Project Harbinger+Air

What I've learned

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the overview I

- Who am I?
- Project Harbinger+Air
- So, where's the data?
- Where is the project now?
- What we learned

Who am I?

Who am I?

Just some pilot

LCDR Alex "Jarvis" Buck

- USNA '11, MIT '13
- MH-60R Seahawk Weapons & Tactics Instructor
- Mostly based from San Diego, C7F + C5F deployments
- Currently at Carrier Air Wing EIGHT in NAS Oceana

In the right place at the right time

Project Harbinger+Air

Project Harbinger+Air

Use machine learning to classify acoustic contact in the spectrogram (*gram*) from an SSQ-53 series DIFAR buoy.

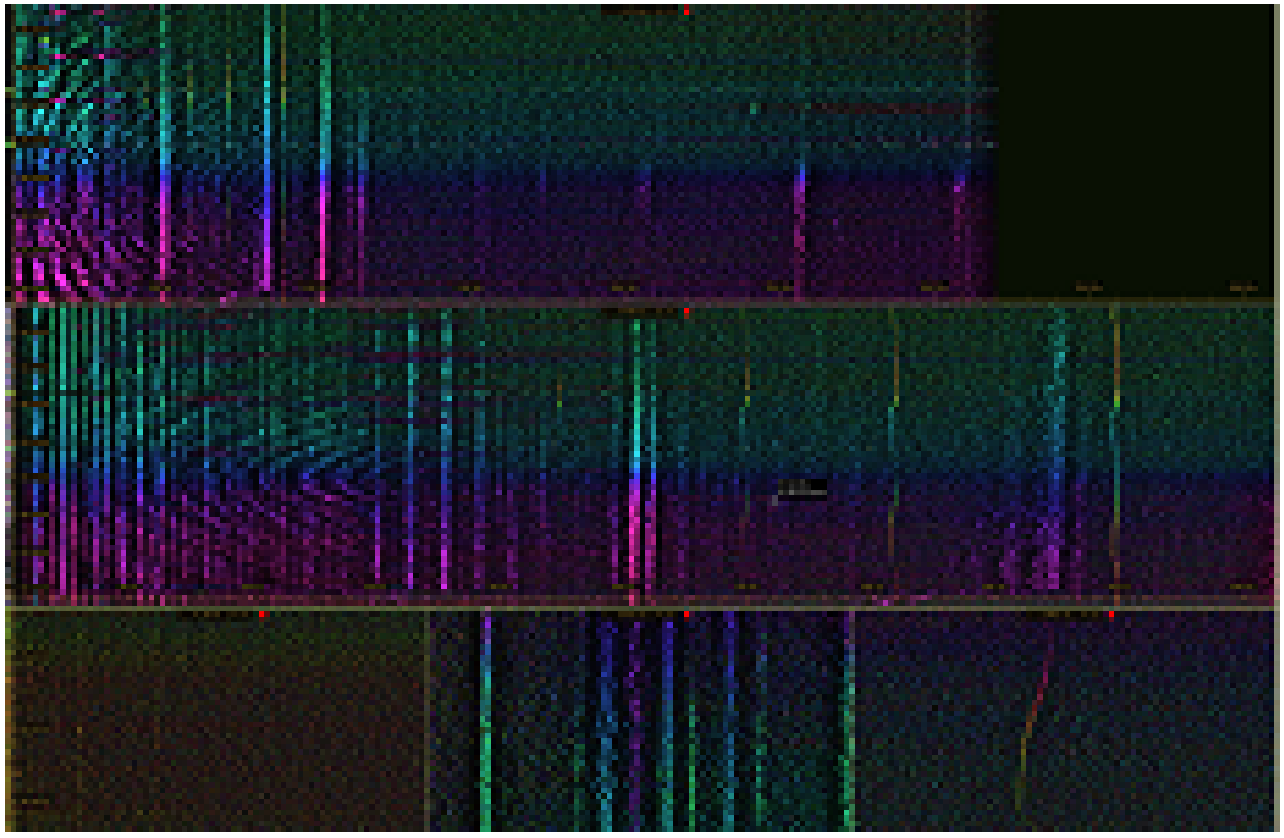

Figure 1: Example Gram Data

Needle in a Haystack

$$SE = SL - RD - NL + DI - PL$$

There are lots of things that make sound in the water other than submarines.

Finding and discriminating subsurface contact from other sources is hard.

Doing so, while managing 4 other sensors is harder.

Let my sensors monitor themselves when I am not.

So, where's the data?

What happens after a flight

It gets deleted

Once any immediate debrief or VI is complete, re-format the cards.

Except ESM... sometimes

Previously the only sensor data collection effort in the MH-60R fleet.[1]

Multiple steps for the aircrew:

- Run a program to parse ESM data
- Find output in obscure folder
- Rename output according to specific format
- Upload output to IntelDocs

[1] I am not counting maintenance data/IMDS in this.

Well that's not great

Every Byte, Every Flight

Minimize aircrew actions and decisions.

Save everything, build batch processing on the backside.
Build future value for other sensors, e.g. ISAR, FLIR, etc. . .

There are lots of bytes

- ~20 GB/flight-hour[2]
- ~240 GB/flight-day (12-hour fly day)
- ~36 TB/2-bird detachment (150 fly days)
- ~60 TB/CVN element (20-hour fly day, 150 fly days)

Not enough storage

We needed a better simple storage solution.

[2] Depends highly on what sensors are being used. Ranges from 10 to 30 GB/flight-hour.

Alone with a Snowball

Harbinger+Air uses AWS Secret Commercial Cloud Services.

AWS Snowball Edge migrates up to 80TB into AWS S3.

Security Manager: “What the *$%! is this?”

Data Pipeline: The fleet side

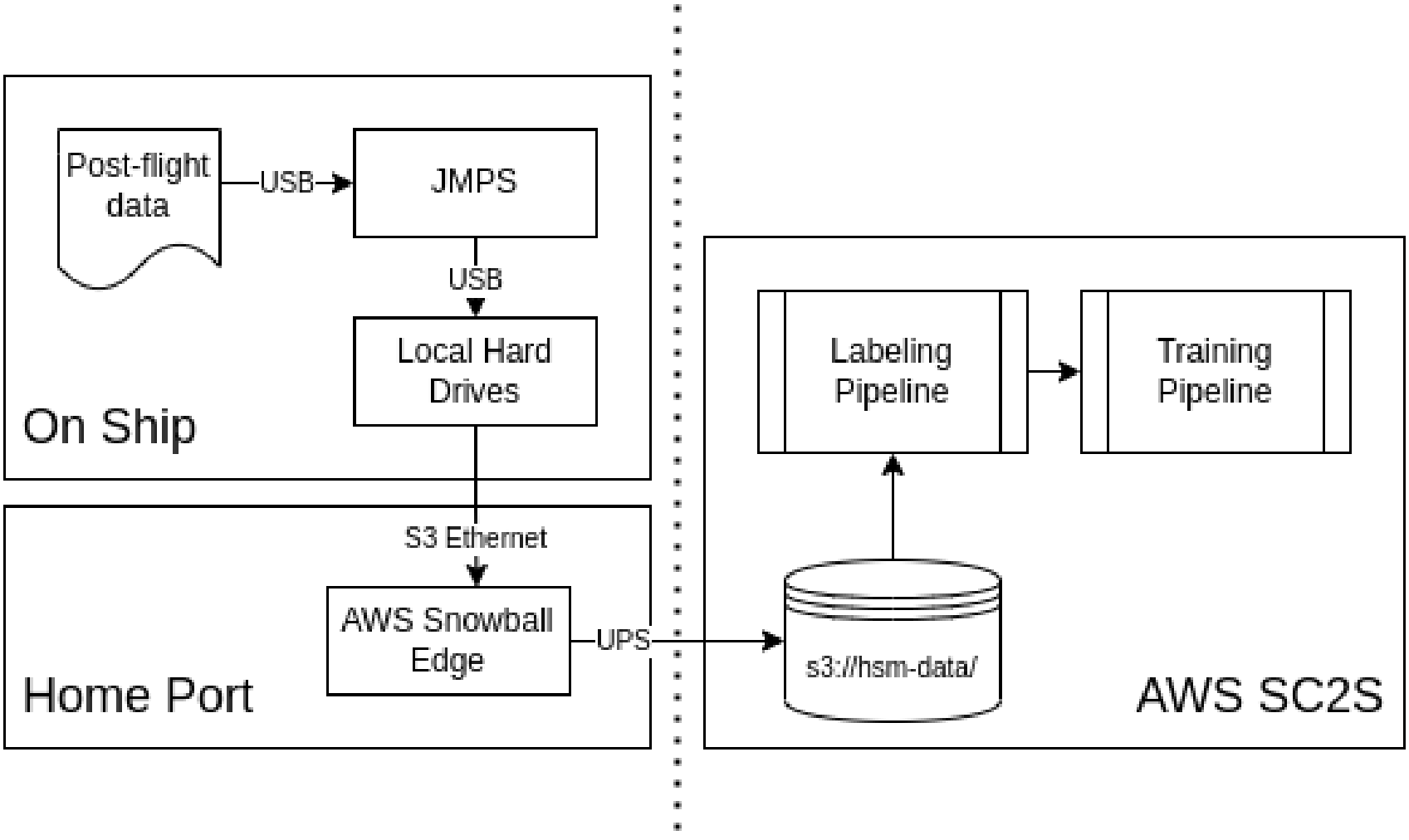

Figure 2: Data Flow

Cronus, the harvester

Tool that:

- Automates the snowball setup
- Minimizes aircrew decisions
- Minimizes aircrew post-flight actions

Its really just a fancy copy/paste operation right now.

Initial version built in 3 weeks. Iterated with users over 4 HARPs throughout 2020 and 2021.

Usage checklist is a single kneeboard sized page.

Where is the project now?

Status of Harbinger+Air fleet collections

- Data collection process used on **14** operational deployments and numerous HARP classes.
- Large 10TB hard drives for on-ship cache. Dump to Snowball upon return.
- Testing initial algorithm later this year on P-8A Mighty Orion.
- Roadmap to MH-60R integration is unknown.

What we learned

What we learned

- Understand the user workflow
- Minimize what the user needs to learn
- Shipping SECRET material is easier than you might think.
- Long-term snowball rental can be expensive.[3]
- Snowballs can fail.
- Labelling is hard.
- Details:
  - ARPDD discriminator data is huge. Nothing uses this data yet.

[3] The first 10 days are free. Intended as dump and ship back.

Future Work

- Batch parser so we can automate