothly without hurting the passengers.

5.2 Implementation Guidelines

According to the design, we suggest programmers to use some sort of Concurrent safe Messaging Queue for the communication between sensing objects and their associated parent objects. We also recommend using concurrent safe Priority Queue for the ECS, so the ECS can react based on the certain given priority. The priority should be considered because in the case of an emergency, the priority for that event should be at the very top so that the ECS should immediately react to it by closing its doors and going to first floor if its not there already.

6 Definition of Terms

The following is a list of definitions contain the most commonly used technical terms within this document, whose meaning may not be immediately apparent to the lay reader. Most definitions are defined by the authors for use within the context of this document. Some may originate from vocabulary shared across the general references cited . In the event that a definition was taken directly from a source, it is followed by a citation. [5]

CGC: Acronym for Cretaceous Gardens Controller

DVR: Acronym for Digital Video Recorder

Electrical Conduction: The movement of electrically charged particles through a transmission medium.

[5] This list is mostly a reduction of the term list found in the preceding Software Design Specification document.

GPS: Global Positioning System

Hardwired Ethernet: This references the latest IEEE standard for Ethernet utilizing physical cables.

Network: All nodes with which the CGC interacts, the links that connect them to each other and to the CGC, the CGC itself, and all related databases.

Node: The generic term that refers to any device connected to the CGC in any way. This includes autonomous vehicles, tokens, the T.Rex monitor, all electric fence panels, all kiosks, and all cameras.

Safely Inactive: A state in which a vehicle is fully functional and ready to be dispatched.

Safely Occupied: A state in which a vehicle contains at least one person, is locked, and is ready to depart.

Token: An interactive device used by the visitor that grants access to locations.