

=gts Pi

V 4.5



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Version History

Revision	Date	Document
1.0	05/01/16	Initial HTML1 created
2.0	07/24/17	Bootstrap front end Jelly tank monitoring Toast food dispensing and monitoring
2.7	08/05/17	Availability updated from 7AM to 8AM.
2.8	11/11/17	Toggle Motor function added. Feed Dispense photo text notifications added.
3.0	01/22/18	Updated HomeKit commands.
4.0	08/07/19	Pool and Hot Tub control added. Sprinkler monitoring and notifications added. Full Screen Fish Tank view added. Updated HomeKit/Alexa commands and integration. Water Softener monitoring added. Trash Day and Trash Can notifications added. Dark Mode added for Super User. "George Awareness" added. Google Analytics added. Bluetooth Restart added. Availability updated from 8AM to 10PM. Toast Overweight Protection added. Removed Individual Light controls.
4.1	08/25/19	Integrated Amazon Dash buttons for home control. Automated Fish Feed notifications
4.2	09/30/19	Added Awareness features, Switch Shortcuts and Robots
4.3	12/26/19	Added Fish Fed Autodetect
4.4	1/27/20	Added Friend Restrictions, Scenes and Automation, DNS
4.5	2/8/20	Dash Fixed, Added Jellyfish Brine Heater, Automatic Roomba



1.0 Summary

What started off as a simple Mother's Day present to my grandma has spiraled out of control. You see, grandma Rose *loved* to watch my cat, Boo. She would play fetch with him, post his snarky mug all over the fridge and even put ice cubes in his water. When I moved him 3,500 miles away, I knew I had to find a way to bring her back into contact with him. This is =gts Pi.

Boo passed away on August 6th, 2017, there is a memorial tab dedicated to him running off of a Django web server.

2.0 Pets

2.1 Pavlov's Pets

Cat and Toast the dog are easily accessible through =gts Pi. They are "pavlovs pets." They are trained to come at the sound of the bell. Not only does =gts Pi provide the opportunity for the web to call and feed Pavlov's pets, the system feeds them twice per day.

2.2 Calling

When Calling Cat or Toast, a bell rings. This is the same bell that rings when food is dispensed. An LED bulb specific to Toast or Cat will turn on for 150 seconds when a call is invoked. (Voice Control 7.0)

Super User – The Super User can disable the buzzer (Voice Control 7.0) (Dynamic UI 6.11)

2.2.1 Call Restrictions

Cat and Toast are accessible between 8AM and 10PM PT. They are busy when breakfast or dinner is being dispensed.

Super User – The Super User can Force Call Cat or Toast with no time restrictions, or manually set their availability.



2.2 Treats

When Toast or Cat is fed a treat, a bell rings on =gts Pi. This is the same bell that rings when breakfast or dinner is dispensed. When a treat is dispensed, a pet-specific LED bulb turns on for 100 seconds. (Voice Control 7.0)

There is a lit LED button on Cat's feeder to dispense treats mechanically. Cat's treats come from a bin containing treats only.

2.2.2 Treat Restrictions

Cat is allowed one treat per day between 8AM and 10PM PT. Toast is allowed three treats per day between 8AM and 10PM PT, but not in excess of one treat every two hours. If a treat is attempted between 5:45PM and 6PM, Toast will tell you that he's having dinner soon. Between 6PM and 6:30PM, treats are not available as he just had dinner. Since this was made for gram, the final treat is saved for her until 8:30PM PT, unless she's already visited that day. Please see section 2.4 for more information on Toast's availability.

Super User – The Super User can feed limitless treats to Cat or Toast. The Super User's treats count towards the maximum of one per day for Cat and three per Toast for everyone else. The treat halt is reset every day at 12AM PT, the SU can free up an additional snack using "Add One Snack" (Voice Control 7.0).

2.2.3 Overweight Protection

The system is aware of the amount of treats that Toast has consumed. If one treat is dispensed, he is only provided half his dinner. If he is dispensed two or three treats, dinner is skipped.

2.3 Scheduled Meals

Cat is automatically dispensed ¼ cup of cat food at 6AM and 6PM. Toast is dispensed 1 cup of food at 8AM and 6:01PM. Toast's meals are dispensed only if =gts Pi detects his presence and if food is available, see section 2.3.1 Food Level Indicator.

The LED bulbs will light up for 360 seconds during scheduled meals and light up two minutes prior to dispensing food.



Super User – The Super User can feed a meal to Cat on demand. The Super User can dispense a smaller portion of cat food to Cat as a snack.

Super User – The Super User can toggle the cat feeder servo using the “Toggle Motor” button. This helps in situations where the feeder jams.

2.3.1 Food Level Indicator

Toast’s dispenser does not visually show food; a gauge is coded into =gts Pi. When the food level approaches 12%, the system will log that the food level is low and will notify the Super Users via text. If the =gts Pi detects the food is empty, it will prevent the system from trying to dispense food. The Food Level Indicator can be seen in Toast’s main page. This value is updated every minute.

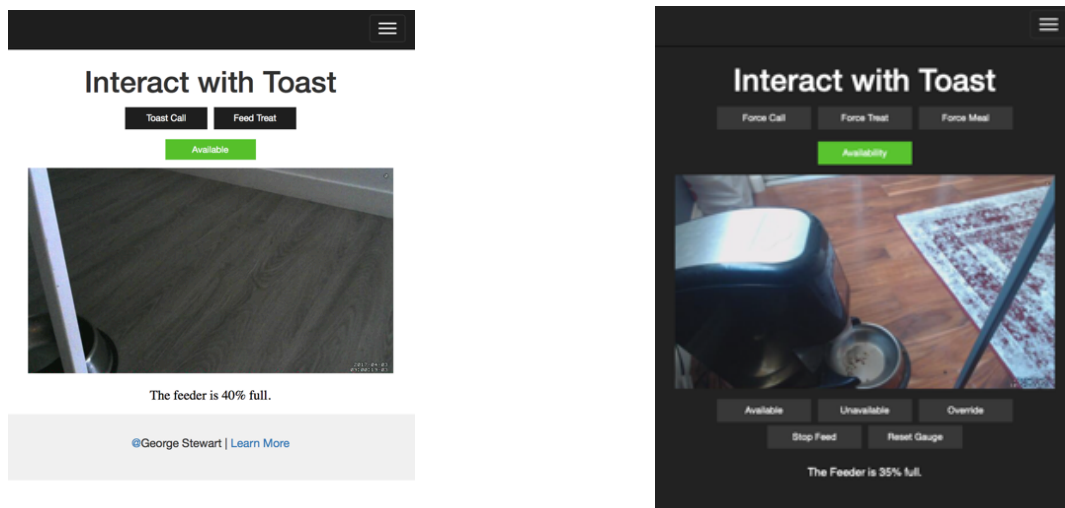


Figure 1. Toast Main Page Showing Food Level Indicator

Super User – When food is running low, the system must be filled and the gauge reset through Toast’s page. (Voice Control 7.0)

2.3.2 Water Level Indicator

Toast's water bowl is equipped with a capacitive soil moisture sensor and uses this to detect that there is water in the bowl. The container holds ~80oz so it does not need to be filled often. When the system detects that the bowl is empty, it progressively sends out notifications to add water to the bowl. When it is filled, it thanks the user who is home.

2.4 Presence Detection

Toast is equipped with a Bluetooth LE dongle. =gts Pi is continuously monitoring for his signal and updating the availability on Toast's main page. If Toast was detected in the last five minutes, the page will show "Available" in a green box. If Toast is marked as unavailable, he can't be called or fed treats. The system will not feed Toast scheduled meals if he is not detected. If =gts Pi sees Toast at all within an hour of a scheduled meal, the system will dispense food. This is because Toast tends to go for walks around meal times.

Super User – Toast's availability can be set manually, note that "Override" must be enabled. Figure 1 shows when the override is set (Voice Control 7.0).

3.0 Lighting

3.1 Jellyfish Friends

The Jellyfish tank came with an LED and an infrared remote control. =gts Pi was equipped with an IR receiver and learned the infrared pulses of the remote control. Once equipped with an IR transmitter, the lights were controllable. The latest tank is equipped with a 433Mhz RF controlled Light strip, =gts PI now has an RF transmitter.

3.1.1 Colors

Select any color on the web page and the system will replicate the color in the tank. The "Fade" button will start the fading sequence. It is important to stop the "Weather" or "Email Notify" scripts as these will immediately change the colors.



3.1.2 Email Notify

With this light show enabled, the system will check George's Gmail and Brandeis email. If there are unread Gmails, the system will blink green (**G**mail) and red. If there are unread Brandeis emails, the system will blink blue (**B**randeis) and red. (Voice Control 7.0) Alexa Voice Control 7.1 *This light show persists during an unexpected reboot.* (Dynamic UI 6.11)

3.1.3 Morning Weather Report

At 6:45AM every morning, =gts Pi parses the weather report for San Diego. If the temperature is within 2 degrees of the last day, the tank lights will fade. If the temperature average is less than 60 F, the tank will illuminate blue. If 60 F or greater, the tank will illuminate red. If the chance of precipitation is greater than 25%, lightning will be simulated. *This light show persists during an unexpected reboot.*

3.1.4 Weather (Live)

When the Weather script is invoked, the current San Diego weather is parsed. If the temperature is less than 60 F, the tank will flash dark blue for the tens place of the temperature followed by a light blue flash for the ones place. This sequence is red and pink for temperatures greater than 60 F. Wind speed then follows temperature with orange and yellow flashes for the tens and ones places. If there is any rain, lightning is simulated. (Voice Control 7.0) *This light show persists during an unexpected reboot.* (Dynamic UI 6.11).

Super User – The Super User can play the lightning script on demand. *This show persists during an unexpected reboot.* (Dynamic UI 6.11)

3.1.5 Tank Air Pump Control

In order to regulate the tank and to prevent the jellyfish from getting trapped in the vents, the air pump cycles. There is a UI button to stop the cycle or to reenale it. There are also buttons for six levels of bubble intensity that persist upon reboot. Disable the cycle when the pump is on (green). Reenable the cycle while the pump is off (red). (Dynamic UI 6.11) The system also monitors that the pump has not been on for 5 minutes and notifies the Super User if it can't toggle it on automatically.

Super User – Has the ability to start/stop the cycle entirely (Voice Control 7.0)



Super User – Feed mode, regulates for 45 minutes to prevent food from getting sucked into the filter. (Voice Control 7.0)

Super User – Pump Light mode, turns the LED red when the pump is off and green when the pump is on. Kills all active tank lighting scripts when enabled.

3.1.6 Full Screen View

In order to have a full screen display of the fish tank and its controls, a new view was added. This works best as a desktop background.. Click the button to get a full screen view.

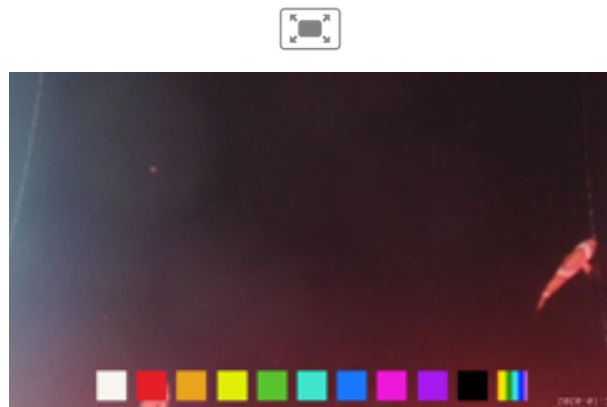


Figure 2 : Jelly Fish Full Screen View

3.2 Pet/Kitchen Lighting

Cat's and Toast's lights are illuminated when called or fed. These lights are also controllable via the main page. There is a brightness setting as well as a disco setting. (Voice Control 7.0) (Siri/HomeKit 7.2) (Dynamic UI 6.11)

3.3 Motion Light

If motion is detected in front of Cat's feeder, a blue light is illuminated for 30 seconds. If motion is detected in front of Toast's feeder, a red light is illuminated for 30 seconds. If grandma is being notified via sms, a pink light is illuminated.

3.4 Light Logs

All lighting requests are captured in a log on the main page. If lights are controlled via Siri or HomeKit, the actions are captured here as well. Grandma has her own specific light logging.

Super User – The Super User can clear the logs.

4.0 Sunrise Alarm

4.1 Status

The sunrise alarm mimics the lighting of an early morning sunrise. The length of the alarm is 30 minutes. The status of the alarm can be checked on the Sunrise page.

4.2 **Super User** – Setting the Alarm

The alarm can be set to start at 5:15AM, 6:15AM, 6:30AM, 7:00AM or 7:30AM. The alarm is set as disabled by default at 8AM on Friday and is reactivated at 8AM on Sunday. (Voice Control 7.0) (Dynamic UI 6.11)

4.3 **Super User** – Turning off the Alarm

The alarm is disabled with the “Off” switch. If the simulation or alarm is running, the LED will turn off. If using the “Off” switch, the alarm must be reactivated by selecting a time. The alarm will not be reactivated at 8AM on Sunday if the previous state was “Off.” (Dynamic UI 6.11)

If the alarm is running, it can be stopped using Siri/HomeKit. Toggle the “Sunrise” tile, this will not disable the alarm for the following day. The alarm can also be stopped using (Voice Control 7.0) (Siri/HomeKit 7.2).

4.4 **Super User** – Simulating the Alarm

The alarm can be simulated over an expedited period of 30 seconds using the “simulate” button.



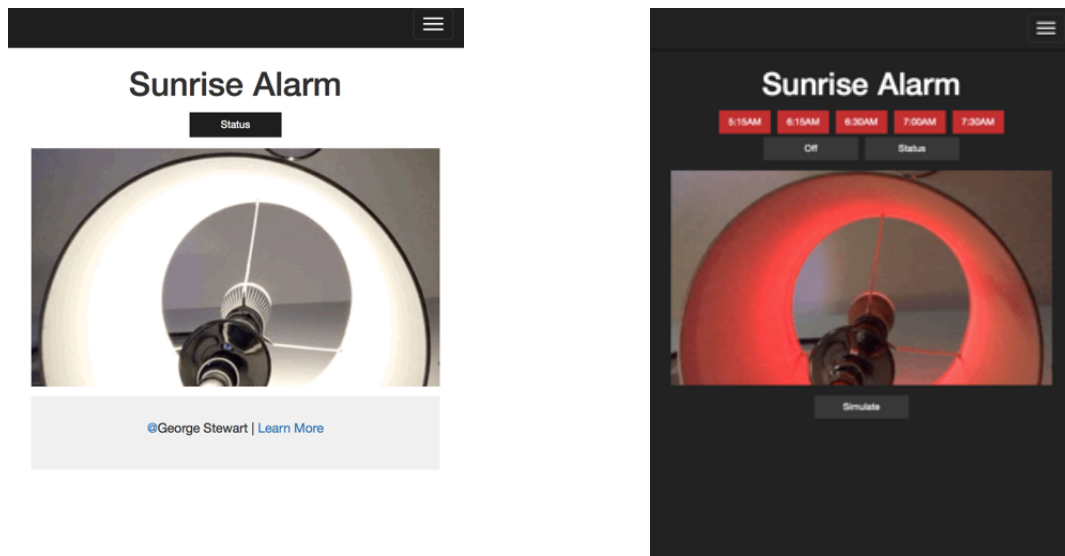


Figure 3. Sunrise Alarm Main Page

5.0 Motion Detection

5.1 Recording Pets

If motion is detected, =gts Pi will record a .avi file to a folder accessible by the Super User. Motion will also notify Grandma via a live MMS message showing that Cat or Toast were detected, between 8AM and 8PM PT, but not more than two times per day and no more than once every two hours.

5.2 **Super User** – Petcam Links

Using “Catcam” or “Dogcam” the links to the videos are generated and can be opened using a browser. The date and time is captured in the filename.

5.3 **Super User** – Clearing the directories

The Catcam and Dogcam directories can be cleared using the “Clear Cams” button.

5.4 Feed Text Notifications

Once food has been dispensed, notifications are sent which show how much food was actually dispensed. These notifications are suppressed if either pet is “Unavailable.”

6.0 System Utilities

6.1 Network IP Change

Every 15 minutes, =gts Pi pings a server and writes the IP of the Comcast router. If it is changed, an email is sent to the Super User to verify the DNS servers were updated automatically.

6.1.1 IP Monitor

=gts Pi parses the HTTP logs and collects IP addresses of those who access it. These IP addresses are counted and stored every night at midnight. The IP's and city of all actions are displayed in the **Super Users** Server.log

```
Toast treats 2/3 denied 03-06, 14:17
107.131.125.96, San Francisco, California
Toast called 03-06, 13:55
75.131.146.131, Worcester, Massachusetts
Boo treats dispensed 03-06, 13:55
75.131.146.131, Worcester, Massachusetts
Boo called 03-06, 13:55
75.131.146.131, Worcester, Massachusetts
Toast called 03-06, 13:54
75.131.146.131, Worcester, Massachusetts
Toast treats 1/3 dispensed 03-06, 13:54
75.131.146.131
Silent Mode turned off 03-06, 11:14
17.114.19.150, Cupertino, California
Silent Mode turned on 03-06, 11:14
17.114.19.150, Cupertino, California
One treat added 03-06, 11:14
17.114.19.150, Cupertino, California
Silent Mode turned off 03-06, 11:07
```

[Close](#)

Figure 4. IP and City in Super User Server log

6.1.2 Active Connections

=gts Pi calculates the number of active HTTP connections and displays the count on the Super User's home page.



6.2 Local Auto Restart

Unfortunately, =gts Pi does not have robust USB ports, the hub tends to lock up. =gts Pi monitors the errors on the ports and will reboot the system if it does not recover on its own.

6.3 Alexa WeMo Server

=gts Pi emulates WeMo switches. This allows Amazon Alexa to communicate with =gts Pi. See section 7.1.

6.4 Homebridge

=gts Pi acts as a HomeKit bridge. This allows non-HomeKit devices such as WeMo switches and MiLight bridges to communicate with Siri/HomeKit. See section 7.2.

6.5 Server Logs

Toast and Cat actions as well as system restarts are all tracked in the Server Logs. Grandma and the Super User have specific logging.

Super User – The server logs can be cleared on the Super Users home page.

6.6 **Super User** – Remote Reboot

The Super User can remotely reboot =gts Pi using the “Reboot Pi” button on the home page.

6.7 **Super User** – Automatic git commit

=gts Pi automatically commits daily updates to a git repo with all code changes.

6.8 **Super User** – VNC Toggle

VNC and GUI services are set to off by default, conserving resources. Use “Toggle VNC” to enable and disable the services.



6.9 Super User – Heartbeat

The USB bus is unreliable and causes occasional system panics. There is a sister system constantly pinging =gts Pi, if a system hang greater than 2 minutes is detected, it will toggle the power to the other.

6.10 Watchdog

A watchdog script monitors Alexa and Bluetooth services and will restart these jobs without requiring a reboot. If the system detects a Bluetooth issue, it will temporarily block Bluetooth tracking tools from running, preventing false geofence alarms.

6.11 Dynamic UI

Certain UI buttons have the ability to update based on their current state. These buttons are highlighted with the *Dynamic UI* tag. Your browser must have caching disabled for this to work properly.

6.12 Analytics

The sites active users are actively being monitored by *Google Analytics*.

6.13 DNS Server

=gts Pi acts as a DNS server for the home. It will filter all known ad agencies resulting in an ad-limited experience.

7.0 Voice Control

7.1 Alexa Voice Control

=gts Pi virtually replicates 16 WeMo switches, allowing many functions to be called by Amazon Alexa. These calls are documented in the respective Light Logs and Server Logs.



7.2 Siri/HomeKit Integration

=gts Pi acts as a HomeKit bridge and controls the MiLight LED Desk Lights. The WeMo outlets (not HomeKit enabled out of the box) are virtualized using this system. A currently running sunrise alarm can be disabled using the “Sunrise” tile in control center. Many of the HomeKit actions have an accompanied switch to trigger actions such as logging on the Pi.

7.1.1 Voice Commands

“Turn on Toast Buzzer”

Calls Toast using Super User privileges.

“Turn on Cat Buzzer”

Calls using Super User privileges.

“Turn on Toast Snack”

Dispenses Toast treats using Super User privileges.

“Turn on Cat Snack”

Dispenses treats using Super User privileges.

“Turn on/off Fish Feed”

Starts the Jellyfish tank weather light show.

“Turn on/off Fish Mail”

Starts the Jellyfish tank mail light show.

“Turn on/off Fish Light”

Starts the Jellyfish tank fade light show.

“Turn on/off Desk Lights”

Control the LED lights for Cat and Toast.

“Turn on Fish Feed”

Enables 35min on/off cycle the jellyfish to consume more food.

“Turn on/off Silent”

Silences the “Call” buzzer, silenced calls append the log with (s).



“Turn on Toast Reset”

Resets Toast’s food level indicator.

“Turn on Hot Tub”

Calls the script to turn on the hot tub.

“Turn on Pool Lights”

Calls the script to turn on Pool Lights.

“Turn on Sunrise” (HomeKit Only)

Simulate the sunrise alarm.

“Turn on six fifteen Sunrise” (HomeKit Only)

Set the sunrise alarm for 6:15AM.

“Turn on six thirty Sunrise” (HomeKit Only)

Set the sunrise alarm for 6:30AM.

“Turn on seven o clock Sunrise” (HomeKit Only)

Set the sunrise alarm for 7:00AM.

“Turn off Sunrise” (HomeKit Only)

Turns off the currently playing sunrise alarm but does not disable it for the next day.

“Turn on One More Snack” (HomeKit Only)

Free’s up an immediate snack for general users.

“Turn on/off Toast Availability” (HomeKit Only)

Manually sets Toasts availability, note override must be on.

“Turn on/off Toast Override” (HomeKit Only)

Allows presence detection / Toasts Availability to be overridden.

“Trigger <Scene>”

Sets the HomeKit Scene and logs to the Light Log. Updates state files.

In addition, Alexa or Siri can turn off any light or accessory in the house.



8.0 Button Control

8.1 Amazon Dash

As of August 31st, 2019, Amazon no longer supports Dash Buttons. In order to give more control over some devices that are mapped to an outlet or script rather than a light switch, Dash buttons were repurposed allowing physical button control.

- Toast Feeder Reset
- Bedroom Side Fans Toggle
- Outdoor Hanging Light Toggle
- Hot Tub sequence Toggle

8.2 Smart Switch Shortcuts

In order to be more efficient using the switches in the house, shortcuts have been implemented. These can be initiated by a “Long Press” (2 seconds) on the Smart Switch.

- Bed Room Dimmer Long Press : Toggles bedroom lights, fan, master bathroom lights x 4.
- Master Bathroom (first switch) Long Press : Toggles all four bathroom switches.

9.0 Pool Monitoring and Control

9.1 Pool System

The pool at the house is 20 years old but the pump and control system has been retrofitted with a USB to Serial convertor, the serial bus is read and manipulated by =gts Pi. The controls are hosted via a web server and simultaneously by HomeKit. The filter pump, hot tub pump, pool temperature, hot tub temperature, jets and lights can be controlled. Before =gts Pi, a member of the household would have to toggle multiple buttons to turn on the hot tub sequence.



9.2 Hot Tub

=gts Pi controls the hot tub sequence using Alexa or HomeKit. By enabling “Hot Tub” all necessary switches are toggled. When triggered, the Hot Tub is set to 102 degrees from October to May and 99 degrees from June to September. The maximum temperature is 104 degrees. When enabling the Hot Tub, the time of day is checked, the Pool Lights will only turn on from Dusk until Dawn. These actions are logged. The hot tub and pool temperatures are only available if the pump is on.

9.3 Pool Notifications

Due to the expensive cost of natural gas and electricity in the state of California, the system will send out a notification if the hot tub, pool heater or pool lights are turned on.

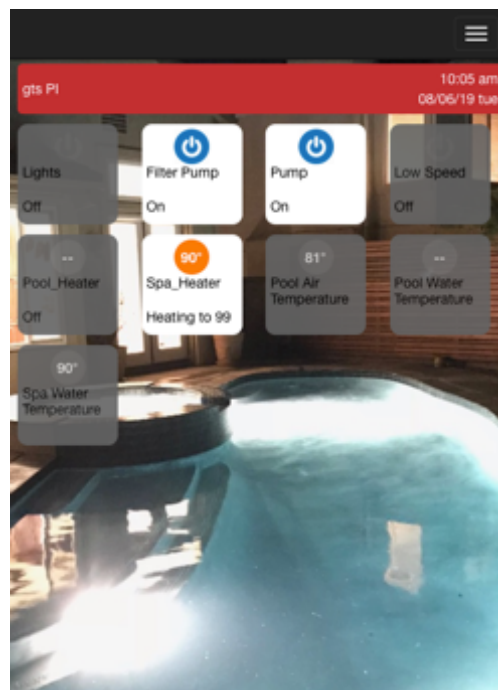


Figure 5 : Pool Dashboard (Super User)

10.0 Home Management

10.1 Sprinkler System

The sprinkler system is very old but is powered by a 120V outlet. It has its own schedule and clock. The sprinklers will run at 5AM on Sunday, Wednesday and Friday (only in Summer months). =gts Pi checks the weather and will automatically cut power to the sprinkler system if rain was detected in the previous 36 hours. =gts Pi sends a notification before it disables or reenables the sprinkler system.

10.2 Water Softener

The water softener in the garage requires pellets, there is no gauge on the system so the system tracks when it is refilled. =gts Pi will notify the Super Users when it approaches 20% full. The gauge is reset on the Super User home page below the current level.

10.3 Trash Day

Trash is taken out weekly and recycling bi-weekly on Mondays, unless Monday is a holiday. =gts Pi recognizes the day of the week and holiday and monitors the trash cans proximity. =gts Pi reminds the Super Users if its trash only or recycling and trash day one day prior. As time goes on, =gts Pi continues to remind to take out the trash, the Super User can reset the trash notification on the home page and see the current status.

10.3.1 Trash Autodetect

=gts Pi is continuously monitoring the Bluetooth beacon in the trash can. If the trash can goes missing for 5 minutes the day before trash day, the Super Users are notified that the trash has gone out and notifications are ceased. When the trash bins are returned to their base, the Super Users are notified and thanked based on who's present.



10.4 Pool Maintenance

The pool requires weekly maintenance including skimming, cleaning out filters, turning on a robot and adding chemicals. The day before maintenance is due, the Super Users will be sent a notification as well as a reset link. Once maintenance is complete, the Super User can acknowledge by clicking the link. This will also reset the count for the specific Super User which will ensure an even distribution of chores.

George, add chemicals to the pool, vacuum and reset by clicking this link
<http://XXX/>

10.5 George Awareness

=gts Pi is constantly looking for the Bluetooth tracker in George's wallet. As he returns home and leaves, a buzzer rings. Some notifications are also suppressed when George is home. The status updates on the Super User's home page.

10.5.1 George Awareness – Fish Feed

If George has not been detected home around Fish Feeding times, =gtsPi will send out a notification to others in the home to feed the fish. These notifications will be sent at hourly after 8PM. Using motion detection, =gtsPi knows when the fish have been fed and cease the notifications until the following day.

10.5.2 Home Awareness – Security

Using HomeKit location status =gtsPi will check the status of the alarm and garage door and automatically enable and notify everyone in the home. If George enters the proximity of the house, the alarm is disabled automatically.

10.5.3 Home Awareness – Motorcycle Mode

Using HomeKit location status =gtsPi will check the status of the alarm and garage door and automatically enable and notify everyone in the home. If George enters the proximity of the house, the lights flash in acknowledgement and the car is pinged. If the car is in Park, =gtsPi assumes George is on his motorcycle and automatically opens the garage door, hands free.



10.7 Home Awareness - Roomba

Using HomeKit location status, =gtsPi will automatically start the Roomba after everyone has left in the morning. It will return to home when the first person arrives home or if it completes the job.

10.6 Jellyfish Brine Shrimp Heater

The garage has a spot for hatching brine shrimp but they need a water temperature of 75 degrees. =gts Pi detects if hatching is in progress and uses the outdoor temperature to determine if the brine shrimp heater is necessary.

11.0 Home Automation

11.1 Hardware

There are 33 light rocker switches, 7 light dimmer switches, 7 smart outlets that are controllable. There are 6 zones of color LED lights including outdoor, front yard, theater, living room, accent and jellyfish. The color zones are composed of 20 hue lights and 4 LED strips. There are 5 automated kitchen blinds. The pool lights are controlled by a reverse engineered 433MHz signal. The thermostat, alarm pool, 6 Sonos speakers, HomPods, iPads and 5 Apple TVs are integrated into the system.

11.2 Scenes

HomeKit Scenes can be called via Siri from any of the devices in the house. There are scenes based on mood, occasion, event, or time of day. These scenes will log to =gts Pi when triggered.

“Good Morning”

Turns off the sunrise alarm, enables soft lighting in bathroom and kitchen, turns on a Hue Lab color of “Morning Glory in Accent, Theater and Living Room”.

“Feeling Social”

Turns on accent lights around the bar and upstairs, sets Hue Lab “Arctic Aurora” in Outdoor, Accent, Living Room and Theater. Turns on LED strips to Cyan.



“Feeling Feisty”

Turns all color lights and LED strips to Red including the pool. Turns off all hard lighting around the house.

“TV Time”

Closes the blinds in the living room, turns off hard lighting in living room and kitchen.

“Movie Time”

Turns off hard lighting in the theater and front room, turns on the theater dimmer and the theater wall and ground strips to red, turns them off after 3 minutes.

“Night Swim”

Turns all indoor lighting and pool to blue, sets “Pool Party” Hue Labs scene.

“Party Time”

Turns on the “Color Loop” Hue Labs scene on all indoor and backyard lights which randomly change colors.

“Power Up”

Turns on every light in the house.

“Light the Candles”

Turns on the Hue Labs “Candlit” scene simulating a candle in Accent, Theater and Living Room.

“Sunset”

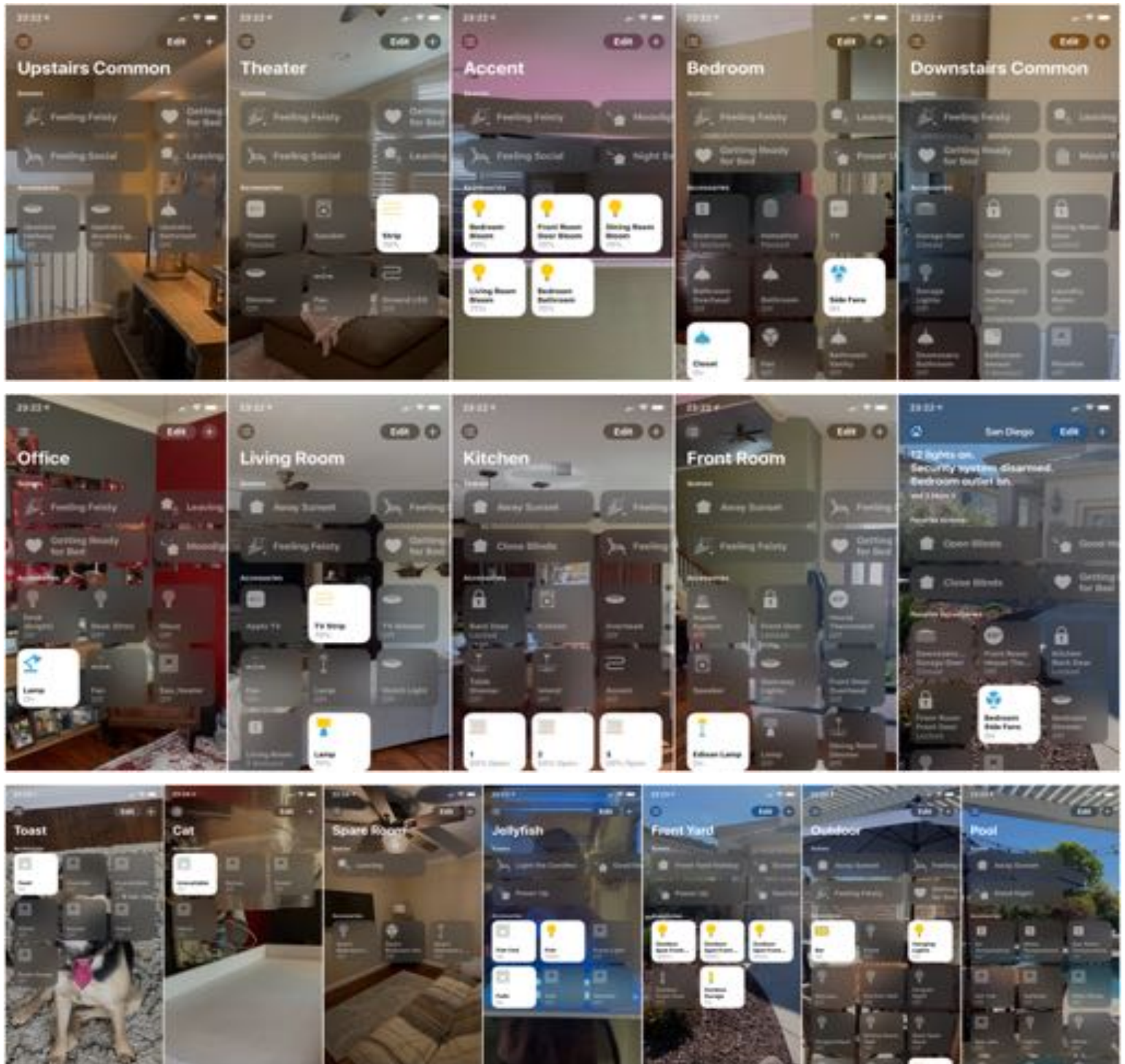
Automatically triggered 30 minutes before sunset, turns on “Savanna Sunset” in Accent, Living Room and Theater. Turns on the outdoor bar strip and jellyfish lighting to orange.

“Moonlight”

Automatically triggered one hour after sunset, turns on “Arctic Arora” in Accent, Living Room and Theater. Turns on the outdoor bar strip and jellyfish lighting to deep blue.



Screenshots



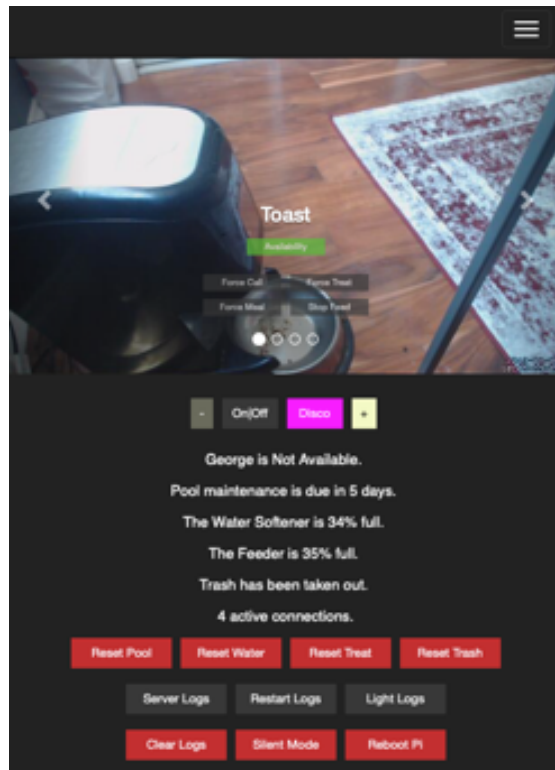


Figure 7. Super User Homepage

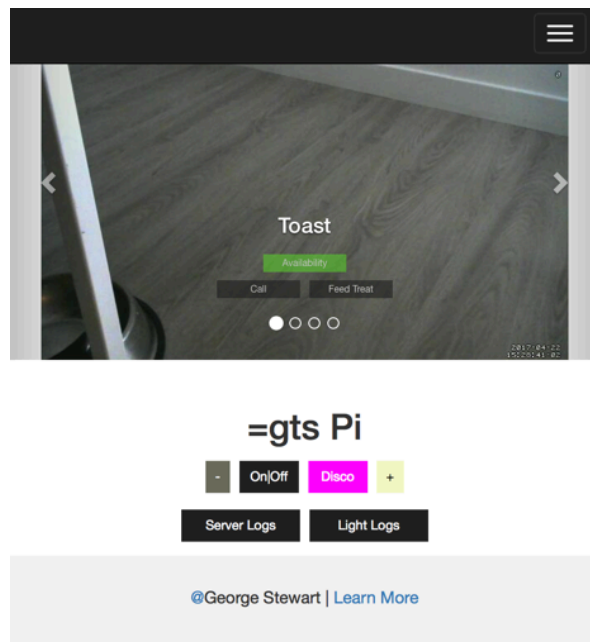


Figure 8. User Homepage



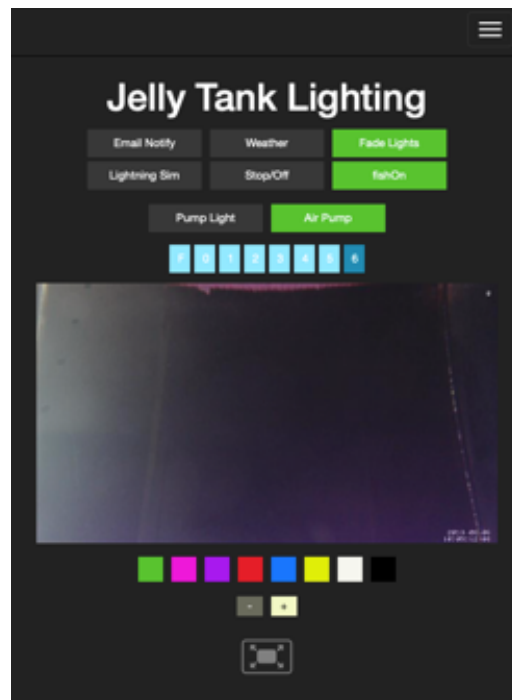


Figure 9. Super User Jelly Tank Lighting Page

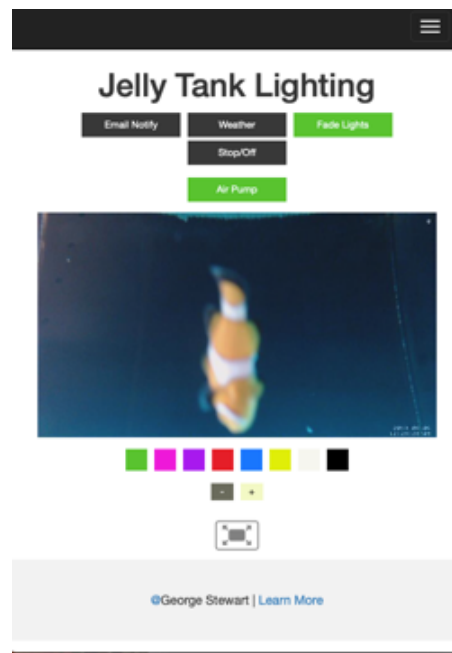


Figure 10. User Jellyfish Page



Figure 11. Super User Interact with Cat Page

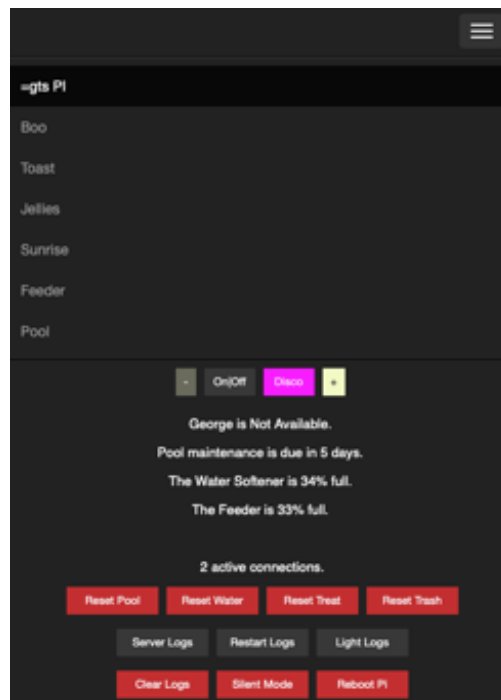


Figure 12. Page Menu Bar



Figure 13 : Toast Feeding Robot



Figure 14 : Cat Feeding Robot



Figure 15 : Water Level Sensing Robot