

# Vector Documentation

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**Because crashing Galaxy's computer is a tradition**

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# 1. Vector Resources

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This is a wiki for gathering and sharing information about [Anki Vector](#)

[PDF version](#)

## 1.1 Personalizing Vector

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This is for notes on how to customize or personalize Vector. You may have to consult the How-To's below.

See also: the [forums](#)

## 1.2 Troubleshooting

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- [What Do Vector's Back Lights Mean?](#)
- How to check for software problems
- The big long list of error codes is Appendix D of the [Technical Reference Manual](#), and in TBD

See also the [troubleshooting at DDL's site](#):

- Troubleshooting Vector's Connection
- How Do I Find Vector's Serial Number?
- Why does Vector need a 2.4 GHz network?
- Vector does not understand me: Troubleshooting Speech Recognition
- What Do Vector's Back Lights Mean?
- Why does Vector show an error?
- Troubleshooting charging issues
- Why is there no sound?

## 1.3 Service Guide

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Collected notes on repairing or modifying Vector.

- Assembly and [exploded view diagrams](#). I am a sucker for exploded diagrams and drawings.
- How to update software
- How to clean wheels/sensors
- Where to [get parts](#) -- treads, etc.
- How to replace the battery?
- Boards?

## 1.4 How-Tos

---

These try to tell you how to accomplish particular tasks.

Some highlights:

- Using GDB to [trace function calls](#)
- Using AudioKinetic WWise to [convert sound files to WEM format](#)
- Dauler sells stickers with the marker symbols preprint at (3D Designs by Dauler)[<https://designsbydauler.com/collections/vector-robot>]

## 1.5 Developer documentation

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These are reference documentation for programming tools to use Vector. Some of them are for the remote-access SDK's.

### 1.5.1 Technical Reference Manual

- Details on how Vector *works*
- Main architecture of the design (not necessarily the code though) and how it works
- File system structure, files, formats and contents
- Communication protocols

### 1.5.2 Programmers Guides and Examples

PC/Mobile SDK (HTTPS API)

- Python Communication SDK: [Vector - Python SDK](#)
- C# Communication SDK: [Anki.Vector.SDK](#)
- C# [Anki.Vector.WebVizSDK](#) to access the WebViz related information in developer builds.
- C# [Anki.Resources.SDK](#) to access, analyze local (that is, on your computer) copies of the Vectors' application resources/assets
- See the SDK examples

Bluetooth LE implementations. There isn't an SDK for the Bluetooth LE protocol, but there are a few implementations that you might wish to look at/reuse:

- OS-X Objective-C
- linux & C
- Chrome & Javascript and [here](#)

### 1.5.3 WebViz and Console Variables

"Pure" Developer builds of Vector software contain an HTTP API and webserver. This shows what it is, how to use it, and how it works.

### 1.5.4 Application Notes

TODO

### 1.5.5 Vector Enhancement Proposals

These are proposals for changes -- enhancements -- to the modules on Vector.

Some highlights:

- An [overview](#) of the overall proposal process.
- VEP1. [Update-engine changes](#)
- VEP2. [Packagement for modules on Vector](#)

## 1.6 Historical Bots

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This might a place for odds and ends info

- DVT1-4 bot info
- Whiskey info
- Bingo info
- etc

## 1.7 Stuff to help collaborate

---

### 1.7.1 Guidance

These provide tips/suggestions on style, naming. They are related to the "How-to's" but they don't walk you thru to a specific goal. For instance, some might describe how to do a particular style of design or implement a kind of behavior.

Examples:

- Recommendations for sound event names
- Steps that a design/process can do to meet the spec

Good title:

Bad title:

Writing guide.

- Other writer guides - Show how to do something in general, like a tutorial
- Document and show off how you built one of your projects Background: This is a note I made for myself to guide me on the right tone, help with consistency and give me some direction.

### 1.7.2 Templates

The document-templates folder includes some start files that can be used as templates when creating new documents:

- A template for [how to documents](#)
- A [generic template](#) for other files

## 2. Contributing

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### 2.1 Contributing

---

We want contributing to Project Victor to be fun, enjoyable, and educational for all. We love receiving contributions from our community, all contributions are welcome, including:

- issues (bug reports),
- new documents
- updates and tweaks,
- blog posts,
- workshops
- etc

There are many ways to contribute, including submitting bug reports, improving documentation, submitting feature requests, reviewing new submissions, or contributing bits that can be incorporated into the project.

#### 2.1.1 Not sure how to start contributing?

If you are worried or don't know where to start, you can reach out with questions to anyone from the Project Victor team on

- [Official Anki developer forums](#)
- [Anki robots Discord chat](#)

#### 2.1.2 Pair programming

Other projects offer free [pair programming sessions](#) to the community. I think that might be a neat idea, if there's something others would like to work on together.....

#### 2.1.3 Code of Conduct

By participating in this project, you agree to abide by our [Code of Conduct](#). We expect all contributors to follow the [Code of Conduct](#) and to treat fellow humans with respect.

#### 2.1.4 Important Resources

The important documents and links are on the [front page of the wiki](#).

#### 2.1.5 Improving Documentation

If you have a suggestion for the documentation, I would recommend that you take a stab at making the changes to the documentation.

For large fixes, please build and test the documentation before submitting the pull-request to be sure you haven't accidentally introduced any layout or formatting issues.

#### **How to Create the HTML and PDF files**

The source documentation text files can be found [documents directory](#). The built out files will be placed within a [site] directory.

First, install the documentation tools:

```
pip3 install mkdocs-material
pip3 install mkdocs-localsearch
```

Then you can build the html site simply by:

```
mkdocs build
```

### **Building a PDF file as well**

You can also build the PDF. First install the tools:

```
pip3 install mkdocs-with-pdf
```

There is some further installation, see the following link for more details: <https://pypi.org/project/mkdocs-with-pdf/>

Rename the "mkdocs.yml" file Then rename "mkdocs-pdf.yml" to "mkdocs.yml"

To build is the same as before

```
mkdocs build
```

### **Whitespace Cleanup**

Don't mix code or documentation changes with whitespace cleanup! If you are fixing whitespace, include those changes separately from your code changes. If your request is unreadable due to whitespace changes, it will be rejected.

Please submit whitespace cleanups in a separate pull request.

## **2.1.6 Pull Request Process**

Do you have any labelling conventions?

Add notes for pushing your branch:

When you are ready to generate a pull request, either for preliminary review, or for consideration of merging into the project you must first push your local topic branch back up to GitHub:

```
git push origin newfeature
```

Include a note about submitting the PR:

Once you've committed and pushed all of your changes to GitHub, go to the page for your fork on GitHub, select your development branch, and click the pull request button. If you need to make any adjustments to your pull request, just push the updates to your branch. Your pull request will automatically track the changes on your development branch and update.

1. Ensure any install or build dependencies are removed before the end of the layer when doing a build.
2. You may merge the Pull Request in once you have the sign-off of two other developers, or if you do not have permission to do that, you may request the second reviewer to merge it for you.

### **Review Process**

The process is likely to be lite for many changes.

Many pull requests are likely to open for several days, until the core team can approve them in Github. In some cases, multiple people will have the chance to review/comment.

### **Addressing Feedback**

Once a PR has been submitted, your changes will be reviewed and constructive feedback may be provided. Feedback isn't meant as an attack, but to help make sure the highest-quality code makes it into our project. Changes will be approved once required feedback has been addressed.

If a maintainer asks you to "rebase" your PR, they're saying that a lot of files has changed, and that you need to update your fork so it's easier to merge.

To update your forked repository, follow these steps:

```
# Fetch upstream master and merge with your repo's master branch
git fetch upstream
git checkout master
git merge upstream/master

# If there were any new commits, rebase your development branch
git checkout newfeature
git rebase master
```

If too much code has changed for git to automatically apply your branches changes to the new master, you will need to manually resolve the merge conflicts yourself.

Once your new branch has no conflicts and works correctly, you can override your old branch using this command:

```
git push -f
```

Note that this will overwrite the old branch on the server, so make sure you are happy with your changes first!

## 2.1.7 How people can contribute

- You can help us answer questions our users have
- You can help build and design our website
- You can help clean up our existing documentation, polishing it and so on
- You can help create new documentation
- Create an example of some changes / fixes/ hacks

## 2.2 Contributor Covenant Code of Conduct

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### 2.2.1 Our Pledge

We as members, contributors, and leaders pledge to make participation in our community a harassment-free experience for everyone, regardless of age, body size, visible or invisible disability, ethnicity, sex characteristics, gender identity and expression, level of experience, education, socio-economic status, nationality, personal appearance, race, religion, or sexual identity and orientation.

We pledge to act and interact in ways that contribute to an open, welcoming, diverse, inclusive, and healthy community.

### 2.2.2 Our Standards

Examples of behavior that contributes to a positive environment for our community include:

- Demonstrating empathy and kindness toward other people
- Being respectful of differing opinions, viewpoints, and experiences
- Giving and gracefully accepting constructive feedback
- Accepting responsibility and apologizing to those affected by our mistakes, and learning from the experience
- Focusing on what is best not just for us as individuals, but for the overall community

Examples of unacceptable behavior include:

- The use of sexualized language or imagery, and sexual attention or advances of any kind
- Trolling, insulting or derogatory comments, and personal or political attacks
- Public or private harassment
- Publishing others' private information, such as a physical or email address, without their explicit permission
- Other conduct which could reasonably be considered inappropriate in a professional setting

### 2.2.3 Enforcement Responsibilities

Community leaders are responsible for clarifying and enforcing our standards of acceptable behavior and will take appropriate and fair corrective action in response to any behavior that they deem inappropriate, threatening, offensive, or harmful.

Community leaders have the right and responsibility to remove, edit, or reject comments, commits, code, wiki edits, issues, and other contributions that are not aligned to this Code of Conduct, and will communicate reasons for moderation decisions when appropriate.

### 2.2.4 Scope

This Code of Conduct applies within all community spaces, and also applies when an individual is officially representing the community in public spaces. Examples of representing our community include using an official e-mail address, posting via an official social media account, or acting as an appointed representative at an online or offline event.

### 2.2.5 Enforcement

Instances of abusive, harassing, or otherwise unacceptable behavior may be reported to the community leaders responsible for enforcement at [INSERT CONTACT METHOD]. All complaints will be reviewed and investigated promptly and fairly.

All community leaders are obligated to respect the privacy and security of the reporter of any incident.

### 2.2.6 Enforcement Guidelines

Community leaders will follow these Community Impact Guidelines in determining the consequences for any action they deem in violation of this Code of Conduct:

## 1. Correction

**Community Impact:** Use of inappropriate language or other behavior deemed unprofessional or unwelcome in the community.

**Consequence:** A private, written warning from community leaders, providing clarity around the nature of the violation and an explanation of why the behavior was inappropriate. A public apology may be requested.

## 2. Warning

**Community Impact:** A violation through a single incident or series of actions.

**Consequence:** A warning with consequences for continued behavior. No interaction with the people involved, including unsolicited interaction with those enforcing the Code of Conduct, for a specified period of time. This includes avoiding interactions in community spaces as well as external channels like social media. Violating these terms may lead to a temporary or permanent ban.

## 3. Temporary Ban

**Community Impact:** A serious violation of community standards, including sustained inappropriate behavior.

**Consequence:** A temporary ban from any sort of interaction or public communication with the community for a specified period of time. No public or private interaction with the people involved, including unsolicited interaction with those enforcing the Code of Conduct, is allowed during this period. Violating these terms may lead to a permanent ban.

## 4. Permanent Ban

**Community Impact:** Demonstrating a pattern of violation of community standards, including sustained inappropriate behavior, harassment of an individual, or aggression toward or disparagement of classes of individuals.

**Consequence:** A permanent ban from any sort of public interaction within the community.

## 2.2.7 Attribution

---

This Code of Conduct is adapted from the [Contributor Covenant](https://www.contributor-covenant.org/version/2/0/code_of_conduct.html), version 2.0, available at [https://www.contributor-covenant.org/version/2/0/code\\_of\\_conduct.html](https://www.contributor-covenant.org/version/2/0/code_of_conduct.html).

Community Impact Guidelines were inspired by [Mozilla's code of conduct enforcement ladder](#).

For answers to common questions about this code of conduct, see the FAQ at <https://www.contributor-covenant.org/faq>. Translations are available at <https://www.contributor-covenant.org/translations>.

## 3. Customization

---

### 3.1 Body modifications

---

- Ilkez sells cute ears, deedly-boppers, and treads at his [Etsy site](#)
- [Redwish's review of tread by Ilkez \(original post\)](#)
- Dauler sells ear, horns, treads, stickers, and other fanciful mods, and 3D STL's at [3D Designs by Dauler](#) and [Etsy](#)
- Dauler sells treads at [3D Designs by Dauler](#)
- [Cat ears](#) for Vector, as 3D files by "misconduct"

## 3.2 Customization

---

This is for notes on how to customize or personalize Vector.

See also: the [forums](#)

It might be thru configuring the software and files:

- Sounds
- Body movements
- Eyes
- Colors?
- PNGs on face
- Backpack lights
- Cube lights
- Other custom animations

Or it might be physical changes, and tweaks that are distinctive and identify

.. Link to a showcase ..?

### 3.2.1 Customizing animations

---

- animation of eyes
- body movements
- boot animation

People would love tools to gen the animation file... but I suspect that may be hard. The presentations made it sound like it was a lot of Maya rigging and plugins for the export.. but since Maya is expensive, and hard..

Maybe a Unity model tool could be made with a rigged model of Vector? and such for I suspect the value vs effort isn't there for such a specialized area, but who knows?

Tools for generating animation files.

What about mixing-matching existing animations, and adjusting them slightly?

#### **Boot animation draft**

Vector shows a boot animation at startup. This is located in /anki/data/assets/cozmo\_resources/config/engine/animations/boot\_anim.raw and it can be swapped out easily.

Digital Dream Labs has made a Python script which makes it easy to turn GIFs into animations very easily.

#### **DDL official instructions**

- A working installation of python with the Pillow package installed.
- An animated .gif with a resolution of 184x96 pixels
- The script gif\_to\_raw.py to convert the .gif to a raw image.
- Convert the .gif to a raw image: `python gif_to_raw.py bootscreen.gif` This will create a new file bootscreen.gif.raw
- Mount the filesystem for writing. Here we'll do that from the host system: `ssh root@192.168.1.110 "mount -o remount,rw /"`
- Use scp to copy the file in to place: `scp bootscreen.gif.raw root@192.168.1.110:/anki/data/assets/cozmo_resources/config/engine/animations/boot_anim.raw`
- Reboot Vector from the host system: `ssh root@192.168.1.110 "/sbin/reboot"`

### 3.2.2 Sounds

---

### 3.2.3 Behavior tree crafting

---

There are many json files in /anki/data/assets/cozmo\_resources/config/engine/behaviorComponent/. Maybe have some examples of edits of those?

### 3.3 Nose Art Showcase

---

## 4. Document templates

---

### 4.1 VEP Template

---

```
---  
title: VEP123 - The name of the VEP (only a few words)  
summary: An optional description of the proposal, if the title is too short  
authors:  
    - Author Name  
date: 2022-07-10  
---
```

(remove the quotes; they are so that the template is readable)

#### 4.1.1 Description of the changes

---

Motivation: A synopsis of why this should be done -- we don't want complicated goo-gaws for the sake of it.

#### 4.1.2 Some Design decisions

---

Optional

#### 4.1.3 Documentation

---

The documentation (if short) or where can the documentation be found

#### 4.1.4 Cavaets

---

List any limits / warnings about this

#### 4.1.5 Status

---

Has it been tried? How much? Where?

#### 4.1.6 References

---

#### 4.1.7 Change history synopsis

---

Summary of changes to help the reader

## 4.2 How-to template

---

{Choose a good title name for the file. It should lead with what it noun or action is, and follow the pattern of other documents in this section}

### 4.2.1 References and Resources

**Optional** Include some links to other resources here.

## 4.3 Template

---

{Choose a good title name for the file. It should lead with what it noun or action is, and follow the pattern of other documents in this section}

### 4.3.1 References and Resources

---

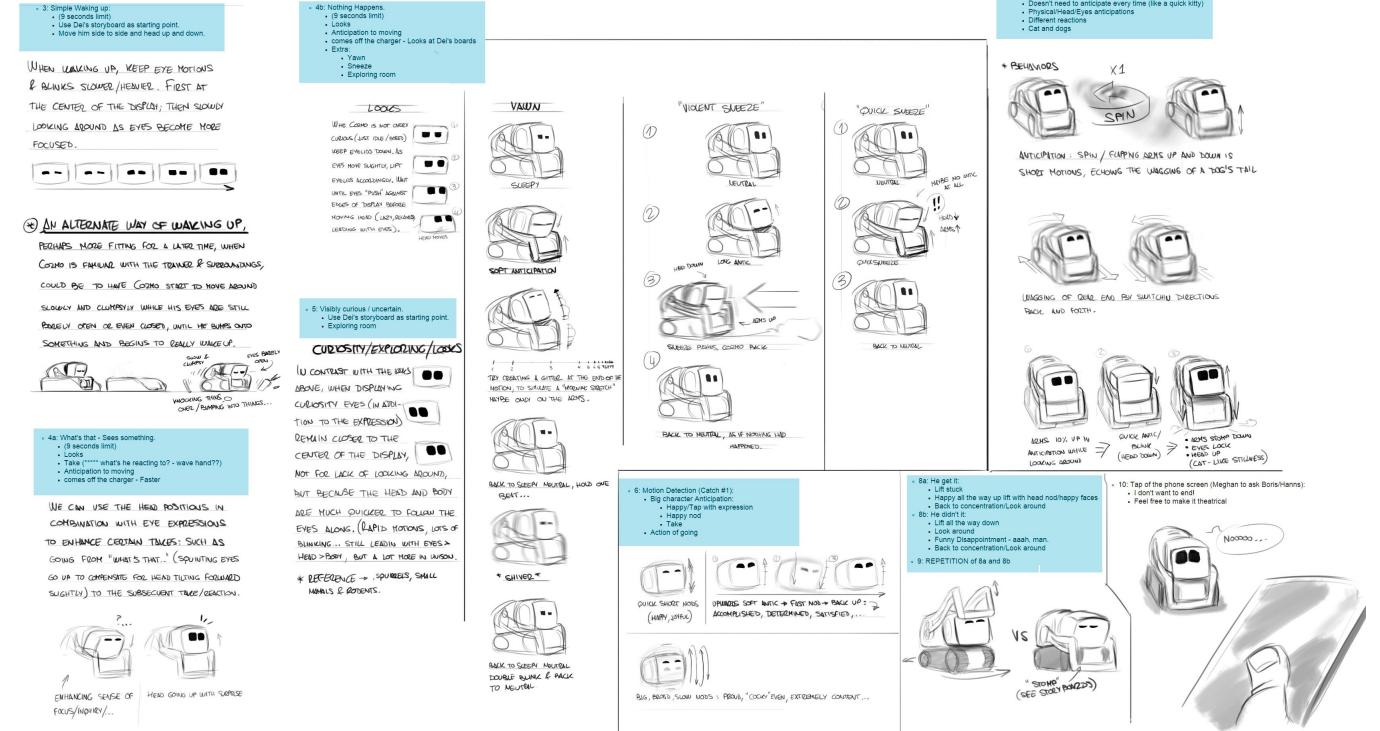
**Optional** Include some links to other resources here.

## 5. Guides

### 5.1 Cozmo Character Design

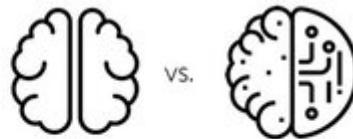
Cozmo -- the generation prior to Vector -- paved a way for a lot of the character design. The principles Anki developed for his character apply to Vector as well.

#### COZMO NOTES & SKETCHES



"Melody!"

Cozmo initiates greeting the user by name



Cozmo asks the user to play a game with him

### 5.1.1 The many faces of Cozmo

---



Sleepy Eyes



Happy



Skeptical



Furious



Surprised



Sad (looking down)



## 5.2 Typefaces

---

If you find that you wish to display text on Vector's display, you probably will have to create a picture with the text pre-rendered or create PNG's for the glyphs. Vector doesn't include a "nice" font internally to display text. He does include a few for the digits, to display the weather, and fault codes.

The typefaces you can consider are:

- Avenir is your best bet. It is the font in the Cozmo style guide, and included in the Cozmo mobile app. "Avenir is a robust font that comes in many weights. It provides us with a timeless elegance and a rock solid foundation."
- Arial is recommended (by the Cozmo style guide) when Avenir isn't available. [You can compare here](#)
- Eurostile is *the* classic font used in science fiction, such as WALL-E, the Incredibles, and so on. It is more square than Avenir. [You can compare here](#)
- Anki had their own graphic font, which is clean, sans serif. Not sure where a TTF or OTF can be found
- Univers is the typeface Anki style guide recommends to use if the "Anki typeface" isn't available. It is very similar to Avenir. Avenir has a few more flourishes. [You can compare here](#)
- TT Norms. The Vector style guide says that the tagline "The Robot to Life With" is set in the font TT Norms. This is also very similar to Avenir. [You can compare here](#)

## 5.3 Vector Character Design

Vector's character:

The image is a promotional graphic for the Anki Vector robot. At the top, the text "VECTOR'S CHARACTER" is written in large, bold, white capital letters, followed by "IS A BLEND OF" in a smaller, lighter font. Below this text are four small square images: a fennec fox, a blue parrot, a sugar glider being held, and a lynx cub. In the center is a large, dark grey, tank-like robot head with glowing blue eyes. To the right of the robot are two more square images: a boy looking at a screen and a white, spherical robot. Below the central robot are two bullet points: "• SMART, REACTIVE, INSTINCTIVE" and "• NOT PERFORMATIVE" on the left, and "• TECH & SCI-FI APPEAL" on the right. In the bottom right corner of the image, the Anki logo is visible.

VECTOR'S CHARACTER  
IS A BLEND OF

- SMART, REACTIVE, INSTINCTIVE
- NOT PERFORMATIVE
- TECH & SCI-FI APPEAL

anki



## CHARACTER INSPIRED BY NATURE

A "placement" -- or pillars -- of Vector character and experience

# VICTOR PILLARS

Victor is the world's most life-like robot

## REACTIVE



Autonomous,  
self directed



Detects and avoids  
cliffs and obstacles



Reacts to directional  
sounds



Responds to being  
held or petted



Recognizes people  
and things

## ENTERTAINING



Endearing character  
pet-like appeal



Emotionally intelligent  
craves human attention



Responds to being  
played with and ignored



Happy  
just to be with you

## FUNCTIONAL



Serves a useful purpose  
in daily life



Enjoys helping out



Explores the world  
learns new things



Understands  
human speech



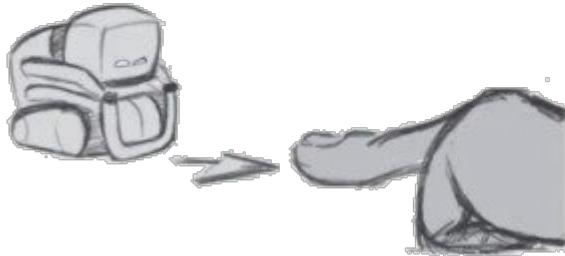
Continuously updated  
with new capabilities

As well as some refinements or things that he can do a bit better than Cozmo:

## POUNCE ON FINGER | FEATURE UPDATE

Cozmo can only pounce forward due to a limited field of vision. Victor has a wider field and we want to leverage that. Make him capable of pouncing in 3 directions.

COZMO



VICTOR



## 6. Historical bots

### 6.1 Bingo and mini-Bingo

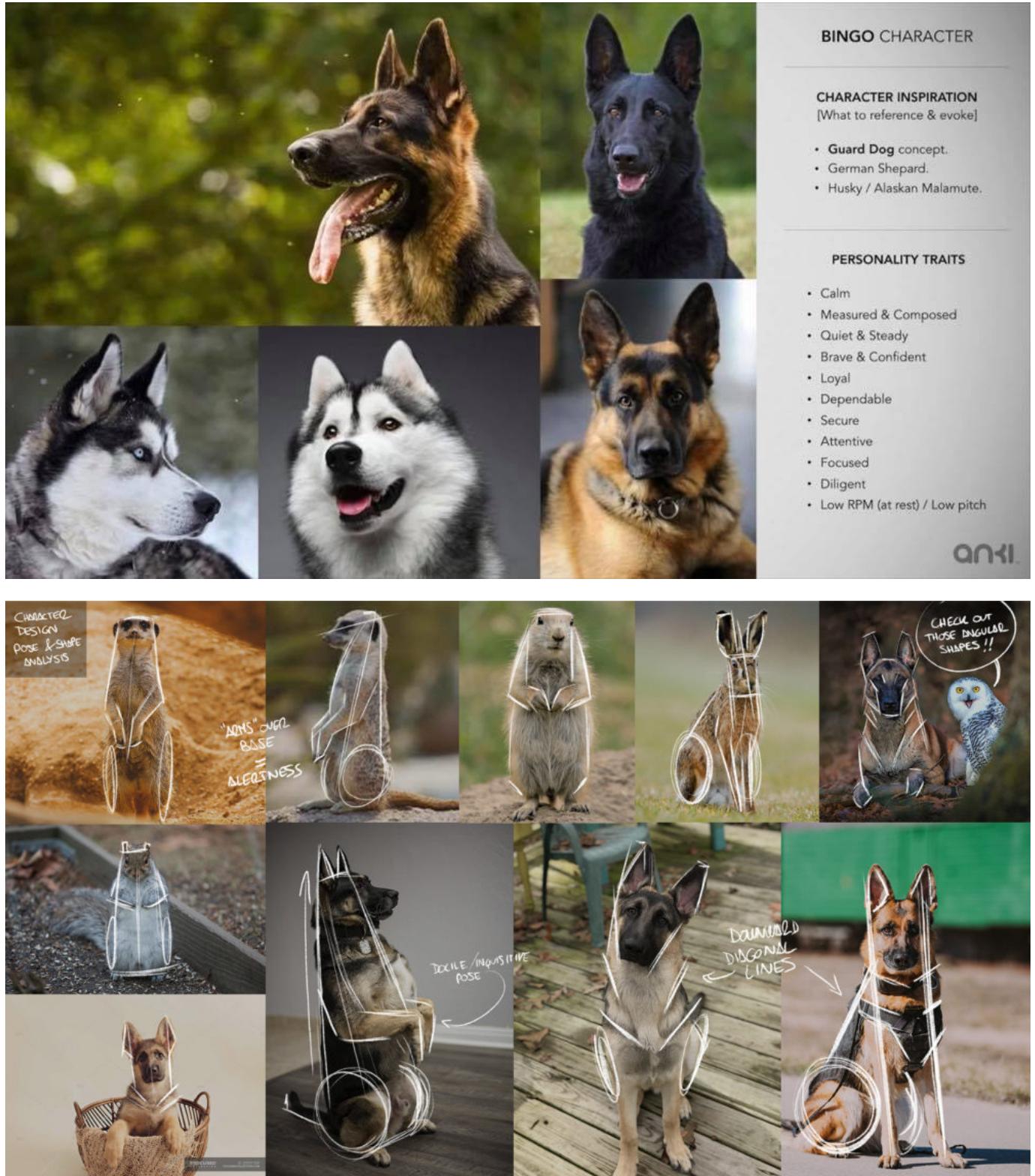
Bingo and mini-Bingo were concepts for possible future robots. One concept was a large body that could be used in a building security role. On the other end was a smaller -- soda can sized -- bot that would suitable for running around the floors in homes.

#### 6.1.1 Mock ups of the idea, feel and inspiration

An exploration of the character design:



Taking inspiration in its spirit and shape from dogs and other animals:



### 6.1.2 Picture of Bingo prototype

A prototype:



A mini Bingo on the desk ([source](#))



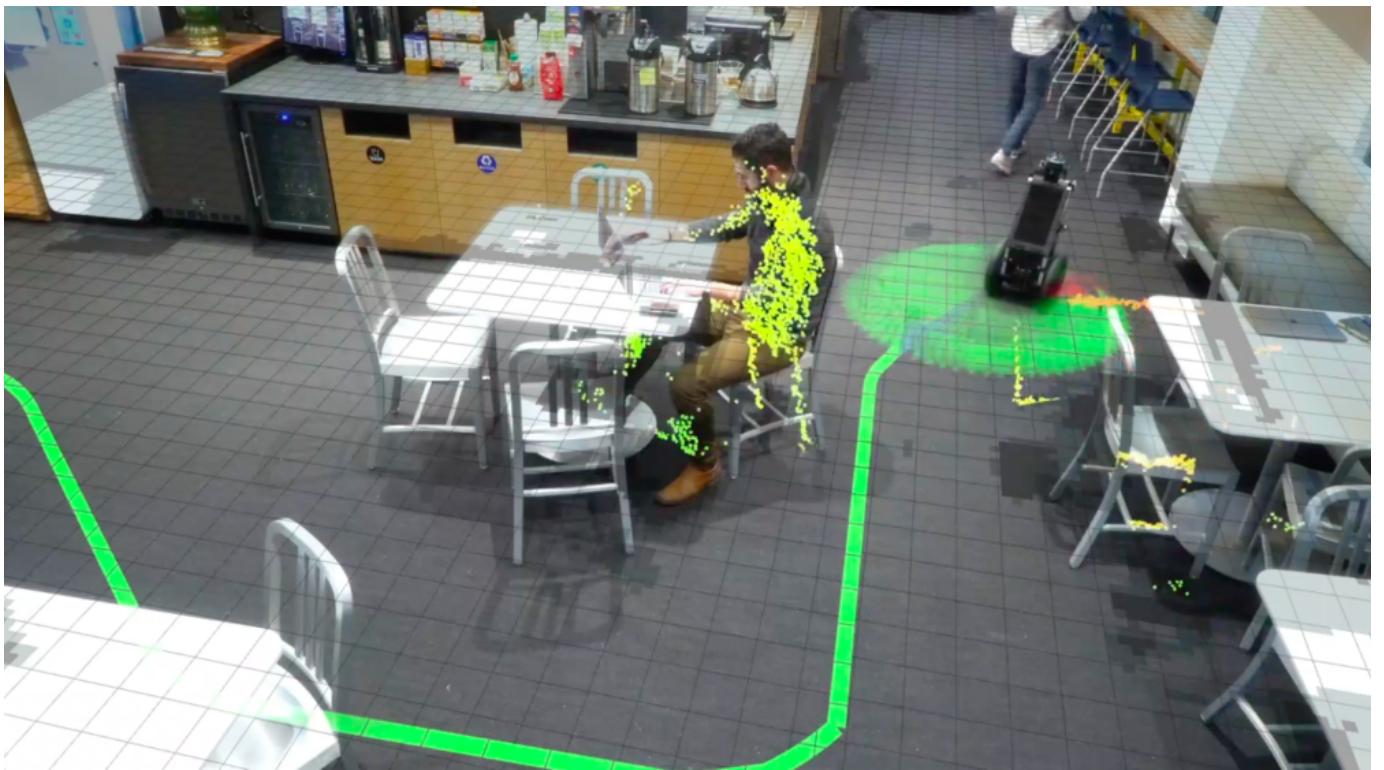
A Bingo in the office ([source](#))



Several were seen in the auction photos:



A picture of it mapping out the Anki kitchen:



### 6.1.3 Some industrial design sketches

Below are some exploratory ideas. Note: these are not what the robot would have looked like; they were trying out ideas for people to respond to and help iteratively craft the look.

From Hans Belker's site:

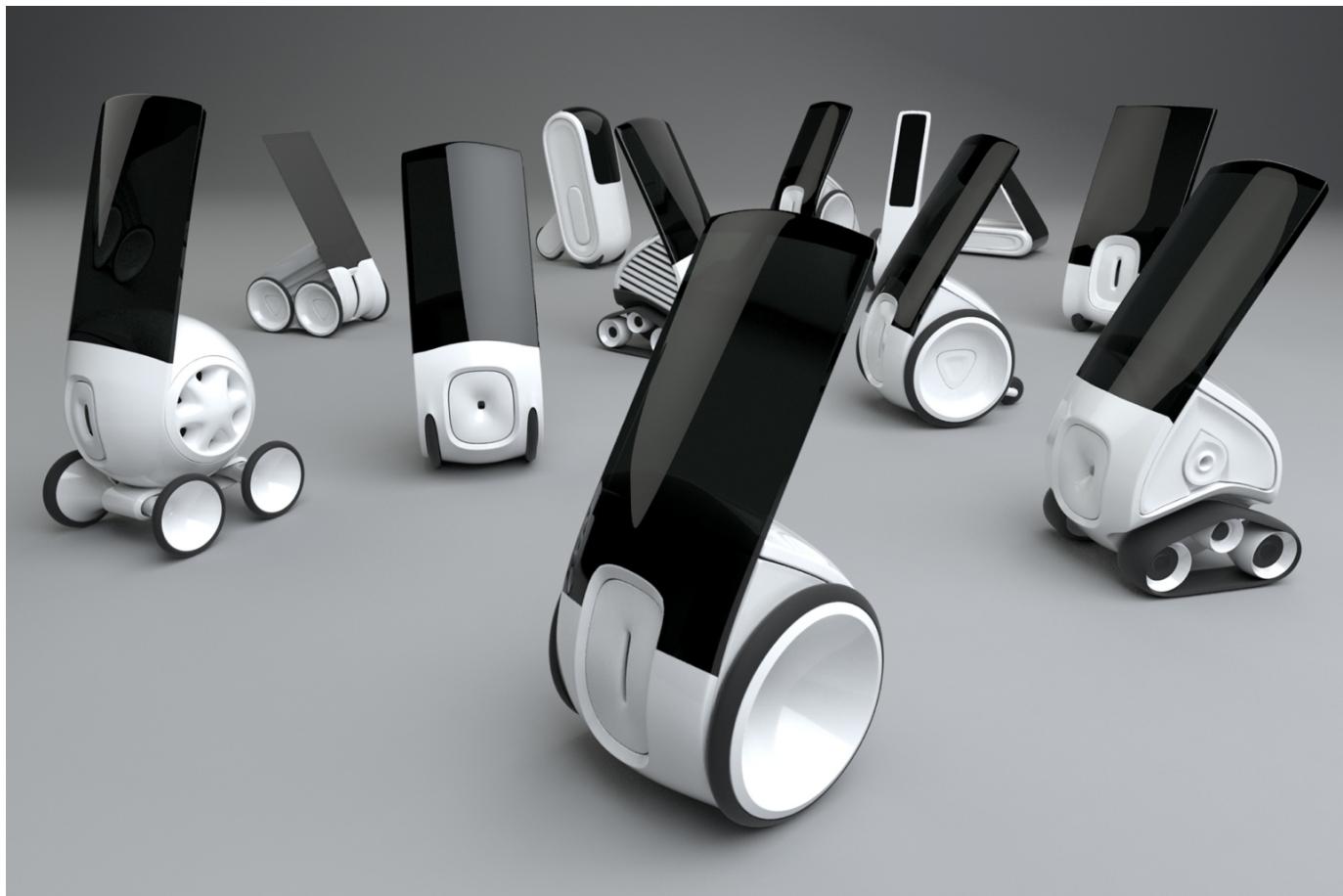
The idea of having a self-navigating and self-balancing robot in the house was going to be the evolution to the current household smart speaker systems. In our mind it could only succeed if it moves around in a smooth and natural looking way.

A self-balancing robot would address these issues, but it also created a long list of mechanical issues that come with it.

A larger office version would have three wheels but still imitate motion by tilting forward. This device would be the ideal office helper / mule. ([Hans Belker](#))



All of the following pictures are from [Hans Belker's site](#)













## 6.2 Victor DVT1

---

"Victor DVT1" prototypes are the first of the Design Validation Test batches for Vector.

These are very similar to finished Vector in terms of hardware, but there are many software differences:

- Their partition tables are old, similar to what looks like stock Qualcomm.
- Many Victor DVT1s run builds which are more similar to Android than Embedded Linux.
- Many Victor DVT1s are in FAC (factory) mode. If you find one in FAC mode, he is very likely running old proof of concept software and there is a low chance of putting him on modern firmware.
- If you find one with Cozmo eyes, it is probably the same proof of concept firmware. Some have been upgraded to a slightly newer kernel though. Some can run behaviors when shaken.
- Their serial numbers are strings such as "1f19f8b7".
- Most have SSH open, but there is a root password. ADB over TCP is fully open but it may require a couple reboots.
- Their BLE software is old, and it is hard to connect them to your own Wi-Fi.

The "head board" hardware is pretty much exactly the same, but the "body board" hardware is very different compared to modern Vector hardware. This locks them to old DFU and they are not viable for normal Vector body replacements.

There are some positives if you are a passionate developer. They have ADB open which means you can solder on USB and mess around all you want. Everything is completely open and unlocked so you could have a fun time. There is no recovery or system\_b partition so be careful.

Their shells (+ motor boards, backpack board, laser) are fully compatible with regular Vector circuitry.

Some of these connect to a network with the credentials below, which can be faked on your own router or hotspot so you can use ADB over TCP:

SSID: `AnkiRobits` Password: `KlaatuBaradaNikto!`

These turn up from time to time on Ebay.



## 6.3 Victor DVT2

---

"Victor DVT2" prototypes are the second of the Design Validation Test batches for Vector.

These are similar to DVT1, with a few differences:

- Victor DVT2s run Embedded Linux and not Android like DVT1.
- Their body boards have a few small electrical differences, and are more compatible with modern firmware.
- Many of these run the same exact build (labelled "0.10.0d"). It is speculated that a few of these were animation bots.
- All we have seen so far run the same exact kernel.
- It is possible to put modern firmware in there but some things will be broken due to the old body board. It also requires many workarounds.

Similarities to Victor DVT1:

- Their serial numbers are strings such as "1f19f8b7".
- The "head board" hardware is pretty much exactly the same, but the "body board" hardware is very different compared to modern Vector hardware. This locks them to old DFU and they are not viable for normal Vector body replacements.
- There are some positives if you are a passionate developer. They have ADB open which means you can solder on USB and mess around all you want. Everything is completely open and unlocked so you could have a fun time. There is no (useful) recovery or system\_b partition so be careful.
- Most have SSH open, but there is a root password. ADB over TCP is fully open but it may require a couple reboots.
- Most of them have old BLE software, and it is hard to connect them to your own Wi-Fi.

Their shells (+ motor boards, backpack board, laser) are fully compatible with regular Vector circuitry.

Some of these connect to a network with the credentials below, which can be faked on your own router or hotspot so you can use ADB over TCP:

SSID: `AnkiRobits` Password: `KlaatuBaradaNikto!`

These turn up from time to time on Ebay.



## 6.4 Victor DVT3

---

"Victor DVT3" prototypes are the third of the Design Validation Test batches for Vector.

These look exactly like DVT2s, but there are a few differences here and there:

- Most of them are running firmware very similar to modern firmware.
- It is possible to connect many of them to Wi-Fi without faking a network.
- All we have seen so far have SSH open with the normal modem key.
- Their body boards are a little different.
- Many have been upgraded(?) to the modem partition table and have unlock OTAs so their headboards could act exactly like normal dev boards. A body board replacement would be required for it to fully work though as modern firmware doesn't know how to communicate with the body board in these.
- They started off with a random string serial number, but many have been upgraded to the more normal 00##### layout.
- Their head boards have heatsinks. This ended up not being necessary for production.

Similarities to Victor DVT1/2:

- Their serial numbers started off as strings such as "1f19f8b7".
- The "head board" hardware is pretty much exactly the same, but the "body board" hardware is very different compared to modern Vector hardware. This locks them to old DFU and they are not viable for normal Vector body replacements.

Their shells (+ motor boards, backpack board, laser) are fully compatible with regular Vector circuitry.

DVT3 is when a lot of Vector personality development happened. Their firmwares can vary between 0.9 to 0.12 betas. These act similar to how Vector is today.

Some of these bots may boot up to an exclamation point. Turning them upside-down then double (or triple) pressing the button will let them finish bootup. Then, you can shake them around to make them explore around.

These turn up from time to time on Ebay.





## 6.5 Victor DVT4

---

"Victor DVT4" prototypes are the last of the Design Validation Test batches for Vector.

These look just like production Vectors, and the circuitry is final.

There are a couple software differences though:

- No unlock OTA have been found for a DVT4.
- Many are prod locked, and can only download firmwares like 0.10. We don't have these OTAs.

The body board in these are normal and can be used as a replacement for a normal Vector.

These have serial numbers following this format: 00e1#####

Some of these bots may boot up to an exclamation point. Turning them upside-down then double (or triple) pressing the button will let them finish bootup. Then, you can shake them around to make them explore around.





## 6.6 Whiskey

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The “Whiskey” prototypes were built from modified Vector hardware. The key change(s) are:

- The time of flight sensor was removed from the body-board
- Two time of flight sensors were placed on the head, on either side of the LCD
- The body-board layout was rearranged to better dissipate heat away from the battery.
- They are labelled as "HW: 7" instead of a normal Vector's "HW: 6". The software can detect this and it makes an extra CCIS menu for the extra sensors.

By placing the time of flight sensors in the head, Whiskey could scan around more — moving the head up and down, as well as using a more sophisticated version of the time of flight sensor. This would allow him to map the edges far better, as well as scan for objects and interesting things like hands and faces.

In some reports the idea was to use the changes to the TOF sensor placement for a next generation Cozmo design. The project was cancelled before Anki’s demise.

In the current form, Whiskeys have a few software quirks. Regular dev bots have both the dev ABOOT key and anki.dev in command line, but many Whiskeys only have the dev ABOOT key and no anki.dev in command line. This means they are restricted to running custom firmware. Some, however, have been unlocked to be full dev bots but not many of those have shown up. Another quirk is that all of them are in FAC mode. They all have dev recoveries, so this is easily bypassable.

These turn up from time to time on Ebay.



## 7. How to

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### 7.1 How to trace calls using GDB

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Vector's command line tools do not include a ptrace (as far as I can see). This can be emulated with GDB. Here is an example tracing a write() call.

1. Start gdb and attach to the process of interest.
2. Add the following scripted breakpoints:

```
break write
command
silent
printf "%d bytes\n", $r2
x/80c $r1
continue
end

set pagination off
```

## 7.2 How to convert animation bin files to JSON

---

The animation binary files are based on Google's flatbuffers using a binary format. Fortunately it is easy to read, since Anki left the description file in the Vector software, and it is an evolution of what was used in Cozmo.

The files can be turned into JSON, and then back. Google's tools will do this for you, see "[Using flac as a JSON Conversion Tool](#)"

You can also turn the JSON file back into a binary file using the same tool.

### 7.2.1 Developer Animation JSON files

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The developer releases of Vector software includes animation JSON files. These are the equivalent to animation binaries, but in JSON format. The developer software -- and perhaps the production software as well -- can read the animation in the JSON form.

## 7.3 How to make a companion cube

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### 7.3.1 3D Print your own cube

Anki Vector Dummy Cube Box by Dauler. This also includes a [PDF with the symbols](#) for the cube sides

You can buy [STL files](#) from etsy.

### 7.3.2 Emulate the cubes electronics

[Efforts to create a "clone" of the cubes electronics.] (<https://forums.anki.com/t/communicating-with-vectors-cube/43042>) SparkFun Pro nRF52840 Mini bluetooth development

## 7.4 How to unzip the OTA file

---

See the [Project Victor Firmware folder](#) for a description how to download the .ota files and how to verify them. It also includes a tool to perform the extraction.

The OTA files are tar.gz files, so they can be opened with tar (or similar tool). Among the files inside are two files:

```
apq8009-robot-boot.img.gz (encrypted)
```

```
apq8009-robot-sysfs.img.gz (encrypted)
```

Decrypting these files is done by:

```
openssl enc -d -aes-256-ctr -pass file:ota.pas -in apq8009-robot-boot.img.gz -out apq8009-robot-boot.img.dec.gz
```

```
openssl enc -d -aes-256-ctr -pass file:ota.pas -in apq8009-robot-sysfs.img.gz -out apq8009-robot-sysfs.img.dec.gz
```

To use OpenSSL 1.1.0 or later, add “-md md5” to the command:

```
openssl enc -d -aes-256-ctr -pass file:ota.pas -md md5 -in apq8009-robot-boot.img.gz -out apq8009-robot-boot.img.dec.gz
```

```
openssl enc -d -aes-256-ctr -pass file:ota.pas -md md5 -in apq8009-robot-sysfs.img.gz -out apq8009-robot-sysfs.img.dec.gz
```

The keys can be found in the [detail/keys folder](#) in the Project Victor repository.

(from <https://groups.google.com/forum/#!searchin/anki-vector-rooting/openssl%7Csort:date/anki-vector-rooting/YIYQsX08OD4/fvkAOZ91CgAJ>)

## 7.5 How to use Cozmo animation files

---

Cozmo's animation .bin files can be used on Vector, mostly. You do need know how to trigger them.

### 7.5.1 Why does this even work?

Cozmo's animation schema is very similar to Vector's.

When Vector reads and interprets the animation file it uses the flatbuffers library. This library uses default values for fields that are missing in a file — fields that Vector uses but that the Cozmo animation files doesn't provide. And the library ignores fields in the file that it doesn't know about — fields that Cozmo uses but Vector doesn't. So that gives it a lot of compatibility for faces, lights, motions.

Where Vector completely ignores Cozmo features is the sound. The sound features in the animation files is completely different between the two. (If cozmos sounds tracks work without fuss, Id be surprised ... or maybe they have a Cozmo compatibility layer?)

### 7.5.2 How to get a Cozmo animation file

#### 7.5.3 How to put it on Vector

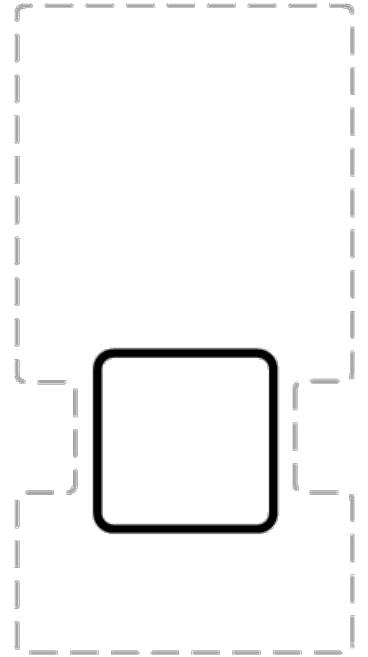
- Include how to link it into the behavior or what not

#### 7.5.4 What about fixing up the audio stuff?

A bit of background the animation files send audio events, or audio trigger names (plus some audio parameter adjustments) that are used to tell the audio engine to play a particular sound.

You will have to convert the animation to JSON Then edit them to the new schema and change the audio trigger name to one that Vector supports. Then repack it into an animation bin file.

## 7.6 Making paper dolls for Vector to play with



### 7.6.1 Laser Printer Version

1. Download one of the two version of the pattern template:
  - Without the symbols: [PDF](#) or [Visio](#)
  - One includes little symbols on them
  - The other doesn't (You can add the pictures using stickers)
2. Make any changes, like adding color patters (Optional)
3. Print. If you're like me, the printer doesn't like card stock
4. Cut out
5. Use a glue, like a spray glue, to attach to cardstock
6. Cut that.
7. Color it in (Optional)
8. Add little tails so it will stay upright

### 7.6.2 Cricut Version

1. Download one of the two version of the pattern template:
  - Without the symbols: [PDF](#) or [Visio](#)
  - One includes little symbols on them
  - The other doesn't (You can add the pictures using stickers)
  - One has the cut pattern
  - Two have the print patterns. Pick one.
2. Make any changes, like adding color patters (Optional)
3. Use Cricut, print-then-cut mode
  - Print
  - Cut out
  - Cut out card stock

4. Print on cardstock? If you're like me, the printer doesn't like card stock
5. Use a glue, like a spray glue, to attach to cardstock
6. Color it in (Optional)
7. Add little tails so it will stay upright

## 7.7 Using AudioKinetic WWise to convert the sound files to WEM

---

This is not an easy tool to use, or export from. First download and install AudioKinetic WWise.

### 7.7.1 Importing

1. Project>Import Audio files [image]
2. Click "Add Files" button
3. Select files
4. Click "Open"
5. Click "Import"

### 7.7.2 Settings.

How to get setting.

1. I went to search, typed name
2. On the popup of the files, Right Click
3. Select "Edit"
4. Click "Conversion" tab
5. Click "Edit" button
6. Scrolled until the Format is visible
7. Change this to "Vorbis" {The other items may warrant tweeking, but I don't know about them yet.}

### 7.7.3 Converting and exporting

1. Project >> Convert All Audio Files
2. Click "Ok"
3. Todo: steps to find the WEM files
4. Todo: steps to replace the one on vector

### 7.7.4 Issues

The soundbank may be too large.

- WWise, free version, has a cap of 200 audio files max
- Break the soundbanks up so that people can modify the free tools
- The tool is hard to use.

## 8. Service

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### 8.1 Arms

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In a fall, Vector's lift arms may pop apart. This was an intentional design to prevent them from breaking.

#### 8.1.1 Broken lift gear

From Discord:

Sometimes, when Vector or Cozmo take a particularly unlucky fall, the force of impact is transferred from the arm into the gearbox. There's a repair that works about half the time: You need to remove the arms, rotate the lift gear 180 degrees (you can use the arm as a tool to do this), and reinstall the arms. When this works, it's because you're moving the broken gear tooth out of the way, and using the "other half" of the gear teeth.

Cozmo and Vector have the same basic arm design and arm disassembly/reassembly is one of the safer operations you can perform.

To disassemble:

1. "Pull at the upper set of arms at the shoulder (the joint where they connect to the body, in back). Pull hard enough to pop both off their joints.
2. "Tilt the lift up - higher than it normally can, over the head.
3. "When the lift is high enough, you'll find a point where you can pull gently on the lower arms and they'll pop free.

Reassembly is the reverse of the above. The important thing to notice during disassembly is that the lower arms have a certain angle where they easily come out. You have to use that angle to pop them in and out. If they are not coming out/going in easily, the angle is not high enough or too high.

#### 8.1.2 Spare parts

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[Anki Vector Lifting Forks by Dauler July 05, 2019](#)

[3D Model .stl Vector Robot Lift Forks FDM and Resin Models DesignsByDauler](#)

## 8.2 Replacing the Battery

Please fill this in!

See this [iFixit instruction](#)

Replacement battery options:

- <https://www.ebay.com/item/3-7V-320-mAh-Polymer-Li-battery-Lipo-For-GPS-Mp4-DVD-PDA-Camera-Tablet-PC-402535/122584822407>
- A bigger battery: <https://www.aliexpress.com/item/32956226523.html>

Note: neither of these is the same "toy safe" kind as the original, and so have a few different characteristics

Desolder the battery's positive lead first. Then wrap the end of the lead in electrical tape to insulate it -- to help prevent it from touching sensitive electronics.

See also [https://www.reddit.com/r/AnkiVector/comments/i48qg8/vector\\_story\\_with\\_happy\\_ending/](https://www.reddit.com/r/AnkiVector/comments/i48qg8/vector_story_with_happy_ending/)



## 8.3 Disassembly notes

---

Summary:

- Avoid shorting anything
- Wear gloves
- Don't disassemble / move the time of flight sensor & window
- Don't disassemble / move the camera and its lens/window

See also [iFixit's services guides for Vector](#)

### 8.3.1 Avoid Shorts, disconnect the battery

Tip from Discord:

Take care to avoid shorting anything while the battery is connected. I had a habit of desoldering the battery's positive lead as soon as I could reach it, before pulling the guts entirely out of the robot - just to avoid damage.

Wrap the end of the positive lead in electrical tape to seal it off, and be sure that it gets no where near any of the electronics.

### 8.3.2 Wear gloves

Wear gloves to keep fingerprints off of the inside of the camera lens and time of flight sensor lens.

Tip from Discord:

Sometimes a fingerprint or smudge on the [time of flight sensor] window can mess it up.

That can be hard to clean, especially if it is on the inside. Nitrile gloves can help prevent this.

### 8.3.3 Don't muck with the time of flight sensor

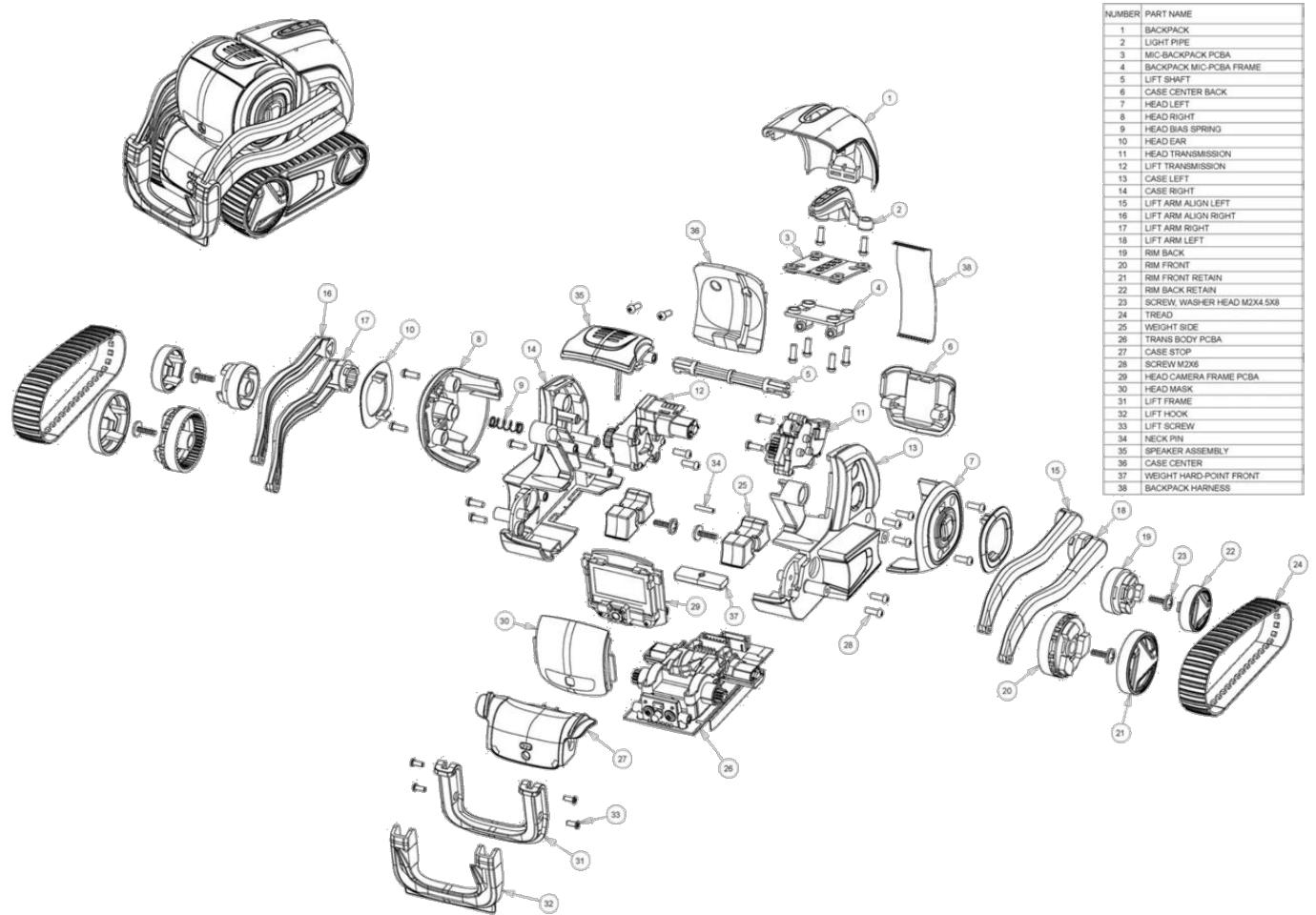
Tip from Discord:

Disassembling a Vector can cause a change in the relationship between the [time of flight] sensor window and [time of flight] sensor behind it. Any change like that requires re-calibration.

And we can't recalibrate.

## 8.4 Exploded View

### 8.4.1 Exploded Views of Vector's assembly

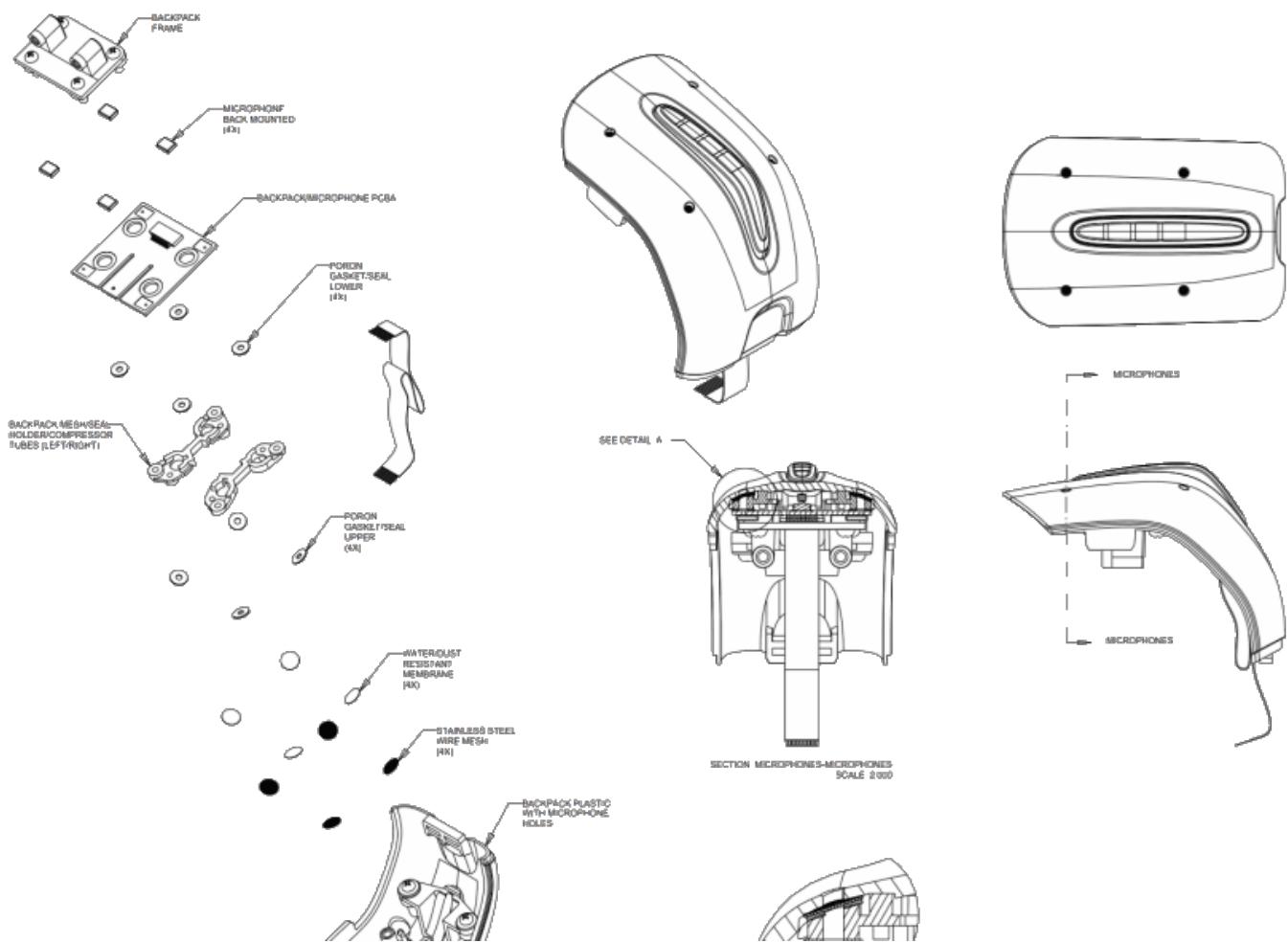




Zoom in on the exploded view of head



## An exploded view of backpack assembly



## 8.5 LCD Replacement

A batch of Vectors have LCD screens that form lines on them. The lines often start at the bottom, both marring the eyes and making the Bluetooth LE pairing pin codes illegible.

The community initially thought that the LCD connections to the head-board became delaminate with falls, lots of head motion, shaking and bad luck. This was wrong.

It was a bad batch of LCDs with a faulty gasket on the glass/plastic pieces that let humidity in and corrodes the electrical bits.

Project Victor has done some work to locate a replacement LCD LCD replacement

- ST0103A3W from <http://www.santechnology.com/products/>

**terminator3d3700** has been working on a home set up to replace LCD displays, with some success:

- See [https://www.reddit.com/r/AnkiVector/comments/jwu77d/vector\\_displays/](https://www.reddit.com/r/AnkiVector/comments/jwu77d/vector_displays/)
- [https://www.reddit.com/r/AnkiVector/comments/ju7i4i/vectors\\_new\\_screen/](https://www.reddit.com/r/AnkiVector/comments/ju7i4i/vectors_new_screen/)
- Contact him if interested



## 8.6 Parts kits

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- Replacement Parts: Wheel hubs, wheels, treads, lift arms, body boards, back pack boards, ears, gears, etc.
- A [listing 3D printable parts](#)

### Replacement boards

We do not have these, but it would be nice:

- Body boards
- Time of flight boards
- LCD module
- Motor encoder
- Backpack boards

Modifying board firmware:

- Mechanism to sign new body board FW?



## 9. Software design

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## 9.1 Animation Triggers

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Trigger Name	Description
AlexaError2Idle	
AlexaErrorLoop	
AlexaErrorLoop	
AlexaIdle2Listen	
AlexaIdle2Speak	
AlexaListen2Error	
AlexaListen2Idle	
AlexaListen2Speak	
AlexaListen2Think	
AlexaListenLoop	
AlexaNotification	
AlexaSignOut	
AlexaSpeak2Error	
AlexaSpeak2Idle	
AlexaSpeak2Listen	
AlexaSpeakLoop	
AlexaThink2Error	
AlexaThink2Idle	
AlexaThink2Speak	
AlexaThinkLoop	
AlreadyAtFace	
AudioOnlyHuh	
BlackJack_Deal	
BlackJack_GetIn	
BlackJack_GoodLuck	
BlackJack_Idle	
BlackJack_Quit	
BlackJack_Response	
BlackJack_RtpIdle	
BlackJack_RtpPlayerNo	
BlackJack_RtpPlayerYes	
BlackJack_RtpRequest	
BlackJack_RtpTimeOut	
BlackJack_SpeechGetIn	
BlackJack_SpeechShortStatement	

Trigger Name	Description
BlackJack_Spread	
BlackJack_Swipe	
BlackJack_VictorBlackJackLose	
BlackJack_VictorBlackJackWin	
BlackJack_VictorBust	
BlackJack_VictorLose	
BlackJack_VictorPush	
BlackJack_VictorWin	
BumpObjectFastGetIn	
BumpObjectFastGetOut	
BumpObjectFastLoop	
BumpObjectSlowGetIn	
BumpObjectSlowGetOut	
BumpObjectSlowLoop	
Carrying	
ChargerDockingAlreadyHere	
ChargerDockingDrivingEnd	
ChargerDockingDrivingLoop	
ChargerDockingDrivingStart	
ChargerDockingFailure	
ChargerDockingLeftTurn	
ChargerDockingRaiseLift	
ChargerDockingRequest	
ChargerDockingRequestGetout	
ChargerDockingRequestPickup	
ChargerDockingRequestWaitLoop	
ChargerDockingRightTurn	
ChargerDockingSearchAfterCompletedSearch	
ChargerDockingSearchSingleTurn	
ChargerDockingSearchSingleTurnEnd	
ChargerDockingSearchWaitForImages	
ChargerDockingSettle	
ChargerDockingSevereRequest	
ChargerDockingSevereRequestGetout	
ChargerDockingSorryButLowBattery	

Trigger Name	Description
ChargerReaction	
ChargerReaction	
ChargerReaction	
ClockGetIn	
ClockGetOut	
ComeHereStart	
ComeHereSuccess	
ConnectToCubeFailure	
ConnectToCubeGetIn	
ConnectToCubeLoop	
ConnectToCubeLostConnection	
ConnectToCubeSuccess	
ConnectWakeUp	
ConnectWakeUpLights	
Connected	
CountingFastLoop	
CountingGetInEven	
CountingGetInOdd	
CountingGetOut	
CountingSlowLoop	
CubePounceBackup	
CubePounceDriveGetIn	
CubePounceDriveGetOut	
CubePounceDriveLoop	
CubePounceFake	
CubePounceGetIn	
CubePounceGetOutBored	
CubePounceGetReady	
CubePounceGetUnready	
CubePounceIdleLiftDown	
CubePounceIdleLiftUp	
CubePounceLoseHand	
CubePounceLoseSession	
CubePouncePlayerLose	
CubePouncePlayerWin	

Trigger Name	Description
CubePouncePounceClose	
CubePouncePounceNormal	
CubePounceReactToCube	
CubePounceWinHand	
CubePounceWinSession	
DEPRECATED_AcknowledgeFaceNamed	
DEPRECATED_AcknowledgeFaceUnnamed	
DEPRECATED_AcknowledgeObject	
DEPRECATED_ComeHere_SearchForFace	
DEPRECATED_CubeMovedSense	
DEPRECATED_CubeMovedUpset	
DEPRECATED_DizzyReactionHard	
DEPRECATED_DizzyReactionMedium	
DEPRECATED_DizzyReactionSoft	
DEPRECATED_DizzyShakeLoop	
DEPRECATED_DizzyShakeStop	
DEPRECATED_DizzyStillPickedUp	
DEPRECATED_LaserAcknowledge	
DEPRECATED_LaserDriveEnd	
DEPRECATED_LaserDriveLoop	
DEPRECATED_LaserDriveStart	
DEPRECATED_LaserGetOut	
DEPRECATED_LaserPounce	
DEPRECATED_LookDownForLaser	
DEPRECATED_NamedFaceInitialGreeting	
DEPRECATED_SearchForFace_FoundFace	
DEPRECATED_SearchForFace_Search	
DEPRECATED_StackBlocksSuccess	
DanceBeatCantDoThat	
DanceBeatEyeHold	
DanceBeatGetIn	
DanceBeatGetOut	
DanceBeatGetReady	
DanceBeatListening	
DanceBeatNoBeatDetected	

Trigger Name	Description
DanceToTheBeat	
DealerCardLayout	
DockEndDefault	
DockLoopDefault	
DockStartDefault	
DriveEndAngry	
DriveEndDefault	
DriveEndHappy	
DriveEndLaunch	
DriveLoopAngry	
DriveLoopDefault	
DriveLoopHappy	
DriveLoopLaunch	
DriveOffChargerFarLeft	
DriveOffChargerFarRight	
DriveOffChargerLeft	
DriveOffChargerRight	
DriveOffChargerStraight	
DriveStartAngry	
DriveStartDefault	
DriveStartHappy	
DriveStartLaunch	
DrivingTo	
ExploringHuhClose	
ExploringHuhFar	
ExploringLookAround	
ExploringLookAtHuman	
ExploringQuickScan	
ExploringReactToHandDrive	
ExploringReactToHandGetIn	
ExploringReactToHandGetOut	
ExploringReactToHandLift	
ExploringReactToHandReaction	
ExploringScanCenterFromLeft	
ExploringScanCenterFromRight	

Trigger Name	Description
ExploringScanToLeft	
ExploringScanToRight	
EyeColorGetIn	
EyeColorGetOut	
EyeColorIdle	
EyeColorSwitch	
EyeContactLookLoop	
FacePlantRoll	
FacePlantRollArmUp	
FailedToRightFromFace	
Feedback_Apology	
Feedback_BadRobot	
Feedback_BeQuiet	
Feedback_GoodRobot	
Feedback_ILoveYou	
Feedback_MeanWords	
Feedback_ShutUp	
FetchCubeFailure	
FetchCubeSetDown	
FetchCubeSuccess	
FindCubeReactToCube	
FindCubeTurns	
FindCubeWaitLoop	
FistBumpIdle	
FistBumpLeftHanging	
FistBumpRequestOnce	
FistBumpRequestRetry	
FistBumpSuccess	
Flash	
FlipDownFromBack	
FoundFace	
FrustratedByFailureMajor	
GatherCubesAllCubesInBeacon	
GatherCubesCubeInBeacon	
GazingLookAtFacesGetInLeft	

Trigger Name	Description
GazingLookAtFacesGetInRight	
GazingLookAtFacesTurnLeft	
GazingLookAtFacesTurnRight	
GazingLookAtSurfaceReaction	
GazingLookAtSurfaceTurnLeft	
GazingLookAtSurfacesGetInLeft	
GazingLookAtSurfacesGetInRight	
GazingLookAtSurfacesTurnRight	
GazingLookAtVectorReaction	
GoToSleepGetIn	
GoToSleepOff	
GoToSleepSleeping	
GreetAfterLongTime	
HeldOnPalmEdgeNervous	
HeldOnPalmEdgeRelaxed	
HeldOnPalmGetInNervous	
HeldOnPalmGetInRelaxed	
HeldOnPalmLookingNervous	
HeldOnPalmNestling	
HeldOnPalmPickupNervous	
HeldOnPalmPickupRelaxed	
HeldOnPalmPutDownNervous	
HeldOnPalmPutDownRelaxed	
HeldOnPalmReactToJolt	
HeldOnPalmRollOff	
HeldOnPalmTransitionToRelaxed	
HighTemperatureWarningFace	
ICantDoThat	
Idle_09	
InitialWakeUp	
InteractWithFaceTrackingIdle	
InteractWithFacesInitialNamed	
InteractWithFacesInitialUnnamed	
Interacting	
InteractingBehaviorLock	

Trigger Name	Description
InvalidAnimTrigger	
InvestigateHeldCubeGetIn	
InvestigateHeldCubeGetOutBored	
InvestigateHeldCubeGetOutCubeLost	
InvestigateHeldCubeOnSetDown	
InvestigateHeldCubeTrackingLoop	
KnowledgeGraphAnswer	
KnowledgeGraphGetIn	
KnowledgeGraphGetOut	
KnowledgeGraphListening	
KnowledgeGraphSearching	
KnowledgeGraphSearchingFail	
KnowledgeGraphSearchingFailGetOut	
KnowledgeGraphSearchingGetIn	
KnowledgeGraphSearchingGetOutSuccess	
KnowledgeGraphSuccessReaction	
LookAround	
LookAtDevice	
LookAtDeviceGetIn	
LookAtDeviceGetOut	
LookAtUserEndearingly	
LookInPlaceForFacesBodyPause	
LookInPlaceForFacesBodyPause_Active	
LookInPlaceForFacesHeadMovePause	
LowBattery	
MeetVictor	
MeetVictorConfusion	
MeetVictorDuplicateName	
MeetVictorGetIn	
MeetVictorLookFace	
MeetVictorLookFaceInterrupt	
MeetVictorSawWrongFace	
MeetVictorSayName	
MeetVictorSayNameAgain	
MessagingMessageDeletedShort	

Trigger Name	Description
MessagingMessageGetIn	
MessagingMessageGetOut	
MessagingMessageLoop	
MessagingMessageRecordReaction	
MessagingMessageRewind	
MovementDriveBackward	
MovementDriveForward	
MovementTurnAround	
MovementTurnLeft	
MovementTurnRight	
Muted	
NeutralFace	
NoCloudGetIn	
NoCloudIcon	
NoWifiGetIn	
NoWifiIcon	
NoWifiSearching	
NothingToDoBoredIdle	
ObservingIdleEyesOnly	
ObservingIdleWithHeadLookingStraight	
ObservingIdleWithHeadLookingUp	
ObservingLookStraight	
ObservingLookUp	
ObservingOnCharger	
ObservingOnChargerGetIn	
ObservingOnChargerGetOut	
Off	
Offline	
Offline_Off	
Onboarding	
OnboardingComeHere	
OnboardingComeHereGetOut	
OnboardingCubeDriveGetIn	
OnboardingCubeDriveGetOut	
OnboardingCubeDriveLoop	

Trigger Name	Description
OnboardingCubeHuh	
OnboardingDriveOffCharger	
OnboardingDriveOffCharger_1p0	
OnboardingListenGetIn	
OnboardingListenGetOut	
OnboardingLookAround	
OnboardingLookAtPhoneDown	
OnboardingLookAtPhoneLoop	
OnboardingLookAtPhoneUp	
OnboardingLookAtUser	
OnboardingLookAtUserGetOut_1p0	
OnboardingLookDown	
OnboardingLookForCube	
OnboardingReactToFaceHappy	
OnboardingWakeUp	
OnboardingWakeWordGetIn	
OnboardingWakeWordSuccess	
PRDemoGreeting	
PettingBlissGetout	
PettingBlissLoop	
PettingLevel1	
PettingLevel1Getout	
PettingLevel2	
PettingLevel2Getout	
PettingLevel3	
PettingLevel3Getout	
PettingLevel4	
PettingLevel4Getout	
PickupCubePreperation	
PickupCubeRetry	
PickupCubeSuccess	
PlaceCubeByChargerFail	
PlaceCubeByChargerReactToCharger	
PlaceCubeByChargerSuccess	
PlanningGetIn	

Trigger Name	Description
PlanningGetOut	
PlanningLoop	
PlayerCardLayout	
PokeObjectDriveLoop	
PokeObjectGetIn	
PokeObjectGetOut	
PopAWheelieInitial	
PopAWheeliePreActionNamedFace	
PopAWheeliePreActionUnnamedFace	
PopAWheelieRealign	
PopAWheelieRetry	
PounceFail	
PounceSuccess	
PounceWProxFoward	
PutDownBlockKeepAlive	
PutDownBlockPutDown	
RTS_OffCharger_Awake_120Left	
RTS_OffCharger_Awake_120Right	
RTS_OffCharger_Awake_150Left	
RTS_OffCharger_Awake_150Right	
RTS_OffCharger_Awake_30Left	
RTS_OffCharger_Awake_30Right	
RTS_OffCharger_Awake_60Left	
RTS_OffCharger_Awake_60Right	
RTS_OffCharger_Awake_Ambient	
RTS_OffCharger_Awake_Back	
RTS_OffCharger_Awake_Front	
RTS_OffCharger_Awake_Left	
RTS_OffCharger_Awake_Right	
RTS_OffCharger_Sleep_120Left	
RTS_OffCharger_Sleep_120Right	
RTS_OffCharger_Sleep_150Left	
RTS_OffCharger_Sleep_150Right	
RTS_OffCharger_Sleep_30Left	
RTS_OffCharger_Sleep_30Right	

Trigger Name	Description
RTS_OffCharger_Sleep_60Left	
RTS_OffCharger_Sleep_60Right	
RTS_OffCharger_Sleep_Ambient	
RTS_OffCharger_Sleep_Back	
RTS_OffCharger_Sleep_Front	
RTS_OffCharger_Sleep_Left	
RTS_OffCharger_Sleep_Right	
RTS_OnCharger_Awake_120Left	
RTS_OnCharger_Awake_120Right	
RTS_OnCharger_Awake_150Left	
RTS_OnCharger_Awake_150Right	
RTS_OnCharger_Awake_30Left	
RTS_OnCharger_Awake_30Right	
RTS_OnCharger_Awake_60Left	
RTS_OnCharger_Awake_60Right	
RTS_OnCharger_Awake_Ambient	
RTS_OnCharger_Awake_Back	
RTS_OnCharger_Awake_Front	
RTS_OnCharger_Awake_Left	
RTS_OnCharger_Awake_Right	
RTS_OnCharger_Sleep_120Left	
RTS_OnCharger_Sleep_120Right	
RTS_OnCharger_Sleep_150Left	
RTS_OnCharger_Sleep_150Right	
RTS_OnCharger_Sleep_30Left	
RTS_OnCharger_Sleep_30Right	
RTS_OnCharger_Sleep_60Left	
RTS_OnCharger_Sleep_60Right	
RTS_OnCharger_Sleep_Ambient	
RTS_OnCharger_Sleep_Back	
RTS_OnCharger_Sleep_Front	
RTS_OnCharger_Sleep_Left	
RTS_OnCharger_Sleep_Right	
ReactToCliff	
ReactToCliffBack	

Trigger Name	Description
ReactToCliffBackLeft	
ReactToCliffBackRight	
ReactToCliffFront	
ReactToCliffFrontLeft	
ReactToCliffFrontRight	
ReactToCliffTurnLeft120	
ReactToCliffTurnLeft180	
ReactToCliffTurnLeft60	
ReactToCliffTurnRight120	
ReactToCliffTurnRight180	
ReactToCliffTurnRight60	
ReactToCubeSearchForCubeLvl1	
ReactToCubeSearchForCubeLvl2	
ReactToCubeSearchForCubeLvl3	
ReactToCubeTapCubeFound	
ReactToCubeTapCubeNotFound	
ReactToCubeTapCubeTappedLvl1	
ReactToCubeTapCubeTappedLvl2	
ReactToCubeTapCubeTappedLvl3	
ReactToCubeTapInteractionGetOut	
ReactToCubeTapInteractionLoop	
ReactToDarkness	
ReactToGoodBye	
ReactToGoodMorning	
ReactToGoodNight	
ReactToGreeting	
ReactToHabitat	
ReactToMotionLeft	
ReactToMotionLeftGetout	
ReactToMotionRight	
ReactToMotionRightGetout	
ReactToMotionTurnLeft	
ReactToMotionTurnRight	
ReactToMotionTurnUp	
ReactToMotionUp	

Trigger Name	Description
ReactToMotionUpGetout	
ReactToObstacle	
ReactToOnLeftSideGetIn	
ReactToOnLeftSideLoop	
ReactToOnRightSideGetIn	
ReactToOnRightSideLoop	
ReactToOnSideEffort	
ReactToOnSideGetOut	
ReactToPerchedOnBlock	
ReactToPickupInitial	
ReactToPickupLoop	
ReactToPutDown	
ReactToShakeSnowGlobe_GetIn	
ReactToShakeSnowGlobe_Lvl1InHand	
ReactToShakeSnowGlobe_Lvl1Loop	
ReactToShakeSnowGlobe_Lvl1OnGround	
ReactToShakeSnowGlobe_Lvl1Waiting	
ReactToShake_GetIn	
ReactToShake_Lvl1InHand	
ReactToShake_Lvl1Loop	
ReactToShake_Lvl1OnGround	
ReactToShake_Lvl1Waiting	
ReactToShake_Lvl2InHand	
ReactToShake_Lvl2Loop	
ReactToShake_Lvl2OnGround	
ReactToShake_Lvl2Waiting	
ReactToShake_Lvl3InHand	
ReactToShake_Lvl3Loop	
ReactToShake_Lvl3OnGround	
ReactToShake_Lvl3Waiting	
ReactToTouchInitial	
ReactToTriggerWordOffChargerBehind	
ReactToTriggerWordOffChargerBehindLeft	
ReactToTriggerWordOffChargerBehindRight	
ReactToTriggerWordOffChargerFrontLeft	

Trigger Name	Description
ReactToTriggerWordOffChargerFrontRight	
ReactToTriggerWordOffChargerLeft	
ReactToTriggerWordOffChargerRight	
ReactToUnclaimedIntent	
ReactToUnclaimedIntentInAir	
ReactToUnexpectedMovement	
RollBlockRealign	
RollBlockRetry	
RollBlockSuccess	
SeasonalHappyHolidays	
SeasonalHappyNewYear	
ShutDown	
Sleep	
SleepNoFade	
SoundOnlyLiftEffortPickup	
SoundOnlyLiftEffortPlaceHigh	
SoundOnlyLiftEffortPlaceLow	
SoundOnlyLiftEffortPlaceRoll	
SpeedTapLose	
SpeedTapWin	
SpinnerBlueCelebration	
SpinnerBlueCycle	
SpinnerBlueHoldTarget	
SpinnerBlueLockIn	
SpinnerBlueLocked	
SpinnerBlueLockedPulse	
SpinnerBlueSelectTarget	
SpinnerGreenCelebration	
SpinnerGreenCycle	
SpinnerGreenHoldTarget	
SpinnerGreenLockIn	
SpinnerGreenLocked	
SpinnerGreenLockedPulse	
SpinnerGreenSelectTarget	
SpinnerPlayerError	

Trigger Name	Description
SpinnerPurpleCelebration	
SpinnerPurpleCycle	
SpinnerPurpleHoldTarget	
SpinnerPurpleLockIn	
SpinnerPurpleLocked	
SpinnerPurpleLockedPulse	
SpinnerPurpleSelectTarget	
SpinnerRedCelebration	
SpinnerRedCycle	
SpinnerRedHoldTarget	
SpinnerRedLockIn	
SpinnerRedLocked	
SpinnerRedLockedPulse	
SpinnerRedSelectTarget	
SpinnerStartGame	
SpinnerYellowCelebration	
SpinnerYellowCycle	
SpinnerYellowHoldTarget	
SpinnerYellowLockIn	
SpinnerYellowLocked	
SpinnerYellowLockedPulse	
SpinnerYellowSelectTarget	
Streaming	
StuckOnEdgeGetIn	
StuckOnEdgeIdle	
StuckOnEdgeLeftGetIn	
StuckOnEdgeLeftIdle	
StuckOnEdgeRightGetIn	
StuckOnEdgeRightIdle	
SuccessfulWheelie	
TakeAPictureCapture	
TakeAPictureFocusing	
TapResponsePulse	
TemperatureDoubleDig	
TemperatureNegDoubleDig	

Trigger Name	Description
TemperatureNegSingleDig	
TemperatureNegTripleDig	
TemperatureSingleDig	
TemperatureTripleDig	
TestAllLeds	
TestOffset	
TestRotation	
TextToSpeechGetIn	
TextToSpeechGetLoop	
TextToSpeechGetOut	
TimerCancelGetIn	
TimerCancelTimer	
TimerCheckTimeGetIn	
TimerCheckTimeGetOut	
TimerRing	
TimerRingGetIn	
TimerRingGetOut	
TimerSetGetIn	
TimerSetGetOut	
UnitTestAnim	
VC_IntentNeutral	
VC_ListeningGetIn	
VC_ListeningGetOut	
VC_ListeningLoop	
VC_SleepingToListeningGetIn	
VC_SleepingToListeningGetOut	
VC_SleepingToListeningLoop	
Visible	
VolumeLevel1	
VolumeLevel2	
VolumeLevel3	
VolumeLevel4	
VolumeLevel5	
WakeUp	
WakeupGetout	

Trigger Name	Description
WeatherCondCloudy_01	
WeatherCondColdClear_01	
WeatherCondRain_01	
WeatherCondSnow_01	
WeatherCondStars_01	
WeatherCondSunny_01	
WeatherCondThunderstorms_01	
WeatherCondWindy_01	

## 9.2 Behaviour IDs

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Behavior ID	Description
AcousticTestMode	
Alexa	
AlexaSignInOut	
AskForHelp	
AskForHelpOnSide	
Asleep	
BasicVoiceCommands	
BeQuietAnims	
BeQuietLoop	
BlackJack	
BlackJackGoodLuckTTS	
BlackJackHandleRTPResponses	
BlackJackHitOrStandPrompt	
BlackJackLookAtFaceInFront	
BlackJackRequestToPlay	
BlackJackRequestToPlayAgain	
BlackJackTextToSpeech	
BlackJackVoiceCommand	
CheckForAndReactToHand	
CubeTrickDispatcher	
DemoTimerUtilityCoordinator	
DevBaseBehavior	
DevImageCapture	
DevBatteryLogging	
DevCubeSpinner	
DevCubeSpinnerConsole	
DevDesignCubeLights	
DevDisplayReadingsOnFace	
DevEventSequenceCapture	
DevImageCapture_PetsAndHands	
DevPlannerTest	
DevSquawkBoxTest	
DevTestBlackjackViz	
DoATrickVoiceCommand	
FetchCubeVoiceCommand	

Behavior ID	Description
FindFacesPhoto	
FindYourCubeVoiceCommand	
FistBumpVoiceCommand	
FrameFaces	
InterruptingVoiceReactions	
DevTestConnectToCube	
DevTestPersonDetectorBehavior	
DevTestPromptUser	
DevTouchDataCollection	
DevTurnInPlaceTest	
DevViewCubeBackpackLights	
DockingTestSimple	
FactoryCentroidExtractor	
ForceStuckOnEdge	
LiftLoadTest	
PlaypenCameraCalibration	
PlaypenDistanceSensor100mm	
PlaypenDistanceSensor300mm	
PlaypenDistanceSensor80mm	
PlaypenDriftCheck	
PlaypenDriveForwards	
PlaypenEndChecks	
PlaypenInitChecks	
PlaypenMotorCalibration	
PlaypenPickupCube	
PlaypenSoundCheck	
PlaypenTest	
PlaypenWaitToStart	
PowerSaveStressTest	
PowerSaveTest	
PuzzleMaze	
ReactToBody	
ReactToGazeDirection	
ReactToGazeDirectionSurface	
SelfTest	

Behavior ID	Description
SelfTestButton	
SelfTestDockWithCharger	
SelfTestDriftCheck	
SelfTestDriveForwards	
SelfTestInitChecks	
SelfTestLookAtCharger	
SelfTestMotorCalibration	
SelfTestPickup	
SelfTestPutOnCharger	
SelfTestPutOnCharger2	
SelfTestScreenAndBackpack	
SelfTestSoundCheck	
SelfTestTouch	
TestStackMonitors	
ChangeEyeColor	
HowOldAreYou	
HowOldAreYouCounting	
ShowWallTime	
SingletonFindFaceInFrontWallTime	
SingletonWallTimeCoordinator	
ComeHereVoiceCommand	
ConfirmHabitat	
ConnectToCube	
CoordinateGlobalInterrupts	
CoordinateInHabitat	
CoordinateWhileHeldInPalm	
CoordinateWhileInAir	
DanceBig	
DanceForwardBackFlower	
DanceFrontRightLeftPoint	
DanceSTwoways	
DanceSwell	
DanceWiggleForwardWiggleBack	
DanceToTheBeat	
DanceToTheBeatCoordinator	

Behavior ID	Description
DanceToTheBeatVoiceCommand	
ListenForBeats	
ListenForBeatsLong	
ListenForBeatsVoiceCommand	
DefaultTextToSpeechLoop	
DriveOffChargerCube	
DriveOffChargerFace	
DriveOffChargerRandomly	
DriveOffChargerRandomlyAnim	
DriveOffChargerStraight	
EmergencyMode	
EmergencyModeAnimDispatcher	
EmergencyModeInAir	
EmergencyModeOffCharger	
EmergencyModeTriggerWord	
GlobalInterruptions	
GreetAfterLongTime	
HabitatMutedDispatcher	
HabitatMutedVoiceCommandResponse	
HighLevelAI	
ActiveLookForFaces	
ConfirmCharger	
ConfirmCube	
Exploring	
ExploringBumpObject	
ExploringExamineObstacle	
ExploringGetIn	
ExploringReferenceHuman	
ExploringVoiceCommand	
FindCubeAndPlayKeepaway	
FistBump	
AcknowledgeCharger	
ClearChargerArea	
EmergencyModeFindAndGoToHome	
FindAndGoToHome	

Behavior ID	Description
FindAndRequestHome	
FindHome	
FindHomeInHabitat	
GoHome	
RequestHomeBecauseStuck	
RequestToGoHome	
WiggleBackOntoChargerFromPlatform	
HeldInPalmDispatcher	
HeldInPalmResponses	
InitialHeldInPalmReaction	
ReactToJoltInPalm	
ReactToPalmTilt	
ReactToPickupFromPalm	
ReactToPutDownFromPalm	
InitialPickupAnimation	
InteractWithFaces	
InteractWithStaticCube	
InvestigateCubeConnectionGate	
InvestigateHeldCube	
MoveCube	
PlaceCubeByCharger	
RollBlockIfNotVertical	
TurnToLastFace	
Keepaway	
KnowledgeGraphQuestion	
KnowledgeGraphTTS	
LookInPlaceHeadDownInAir	
LookInPlaceHeadUp	
LookInPlaceHeadUpInAir	
MeetVictor	
MeetVictorAlreadyKnowYouPrompt	
RespondToRenameFace	
LeaveAMessage	
MessagingPlaybackTTS	
MessagingRecordTTS	

Behavior ID	Description
PlaybackMessage	
NothingToDo_Idle	
Observing	
ObservingDriveOffCharger	
ObservingEyeContact	
ObservingFindFaces	
ObservingLookAtFaces	
ObservingLookAtFacesInAir	
ObservingOffChargerHeadOnly	
ObservingOnCharger	
ObservingOnChargerEyeContact	
ObservingOnChargerGetIn	
ObservingOnChargerGetOut	
ObservingOnChargerIdle	
ObservingOnChargerIdleAnim	
ReactToMotion	
TrackingEyeContact	
PickupCube	
PickupCubeNoInitialReaction	
CubeSpinnerConnectionGate	
CubeSpinnerLookAroundInPlace	
VectorPlaysCubeSpinner	
FetchCube	
FindCube	
FindCubeAndThen	
FindFacesFetchCube	
PlayRollBlock	
PlayWithCube	
PopAWheelie	
SingletonPounceApproachWithProx	
SingletonPounceDispatcher	
SingletonPounceTurnLeft	
SingletonPounceTurnRight	
SingletonPounceWithProx	
PutDownBlock	

Behavior ID	Description
PutDownBlockAtPose	
PutDownDispatch_LookForFaceAndCube	
SayName	
SearchWithinBoundingBox	
ShortLookAroundForFaceAndCube	
FindHomeForSleeping	
GoToSleep	
SleepCycle	
SleepingPersonCheck	
SleepingTriggerWord	
SleepingWakeUp	
SleepingWakeUpLights	
DriveOffChargerIntoSocializing	
Socialize	
SocializeGame	
TrackCube	
TrackCubeTest	
TrackFaceTest	
GoHomeVoiceCommand	
KeepawayVoiceCommand	
LookAtMeVoiceCommand	
LookOverThereVoiceCommand	
PickUpCubeVoiceCommand	
PlayAGameVoiceCommand	
PopAWheelieVoiceCommand	
RollCubeVoiceCommand	
WhatsMyNameVoiceCommand	
WhileInAirDispatcher	
WhileInAirResponses	
WhileInAirResponsesPRDemo	
InitNormalOperation	
InitPRDemo	
IntentUnmatched	
ModeSelector	
MovementBackward	

Behavior ID	Description
MovementForward	
MovementTurnAround	
MovementTurnLeft	
MovementTurnRight	
NoCloud	
NormalWakeUp	
NoWifi	
Onboarding	
OnboardingComeHere	
OnboardingEmulate1p0WaitForVC	
MandatoryPhysicalReactions	
OnboardingLookAtPhone	
OnboardingLookAtUser	
OnboardingLookAtUserOffCharger	
OnboardingLookAtUserOnCharger	
OnboardingPowerOff	
OnboardingTeachComeHere	
OnboardingTeachMeetVictor	
OnboardingTeachWakeWord	
OnboardingWakeUp	
PRDemoBigGreeting	
PRDemoComeHere	
PRDemoExploring	
PRDemoObserving	
PRDemoSleeping	
PRDemoStateMachine	
ProceduralTurnToMicDirection	
QuietMode	
QuietModeEmergencyModeGoHome	
ReactToAbuse	
ReactToAffirmative	
ReactToApology	
ReactToBatteryTooHotToCharge	
ReactToCliff	
ReactToCliffDuringFetch	

Behavior ID	Description
ReactToDarkness	
ReactToFrustrationMajor	
ReactToGoodBye	
ReactToGoodMorning	
ReactToHand	
ReactToHello	
ReactToLove	
ReactToMotorCalibration	
ReactToNegative	
ReactToObstacle	
ReactToPlacedOnSlope	
ReactToPutDown	
ReactToRobotOnBack	
ReactToRobotOnFace	
ReactToRobotOnSide	
ReactToRobotShaken	
ReactToRobotShakenSnowGlobe	
ReactToSoundAsleep	
ReactToSoundAwake	
ReactToSoundDirectionAsleep	
ReactToSoundDirectionAwake	
ReactToTriggerDirectionAwake	
ReactToUncalibratedHeadAndLift	
ReactToUnexpectedMovement	
ReactToTouchPetting	
ReactToUnclaimedIntent	
ResetSafely	
SDKDefault	
SDKOverrideAll	
SeasonalHappyHolidays	
SeasonalHappyNewYear	
ShutUpAnims	
ShutUpMode	
SingletonAnticShowClock	
SingletonCancelTimer	

Behavior ID	Description
SingletonICantDoThat	
SingletonPoweringRobotOff	
SingletonTimerAlreadySet	
SingletonTimerAntic	
SingletonTimerCheckTime	
SingletonTimerRinging	
SingletonTimerSet	
StayOnChargerUntilCharged	
StuckOnEdge	
TakeAPhotoCoordinator	
TimerRingingPRDemo	
TimerUtilityCoordinator	
TriggerWordDetected	
TriggerWordWithoutIntent	
UserDefinedBehaviorSelector	
UserDefinedBehaviorTreeConfirmNewBehavior	
UserDefinedBehaviorTreeRouter	
UserDefinedBehaviorTreeTextToSpeech	
Volume	
Wait	
WeatherCloudyGeneric	
WeatherColdClearGeneric	
WeatherRainGeneric	
WeatherSnowGeneric	
WeatherStarsGeneric	
WeatherSunnyGeneric	
WeatherThunderstormsGeneric	
WeatherWindyGeneric	
WeatherResponses	
WeatherTextToSpeech	

## 9.3 Behaviour Classes

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Behavior Classes	Description
AdvanceClock	
AestheticallyCenterFaces	
Alexa	
AlexaSignInOut	
AnimGetInLoop	
AnimSequence	
AnimSequenceWithFace	
AnimSequenceWithObject	
AskForHelp	
AttentionTransferIfNeeded	
BlackJack	
BumpObject	
CheckForAndReactToSalientPoint	
ClearChargerArea	
ConfirmHabitat	
ConfirmObject	
ConnectToCube	
CoordinateGlobalInterrupts	
CoordinateInHabitat	
CoordinateWeather	
CoordinateWhileHeldInPalm	
CoordinateWhileInAir	
CountingAnimation	
DanceToTheBeat	
DanceToTheBeatCoordinator	
DevBatteryLogging	
DevCubeSpinnerConsole	
DevDesignCubeLights	
DevDisplayReadingsOnFace	
DevEventSequenceCapture	
DevImageCapture	
DevSquawkBoxTest	
DevTestBlackjackViz	
DevTouchDataCollection	
DevTurnInPlaceTest	

Behavior Classes	Description
DevViewCubeBackpackLights	
DispatchAfterShake	
DispatcherPassThrough	
DispatcherQueue	
DispatcherRandom	
DispatcherStrictPriority	
DispatcherStrictPriorityWithCooldown	
DisplayWallTime	
DisplayWeather	
DockingTestSimple	
DriveOffCharger	
DriveToFace	
EnrollFace	
Exploring	
ExploringExamineObstacle	
EyeColor	
FactoryCentroidExtractor	
FetchCube	
FindCube	
FindCubeAndThen	
FindFaceAndThen	
FindFaces	
FindHome	
FistBump	
GoHome	
GreetAfterLongTime	
HighLevelAI	
HowOldAreYou	
InspectCube	
InteractWithFaces	
Keepaway	
KnowledgeGraphQuestion	
LeaveAMessage	
LiftLoadTest	
ListenForBeats	

Behavior Classes	Description
LookAroundInPlace	
LookAtFaceInFront	
LookAtMe	
LookForFaceAndCube	
MoveHeadToAngle	
ObservingLookAtFaces	
ObservingWithoutTurn	
OnboardingCoordinator	
OnboardingEmulate1p0WaitForVC	
OnboardingLookAtPhone	
OnboardingLookAtUser	
OnboardingTeachWakeWord	
OnboardingWakeUp	
PickUpCube	
PlaceCubeByCharger	
PlannerTest	
PlaybackMessage	
PlaypenCameraCalibration	
PlaypenDistanceSensor	
PlaypenDriftCheck	
PlaypenDriveForwards	
PlaypenEndChecks	
PlaypenInitChecks	
PlaypenMotorCalibration	
PlaypenPickupCube	
PlaypenSoundCheck	
PlaypenTest	
PlaypenWaitToStart	
PopAWheelie	
PounceWithProx	
PowerSaveStressTest	
PowerSaveTest	
PoweringRobotOff	
PRDemo	
PRDemoBase	

Behavior Classes	Description
ProceduralClock	
PromptUserForVoiceCommand	
ProxGetToDistance	
PutDownBlock	
PutDownBlockAtPose	
PuzzleMaze	
QuietModeCoordinator	
ReactToBatteryTooHotToCharge	
ReactToBody	
ReactToCliff	
ReactToDarkness	
ReactToFrustration	
ReactToGazeDirection	
ReactToHand	
ReactToMicDirection	
ReactToMotion	
ReactToMotorCalibration	
ReactToPlacedOnSlope	
ReactToPutDown	
ReactToRobotOnBack	
ReactToRobotOnFace	
ReactToRobotOnSide	
ReactToRobotShaken	
ReactToSound	
ReactToTouchPetting	
ReactToUncalibratedHeadAndLift	
ReactToUnclaimedIntent	
ReactToUnexpectedMovement	
ReactToVoiceCommand	
RequestToGoHome	
ResetState	
RespondToRenameFace	
RollBlock	
SayName	
SDKInterface	

Behavior Classes	Description
SearchWithinBoundingBox	
SelfTest	
SelfTestButton	
SelfTestDockWithCharger	
SelfTestDriftCheck	
SelfTestDriveForwards	
SelfTestInitChecks	
SelfTestLookAtCharger	
SelfTestMotorCalibration	
SelfTestPickup	
SelfTestPutOnCharger	
SelfTestScreenAndBackpack	
SelfTestSoundCheck	
SelfTestTouch	
SleepCycle	
Sleeping	
StayOnChargerUntilCharged	
TakeAPhotoCoordinator	
TextToSpeechLoop	
TimerUtilityCoordinator	
TrackCube	
TrackFace	
Turn	
TurnToFace	
UserDefinedBehaviorSelector	
UserDefinedBehaviorTreeRouter	
VectorPlaysCubeSpinner	
Volume	
Wait	
WallTimeCoordinator	
WiggleOntoChargerContacts	

## 9.4 Console variables

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### 9.4.1 Console Variables

Console Variables are part of the developer build. They allow the developer to test, diagnose, and tweak (inject data into) the various modules.

This note is to help gather a description of each of console variables. This format lets us gather information on them, and help understand where they fit in.

These tables are not suitable for the TRM at this time; they may go better in the software design description in the future.

Note: the k seems to be dropped or optional in matching

#### A/B Testing console variables

Variable	Type	Units	Description
kForceDisableABTesting			

#### AIWhiteboard console variables

Variable	Type	Units	Description
kBW_PossibleObjectClose_mm			

#### Alexa console variables

Variable	Type	Units	Description
kAcousticTestMode			
kAlexaEnabledInAU			
kAlexaEnabledInUK			
kAlexaHackCheckForSystemClockSyncPeriod_s			
kAlexaldleDelay_s			
kAlexaMaxIdleDelay_s			
kAllowAudioOnCharger			
kDEV_ONLY_EnableAlexaTemplateRendererStub			
kLogAlexaDirectives			
kNotchPower			

#### Alexa.Init console variables

Variable	Type	Units	Description
kDumpAlexaTriggerAudio			

**Alexa.Messaging console variables**

Variable	Type	Units	Description
kLogAlexaMessages			
kStealAlexaWakewordAudio			

**Animation console variables**

Variable	Type	Units	Description
kShouldPreCacheSprites			
kEyeDartFocusValue_pix			
kIgnoreAnimWhitelist			

**AnimationStreamer console variables**

Variable	Type	Units	Description
kEnableBackpackLightsTrack			
kShouldDisplayPlaybackTime			

**AnimationStreamer.System console variables**

Variable	Type	Units	Description
kDisplayCPUThrottling			
kDisplayHighTemperature			
kDisplayMemoryPressure			
kThermalAlertTemp_C			

**Audio.AnimationStream console variables**

Variable	Type	Units	Description
kAudioAnimationOffset_ms			

**Audio.KeepAlive console variables**

Variable	Type	Units	Description
kEnableKeepAliveEyeBlinkAudioEvents			
kEnableKeepAliveEyeDartAudioEvents			
kEnableKeepAliveEyeSquintAudioEvents			

**Audio.Microphone console variables**

Variable	Type	Units	Description
kNoiseFloorMin			
kNoiseFloorRange			

**Audio.Procedural console variables**

Variable	Type	Units	Description
kEnableHeadProceduralMovement			
kEnableLiftProceduralMovement			
kEnableTreadProceduralMovement			
kHeadCoolDown_ms			
kHeadMovementThreshold_rpms			
kLiftCoolDown_ms			
kLiftMovementThreshold_rpms			
kMaxHeadAccel_rpms2			
kMaxHeadSpeed_rpms			
kMaxLiftAccel_rpms2			
kMaxLiftSpeed_rpms			
kMaxTreadAccel_mmpms2			
kMaxTreadSpeed_mmmps			
kMaxTurnSpeed_mmmps			
kTreadMovementThreshold_mmmps			
kTreadCoolDown_ms			

**BackpackLights console variables**

Variable	Type	Units	Description
kOfflineCheckFreq_ms			
kOfflineTimeBeforeLights_ms			

**BasicActions.TurnTowardsObject console variables**

Variable	Type	Units	Description
kInsertWaitsInTurnTowardsObjectVerify			

**Behavior.BehaviorGoHome console variables**

Variable	Type	Units	Description
kGoHome_VisualVerification_SaveImages			

**Behavior.CheckForAndReactToSalientPoint console variables**

Variable	Type	Units	Description
kCFARTSP_CooldownOverride_sec			

**BehaviorCountingAnimation console variables**

Variable	Type	Units	Description
kSlowLoopBeginSize_loops			

**BehaviorDanceToTheBeatCoordinator console variables**

Variable	Type	Units	Description
kDancingCooldown_sec			

**Behaviors.BehaviorSystemManager console variables**

Variable	Type	Units	Description
kDebugBehaviorStack			

**Behavior.EnrollFace console variables**

Variable	Type	Units	Description
kEnrollFace_TimeoutForReLookForFace_ms			

**Behavior.Exploring console variables**

Variable	Type	Units	Description
kExploringPostBumpReferenceProb			
kMinObjectWidthToBump_rad			
kProbReferenceOnResume			

**BehaviorHighLevelAI console variables**

Variable	Type	Units	Description
kTimeMultiplier			

**Behavior.InteractWithFaces console variables**

Variable	Type	Units	Description
kInteractWithFaces_DriveForwardIdealDist_mm			
kWiggle_ForwardDist_mm			

**Behavior.InternalStatesBehavior console variables**

Variable	Type	Units	Description
kDebugInternalStatesBehavior			

**Behavior.LookAroundInPlace console variables**

Variable	Type	Units	Description
kVizConeOffFocus			

**BehaviorPlannerTest console variables**

Variable	Type	Units	Description
kCubeDistance_mm			

**Behavior.PutDownBlock console variables**

Variable	Type	Units	Description
kBPDB_finalHeadAngle_deg			

**Behavior.PuzzleMaze console variables**

Variable	Type	Units	Description
kPuzzleTimeout_sec			

**Behavior.ReactToCliff console variables**

Variable	Type	Units	Description
kMaxNumRobotStopsBeforeGivingUp			

**Behavior.ReactToHand console variables**

Variable	Type	Units	Description
kHandReaction_DriveForwardSpeed_mmmps			

**Behavior.ReactToPalmEdge console variables**

Variable	Type	Units	Description
kMaxNumInitialReactAttemptsBeforeGivingUp			

**Behavior.TakeAPhoto console variables**

Variable	Type	Units	Description
kHeadAngleDeg			

**Console console variables**

Variable	Type	Units	Description
kSaveModifiedConsoleVarsOnly			

**CpuProfiler console variables**

Variable	Type	Units	Description
kMessageProfilerDuration			
maxProcessingTimePerDrop_ms			

**CubeLightDesign console variables**

Variable	Type	Units	Description
kLED1_s1_red			

**CubeSpinner console variables**

Variable	Type	Units	Description
kAdjustHeightOfSpinnerLift			
kDedupTimeAfterLock_ms			
kIReallyReallyWantToBreakCubeSpinner			

**Dev console variables**

Variable	Type	Units	Description
kForceDisableAnkiDevFeatures			

**DevBaseBehavior console variables**

Variable	Type	Units	Description
kDevDispatchAfterShake			

**DevSquawkBoxBehavior console variables**

Variable	Type	Units	Description
kLiftMovementDuration_s			

**DevViewLights console variables**

Variable	Type	Units	Description
kCubeTriggerIdx			

**DockingMethod(B:0 T:1 H:2) console variables**

Variable	Type	Units	Description
kDefaultDockingMethod			

**DockingTest console variables**

Variable	Type	Units	Description
kMaxNumAttempts			

**DriveToActions console variables**

Variable	Type	Units	Description
kEnablePredockDistanceCheckFix			

**Face.KeepAlive console variables**

Variable	Type	Units	Description
kKeepAliveBlink_SpacingMaxTime_ms			
kKeepAliveBlink_SpacingMinTime_ms			
kKeepAliveEyeDart_DownMinScale			
kKeepAliveEyeDart_HotSpotPositionMultiplier			
kKeepAliveEyeDart_LongDistanceThresh_pix			
kKeepAliveEyeDart_LongShiftFraction1			
kKeepAliveEyeDart_LongShiftFraction2			
kKeepAliveEyeDart_LongSquashFraction1			
kKeepAliveEyeDart_LongSquashFraction2			
kKeepAliveEyeDart_MaxDistFromCenter_pix			
kKeepAliveEyeDart_MaxDistFromCenterFocused_pix			
kKeepAliveEyeDart_MediumDistanceThresh_pix			
kKeepAliveEyeDart_MediumShiftFraction			
kKeepAliveEyeDart_MediumSquashFraction			
kKeepAliveEyeDart_OuterEyeScaleIncrease			
kKeepAliveEyeDart_ShiftLagFraction			
kKeepAliveEyeDart_SpacingMaxTime_ms			
kKeepAliveEyeDart_SpacingMinTime_ms			
kKeepAliveEyeDart_UpMaxScale			
kMaxBlinkSpacingTimeForScreenProtection_ms			

**Habitat console variables**

Variable	Type	Units	Description
kDevForceBeginConfirmHabitat			

**TrackingActions console variables**

Variable	Type	Units	Description
kOverride_PanDuration_s			

**Face.ParameterizedFace console variables****WallTime console variables**

Variable	Type	Units	Description
kProcFace_AntiAliasingFilter			
kProcFace_AntiAliasingSigmaFraction			
kProcFace_AntiAliasingSize			
kProcFace_Display			
kProcFace_EllipseDelta			
kProcFace_EnableAntiAliasing			
kProcFace_EyeLightnessMultiplier			
kProcFace_Gamma			
kProcFace_GammaType			
kProcFace_HotspotFalloff			
kProcFace_HotspotRender			
kProcFace_InterpolationType			
kProcFace_LineType			
kProcFace_NoiseMaxLightness			
kProcFace_NoiseMinLightness			
kProcFace_NoiseNumFrames			
kProcFace_NominalEyeSpacing			
ProcFace_OverrideEyeParams			
ProcFace_OverrideRightEyeParams			
ProcFace_FromLinear			
ProcFace_ToLinear			
ProcFace_DefaultScanlineOpacity			
ProcFace_NominalEyeSpacing			
ProcFace_NoiseFraction			
ProcFace_UseAntiAliasedLines			
ProcFace_GlowRender			
ProcFace_GlowSizeMultiplier			
ProcFace_GlowLightnessMultiplier			
ProcFace_GlowGaussianFilter			
ProcFace_AntiAliasingGaussianFilter			

**Face.ScanlineDistortion console variables**

Variable	Type	Units	Description
kProcFaceScanline_MaxShiftNoise			
kProcFaceScanline_OffNoiseMaxWidth			
kProcFaceScanline_OffNoiseProb			

**FaceInfoScreenManager console variables**

Variable	Type	Units	Description
kAlexaNotificationTimeout_s			
kButtonPressDurationForShutdown_ms			
kFakeButtonPressType			
kToggleMuteTimeout_s			

**GlitchLights console variables**

Variable	Type	Units	Description
kGlitchLightDelay_ms			
kGlitchLightDuration_ms			

**HeldInPalm.Coordinator console variables**

Variable	Type	Units	Description
kMaxTimeForInitialHeldInPalmReaction_ms			

**kWebvizUpdatePeriod console variables**

Variable	Type	Units	Description
kWebvizUpdatePeriod			

**LiftLoadTest console variables**

Variable	Type	Units	Description
kNumLiftRaises			

**ManualAnimationPlayback console variables**

Variable	Type	Units	Description
kShouldDisplayKeyframeNumber			
kNumberOfFramesToIncrement			

**MicData console variables**

Variable	Type	Units	Description
kBeatDetectorUseProcessedAudio			
kDevForceProcessState			
kMicData_ClipRecordTime_ms			
kMicData_CollectRawTriggers			
kMicData_ForceDisableMicDataProc			
kMicData_ForceEnableMicDataProc			
kMicData_QuietTimeCooldown_ms			
kMicData_SaveRawFullIntent			
kMicData_SaveRawFullIntent_WakeWordless			
kMicData_SpeakerNoiseDisablesMics			
kSaveNotches			

**Network console variables**

Variable	Type	Units	Description
kEnableVerboseNetworkLogging			
kMaxPingTimesToTrackOverride			
kPrintNetworkStats			
kPrintNetworkStatsTimeSpacingMS			

**Network.Emulator console variables**

Variable	Type	Units	Description
gUDPMMaxLatency			
gUDPMInLatency			
gUDPNetEmulatorEnabled			
gUDPNetEmulatorRuntimeToggling			
gUDPRandomPacketLossPercentage			

**NetworkStats console variables**

Variable	Type	Units	Description
kLogMessageLatencyOnce			
gNetStat1NumConnections			
gNetStat2LatencyAvg			
gNetStat3LatencySD			
gNetStat4LatencyMin			
gNetStat5LatencyMax			
gNetStat6PingArrivedPC			
gNetStat7ExtQueuedAvg_ms			
gNetStat8ExtQueuedMin_ms			
gNetStat9ExtQueuedMax_ms			
gNetStatAQueuedAvg_ms			
gNetStatBQueuedMin_ms			
gNetStatCQueuedMax_ms			
kNetConnStatsUpdate			

**OSState.DiskInfo console variables**

Variable	Type	Units	Description
kHighDiskPressureMultiple			
kMediumDiskPressureMultiple			

**OSState.MemoryInfo console variables**

Variable	Type	Units	Description
kHighMemPressureMultiple			
kMediumMemPressureMultiple			

**OSState.Temperature console variables**

Variable	Type	Units	Description
kFakeCpuTemperature_degC			
kSendFakeCpuTemperature			

**OSState.Timezone console variables**

Variable	Type	Units	Description
kOSState_FakeNoTime			
kOSState_FakeNoTimezone			

**OSState.Wifilnfo console variables**

Variable	Type	Units	Description
kHighWifiErrorRate			
kMediumWifiErrorRate			

**SpeechRecognizer console variables**

Variable	Type	Units	Description
kSuppressTriggerResponse			

**SpeechRecognizer.Alexa console variables**

Variable	Type	Units	Description
kAlexaRecognizerModel			
kDefaultDetectThreshold			
kForceRunNotchDetector			
kSaveRawMicInput			

**SpeechRecognizer.AlexPlayback console variables**

Variable	Type	Units	Description
kAlexaPlaybackRecognizerModel			
kPlaybackRecognizerSampleCountThreshold			

**SpeechRecognizer.Vector console variables**

Variable	Type	Units	Description
kVectorRecognizerModel			
kVectorRecognizerModelSensitivity			

**StayOnCargerUntilCharged console variables**

Variable	Type	Units	Description
kSafeguardTimeout_s			

**TextToSpeech console variables**

Variable	Type	Units	Description
kEnablePausePrams			
kLeadingSilence_ms			
kMinPlayableFrames			
kPauseBracket_ms			
kPauseComma_ms			
kPausePunctuation_ms			
kPauseSemicolon_ms			
kPauseSpelling_ms			
kTrailingSilence_ms			
kVoicePitch			
kVoiceShaping			
kVoiceSpeed			
kWriteTTSFile			

**Vision.GazeDirection console variables**

Variable	Type	Units	Description
kFaceDirectedAtRobotMinXThres_mm			

**VoiceMessage console variables**

Variable	Type	Units	Description
kRequireKnownUser			

**WallTime console variables**

Variable	Type	Units	Description
kFakeWallTimelsSynced			

**Not Yet Classified**

Variable	Type	Units	Description

## 9.5 Other URLs listed in the code

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There are a bunch of URLs in Anki binary files... these may be part of schemas, random comments, etc.

### 9.5.1 Servers

- <http://s3.amazonaws.com/doc/2006-03-01/>
- <https://developer.amazon.com/docs/alexa-voice-service/settings.html#settingsupdated> The listed documentation for Alexa services
- [anki.com/v github.com/anki/sai-token-service/proto/tokenpb](https://github.com/anki/sai-token-service/proto/tokenpb)
- [support.anki.com](https://support.anki.com)

### 9.5.2 Github repos

- [github.com/anki/sai-chipper-voice/client/chipper](https://github.com/anki/sai-chipper-voice/client/chipper)
- [github.com/anki/sai-chipper-voice/proto/anki/chipperpb](https://github.com/anki/sai-chipper-voice/proto/anki/chipperpb)
- [github.com/anki/opus-go/libopus](https://github.com/anki/opus-go/libopus)
- [github.com/anki/opus-go/ogg](https://github.com/anki/opus-go/ogg)
- [github.com/aws/aws-sdk-go/private/protocol/query](https://github.com/aws/aws-sdk-go/private/protocol/query)
- [github.com/aws/aws-sdk-go/private/protocol/query](https://github.com/aws/aws-sdk-go/private/protocol/query)
- [github.com/aws/aws-sdk-go/aws/credentials/ec2rolecreds](https://github.com/aws/aws-sdk-go/aws/credentials/ec2rolecreds)
- [github.com/aws/aws-sdk-go/private/protocol/eventstream](https://github.com/aws/aws-sdk-go/private/protocol/eventstream)
- [github.com/aws/aws-sdk-go/private/protocol/xml/xmlutil](https://github.com/aws/aws-sdk-go/private/protocol/xml/xmlutil)
- [github.com/aws/aws-sdk-go/vendor/github.com/go-ini/ini](https://github.com/aws/aws-sdk-go/vendor/github.com/go-ini/ini)
- [github.com/aws/aws-sdk-go/aws/credentials/ec2rolecreds](https://github.com/aws/aws-sdk-go/aws/credentials/ec2rolecreds)
- [github.com/aws/aws-sdk-go/private/protocol/eventstream](https://github.com/aws/aws-sdk-go/private/protocol/eventstream)
- [github.com/aws/aws-sdk-go/private/protocol/xml/xmlutil](https://github.com/aws/aws-sdk-go/private/protocol/xml/xmlutil)
- [github.com/aws/aws-sdk-go/vendor/github.com/go-ini/ini](https://github.com/aws/aws-sdk-go/vendor/github.com/go-ini/ini)
- [github.com/aws/aws-sdk-go/private/protocol/query/queryutil](https://github.com/aws/aws-sdk-go/private/protocol/query/queryutil)
- [github.com/aws/aws-sdk-go/vendor/github.com/jmespath/go-jmespath](https://github.com/aws/aws-sdk-go/vendor/github.com/jmespath/go-jmespath)
- [github.com/grd/ogg](https://github.com/grd/ogg)
- [github.com/google/uuid](https://github.com/google/uuid)
- [github.com/cenkalti/backoff](https://github.com/cenkalti/backoff)
- [github.com/dgrijalva/jwt-go](https://github.com/dgrijalva/jwt-go)
- [github.com/gwatts/rootcerts](https://github.com/gwatts/rootcerts)
- [github.com/aws/aws-sdk-go/aws](https://github.com/aws/aws-sdk-go/aws)
- [github.com/golang/protobuf/proto](https://github.com/golang/protobuf/proto)
- [github.com/aws/aws-sdk-go/aws/csm](https://github.com/aws/aws-sdk-go/aws/csm)
- [github.com/golang/protobuf/ptypes](https://github.com/golang/protobuf/ptypes)

### 9.5.3 Other

#### 9.5.4 - [google.golang.org/genproto/googleapis/rpc/status](https://google.golang.org/genproto/googleapis/rpc/status)

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- <http://logo.verisign.com/vslogo.gif>
- [google.golang.org/grpc/peer](https://google.golang.org/grpc/peer)

- [google.golang.org/grpc/status](http://google.golang.org/grpc/status)
- [google.golang.org/grpc/balancer](http://google.golang.org/grpc/balancer)
- [google.golang.org/grpc/encoding](http://google.golang.org/grpc/encoding)
- [google.golang.org/grpc/metadata](http://google.golang.org/grpc/metadata)
- [google.golang.org/grpc/resolver](http://google.golang.org/grpc/resolver)
- [google.golang.org/grpc/keepalive](http://google.golang.org/grpc/keepalive)
- [google.golang.org/grpc/transport](http://google.golang.org/grpc/transport)
- [google.golang.org/genproto/googleapis/rpc/status](http://google.golang.org/genproto/googleapis/rpc/status)
- 

### 9.5.5 Some built in certificates?

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- <http://www.certplus.com/CRL/class2.crl>
- <http://fedir.comsign.co.il/crl/ComSignCA.crl>
- <http://crl.securetrust.com/STCA.crl>
- <http://crl.netsolssl.com/NetworkSolutionsCertificateAuthority.crl>
- <http://www.trustdst.com/certificates/policy/ACES-index.html>
- <http://crl.comodoca.com/COMODOCertificationAuthority.crl>
- <http://crl.xrampsecurity.com/XGCA.crl>
- [www.xrampsecurity.com](http://www.xrampsecurity.com)
- <http://crl.comodoca.com/AAACertificateServices.crl>
- <http://crl.comodo.net/AAACertificateServices.crl>
- <http://www.usertrust.com>
- <http://crl.usertrust.com/UTN-USERFirst-ClientAuthenticationandEmail.crl>
- <http://logo.verisign.com/vslogo.gif>
- <http://www.chambersign.org>
- <http://repository.swisssign.com/>
- <https://ocsp.quovadisoffshore.com>
- <http://www.quovadis.bm>
- <http://www.firmaprofesional.com/cps>
- <http://www.certicamara.com/dpc/0Z>
- <http://www.quovadisglobal.com/cps>
- <http://www.startssl.com/policy.pdf>
- <http://www.startssl.com/intermediate.pdf>
-

## 9.6 Channels

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I'm not sure what these are. They may be part of the logging of information and routing it internally and to a log file.

This note is to help gather a description of each of the channels. This format lets us gather information on them, and help understand where they fit in.

Channel	Description
Actions	
AIWhiteboard	
Alexa	
Audio	
Behaviors	
BlockPool	
BlockWorld	
CpuProfiler	
FaceRecognizer	
FaceWorld	
JdocsManager	the cloud storage?
Keyboard	
MessageProfiler	
Microphones	
NeuralNets	
PerfMetric	
PoseConfirmr	
SpeechRecognizer	
VisionComponent	
VisionSystem	

## 9.7 Software Classes

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Vector's software has a lot of modules -- I'm assuming these are C++ classes. They are not all annotated or understood. Here are some that we've spotted:

Module	Description
AIComponent	
AIWhiteboard	
AccountSettingsManager	
ActionList	
ActionQueue	
Actions	
ActiveFeatureComponent	
AddActiveObject	
AdvertisementService	
AkAlsaSink	
Alexa	
AlexaAudioInput	
AlexaClient	
AlexaComponent	
AlexaImpl	
AlexaMediaPlayer	
AlexaObserver	
AlexaPlaybackRecognizerComponent	
AlignWithObjectAction	
AnimComms	
AnimContext	
AnimEngine	
AnimProcessMessages	
Animation	
AnimationAudioClient	
AnimationComponent	
AnimationGroup	
AnimationGroupContainer	
AnimationGroupEntry	
AnimationStreamer	
Animations	
AnkiLab	
AppCubeConnectionSubscriber	
Array2d	
AttentionTransferComponent	

Module	Description
AudienceTags	
Audio	
AudioBehaviorStackListener	
AudioEngineController	
AudioEventGroupRef	
AudioMultipleFileLocation	
AudioMultiplexer	
AudioMuxClient	
AudioScene	
AudioSceneEvent	
AudioSceneParameter	
AudioSceneStateGroup	
AudioWaveFileReader	
BEIConditionFactory	
BEIConditionMessageHelper	
BackpackLightAnimationContainer	
BackpackLightComponent	
BackpackLightsKeyFrame	
BackupOntoChargerAction	
Battery	
BatteryComponent	
BeatDetector	
BeatDetectorComponent	
Behavior	
BehaviorAcknowledgeFace	
BehaviorAcknowledgeObject	
BehaviorAlexa	
BehaviorAnimSequenceWithObject	
BehaviorAskForHelp	
BehaviorBlackJack	
BehaviorBumpObject	
BehaviorClearChargerArea	
BehaviorComponent	
BehaviorConfirmObject	
BehaviorConnectToCube	

Module	Description
BehaviorCoordinateInHabitat	
BehaviorCoordinateWeather	
BehaviorCountingAnimation	
BehaviorDanceToTheBeat	
BehaviorDanceToTheBeatCoordinator	
BehaviorDevCubeSpinnerConsole	
BehaviorDevSquawkBoxTest	
BehaviorDevTurnInPlaceTest	
BehaviorDispatchAfterShake	
BehaviorDispatcherPassThrough	
BehaviorDispatcherQueue	
BehaviorDispatcherRandom	
BehaviorDispatcherStrictPriorityWithCooldown	
BehaviorDisplayWallTime	
BehaviorDisplayWeather	
BehaviorDockingTest	
BehaviorDockingTestSimple	
BehaviorDriveOffCharger	
BehaviorEnrollFace	
BehaviorExploring	
BehaviorExploringExamineObstacle	
BehaviorEyeColorVoiceCommand	
BehaviorFactoryCentroidExtractor	
BehaviorFetchCube	
BehaviorFindCube	
BehaviorFindFaceAndThen	
BehaviorFindHome	
BehaviorFistBump	
BehaviorGoHome	
BehaviorGreetAfterLongTime	
BehaviorHowOldAreYou	
BehaviorInspectCube	
BehaviorInteractWithFaces	
BehaviorKeepaway	
BehaviorKnowledgeGraphQuestionc	

Module	Description
BehaviorLiftLoadTest	
BehaviorLookForFaceAndCube	
BehaviorObservingLookAtFaces	
BehaviorObservingWithoutTurn	
BehaviorOnboardingCoordinator	
BehaviorPRDemo	
BehaviorPlaceCubeByCharger	
BehaviorPlaypenCameraCalibration	
BehaviorPlaypenDistanceSensor	
BehaviorPlaypenDriftCheck	
BehaviorPlaypenEndChecks	
BehaviorPlaypenPickupCube	
BehaviorPlaypenTest	
BehaviorPopAWheelie	
BehaviorPounceOnMotion	
BehaviorPoweringRobotOff	
BehaviorPromptUserForVoiceCommand	
BehaviorPuzzleMaze	
BehaviorQuietModeCoordinator	
BehaviorReactToBody	
BehaviorReactToCliff	
BehaviorReactToCubeTap	
BehaviorReactToDarkness	
BehaviorReactToHand	
BehaviorReactToMicDirection	
BehaviorReactToMotion	
BehaviorReactToMotorCalibration	
BehaviorReactToPlacedOnSlope	
BehaviorReactToRobotOnBack	
BehaviorReactToRobotOnFace	
BehaviorReactToTouchPetting	
BehaviorReactToUncalibratedHeadAndLift	
BehaviorReactToUnexpectedMovement	
BehaviorReactToVoiceCommand	
BehaviorRequestToGoHome	

Module	Description
BehaviorResetState	
BehaviorRespondToRenameFace	
BehaviorRobustChargerObservation	
BehaviorSDKInterface	
BehaviorSDKLock	
BehaviorSayName	
BehaviorSelfTest	
BehaviorSelfTestDockWithCharger	
BehaviorSelfTestDriftCheck	
BehaviorSelfTestLookAtCharger	
BehaviorSleepCycle	
BehaviorSystem	
BehaviorSystemManager	
BehaviorTakeAPhotoCoordinator	
BehaviorTextToSpeechLoop	
BehaviorTrackCube	
BehaviorTrackFace	
BehaviorUserDefinedBehaviorTreeRouter	
BehaviorUserDefinedBehaviorTreeSelector	
BehaviorVolume	
Behaviors	
BehaviorsBootLoader	
BlackJackGame	
BlackJackSimulation	
BlackJackVisualizer	
Block	
BlockPool	
BlockTapFilterComponent	
BlockWorld	
BodyMotionKeyFrame	
CalculateExperimentHashBucket	
Camera	
CameraCalibrator	
CameraParamsController	
CannedAnimationContainer	

Module	Description
CannedAnimationLoader	
CardSimulation	
CarryingComponent	
ChannelFilter	
CladEnumToStringMap	
CliffAlignToWhiteAction	
CliffSensor	
CliffSensorComponent	
ColorRGBA	
CompositeImage	
CompositeImageLayer	
CompoundActionParallel	
CompoundActionSequential	
ComputePlacementApproachAngle	
ComputePreActionPoseDistThreshold	
ConditionCompound	
ConditionEngineErrorCodeReceived	
ConditionIlluminationDetected	
ConditionMotionDetected	
ConfirmHabitat	
ConnectionFlow	
Console	
ConsoleSystem	
Context	
ContinuityComponent	
CoreTech	
CozmoAPI	
CozmoAnimMain	
CozmoAudioController	
CozmoEngine	
CozmoGameImpl	
CropScheduler	
CubeAccelComponent	
CubeBatteryComponent	
CubeComms	

Module	Description
CubeCommsComponent	
CubeConnectionCoordinator	
CubeInteractionTracker	
CubeLightAnimationContainer	
CubeLightAnimationHelpers	
CubeLightComponent	
CubeLightController	
CubeSpinnerGame	
CustomObject	
DTRawPixelsClassifier	
DanceAnimMetadata	
DancePhrase	
DanceSession	
DasToSdkHandler	
DasToSdkManager	
DataPlatform	
Demo	
DevEventSequenceCapture	
DoleAvailableAnimations	
DriveAndFlipBlockAction	
DriveStraightAction	
DriveToActions	
DriveToFlipBlockPoseAction	
DriveToObjectAction	
DriveToPlaceCarriedObjectAction	
DriveToPlaceRelObjectAction	
DriveToPoseAction	
DrivingAnimationHandler	
EmotionAffector	
EmotionEvent	
EmotionEventMapper	
EmotionScorer	
EngineRobotAudioClient	
EngineRobotAudioInput	
EnrolledFaceEntry	

Module	Description
EraseAllFaces	
Error	
EventKeyFrame	
Expected	
Experiment	
FaceDisplay	
FaceInfoScreenManager	
FaceLayerManager	
FacePlantAction	
FaceRecognizer	
FaceTrackerImpl	
FaceWorld	
Factory	
FactoryTestLogger	
FeatureGate	
FileTransfer	
FindFaces	
FlipBlockAction	
FormatBytesAsHex	
GMMRawPixelsClassifier	
GetAnimationName	
GetBroadcastAddressFromIfAddr	
GetIPv6LinkLocalAddress	
GetLocalIpAddress	
GetLocalIpAddressFromIfAddr	
GetLocalIpv6LinkLocalAddress	
GetMaxOffsetObjectStillVisible	
GetNextAlbumEntryToUse	
GetNextPacketFromEngine	
GetNextPacketFromRobot	
GetRecognitionData	
GetSerializedAlbum	
GoogleBreakpad	
GraphEvaluator2d	
GroundPlaneClassifier	

Module	Description
HabitatDetectorComponent	
HandleAnimationEvent	
HandleMotorAutoEnabled	
HandleMotorCalibration	
HashStringTable	
HeldInPalmTracker	
HueSatWrapper	
IAction	
IActionRunner	
IBEICondition	
IBehavior	
IBehaviorPlaypen	
IBehaviorSelfTest	
ICompoundAction	
IConditionUserIntent	
ICozmoBehavior	
IDockAction	
IDriveToInteractWithObject	
IFormattedLoggerProvider	
IKeyFrame	
INeuralNetMain	
INeuralNetModel	
IPathPlanner	
IPv6	
IScoredBehavior	
ISensorComponent	
ITrackAction	
ITrackLayerManager	
IVisuallyVerifyAction	
Id	
IdCount	
Image	
ImageBase	
ImageBrightnessHistogram	
ImageCache	

Module	Description
ImageSaver	
ImageSensor	
ImuComponent	
InternalStatesBehavior	
Interruption	
IsCloseEnoughToPreActionPose	
IsExternalSdkConnection	
JdocsManager	
JsonTools	
KnowledgeGraph	
KnownMarker	
LOG	
LaserPointDetector	
LinearClassifier	
LocalUdpSocketComms	
Locale	
LocaleComponent	
Location	
Looking	
LoopBoundOverflow	
MapComponent	
Marker	
MarkerDetector	
Mask	
MenuConsoleChannel	
Message	
MicComponent	
MicDataInfo	
MicDataProcessor	
MicDataSystem	
MicDirectionHistory	
MicTriggerConfig	
Microphones	
MinimalAnglePlanner	
Mood	

Module	Description
MoodDecayEvaluator	
MoodManager	
MoodScorer	
MountChargerAction	
MoveHeadToAngleAction	
MoveLiftToAngleAction	
MoveLiftToHeightAction	
Movement	
MovementComponent	
MultiClientComms	
MusicConductor	
NVStorage	
NVStorageComponent	
NamedColors	
NativeAnkiUtilConsoleCallFunction	
NativeAnkiUtilConsoleIsDefaultValue	
NativeAnkiUtilConsoleResetValueToDefault	
NativeAnkiUtilConsoleSetValueWithString	
NativeAnkiUtilConsoleToggleValue	
NetEmulatorUDPSocket	
Network	
NeuralNetModel	
NeuralNetParams	
NeuralNetRunner	
NeuralNets	
ObjectInteractionInfoCache	
ObservableObject	
ObservableObjectLibrary	
ObservableObjectsLibrary	
OffboardModel	
OverheadMap	
PackMaskedId	
PackMaskedIds	
PanAndTiltAction	
ParamTraits	

Module	Description
PathComponent	
PathDolerOuter	
PerfMetric	
PetTracker	
PhotographyManager	
PickupObjectAction	
PlaceObjectOnGroundAction	
PlaceRelObjectAction	
Planner	
PlayAnimationAction	
PopAWheelieAction	
Pose3d	
PoseBase	
PowerStateManager	
PowerStates	
PreActionPose	
ProceduralFace	
ProcessRegistrationMsg	
ProxSensorComponent	
PublicStateBroadcast	
PublicStateBroadcaster	
Puzzle	
QuadTree	
QuadTreeNode	
QuestEngine	
Ran	
RandomGenerator	
RandomVectorSampler	
ReactionStrategyFacePositionUpdate	
ReadBMP	
RecentOccurrenceTracker	
RecognizeFace	
Rectangle	
RegisterNewUser	
RejectIfChargerOutOfView	

Module	Description
RejectIfWouldCrossCliff	
ReliableConnection	
ReliableTransport	
RemoveUser	
RequestAvailableAnimations	
ReselectingLoopAnimationAction	
RetryWrapperAction	
Robot	
RobotActionParams	
RobotAudioKeyFrame	
RobotConnectionManager	
RobotDataLoader	
RobotEventHandler	
RobotHealthReporter	
RobotImplMessaging	
RobotInitialConnection	
RobotManager	
RobotState	
RobotStateHistory	
RobotStats	
RobotStatsTracker	
RollObjectAction	
RollingShutterCorrector	
RotationMatrixBase	
RotationVector3d	
SDKComponent	
SayNameProbabilityTable	
SayTextAction	
SdkAudioComponent	
SdkComponent	
SdkLock	
SendPacketToRobot	
SetSerializedAlbum	
SetSockOpt	
SetThreadPriority	

Module	Description
Setting	
SettingsCommManager	
SettingsManager	
ShowAudioStreamStateManager	
Shutting	
SimpleMoodScorer	
SleepTracker	
SoundbankBundleInfo	
SoundbankLoader	
SpeechRecognizer	
SpeechRecognizerPryonLite	
SpeechRecognizerSystem	
SpeechRecognizerTHF	
SpeedChooser	
SpriteCache	
SpriteEntry	
SpritePathMap	
SpriteSequence	
SpriteSequenceContainer	
SpriteSequenceKeyFrame	
SpriteSequenceLoader	
SpriteWrapper	
StandardWaveDataContainer	
Starting	
StaticMoodData	
Stopping	
StreamingAnimationModifier	
StreamingWaveDataInstance	
TFLiteLogReporter	
TFLiteModel	
TId	
TextToSpeech	
TextToSpeechComponent	
TextToSpeechCoordinator	
TextToSpeechProvider	

Module	Description
TextToSpeechProviderImpl	
TimerUtility	
TouchBaselineCalibrator	
TouchSensor	
TouchSensorComponent	
Track	
TrackFaceAction	
TrackGroundPointAction	
TrackLayerManager	
TrackObjectAction	
TrackPetFaceAction	
TrackpetFaceAction	
TransportAddress	
TriggerAnimationAction	
TriggerEmotionEvent	
TurnInPlaceAction	
TurnTowardsFaceAction	
TurnTowardsObjectAction	
TurnTowardsPoseAction	
UDPTransport	
UdpSocketComms	
UiComms	
UiMessageHandler	
Undistorter	
Unfiltered	
UnpackMaskedIds	
Update	
UpdateExistingAlbumEntry	
UpdateRecognitionData	
UseLoadedAlbumAndEnrollData	
UseLoadedAlbumAndEnrollmentData	
User	
UserDefinedBehaviorTreeComponent	
UserEntitlementsManager	
UserIntentComponent	

Module	Description
UserIntentMap	
Util	
VariableSnapshotComponent	
VerifyDecayGraph	
VisionComponent	
VisionModeSchedule	
VisionProcessingResult	
VisionScheduleMediator	
VisionSystem	
VisuallyVerifyObjectAction	
VizManager	
VoiceMessage	
VoiceMessageSystem	
WeatherIntentParser	
WwiseComponent	
XYPlanner	

## 9.8 Source File referenced in the binaries

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The following source code files were referenced in the binaries:

File
../../../../animProcess/src/cozmoAnim/alexa/alexa.cpp
../../../../animProcess/src/cozmoAnim/alexa/alexaClient.cpp
../../../../animProcess/src/cozmoAnim/alexa/alexaImpl.cpp
../../../../animProcess/src/cozmoAnim/alexa/media/alexMediaPlayer.cpp
../../../../animProcess/src/cozmoAnim/animation/animationStreamer.cpp
../../../../animProcess/src/cozmoAnim/audio/sdkAudioComponent.cpp
../../../../animProcess/src/cozmoAnim/faceDisplay/faceInfoScreenManager.cpp
../../../../animProcess/src/cozmoAnim/micData/micDataSystem.cpp
../../../../animProcess/src/cozmoAnim/micData/micImmediateDirection.cpp
../../../../animProcess/src/cozmoAnim/showAudioStreamStateManager.cpp
../../../../animProcess/src/cozmoAnim/speechRecognizer/speechRecognizerTHFSimple.cpp
../../../../cannedAnimLib/baseTypes/keyframe.cpp
../../../../cannedAnimLib/baseTypes/track.h
../../../../cannedAnimLib/spriteSequences/spriteSequenceLoader.cpp
../../../../coretech/common/engine/math/pose.cpp
../../../../coretech/common/engine/math/poseBase_impl.h
../../../../coretech/common/engine/math/poseOriginList.cpp
../../../../coretech/common/engine/math/poseTreeNode.h
../../../../coretech/common/engine/utils/recentOccurrenceTracker.cpp
../../../../coretech/common/robot/array2d.h
../../../../coretech/common/robot/arrayPatterns.h
../../../../coretech/common/robot/arraySlices.h
../../../../coretech/common/robot/interpolate.h
../../../../coretech/common/robot/matrix.h
../../../../coretech/common/robot/memory.cpp
../../../../coretech/common/robot/sequences.h
../../../../coretech/common/robot/serialize.h
../../../../coretech/vision/engine/camera.cpp
../../../../coretech/vision/engine/enrolledFaceEntry.cpp
../../../../coretech/vision/engine/faceRecognizer_okao.cpp
../../../../coretech/vision/engine/faceTrackerImpl_okao.cpp
../../../../coretech/vision/engine/imageBuffer/imageBuffer.cpp
../../../../coretech/vision/engine/imageCompositor.cpp
../../../../coretech/vision/engine/markerDetector.cpp
../../../../coretech/vision/engine/undistorter.cpp

**File**

././coretech/vision/robot/computeCharacteristicScale.cpp  
 ././coretech/vision/robot/computeCharacteristicScale\_binomial.cpp  
 ././coretech/vision/robot/computeQuadrilaterals.cpp  
 ././coretech/vision/robot/connectedComponents.h  
 ././coretech/vision/robot/detectFiducialMarkers.cpp  
 ././coretech/vision/robot/fiducialMarkers.cpp  
 ././coretech/vision/robot/filtering.cpp  
 ././coretech/vision/robot/histogram.cpp  
 ././coretech/vision/robot/imageProcessing.h  
 ././coretech/vision/robot/integralImage.cpp  
 ././coretech/vision/robot/laplacianPeaks.cpp  
 ././coretech/vision/robot/nearestNeighborLibrary.cpp  
 ././coretech/vision/robot/quadRefinement.cpp  
 ././coretech/vision/robot/traceBoundary.cpp  
 ././coretech/vision/robot/transformations.cpp  
 ././coretech/vision/shared/compositeImage/compositeImage.cpp  
 ././coretech/vision/shared/compositeImage/compositeImageBuilder.cpp  
 ././coretech/vision/shared/compositeImage/compositeImageLayer.cpp  
 ././coretech/vision/shared/hueSatWrapper.cpp  
 ././coretech/vision/shared/spriteCache/spriteWrapper.cpp  
 ././coretech/vision/shared/spritePathMap.cpp  
 ././coretech/vision/shared/spriteSequence/spriteSequence.cpp  
 ././cubeBleClient/cubeBleClient.cpp  
 ././engine/actions/actionContainers.cpp  
 ././engine/actions/basicActions.cpp  
 ././engine/actions/dockActions.cpp  
 ././engine/actions/trackGroundPointAction.cpp  
 ././engine/aiComponent/aiWhiteboard.cpp  
 ././engine/aiComponent/alexaComponent.cpp  
 ././engine/aiComponent/behaviorComponent/activeBehaviorIterator.cpp  
 ././engine/aiComponent/behaviorComponent/asyncMessageGateComponent.cpp  
 ././engine/aiComponent/behaviorComponent/behaviorComponentMessageHandler.cpp  
 ././engine/aiComponent/behaviorComponent/behaviorContainer.h  
 ././engine/aiComponent/behaviorComponent/behaviorExternalInterface/behaviorEventComponent.cpp  
 ././engine/aiComponent/behaviorComponent/behaviorExternalInterface/behaviorExternalInterface.cpp

**File**

./././engine/aiComponent/behaviorComponent/behaviorStack.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviorSystemManager.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviorTimers.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviorTypesWrapper.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/alexa/behaviorAlexa.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/animationWrappers/behaviorAnimGetInLoop.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/animationWrappers/behaviorAnimSequence.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/animationWrappers/behaviorAnimSequenceWithFace.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/animationWrappers/behaviorCountingAnimation.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/animationWrappers/behaviorTextToSpeechLoop.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/attentionTransfer/behaviorAttentionTransferIfNeeded.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/basicWorldInteractions/behaviorDriveOffCharger.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/basicWorldInteractions/behaviorInteractWithFaces.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/behaviorHighLevelAI.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/behaviorLookAroundInPlace.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/behaviorResetState.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/behaviorStayOnChargerUntilCharged.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/blackjack/behaviorBlackJack.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/blackjack/blackJackVisualizer.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/coordinators/behaviorCoordinateWhileHeldInPalm.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/coordinators/behaviorCoordinateWhileInAir.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/coordinators/behaviorQuietModeCoordinator.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/cubeSpinner/behaviorVectorPlaysCubeSpinner.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/danceToTheBeat/behaviorDanceToTheBeat.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/devBehaviors/behaviorDevViewCubeBackpackLights.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/devBehaviors/behaviorDispatchAfterShake.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/devBehaviors/behaviorReactToBody.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/dispatch/behaviorDispatcherRerun.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/dispatch/behaviorDispatcherScoring.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/dispatch/behaviorDispatcherStrictPriorityWithCooldown.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/dispatch/iBehaviorDispatcher.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/freeplay/putDownDispatch/behaviorLookForFaceAndCube.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/freeplay/userInteractive/behaviorPuzzleMaze.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/habitat/behaviorConfirmHabitat.cpp  
 ./././engine/aiComponent/behaviorComponent/behaviors/iCozmoBehavior.cpp

**File**

./../engine/aiComponent/behaviorComponent/behaviors/internalStatesBehavior.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/meetCozmo/behaviorEnrollFace.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/meetCozmo/behaviorRespondToRenameFace.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/photoTaking/behaviorAestheticallyCenterFaces.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/photoTaking/behaviorTakeAPhotoCoordinator.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/prDemo/behaviorPRDemoBase.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/reactions/behaviorCheckForAndReactToSalientPoint.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/reactions/behaviorReactToCliff.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/reactions/behaviorReactToDarkness.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/reactions/behaviorReactToMotion.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/reactions/behaviorReactToPutDown.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/reactions/behaviorReactToUnexpectedMovement.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/reactions/behaviorReactToVoiceCommand.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/robotDrivenDialog/behaviorPromptUserForVoiceCommand.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/sdkBehaviors/behaviorSDKInterface.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/simpleFaceBehaviors/behaviorDriveToFace.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/simpleFaceBehaviors/behaviorFindFaceAndThen.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/simpleFaceBehaviors/behaviorSayName.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/sleeping/behaviorSleepCycle.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/timer/behaviorProceduralClock.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/timer/behaviorTimerUtilityCoordinator.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/timer/behaviorWallTimeCoordinator.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/userDefinedBehaviorTree/behaviorUserDefinedBehaviorSelector.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/victor/behaviorReactToTouchPetting.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/victor/behaviorReactToUnclaimedIntent.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/victor/behaviorTrackFace.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/weather/behaviorCoordinateWeather.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviors/weather/behaviorDisplayWeather.cpp  
 ./../engine/aiComponent/behaviorComponent/behaviorsBootLoader.cpp  
 ./../engine/aiComponent/behaviorComponent/iBehavior.cpp  
 ./../engine/aiComponent/behaviorComponent/stackMonitors/stackCycleMonitor.cpp  
 ./../engine/aiComponent/behaviorComponent/userDefinedBehaviorTreeComponent/userDefinedBehaviorTreeComponent.cpp  
 ./../engine/aiComponent/behaviorComponent/userIntentComponent.cpp  
 ./../engine/aiComponent/behaviorComponent/userIntentMap.cpp  
 ./../engine/aiComponent/behaviorComponent/weatherIntents/weatherConditionRemaps.cpp

## File

./././engine/aiComponent/beiConditions/beiConditionFactory.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionAnyStimuli.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionBatteryLevel.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionBecameTrueThisTick.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionBehaviorTimer.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionCliffDetected.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionCompound.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionEmotion.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionFeatureGate.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionObjectKnown.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionOffTreadsState.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionProxInRange.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionRobotPitchInRange.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionRobotRollInRange.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionSalientPointDetected.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionSettingsUpdatePending.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionSimpleMood.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionTimedDedup.cpp  
 ./././engine/aiComponent/beiConditions/conditions/conditionTimerInRange.cpp  
 ./././engine/aiComponent/beiConditions/conditions/iConditionUserIntent.cpp  
 ./././engine/aiComponent/timerUtility.cpp  
 ./././engine/block.cpp  
 ./././engine/blockWorld/blockWorld.cpp  
 ./././engine/comms/robotConnectionData.cpp  
 ./././engine/components/animationComponent.cpp  
 ./././engine/components/battery/batteryComponent.cpp  
 ./././engine/components/cubes/cubeCommsComponent.cpp  
 ./././engine/components/cubes/cubeConnectionCoordinator.cpp  
 ./././engine/components/cubes/cubeInteractionTracker.cpp  
 ./././engine/components/cubes/cubeLights/cubeLightAnimationHelpers.cpp  
 ./././engine/components/mics/beatDetectorComponent.cpp  
 ./././engine/components/pathComponent.cpp  
 ./././engine/components/powerStateManager.cpp  
 ./././engine/components/sdkComponent.cpp  
 ./././engine/components/variableSnapshot/variableSnapshotComponent.h

File
./././engine/components/visionComponent.cpp
./././engine/drivingAnimationHandler.cpp
./././engine/faceWorld.cpp
./././engine/moodSystem/emotion.cpp
./././engine/moodSystem/moodDecayEvaluator.cpp
./././engine/moodSystem/moodManager.cpp
./././engine/moodSystem/staticMoodData.cpp
./././engine/navMap/mapComponent.cpp
./././engine/petWorld.cpp
./././engine/robot.cpp
./././engine/robot.h
./././engine/robotDataLoader.cpp
./././engine/vision/imageSaver.cpp
./././engine/vision/visionSystem.cpp
./././generated/proto/external_interface/alexa.pb.cc
./././generated/proto/external_interface/behavior.pb.cc
./././generated/proto/external_interface/cube.pb.cc
./././generated/proto/external_interface/messages.pb.cc
./././generated/proto/external_interface/nav_map.pb.cc
./././generated/proto/external_interface/response_status.pb.cc
./././generated/proto/external_interface/settings.pb.cc
./././generated/proto/external_interface/shared.pb.cc
./././lib/das-client/src/DAS.cpp
./././lib/das-client/src/dasAppender.cpp
./././lib/util/source/anki/util./util/cladHelpers/cladEnumToStringMap.h
./././lib/util/source/anki/util./util/entityComponent/componentWrapper.h
./././lib/util/source/anki/util./util/entityComponent/dependencyManagedEntity.h
./././lib/util/source/anki/util./util/entityComponent/entity.h
./././lib/util/source/anki/util./util/entityComponent/iDependencyManagedComponent.h
./././lib/util/source/anki/util/entityComponent/dependencyManagedEntity.h
./././lib/util/source/anki/util/random/randomIndexSampler.cpp
./././platform/switchboard/anki-wifi/connmanbus.c
pfft.cpp
randombytes/randombytes.c
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/gateway/config_linux.go

**File**

/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/gateway/ipc\_manager.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/gateway/main.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/gateway/message\_handler.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/gateway/multilimiter.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/gateway/switchboard\_proxy.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/gateway/tokens.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/cloudproc/cloudproc.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/cloudproc/opts.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/cloudproc/server.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/config/urls.go  
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/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/ipc/baseserver.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/ipc/dgram.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/ipc/path\_vicos.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/ipc/unixgram.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/jdocs/client.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/jdocs/jdocs.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/jdocs/opts.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/jdocs/server.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/jdocs/translate.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/log/das.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/log/log.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/log/log\_vicos.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/logcollector/cladhandler.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/logcollector/logcollector.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/logcollector/opts.go  
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/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/robot/cert.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/robot/crash\_reporter.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/robot/error.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/robot/esn.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/robot/esn\_vicos.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/robot/loguploader/loguploader.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/Accessor.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/client.go

**File**

/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/errorhandler.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/handlers.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/identity/getcert\_vicos.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/identity/identity.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/options.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/queue.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/refresher.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/sts.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/token/token.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/util/grpc.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/util/grpc\_vicos.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/util/multierror.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/util/util.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/options.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/process.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/receive.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/send.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/stream/api.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/stream/conn\_chipper.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/stream/connect.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/stream/context.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/stream/init.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/stream/opts.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/anki/voice/stream/opts\_vicos.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/opus-go/libopus/decoder.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/opus-go/libopus/encoder.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/opus-go/libopus/errors.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/opus-go/ogg/ogg.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/opus-go/opus/header.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/opus-go/opus/opus.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/sai-chipper-voice/client/chipper/chipper.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/sai-chipper-voice/client/chipper/options.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/sai-chipper-voice/proto/anki/chipperpb/chipperpb.pb.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/sai-go-util/testutils/testtime/time.go  
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/sai-jdocs/proto/jdocspb/jdocs.pb.go

File
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/sai-token-service/client/clienthash/hash.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/sai-token-service/model/token.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/anki/sai-token-service/proto/tokenpb/token.pb.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/go/src/github.com/aws/aws-sdk-go/aws/awserr/error.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/process/main.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/cloud/process/platform_vicos.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/cladgo/src/clad/cloud/common.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/cladgo/src/clad/cloud/docs.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/cladgo/src/clad/cloud/logcollector.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/cladgo/src/clad/cloud/mic.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/cladgo/src/clad/cloud/token.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/cladgo/src/clad/gateway/messageExternalToRobot.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/cladgo/src/clad/gateway/messageRobotToExternal.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/cladgo/src/clad/gateway/shared.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/cladgo/src/clad/gateway/switchboard.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/alexa.pb.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/behavior.pb.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/cube.pb.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/extensions.pb.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/external_interface.pb.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/external_interface.pb.gw.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/messages.pb.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/nav_map.pb.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/response_status.pb.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/settings.pb.go
/mnt/devhomes/build/work/83941694d19f355d/anki/victor/generated/go/src/proto/external_interface/shared.pb.go
_cgo_gotypes.go

### 9.8.1 Signal Essence files

---

{Am I the only one who thinks "Signal Essence" sounds like a perfume name?}

File
../../../../EXTERNALS/anki-thirdparty/signalEssence/v008/vicos/project/anki_victor/mmif_proj.c
../../../../EXTERNALS/anki-thirdparty/signalEssence/v008/vicos/project/anki_victor/policy_actions.c
../../../../EXTERNALS/anki-thirdparty/signalEssence/v008/vicos/project/anki_victor_vad/nfbm_f32_anki.c
../../../../EXTERNALS/anki-thirdparty/signalEssence/v008/vicos/project/anki_victor_vad/svad.c
../../../../EXTERNALS/opencv/vicos/include/opencv2/core/mat.inl.hpp
../../../../se_lib/aec_common.c
../../../../se_lib/aec_msu.c
../../../../se_lib/aec_pbfd.c
../../../../se_lib/aec_stereo.c
../../../../se_lib/aec_tapered_wts.c
../../../../se_lib/aec_td.c
../../../../se_lib/aecmonitor.c
../../../../se_lib/avepower_i16.c
../../../../se_lib/buffer_composer.c
../../../../se_lib/cl_agc.c
../../../../se_lib/cl_agc_i16.c
../../../../se_lib/conv.c
../../../../se_lib/dcremove.c
../../../../se_lib/dcremove_f32.c
../../../../se_lib/decimate31.c
../../../../se_lib/downsampn.c
../../../../se_lib/fdanalyze.c
../../../../se_lib/fdechomodel.c
../../../../se_lib/fdemphasis.c
../../../../se_lib/fdsearch.c
../../../../se_lib/fdsearch_winner.c
../../../../se_lib/float_dft.c
../../../../se_lib/float_dft_fftpack.c
../../../../se_lib/float_dft_pffft.c
../../../../se_lib/frdelay.c
../../../../se_lib/gainest.c
../../../../se_lib/highpass_filter_array.c
../../../../se_lib/interpn.c
../../../../se_lib/leakyave.c
../../../../se_lib/lec.c

File
./././se_lib/lrhpf.c
./././se_lib/meta_aec.c
./././se_lib/meta_fda.c
./././se_lib/mmmfx.c
./././se_lib/mmmfxcalibactions.c
./././se_lib/mmmfxspatialfilter.c
./././se_lib/mmif_helper.c
./././se_lib/mmpreprocessor.c
./././se_lib/mmvalidate.c
./././se_lib/morpho.c
./././se_lib/multiaeac.c
./././se_lib/multichan_delay.c
./././se_lib/multichan_delay_f32.c
./././se_lib/narrowband_noisegen.c
./././se_lib/nfbn_f32.c
./././se_lib/nrgainv.c
./././se_lib/output_injector.c
./././se_lib/ref_proc.c
./././se_lib/rfir.c
./././se_lib/rfir_f.c
./././se_lib/sampledelayqueue.c
./././se_lib/sampledelayqueue_f32.c
./././se_lib/sat_detector.c
./././se_lib/scratch_mem.c
./././se_lib/se_crossover.c
./././se_lib/se_dft.c
./././se_lib/se_dft_fftpack.c
./././se_lib/se_dft_fxp.c
./././se_lib/se_dft_pfff.c
./././se_lib/se_dft_qfc
./././se_lib/se_diag.c
./././se_lib/se_nr.c
./././se_lib/se_rev.c
./././se_lib/subbandsplitter.c
./././se_lib/system_tests.c

File
../../../../se/lib/tdinterp.c
../../../../se/lib/trackfilters.c
../../../../se/lib/upsamplen.c
../../../../se/lib/vadd.c
../../../../se/lib/vavepower.c
../../../../se/lib/vavepowerrms_i16.c
../../../../se/lib/vcmul.c
../../../../se/lib/vcmul_i16_i32.c
../../../../se/lib/vdotproduct_i16_i32.c
../../../../se/lib/vdotproductq15_i16.c
../../../../se/lib/vdotproductswithleftshift_q15_i16.c
../../../../se/lib/vfill_i16.c
../../../../se/lib/vfill_i32.c
../../../../se/lib/vfloatlib.c
../../../../se/lib/vgen_exp_ramp.c
../../../../se/lib/vgenctone.c
../../../../se/lib/vgentone.c
../../../../se/lib/vgetindex.c
../../../../se/lib/vgetvalue.c
../../../../se/lib/vinvertorder.c
../../../../se/lib/vleftshifts_i16.c
../../../../se/lib/vlimitmin.c
../../../../se/lib/vmax.c
../../../../se/lib/vmin.c
../../../../se/lib/vmmadd.c
../../../../se/lib/vmove_i16.c
../../../../se/lib/vmove_i32.c
../../../../se/lib/vmovesrcstride_i16.c
../../../../se/lib/vmul.c
../../../../se/lib/vpower_i16_i32.c
../../../../se/lib/vpowerwithexponent_i16_i32.c
../../../../se/lib/vscale.c
../../../../se/lib/vsub_i16.c
../../../../se/lib/vsum_i32.c
../../../../se/lib/vtrackupavedown.c

**File**

*./././se\_lib/win\_fcns.c*

*./././se\_lib/winbufdft.c*

*./././se\_lib/wola.c*

**9.8.2 Google BreakPad and Minidump****File**

*/src/client/linux/handler/minidump\_descriptor.h*

*/src/client/linux/minidump\_writer/directory\_reader.h*

*/src/client/linux/minidump\_writer/line\_reader.h*

*/src/client/linux/minidump\_writer/proc\_cpuminfo\_reader.h*

*/src/client/minidump\_file\_writer-inl.h*

*/src/common/linux/elfutils-inl.h*

# 10. Tools

---

## 10.1 Animation tool

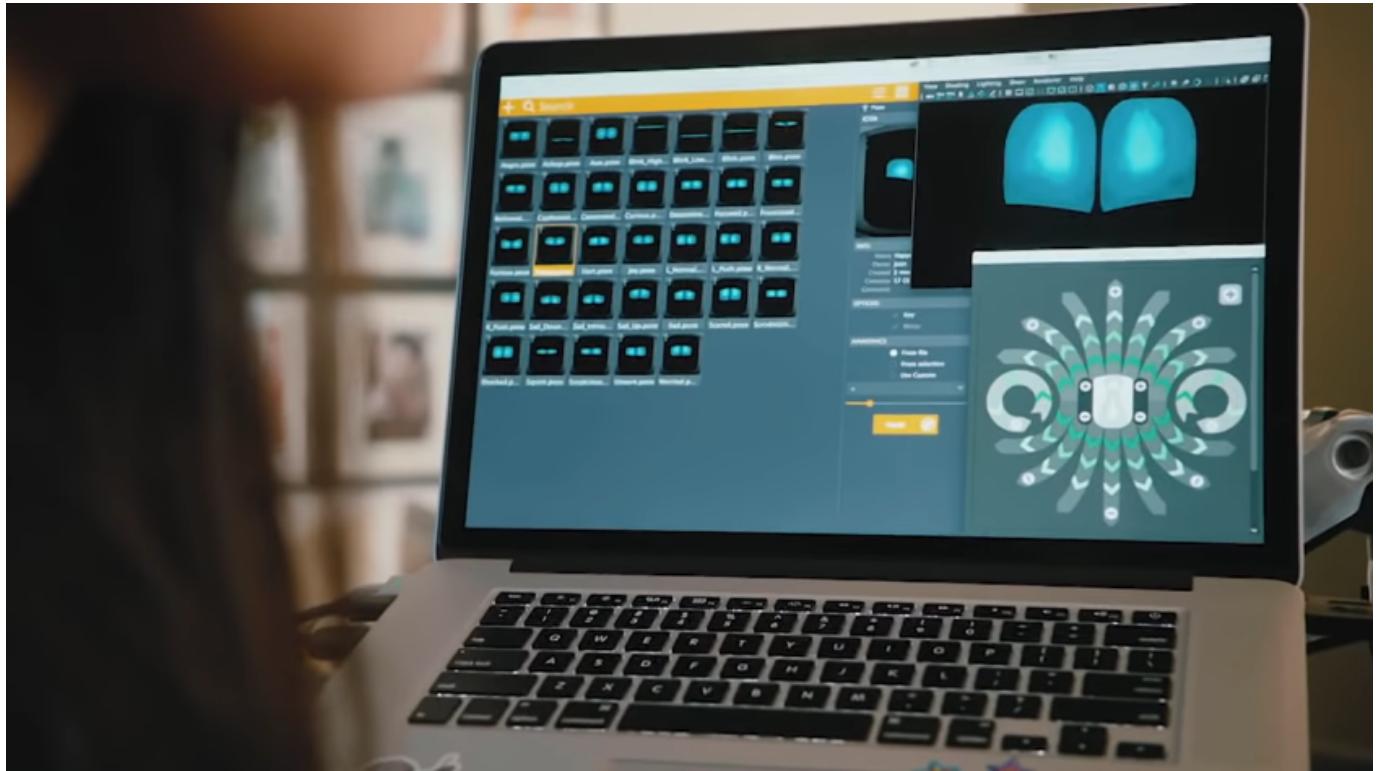
---

### 10.1.1 Maya

Anki used Maya to animate Cozmo and Vector. The tool used a plugin to emit the movements, as JSON using a format that the animation engine could read with the flatbuffers library. (See [How to convert animation bin files to JSON](#) for a bit more on converting between JSON text and the binary format.)

The animations tools had UIs with at least the following two screens:





VIRTUAL VECTOR IN MAYA PERFORMING AN ANIMATION



REAL WORLD VECTOR PERFORMING THE SAME ANIMATION

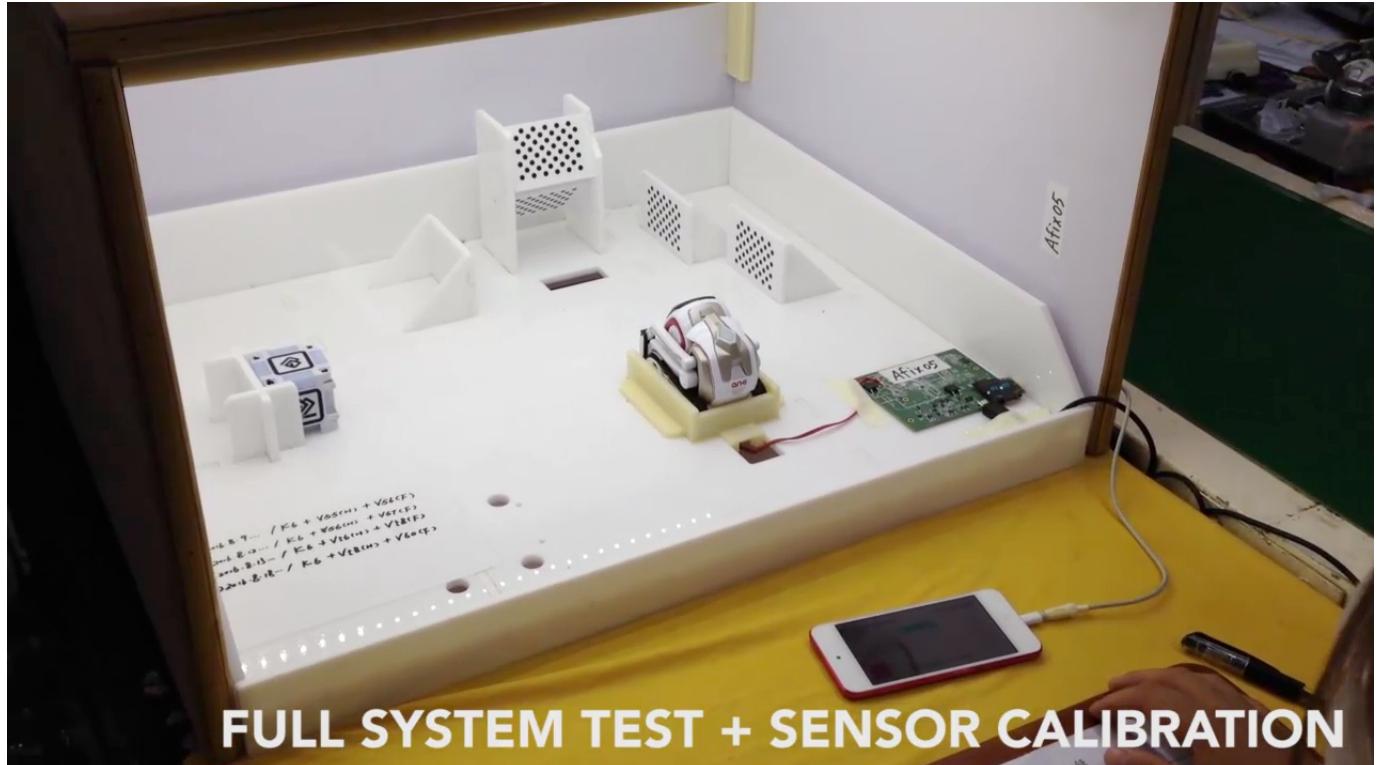
## 10.2 Playpen

Playpen is a test station used calibration Vector and Cozmo's camera, and perhaps other sensors.

Once Cozmo is fully assembled, he's placed in the Playpen to take his "final test". He does a lot of things in there, but one thing he does is an eye test. He drives around from target to target, making sure he can count all the dots, they're all in focus, and they're all where he expects them to be (literally, his head is on straight!).[discord](#)

### 10.2.1 Cozmo's playpen

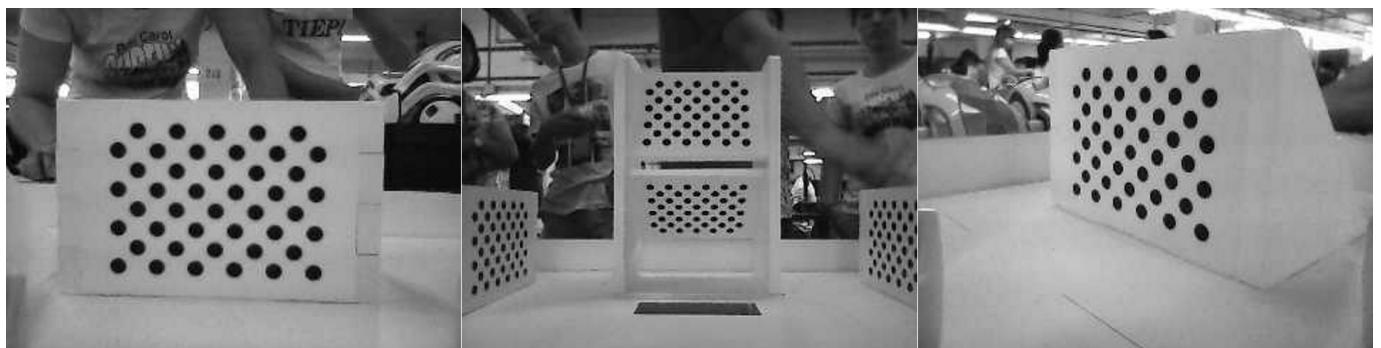
This is what one looks like for Cozmo:



And for Vector



And this is what Cozmo sees:



A direct shot of a calibration image that Vector sees:



### 10.2.2 Creating a new one for Vector?

TODO / TBD: We don't know how to make a replacement one yet. Or all the steps in issuing commands to Vector.

## 10.3 Webots

Anki used Maya to test Cozmo and Vector's emotion model on the desktop using Webots before downloading. And perhaps the behavior tree.

Cozmo's Mood Manager can be visualized in Webots, a software program designed for the development and simulation of robots. Labeled by the small, multi-color words (top right-hand corner of the photo), data points change over time based on Cozmo's mood.([Interview with Sr Sound Designer Ben Gabaldon](#))



## 11. Troubleshooting

---

### 11.1 Backpack Lights

---

#### VECTOR LED SUMMARY

LEDs	Animation	What it means
●	The small circular light glows a steady green.	Vector is on.
	The rectangular lights glow green and climb up his Back button.	<b>Charging:</b> Vector is getting more energy. When he's done, his rectangular lights will stop glowing.
	The rectangular lights glow light blue and climb up his Back button 1 then 2 then 3.	<b>Booting:</b> Vector is starting up. When he's done, these rectangular lights will stop glowing light blue.
	The rectangular lights glow solid blue.	<b>Speaking to Vector:</b> After you've said "Hey Vector", Vector is ready to hear what you have to say.
	The rectangular lights will pulse orange continuously.	<b>Connection:</b> Vector can't connect to Wi-Fi. Connect with the Vector app to figure out what's happening.
	The rectangular red light on the bottom of his backpack will pulse..	<b>Low battery:</b> Place Vector on his charger.

Things that this could do:

- Diagram of the backpack lights
- Show the FAC lights
- Changes to the backpack lights in the custom software

See also DDL.

## 11.2 FAC (Factory) Mode

Vector has a "FAC" mode, used in the factory to test and calibrate the robot. When in FAC mode, the display has a red background, with either the letters "FAC" displayed:



Or one to two digits displayed. These appear to be calibration errors (makes sense since we don't have a playpen to calibrate them with).



And his backpack lights have an unusual color pattern – red, green, and blue:



This mode is never intended to be seen outside of the factory, so little is known. Only a couple of units have been found in this mode; one after it had been intentionally damaged, and its calibration & EMR data were corrupted or inaccessible. In all likelihood, the software checks its EMR to see if it has been released; if not, it enters the FAC mode at whatever the "next" stage is according to the EMR. At that point Vector expects to be placed into manufacturing test fixtures, such as the playpen.

If you see a normal Vector in this mode on a place like eBay, it is recommended you don't buy him. The software he is running is still 0.9.0 recovery just in a different mode and there aren't any dev things open.

## 11.3 Hardware error codes

---

If something has gone wrong, an error will appear on Vector's face. These errors happen if Vector's hardware is bad, but some of them could also be software.

801

- Rampost was unable to communicate with the body board at boot. This will show up before an 898 or 899 error. If the board shows just a purple light and won't turn off, you need to wait for his battery to die. After that, turn him back on. If there is still a purple light, there could be a hardware issue with the body board.

870-895

- Body board has a specific hardware fault.

896(?)897

- Seems to be Whiskey specific. It seems to only show in their dev recovery and they work fine in normal firmware.

898

- There was an error when trying to communicate with the body board. If the board shows just a purple light and won't turn off, you need to wait for his battery to die. After that, turn him back on. If there is still a purple light, there could be a hardware issue with the body board.

899

- The firmware was unable to find the body. If the board shows just a purple light and won't turn off, you need to wait for his battery to die. After that, turn him back on. If there is still a purple light, there could be a hardware issue with the body board.

950

- This error will only occur on a Whiskey. The software is unable to open the extra ToF sensors. It is possible that one or both of the sensors are broken.
- This can be fixed with an EMR/OEM swap. Instructions soon

960

- IMU hardware failed.

970

- The Wi-Fi hardware failed.

980-981

- An error occurred when trying to communicate with the camera. If he is stuck on this error, go to recovery and clear user data. If he is still stuck, the camera may not be soldered on well or it could be broken.

990

- Vic-anim is unable to open the display for writing. This is something you will probably never see.

## 11.4 Software error codes

---

If something has gone wrong, an error will appear on Vector's face. The ones on this page are (usually) software.

914-915

- There was an issue with vic-engine. Vector should restart to normal operation on his own.

913

- There was an issue with vic-switchboard. This could happen if there was an error in BLE communication or if you entered too long of a string into the SDK.  
He should restart fine.

916-917

- There was an issue with vic-robot. He should restart just fine.

800

- There was an issue with vic-anim. He should restart just fine. If he doesn't, restart into recovery and clear user data.

850-852

- There was an issue with the cloud and/or serial number. A clear user data may help.

920-921

- There was an issue with vic-gateway or vic-gateway-cert. If he is stuck on this, you may need to clear user data.

923

- Vic-cloud has crashed. He should restart fine. If you got an 801-899 error before, this may be the server's fault.

## 12. Vector enhancement proposals

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### 12.1 Vector Enhancement Proposals

Memos, cheekily named for Python's memo system. At the moment, I see these as proposals for changes to the software and files on a Vector. (Proposals for changes to the site or documentation, or build tools, etc should go elsewhere.)

This would be relevant for changes, esp substantial changes, that you might like many people to adopt.

File Format:

- I'm going to try to use markdown most often, but
- PDF/HTML export for normal human readers

Common elements, to make it easier to read and management them:

The first part is the markdown front matter: it begins and ends with --- and the lines inside contain YAML. This lets other tools extract the basics.

```
---
title: VEP123 - The name of the VEP (only a few words)
summary: An optional description of the proposal, if the title is too short
authors:
  - Author Name
date: 2022-07-10
---
```

The title starts with "VEP" and a unique (serial) number. It is followed by a brief description or topic of the proposal. The other fields are self explanatory, and helps track the info

Other outline, organization:

- Description of the changes
- Some Design decisions
- Documentation
- Cavaets
- Status
- References
- Change history synopsis (this is for people)

## 12.2 VEP1 - Update-engine changes

---

**Summary:** Update-engine changes to make for unsigned, incremental updates; and to reduce the number of partitions modified.

**Authors:** Randall Maas

### 12.2.1 Description of the changes

Motivation: Building a new, experimental development release is not possible with an stock update-engine:

1. We can't create an OTA file for unmodified production, development and OSKR bots, as it needs to be signed in order for the update-engine to apply it.
2. The OTA update is very "heavy weight" -- it needs to update the boot and system files systems (with a 200+MB file!) just to change a couple of files.

This enhancement changes the following to the update engine:

- remove signing check of the manifest, update files
- Allows replacing individual partitions, esp just the system file system; usually it replaces several at a time
- Allows using tar to update the contents of the system file system
- This is not recommended since it doesn't get the permissions right

### 12.2.2 Documentation

- none at this time

### 12.2.3 Cavaets

- the tar based updating of the system file system doesn't always work as expected, since the busybox tar doesn't preserve permissions
- it is tricky to create a tar file
- there is no undo for a partial update
- this probably doesn't disable delta updates properly, so if a delta update were to be issued, we'd need a way to make sure it doesn't mess up the FS.

### 12.2.4 Status

- it works well (except the system fs file-only changes), I believe that Wire has used this or a modified version
- I am considering other changes to support package-based updates to the file system, to better address the above issues.

### 12.2.5 References

### 12.2.6 Change history synopsis

## 12.3 VEP2 - Package management for modules on Vector

---

**Summary:** Supports installing and uninstalling packages/modules on Vector

**Authors:** Randall Maas

### 12.3.1 Description of the changes

Motivation: We needed a way to package changes to a few files on an already deployed system, to ensure that the permissions are correct on the files (usually executable), and some restrictions/protections from screwing up system files. (Ie, don't force it to be unbootable)

This is a package manager that does those, and adds in a few extras:

- It allows modifying parts of a file, usually the version identifier of the system, so we know what we're working with.
- Lists the installed packages
- Can uninstall packages
- Can set the permissions for the files.

### 12.3.2 Some Design decisions:

- The tool had to be small, and not hard to deploy
- The tool can't be compiled (we don't know how)
- It had to be based on tools already on Vector: python 2.7, and busybox based utils. Busybox supplies the shell, and tar... except tar doesn't support preserving permissions.
- It is preferred to separate out the package manager from the update-engine as much as possible, to make it more understandable and support testing.

#### It just installs the packages

This tool doesn't do everything that the other managers do:

- It doesn't check dependencies
- It doesn't download files
- It has minimal pre-flight, post-flight scripts that are run.

The package download is handled by either the update-engine (and its line of control), or by scp command. The lack of dependency check is a benefit, as it's hard to maintain, and it is rarely used correctly: maintainers tend to choose a dependency of "the latest version" (as of when the package was), negating its use.

### 12.3.3 Documentation

The documentation of the tool is included as part of its tgz. This is a quick overview.

When a package is installed it creates another package taking a snapshot of those files already there. When the package is uninstalled this 2nd package is used to replace the newer files with the older ones. It doesn't delete any files that were added since or by the first package, so some extra stuff can accumulate, but that is far safer.

Creating a package. To create a package, let's call it demo, requires setting up the file system with the files, and the package manifest. The manifest says, among other things:

1. The package name, version, and other helpful paperwork info.
2. Where to get the files from locally, and where they should be placed into filesystem deployed when deployed on a Vector.
3. The path to any files that should be modified, and how. This is used to change the reported version string.
4. The permissions to set the files to

I've attached a really simple demo to demonstrate. To create a package unzip them, and then:

```
./vector-pkg.py create -pkg=demo
```

That will create .vpkg file — a gzip'd tar file with a specific layout. From here everything has to be on a Vector.

Installation. To install the vpkg:

```
./vector-pkg.py install -pkg=demo-1.vpkg
```

Uninstall. To uninstall the vpkg later

```
./vector-pkg.py uninstall -pkg=demo-1
```

## 12.3.4 Cavaets

---

### 12.3.5 Status

---

Not tested by others yet. Once the bugs are shaken out, the update-engine can be tweaked. When the update-engine gets a URL with ".vpkg" (such as from the BLE app) at the end, it downloads it, and then pass it to the package manager.

### 12.3.6 References

---

### 12.3.7 Change history synopsis

---

## 12.4 VEP3 - Developer configurations for robot

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**Summary:** Change robot configurations for

This is a stub proposal for a VPKG with many common configuration settings for a Developer-tinkering bots.

- configure many servers to use main production server
- configure servers to use local servers (logging)
- Customize: CPU, Heat, Display settings

Not sure if these can be downloaded via Bluetooth LE

- server configuration
- local preferences

### 12.4.1 References

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### 12.4.2 Change history synopsis

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## 12.5 VEP4 - Logging

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**Summary:** Changes to the logging scripts, configuration to local servers. This is to modify the servers to use for the logging, crash dumps, and similar. Events/logs will no longer be sent to AWS, or backtrace.io.

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This a draft proposal (to be filled in) on how to modify Vector config files and scripts to send logging and crash dumps to a server of our choosing.

- Logging
- Trace information
- Server
- Settings
- DAS optin/optout

Replace /anki/bin/vic-log-upload - moving aside, /anki/bin/vic-log-upload since it just does AWS, S3:// - put in something that can contact our local server

Files:

- server\_config.json
- log uploader

### 12.5.1 References

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### 12.5.2 Change history synopsis

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