The Dronenaut App Talk

with RxDevice/RxPatterns Technology

Dronenaut is a soon to be release IOS (iPad/iPhone) app that controls Parrot Minidrones with voice control.

The figure here is the Dronenaut character from the app.

The App is also a demonstrator for the RxDevice/Patterns software technology.

Originware.com

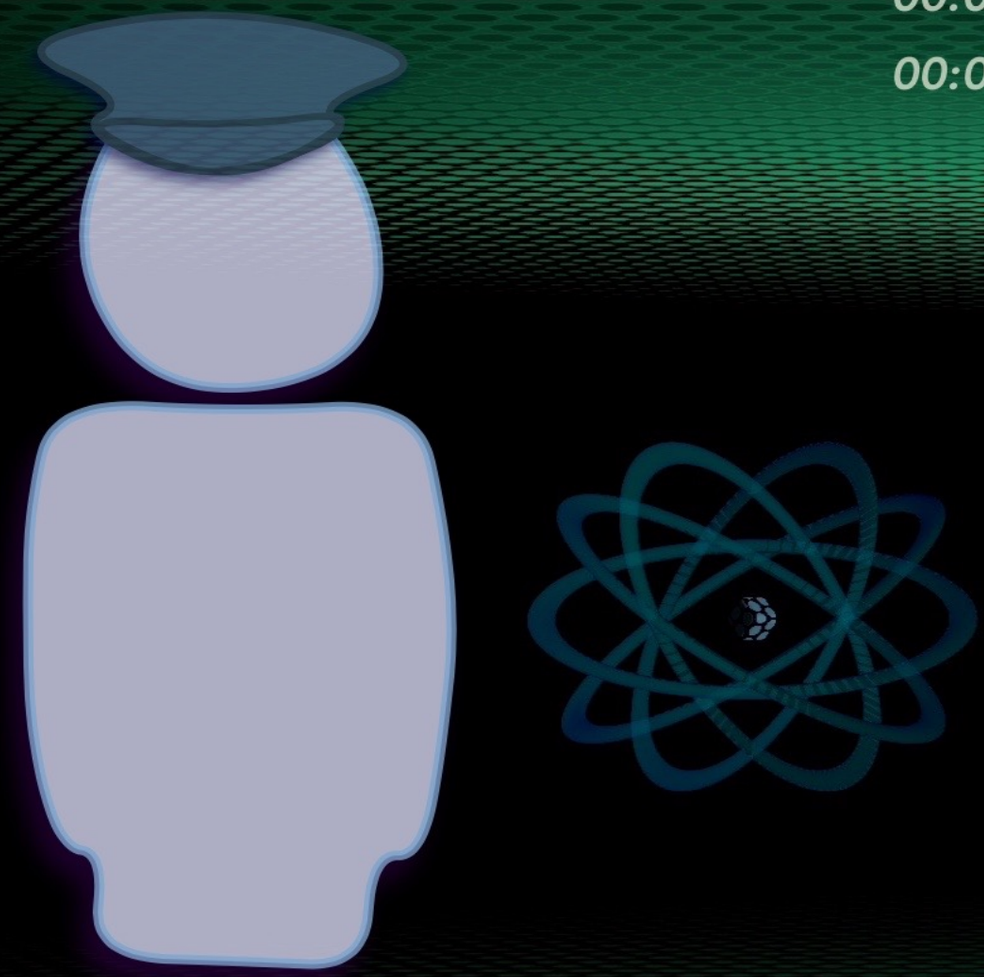
www.originware.com

This is a screen capture of the www.originware.com website. Please see the Doc section for more information on RxDevice and RxPatterns technology.

There is an Evaluation kit for RxPatterns as well.

When the Dronenaut app is released, some source code snippets will be released to demonstrate the use of RxDevice/ Patterns in the app.

Dronenaut (for Parrot™ Minidrone)



Flight Log

00:00:03 *Scanning for drones*

00:00:56 *Discovered Airborne Night Drone*

00:00:58 *Battery: 55%*

Avatar Based Interface

Employs Voice Recognition

Employs Voice Synthesis

Controls Parrot Minidrones

Bluetooth LE4.0 to Drone

Technology demonstrator for RxDevice/ RxPatterns

Battery: 55%

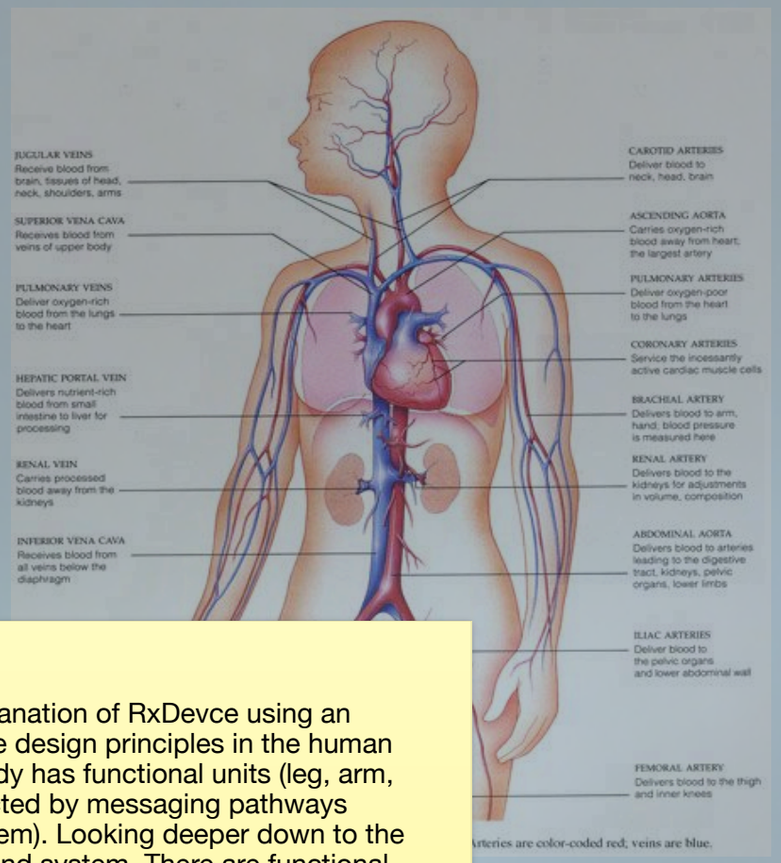
Basic screen shot of the app with some notes on the right,

Talk Content

- Minidrone Device Technology
  - Discussion on Parrot Minidrone Technology
  - Bluetooth LE
  - Protocol used to control Minidrones
  - Drones in the news (social aspects)
- The coming Avatar based UI (applicable to apps and IOT interfaces)
  - Discussion on current Speech Recognition and Synthesis technology.
  - Discussion on using Avatars as human interfaces.
- Operation of the Dronenaut App
  - The Dronenaut App demonstration
  - Drone flight demonstrations.
- Visualisation of Software Architecture and Operation.
  - RxPatterns/RxDevice technology discussion
  - Realtime Dronenaut operation visualisation

Basic concept of RxDevice

Example: Bipedal Control System (Macro Level Of Detail)

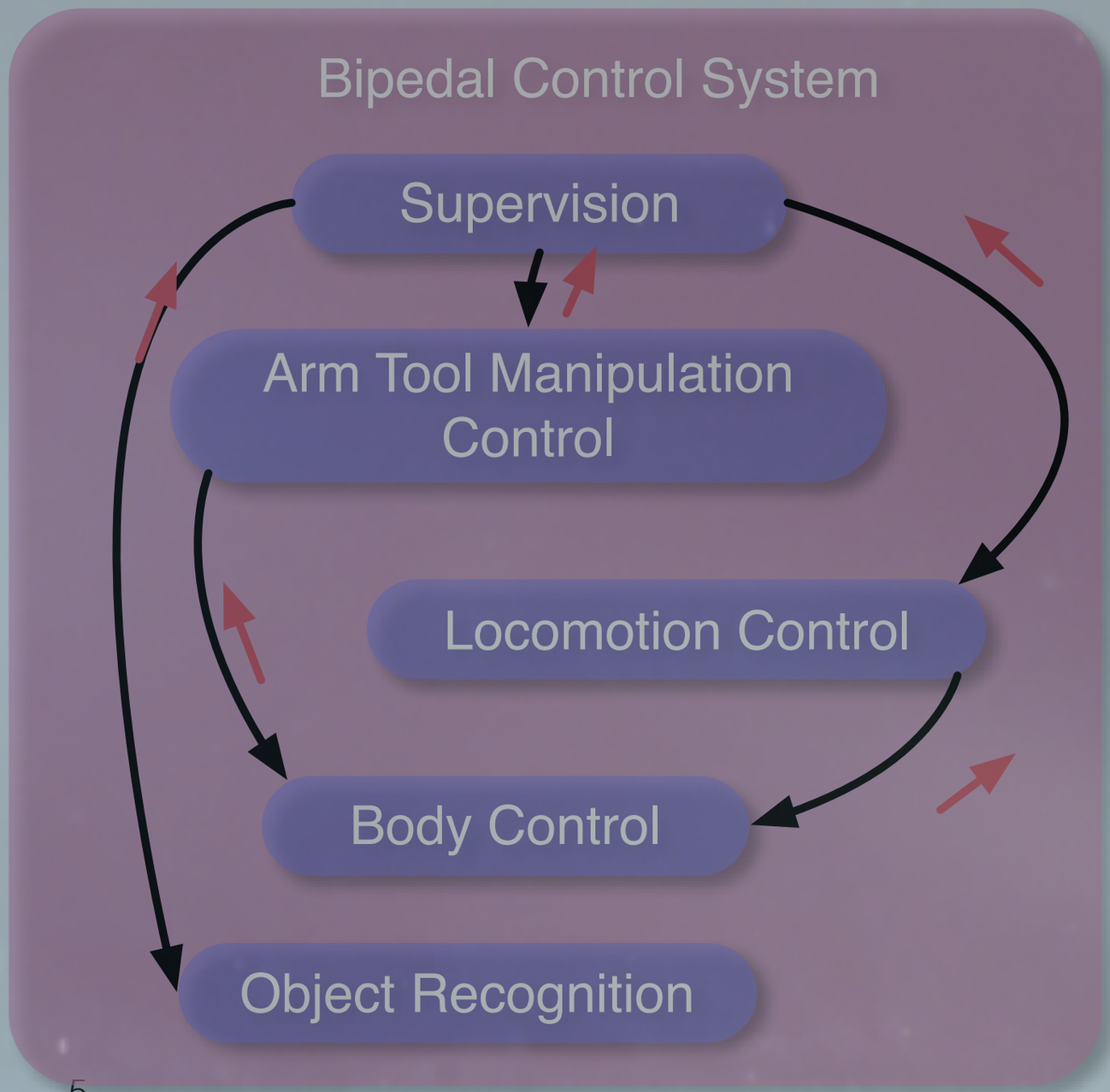


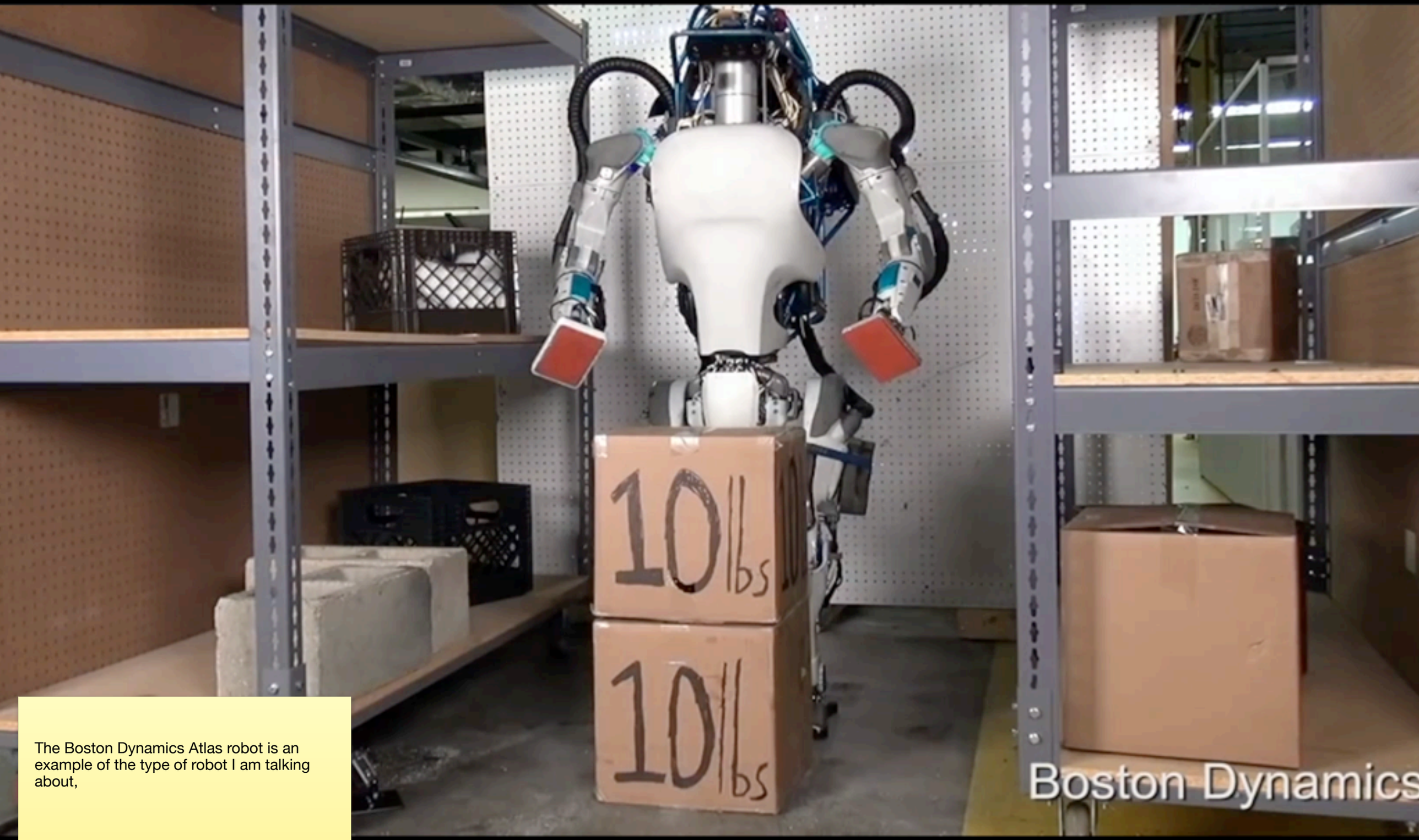
Concept explanation of RxDevce using an analogy to the design principles in the human body. The body has functional units (leg, arm, torso) connected by messaging pathways (nervous system). Looking deeper down to the organ and gland system, There are functional units controlled by chemical messengers that flow through control channels (blood vessels). So this design principle is fractal (i,e used as you go to finer levels of detail).

RxDevice uses the principle of a fabric of functional processing units, controlled and messaged by notifications flowing through channels that link the units.

The right pane is an example of a macro level decomposition using RxDevice of bipedal carton stacker robot. Showing high level functional units and messaging/control channels.

ww.youtube.com/
kY

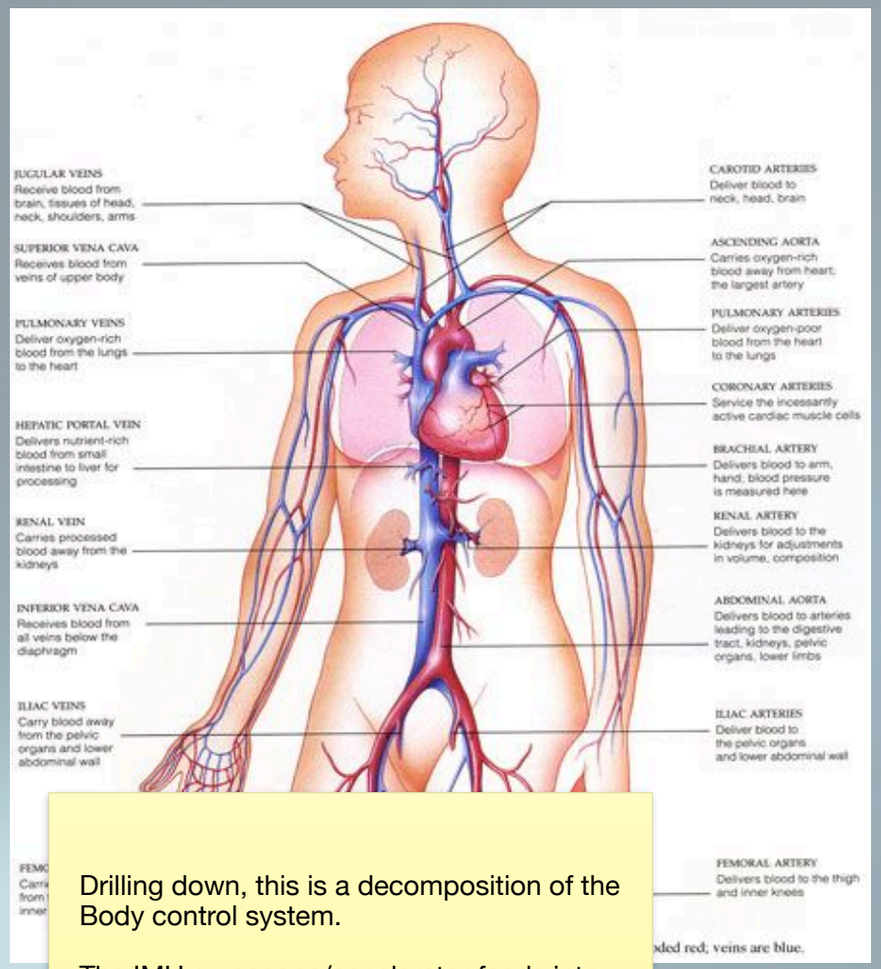




The Boston Dynamics Atlas robot is an example of the type of robot I am talking about,

Basic concept of RxDevice

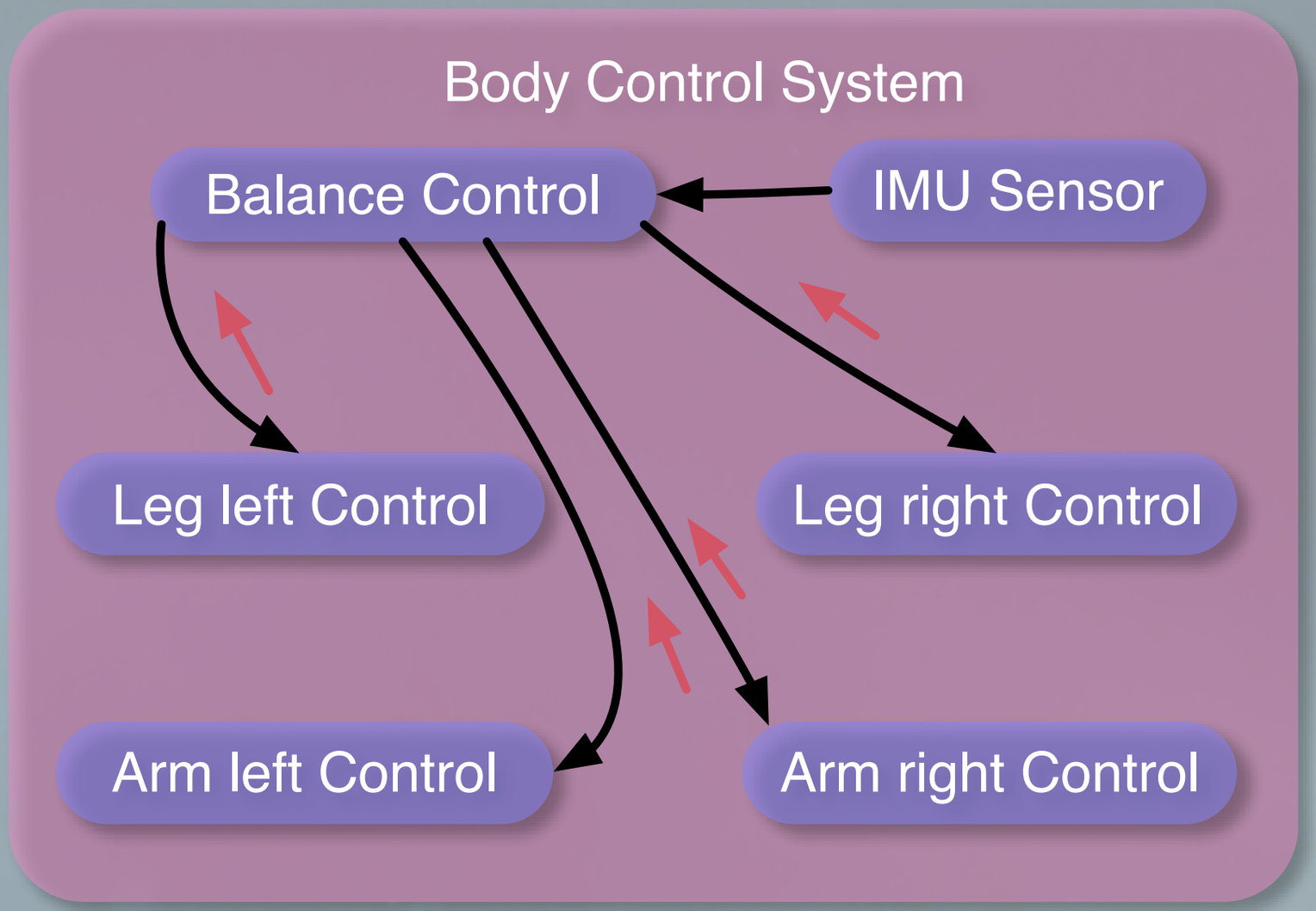
Example: Bipedal Control System (Body Level Of Detail)



Drilling down, this is a decomposition of the Body control system.

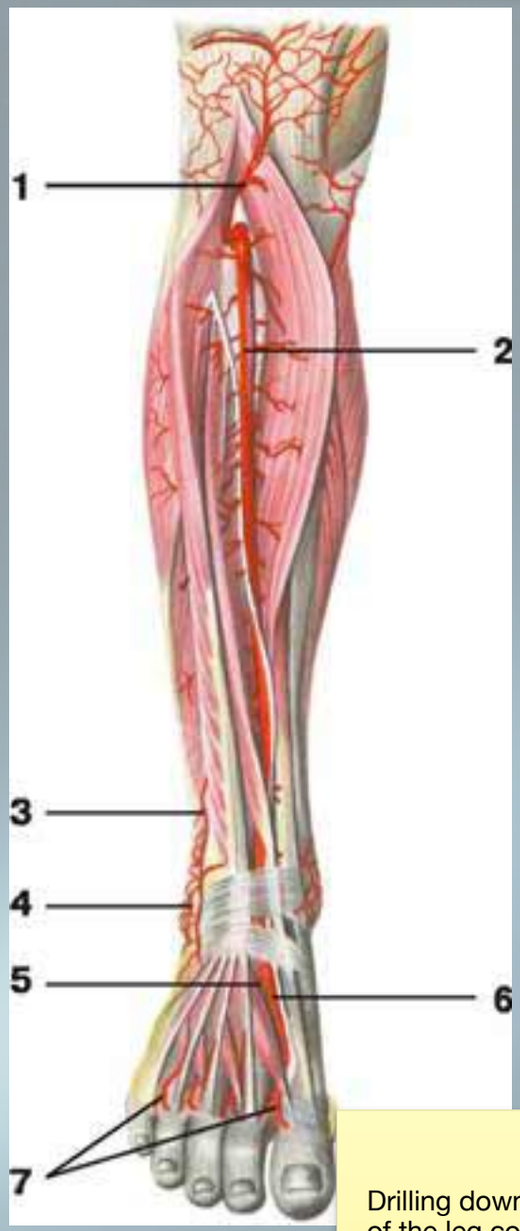
The IMU gyroscope/accelerator feeds into balance control, which in turn messages to the legs to ensure the centre of mass of the robot in under the legs.

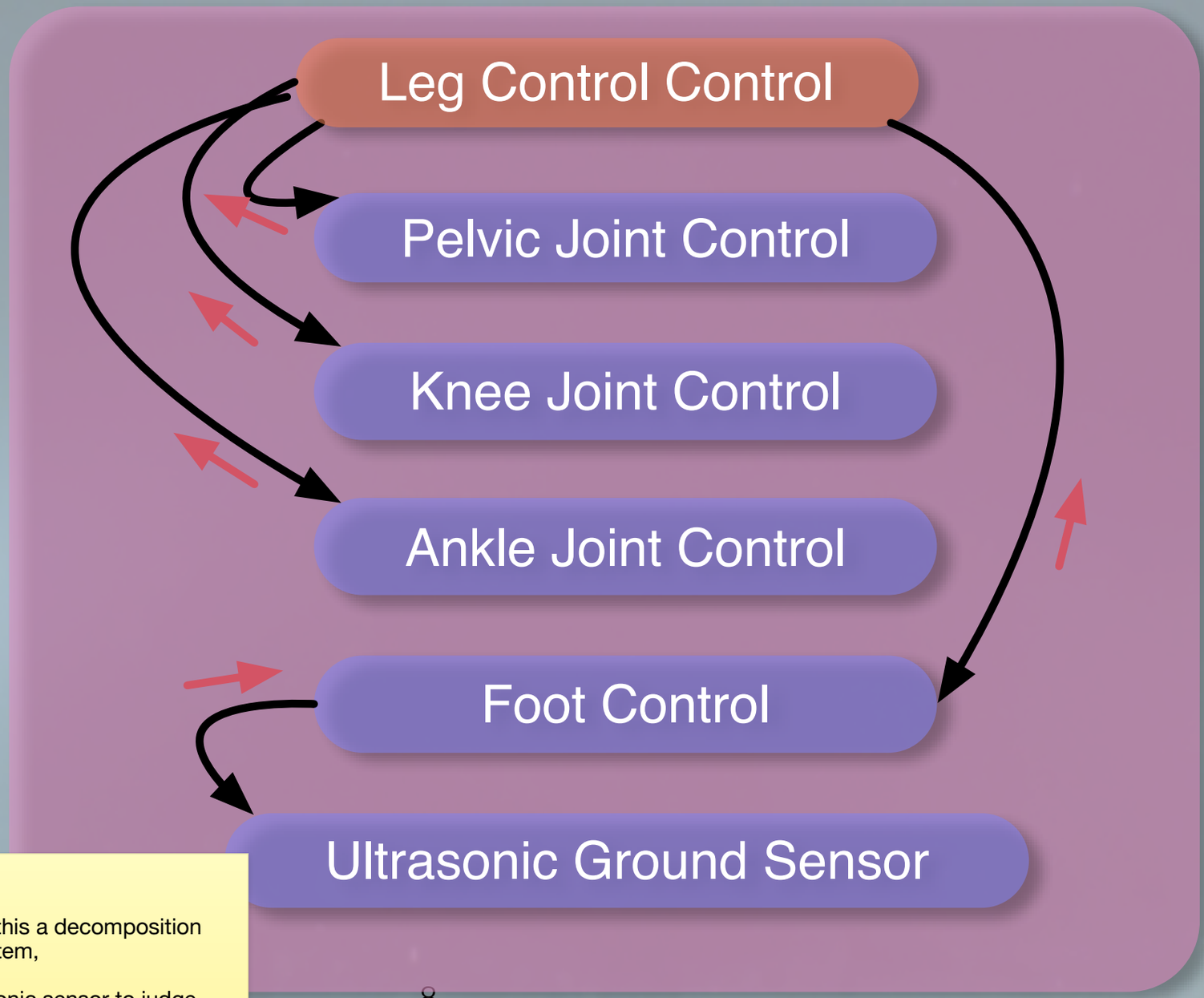
The balance control system is essential for walking, crouching etc.



Basic concept of RxDevice

Example: Bipedal Control System (Leg Level Of Detail)





Drilling down further this a decomposition of the leg control system,

The foot has a Ultrasonic sensor to judge the distance the foot has from the ground.

Parrot Minidrone Section

The Parrot Minidrone

Specifications

Models
Airborne Night (includes flashing leds)
Airborne Cargo (can carry objects)
Rolling Spider
Hydrofoil (with hydrofoil full)
Mambo (with catcher and canon)

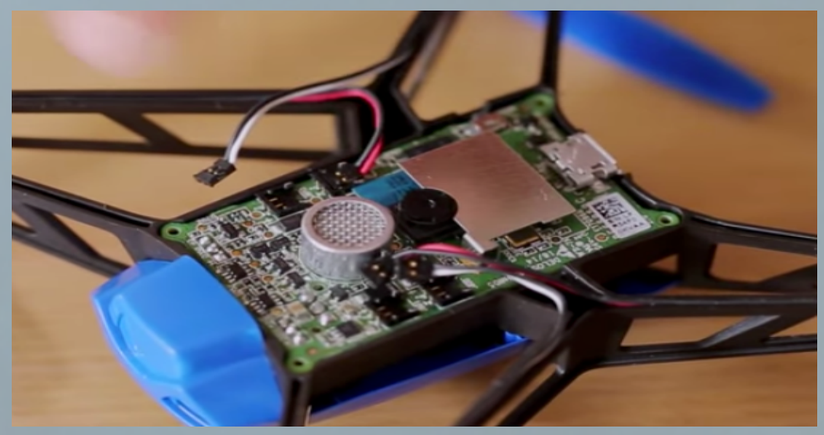
Sensors:
IMU (gyro, accelerometer)
Barometer
Ultrasonic ground sensor

Battery
550 mAh LiPo
2.5A max current

OS
Cut down version of Linux called Delos

Vertical Camera
60FPS 640x480

CPU
ARM A9-800Mhz
1GB of DDR Ram
Flash Drive



Network
Bluetooth LE4.0
Range: 10 - 20 m

The Parrot Minidrone

Comms Protocol

Channels

Status: Drone Status: Drone -> Controller

Sender: Commands: Controller -> Drone
Receiver: Command Results: Drone -> Controller

PCMD: Drone -> Controller

FTP21: Bulk Data Transfer (Photo data)
FTP51: Bulk Data Transfer (Photo data)

Packet Types

Data
Ack

Packet Data Format

<Byte: Packet Type>
<Byte: Sequence number>
<Data>

The Parrot Minidrone

Comms Protocol (Events)

Events: (Status/Receiver channels) Drone -> Controller

Alerts:	Battery low, Motor cut out.
Battery:	Battery level
Charging State:	Charge rate.
Flight Status:	Landed, Taking off, Hovering, Landing, Rolling, Auto Takeoff.
Media Events:	Picture taken, Media changes.

The Parrot Minidrone

Comms Protocol (Cmds)

Commands: (Sender Channel) Controller -> Drone

Config: Set config

Flight Mode: Trim, Take off, Land, Auto Take off

Settings: Set light intensity

Picture: Take picture, transfer photo.

Manoeuver: Flip (back, forward, left, right)

Lights: Set light pattern (flash, oscillate)

Misc: Disconnect, Reboot, Debug Modes.

Config

Max Rotation Speed
Max Horizontal Speed
Max Vertical Speed
Auto Cutout
Country
Date/Time
Accessories

The Parrot Minidrone

Comms Protocol (Replies)

Command Replies (Receiver/Status channel)
Drone -> Controller

Config: Config settings

Lights: Headlight intensity change.

Sensor: Sensor list and availability.

Config

Max Rotation Speed
Max Horizontal Speed
Max Vertical Speed
Auto Cutout
Country
Date/Time
Accessories
Software version

The Parrot Minidrone

Comms Protocol (Motion)

Motion Command: (on PCMD Channel)
Controller -> Drone

Single PCMD command:

Set Pitch Angle (-100 - 100)
Roll Angle (-100, 100),
Yaw Angle(-100, 100)
Gaz (-100, 100)

Sets Motor Controls

Can be pulsed to with in 20 - 50 ms.

Max speed in the order of 3m/s

Also used as a keep alive event by the Drone.

Drone Flying Section

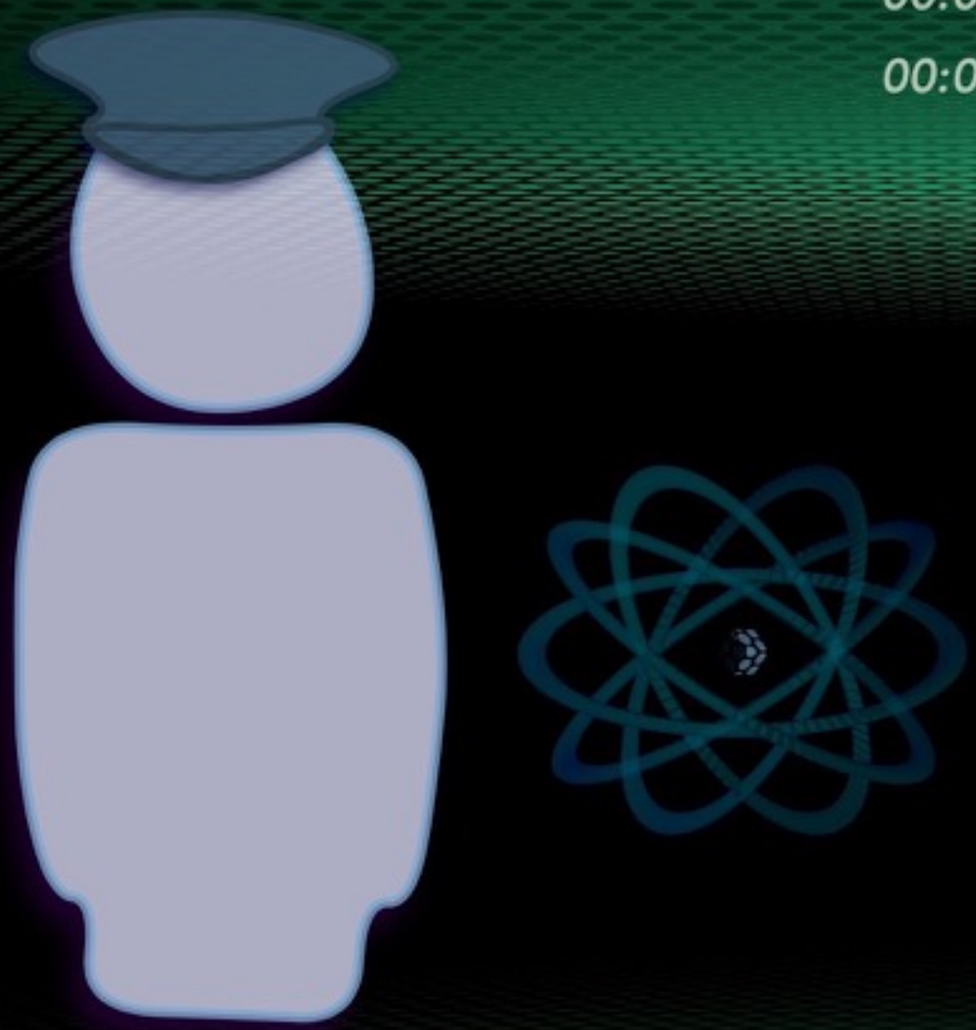
Dronenaut (for Parrot™ Minidrone)

Flight Log

00:00:03 Scanning for drones

00:00:56 Discovered Airborne Night Drone

00:00:58 Battery: 55%



Battery: 55%

Help - Vocal Commands (Tap to dismiss)

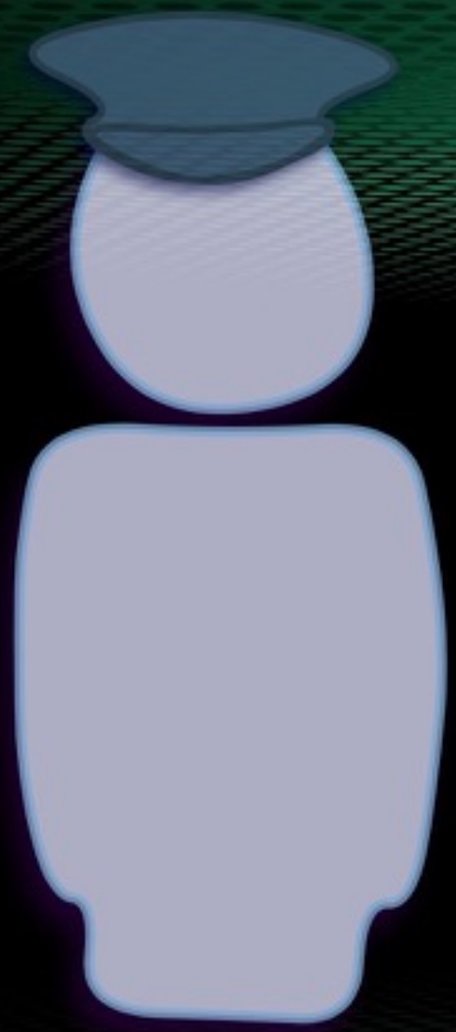
- **App Start Up**
  - Assistance
    - help
    - show video
- **Stationary**
  - Show
    - show log
    - show settings
    - show status
  - Config
    - wheels (on/off)
    - auto take off
  - Flight
    - take off
- **Stationary & Flight**
  - Diagnostics
    - show diagnostics
    - hide diagnostics
  - Lights
    - start blinking
    - stop blinking
    - flash lights
  - Set
    - set max altitude
    - set max speed
- **Flight**
  - Landing
    - land
    - emergency
  - Motion
    - motion left
    - motion right
    - motion forward
    - motion backwards
    - turn left
    - turn right
    - turn about
  - Manuever
    - flip
    - flip left
    - flip right
    - flip forward
    - flip backward
  - Photos
    - take picture
- **Manual Flight**
  - Press finger on flight pad
    - engage axial
    - engage steering
    - engage turning

This is the help popover for the app.

Voice “help” to Dronenaut to view the popover.

Voice cmd: Showing help.

Dronenaut (for Parrot™ Minidrone)



Settings

Speech Verbosity	3.0
Drone Responsiveness	5.0
Max Altitude	2.0
Max Speed	3.0
Volume	0.32
Speech Rate	0.4
Max Listen Duration	8.5
Speaking Voice	en-GB (Daniel)
Recognition Language	en-US (USA)

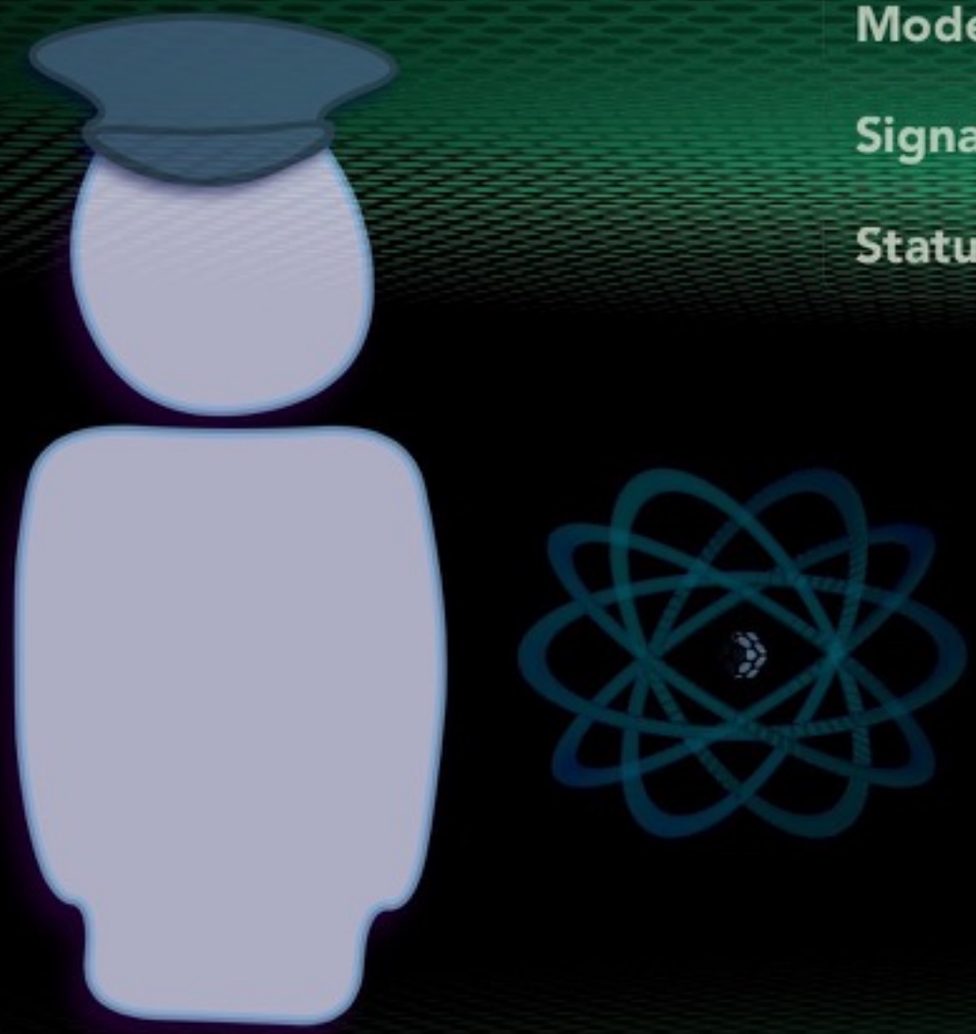
Elapsed Times

Recognition Time	0 sec
Flight Time	
Remaining Flight Time	

Battery: 55%

This is the settings screen. You swipe in right side panel to get the various panels.

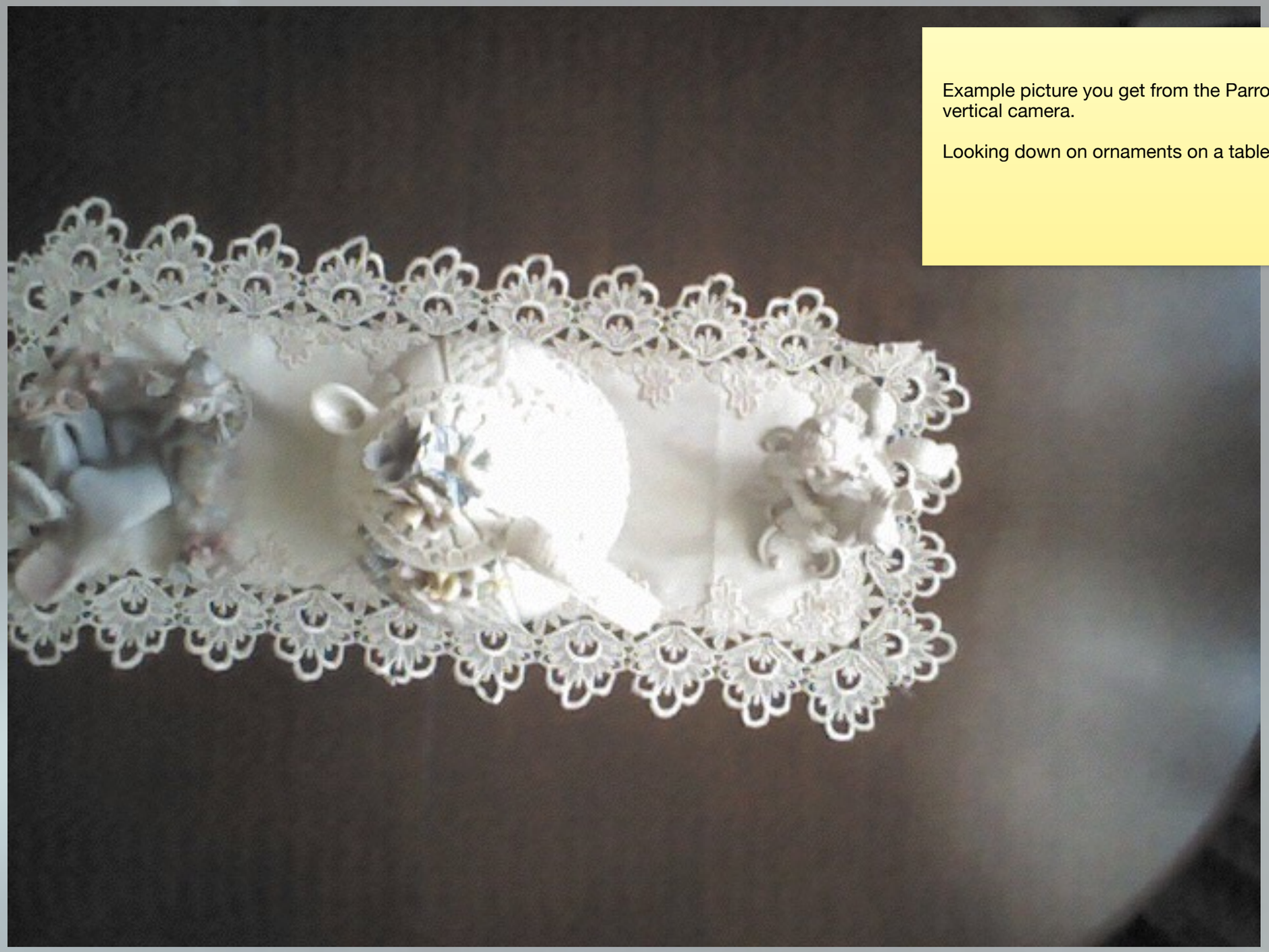
Dronenaut (for Parrot™ Minidrone)



Drone Status

Name	Blaze_012569
Model	Airborne Night
Signal	-41db
Status	Ready

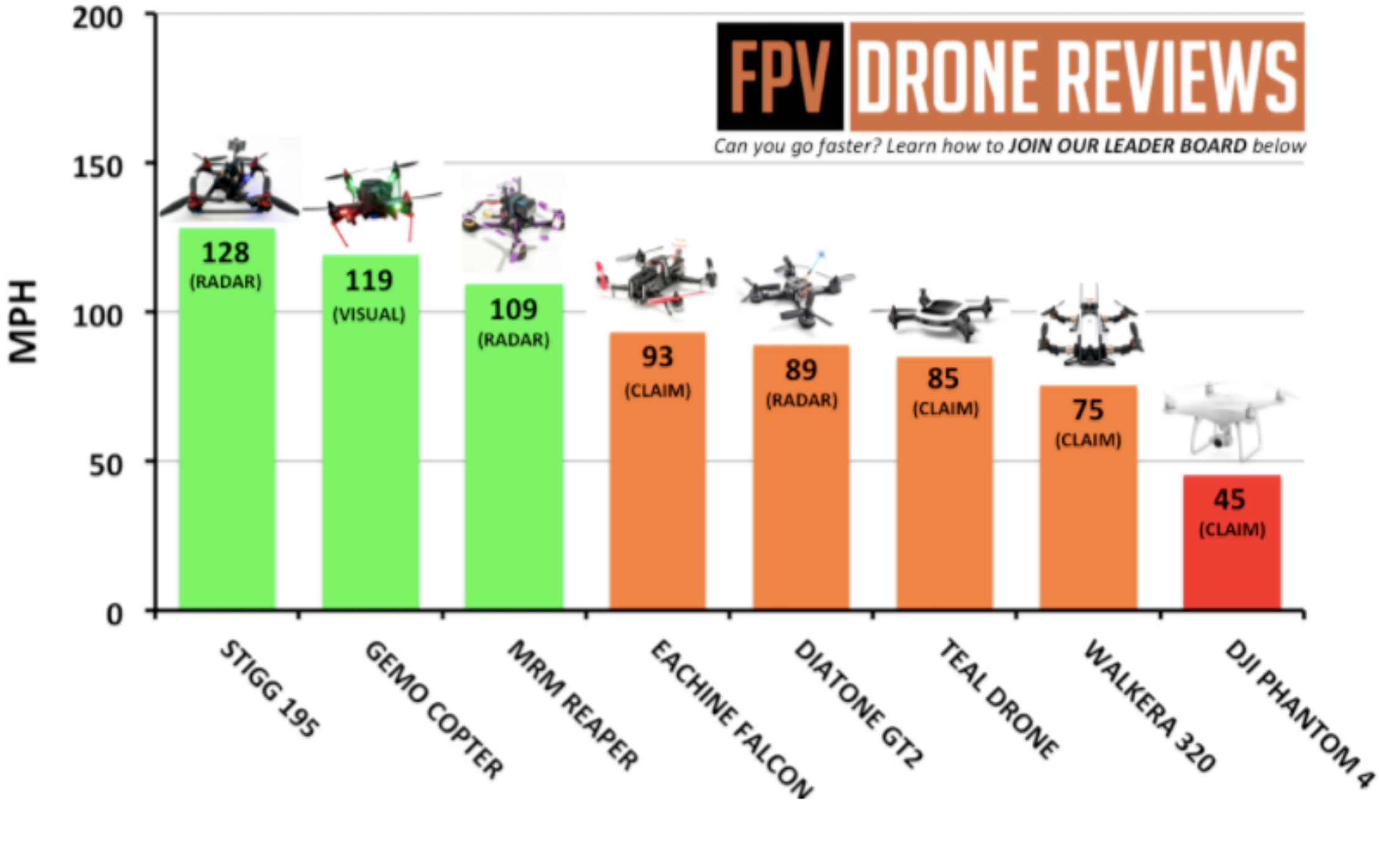
Battery: 55%



Example picture you get from the Parrot vertical camera.

Looking down on ornaments on a table.

How Fast Do Drones Go ?



FPV Drone Racing

FVP (First Person View) quadcopter flying with realtime video feeds

Started in France 2014, when a small group of enthusiasts got together for race through forest and posted the feeds on the net.

2016: Dubai hosted a Drone Racing match with a net purse of $US1M

In the US drone racing is being prompted in the same way NFL is.

FPV Drone Racing: Videos

France: one of the first races: https://www.youtube.com/watch?v=ZwL0t5kPf6E

FPV Antics: https://youtu.be/1MBW8zoZUR4

Dubai Race: https://www.youtube.com/watch?v=pZ0viMxYDA4

Drone racing from car: https://youtu.be/oQkOoqHm7O8

Bluetooth LE Section

Bluetooth LE (Smart) 4.0 - 4.2

Spread Spectrum Transmission: 40 channels separated at 2 Mhz intervals over 2.4 - 2.4835 GHz.

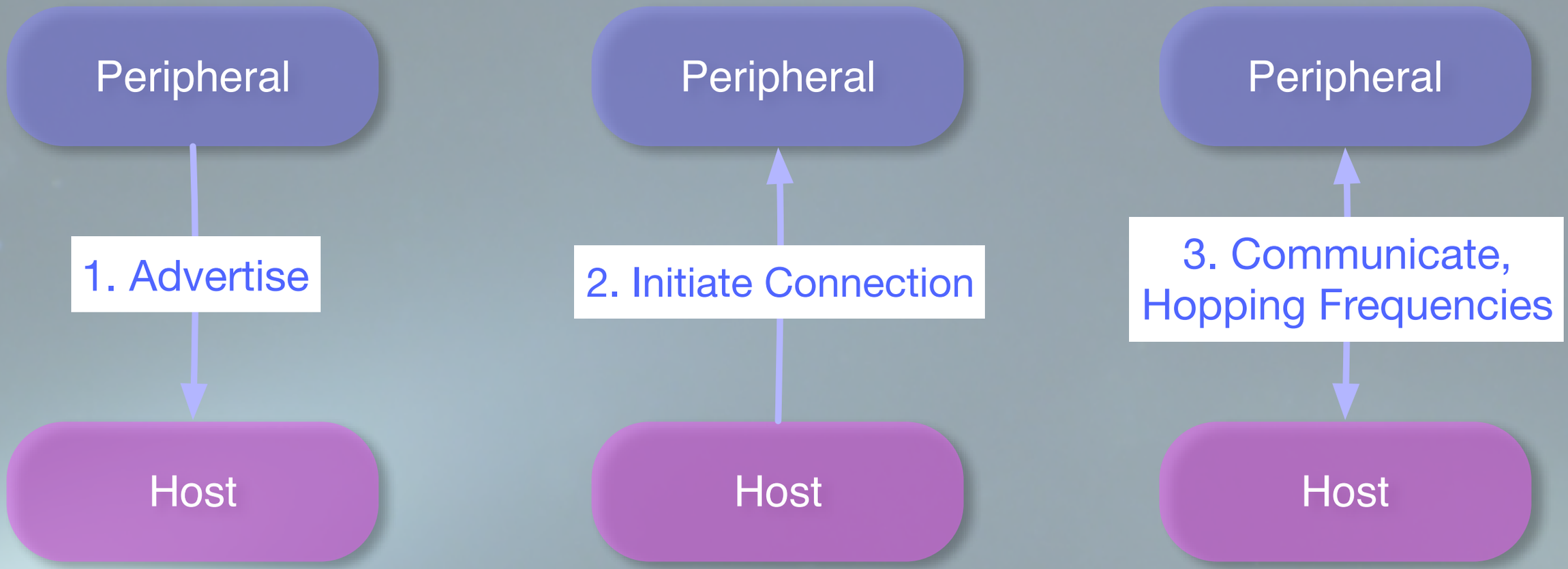
Distance Range given by spec: Class 1: 100m, Class 2: 10m, Class 3: 1m

Approx Realistic Data Rate: ~ 260Kbs (BLE 4.0), ~ 650 Kbs (BLE 4.2)

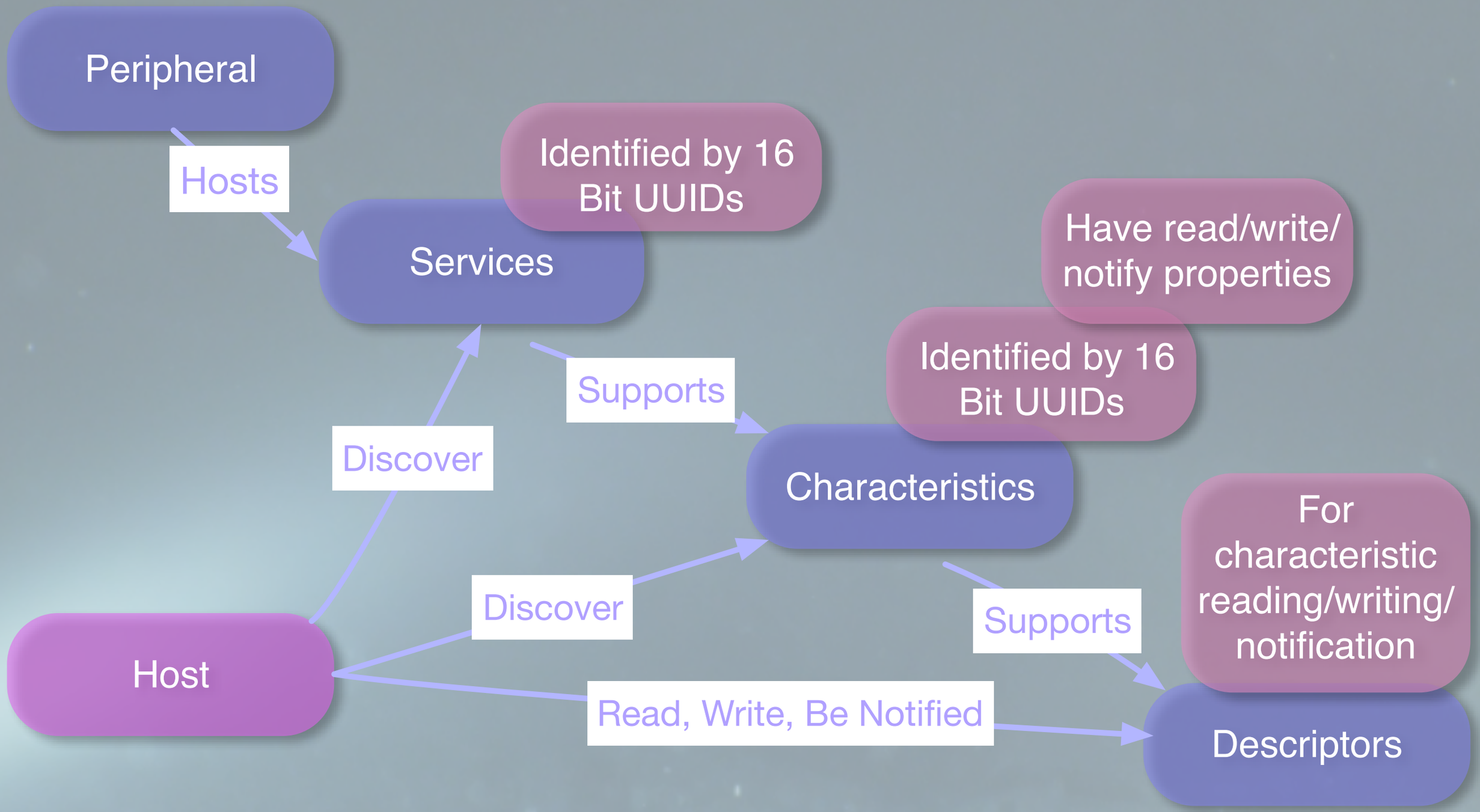
Peak Current consumption: < 15mA

Note: The most recent standard is 5.0, released June 2016, devices should start appearing this year.

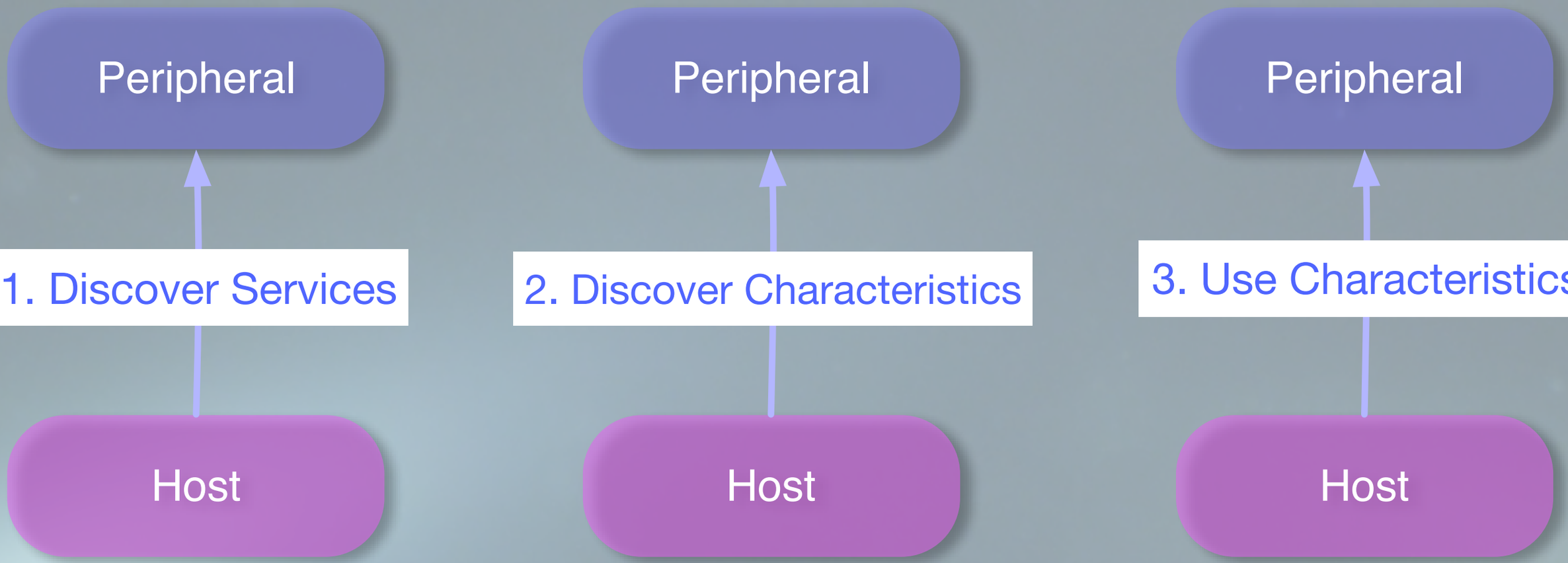
Bluetooth LE - Connection Protocol



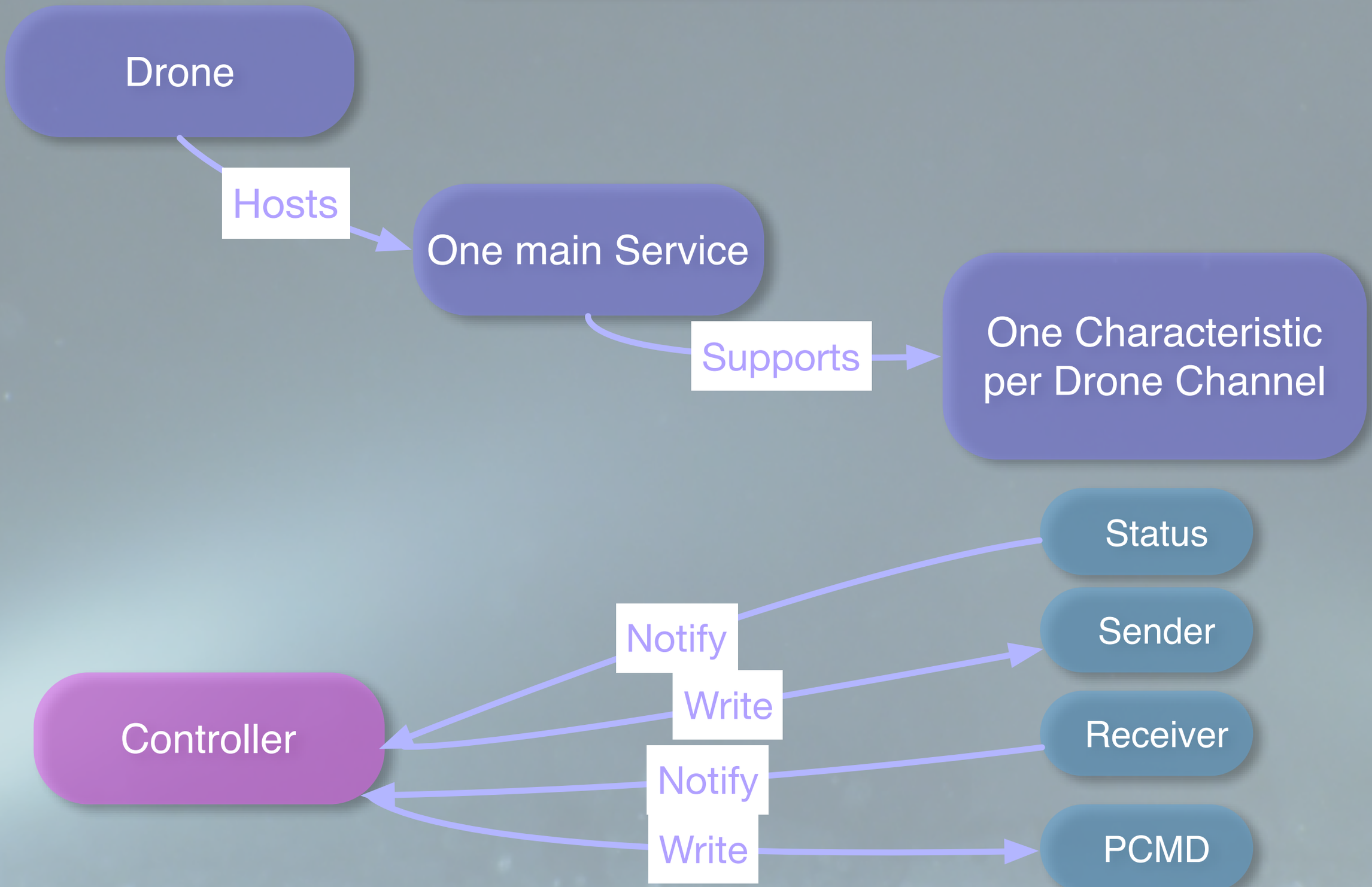
Bluetooth LE - Services



Bluetooth LE - Service Discovery Protocol



The Parrot Minidrone BLE Services



INDEPENDENT

Man arrested for landing 'radioactive' drone on Japanese Prime Minister's roof

A man has been arrested in Fukui, western Japan, for landing a drone that was carrying a small amount of radioactive sand on the roof of the Japanese Prime Minister's home.

40-year old Yasuo Yamamoto turned himself in to police late on Friday night, claiming he landed the drone on Prime Minister Shinzo Abe's roof in protest against the Japanese government's nuclear energy policy.

Fukui is home to around a quarter of Japan's 48 nuclear reactors - all are offline after the 2011 Fukushima disaster, but Mr Abe's government wants to restart as many of the reactors as possible.

Officials cover the DJI Phantom II drone before a proper containment crew arrives. Dated: April 2015

Speech Recognition Section

Speech Recognition as a Simple Interface

Why use it ?

- Simplifies the interface
- Solution for App overload
- Can be personalised

- Person is busy doing something (driving)
- Limited visual representation real estate
- Person is wanting a reasonable collection of simple things to be performed.
- Interface can be more active and preemtive.
- Relating on the human level rather than the computer level.

Speech Recognition as a Simple Interface

Device may require more information.

Mechanisms to determine when person is addressing the system.

Continuous keyword recognition

Facial recognition

Speech Recognition

Problems:

- Latency
  - Systems online.
  - Use continuous audio feed.
- Background noise
- Background chatter
  - Use directional audio signal processing.
- Identify false positives
  - Adaptive learning.
- Content context
  - Supply expected words.

Speech Recognition Services with Available SDKs:

- Google Speech API
- Apple Siri
- Amazon Alexa
- Microsoft Cortanta
- Nuance (Dragon)
- Viv (Bought by Samsung - not available yet)

Google Speech API

Service URL: googleapis.l.google.com.

URL: located in MountainView CA, ping time ~16mSec

Recog Latency: 3 - 4sec (generally)

Audio Feed: 16Kbps mono 16 bit channel.

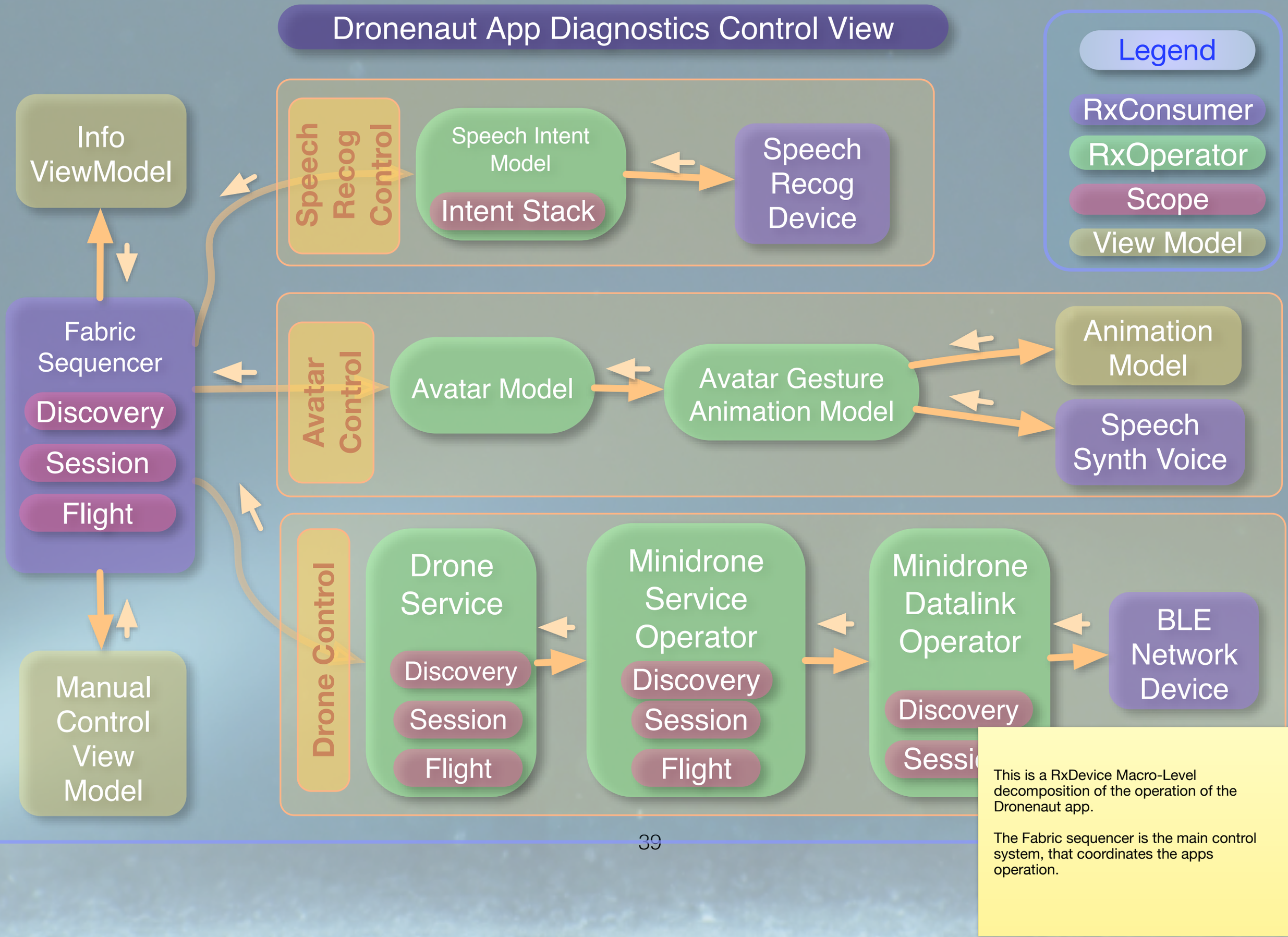
Performs continuous recognition from the time of feed commencement.

Replies with running possible matches and then final match result.

Cost: approx $AUS 1.16 per hour of recog feed time.

RxDevice Section

Dronenaut App Diagnostics Control View



This is a RxDevice Macro-Level decomposition of the operation of the Dronenaut app.

The Fabric sequencer is the main control system, that coordinates the apps operation.

Dronenaut (for Parrot™ Minidrone)

Diagnostic Control View

Info ViewModel

Fabric Sequencer

- Discovery
- Session
- Flight

Manual Flight Control ViewModel

Speech Recog Control

Speech Intent Model

- Speech Intent Stack

Speech Recog Service

Avatar Control

Avatar Model

Avatar Gesture Model

Speech Synth Voice

Animation Model

Drone Control

Drone Service

- Discovery
- Session
- Flight

Minidrone Service Operator

- Discovery
- Session
- Flight

Minidrone Datalink Operator

- Discovery
- Session

BLE Network Device

Legend

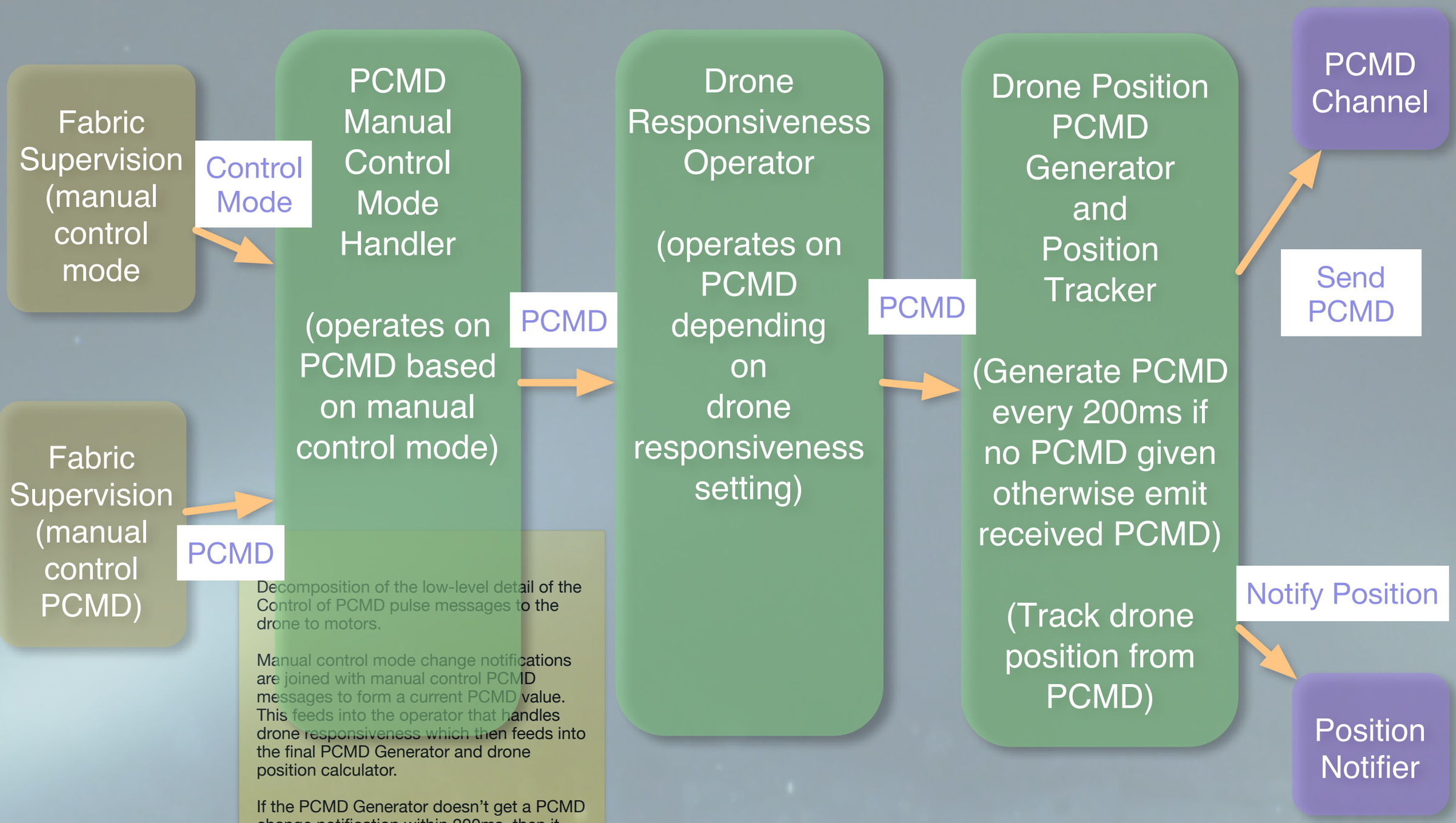
- RxDevice
- RxOperator
- Scope
- ViewModel

In this screen you can tap on Dronenaut, voice a command and see the internal procedure of that command.

Screen shot of the diagnostics screen of the App which displays in realtime the flow of notifications through the RxDevice Fabric.

Scopes (Discovery/Session/Flight) indicate the current operational context of the individual fabric processing unit

PCMD Sequencer - RxPatterns



Virginia Woman Says She Shot Down Drone Near Actor Robert Duvall's Home

"I had my .20-gauge there, so I put two 71/2 birdshot shells in it," Jennifer Youngman said

A Virginia woman says she shot down a drone after she spotted the device flying over her famous next door neighbor Robert Duvall's house and it veered onto her land.
Jennifer Youngman said she was cleaning two guns on her front porch in Fauquier County when she saw two men park in front of the actor's home.

The men set up a table and began operating the drone over "The Godfather" star's property.The device buzzed about 75 feet in the air and disturbed his cows, Youngman said.

But when the men appeared to have lost control of the drone, Youngman took action.

“They were going a little too fast and they went over my airspace," she told "I had my .20-gauge there, so I put two 71/2 birdshot shells in it, and there you are.”

Source: Virginia Woman Says She Shot Down Drone Near Actor Robert Duvall's Home | NBC4 Washington http://www.nbcwashington.com/news/local/Virginia-Woman-Shoots-Down-Drone-Near-Actor-Robert-Duvalls-Home-391423411.html#ixzz4Z7SMIjh6

Misc Videos

Boston Dynamics Atlas Robot

Ehang 185 Taxi

Silly things people do with drones

Anti Drone Technology