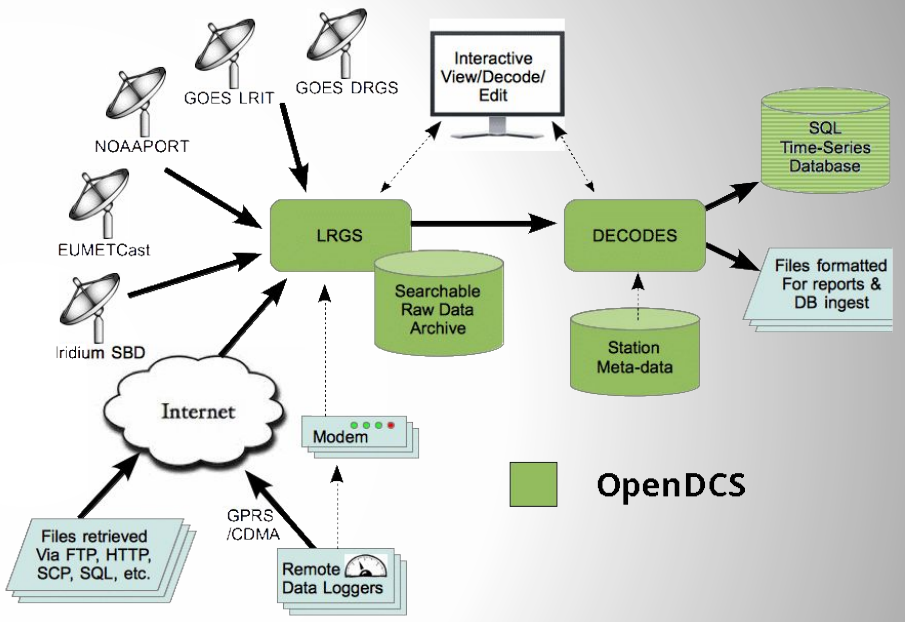
OpenDCS Training/Demos

Spring 2024 TWG Day Two
GOES DCS User Training
April 3, 2024

Andrew Gilmore
www.precisionwre.com



PRECISION
WATER RESOURCES ENGINEERING

Presenter Bio: Andrew Gilmore

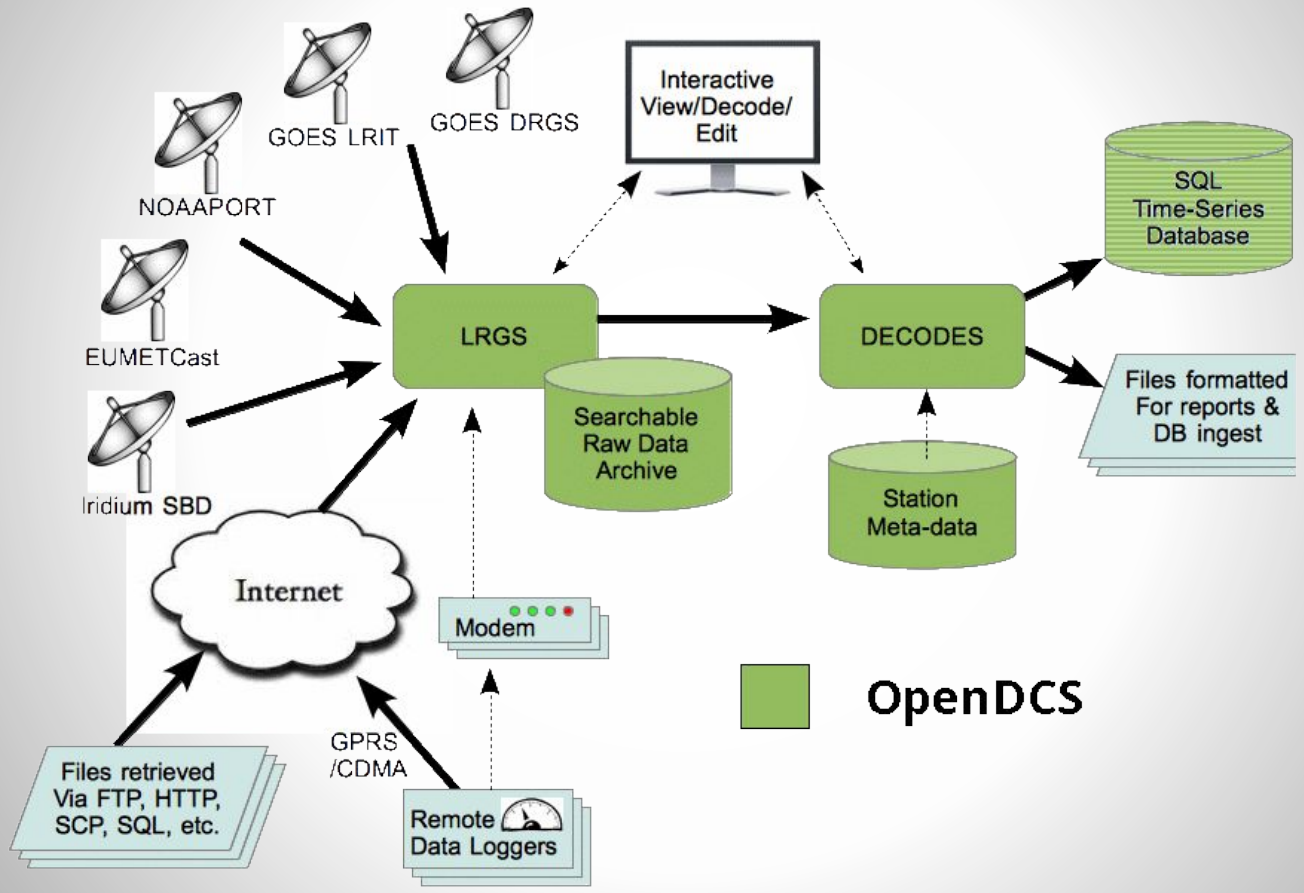
- Passionate about hydrologic data
- Water Resources Engineer/Linux Sysadmin
- PWRE Reclamation HDB Program Manager
- Reclamation HDB Team Lead 2002-2010
- DECODES contributor since ~2006
- OpenDCS development team

Agenda

- What is OpenDCS?
  - Installation Demonstration
- LRGS Usage/DCS Message Browser
  - Raw Data Demonstration
- Platform Configuration
  - Easy Mode (Platform Import e.g. USGS)
  - Manual Platform Creation
- Decoding Demonstration
- Data Retrieval Setup Demonstration
- Review/Conclusion

What is OpenDCS?

1. Data Acquisition and Decoding



2. Computation Processor and Database - Out of scope for this training!

OpenDCS History

- 1999 – Java-based LRGS developed for USGS
- 2001 – Java-based DECODES developed for USGS and USACE
  - Database schema for XML and SQL
- 2004 – DCP Monitor Tomcat Web App funded by USACE MVR
  - Also DECODES in-line Rating Computations
- 2005 – Computation Processor Design funded by US Bureau of Reclamation and USGS
- 2007 – Computation Processor (CP) implemented for USBR Hydrologic Database (HDB)
- 2007 – Support for LRIT (now HRIT) added to LRGS
- 2008 – Iridium support added to LRGS
- 2008 – CP ported to USACE CWMS
- 2012 - ”OpenDCS” released with several improvements to GUI design
- 2014 – OpenTSDB (Time Series Database) – a kind of “CWMS-Lite” implemented in PostgreSQL
- 2015 and later: Improvements to all modules.

P W R E

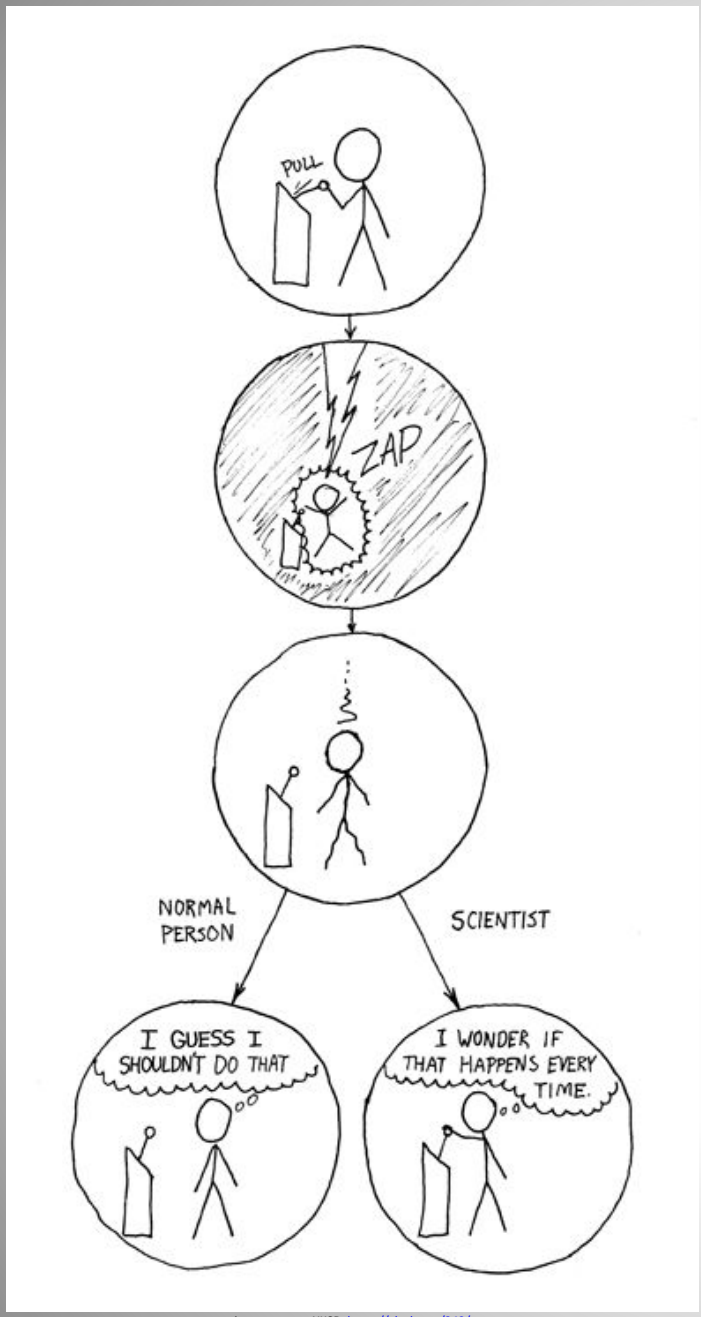


image source: XKCD, https://xkcd.com/242/

Warning: Live Demonstrations Ahead

P W R E

Installation Demo

Installer:

https://github.com/opendcs/opendcs/releases

Documentation installed as PDF, also online at:

https://opendcs-env.readthedocs.io/en/latest/

Local Readout Ground Station (LRGS)

- USGS 1999 development
- GOES DCS raw data access without big dish
- Now HRIT/DDS/IRIDIUM/EDL/Poll/FTP/Web
- Retention time dependent on disk space
- Offers local/backup copy of telemetry
- For setup, see documentation
- OpenDCS usage can leverage public LRGS
  - LRGS Installation NOT required
  - DDS logins required, request from Wallops

Raw Data Access Demo

- Launcher GUI Setup
- DCP Message Browser
- Search Criteria
  - Filters
    - Platform
    - Time Range
    - Quality
    - Channel
    - Others
- Raw/Decoded
- Formatting

LRGS Message Header

Before Message Display Format Hint:

```
NESDISIDYYDDDHHMMssCdbFOMQchnSCDTXLEN\n
3475742A22213210742G46+0NN172WUP00122<DCP message data>
```

DCP ID	Julian Date	Time	Failure?	Signal Strength	Freq. Offset	Modulation Quality	Data Quality	Channel	Spacecraft	Uplink Carrier Status	Message Length
NESDISID	YYDDD	HHMMss	C	db	FO	M	Q	chn	S	CD	TXLEN
3475742A	22213	210742	G	46	+0	N	N	172	W	UP	00122

More details in

LRGS Message Header Reference

https://opendcs-env.readthedocs.io/en/latest/legacy-lrgs-userguide.html#dcp-message-content

Post Demo Questions?

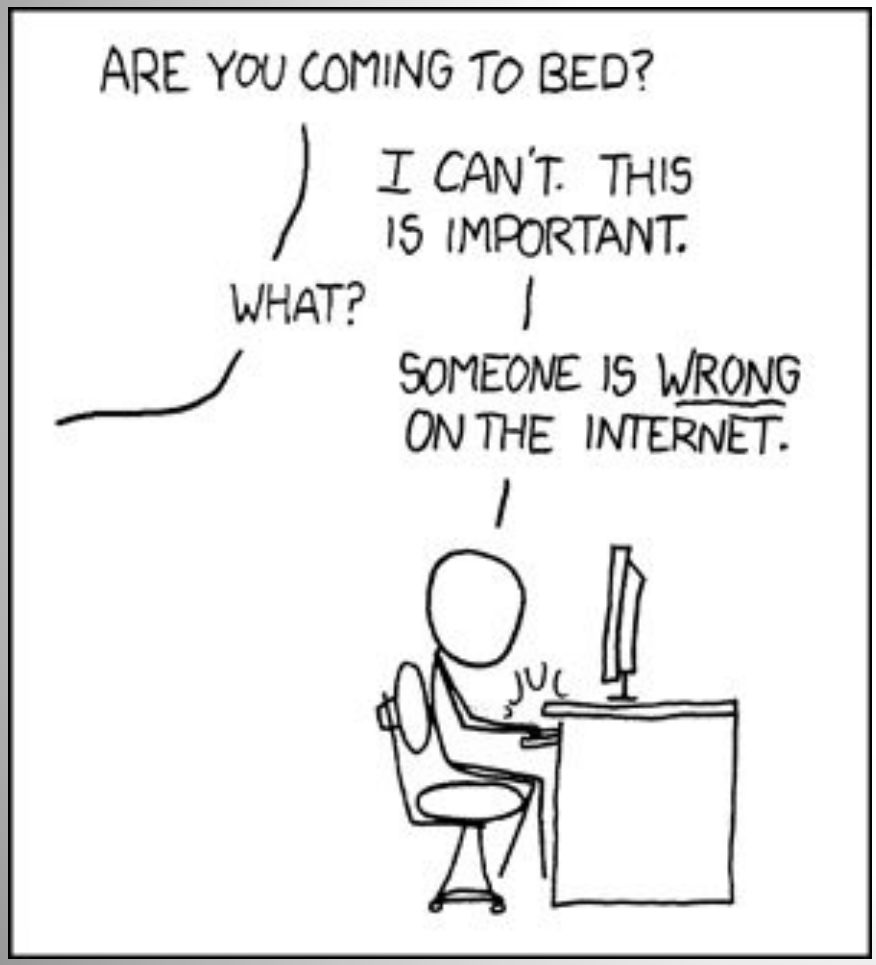
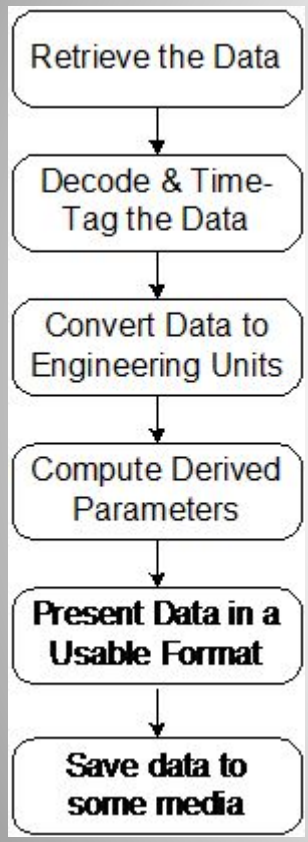
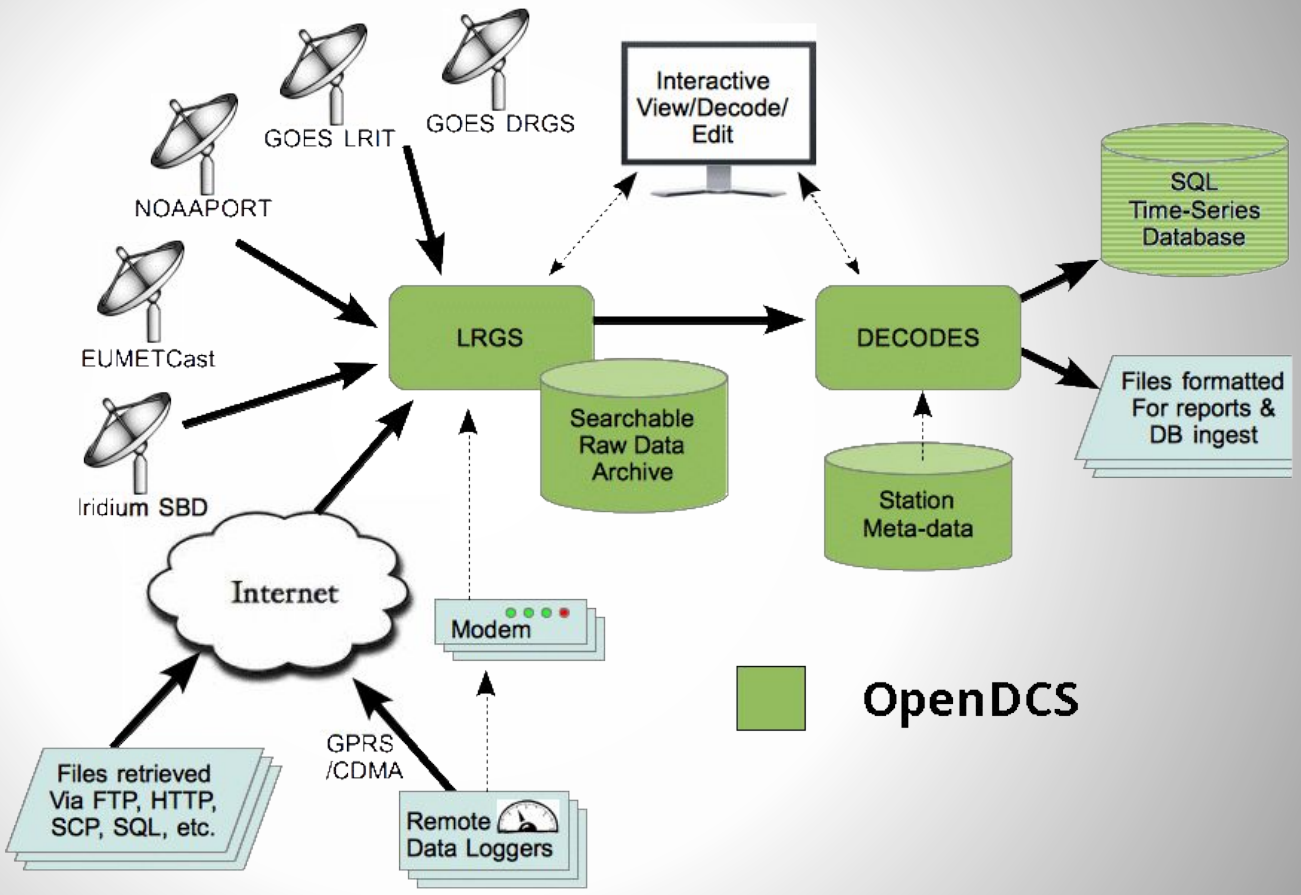


image source: XKCD, https://xkcd.com/386/

DECODES


Retrieve the Data
Decode & Time-Tag the Data
Convert Data to Engineering Units
Compute Derived Parameters
Present Data in a Usable Format
Save data to some media


GOES LRIT
GOES DRGS
NOAAPORT
EUMETCast
Iridium SBD
Interactive View/Decode/ Edit
LRGS
Searchable Raw Data Archive
DECODES
SQL Time-Series Database
Files formatted For reports & DB ingest
Station Meta-data
Internet
Modem
GPRS /CDMA
Files retrieved Via FTP, HTTP, SCP, SQL, etc.
Remote Data Loggers
OpenDCS

Station Metadata Creation

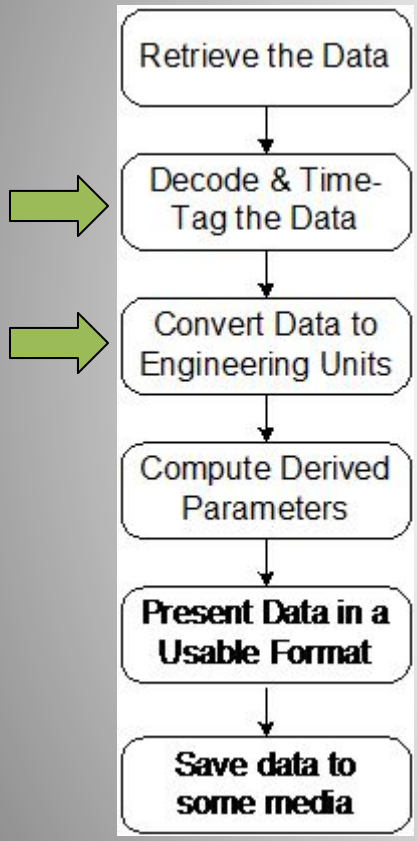
- Easy Method:
  - Platform import:
    - Was USGS Config Repository - now JSON format!
    - Export file from anyone using OpenDCS
  - Key Win: Decoding Scripts from the owners!
- Manual creation
  - Decoding Script Format Language

    https://opendcs-env.readthedocs.io/en/latest/legacy-decoding-guide.html#the-decodes-format-language

Configure Decoding

- Database Editor
  - Data storage in XML files or SQL databases
  - Sites - Metadata including Lat/Long/Elevation
  - Platforms - Can be aggregate of sites
  - Config - Can be shared between Platforms
  - Decoding Scripts - Specific to Config
    - Should be tested

Metadata and Decoding Demo



Raw:

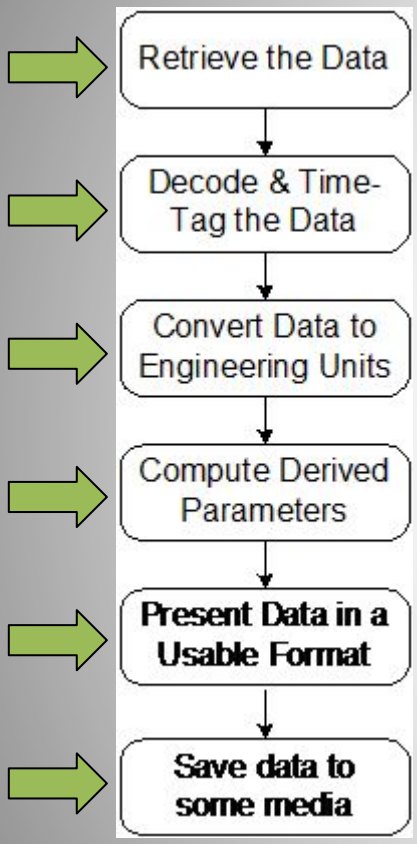
```
DD71A01E22211075154G47-3NN164WXW00078
BST@Du@HYAUZ@Du@HYAUb@Du@HYAR{@Du@HYATp@Du@HYATz@Du@HYAWt@Du@HYAYe@Du@HYAN|h
```

Decoded:

```
Message for Platform 06620000-SU8200D-1

                    | STAGE | BATVT | Precip | ATemp |
                    | 00065 | 70969 | 72192  | 00021 |
        UTC         |  ft   | volt  |   in   | deg F |
07/30/2022 06:00:00 | 3.09  |       | 5.37   | 50.52 |
07/30/2022 06:15:00 | 3.09  |       | 5.37   | 57.33 |
07/30/2022 06:30:00 | 3.09  |       | 5.37   | 56.2  |
07/30/2022 06:45:00 | 3.09  |       | 5.37   | 54.34 |
07/30/2022 07:00:00 | 3.09  | 12.8  | 5.37   | 54.24 |
07/30/2022 07:15:00 | 3.09  |       | 5.37   | 53.07 |
07/30/2022 07:30:00 | 3.09  |       | 5.37   | 54.74 |
07/30/2022 07:45:00 | 3.09  |       | 5.37   | 54.66 |
```

Routing Spec Demo



- Connects everything
  - *Data Source*
  - *Network List* Filters
  - *Config* Decodes
  - *Presentation Group*
  - *Output Format*
  - *Consumer*

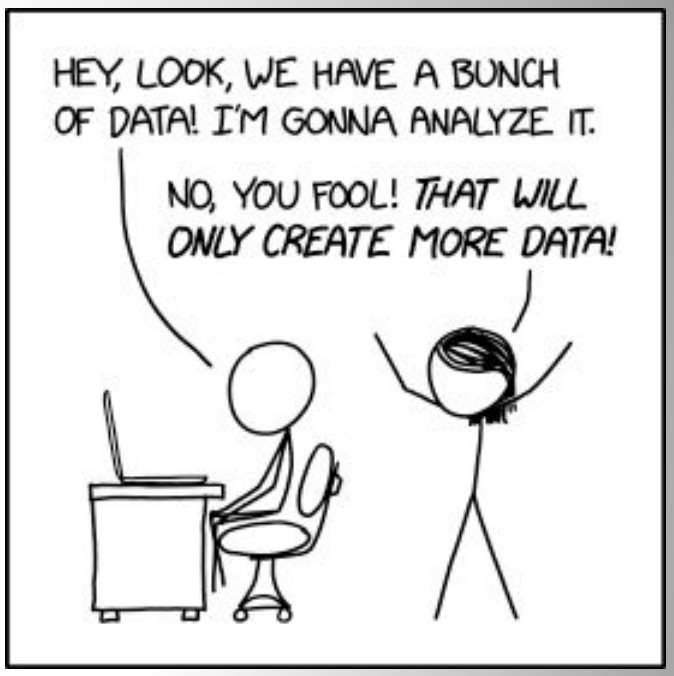


image source: XKCD, https://xkcd.com/2582/

- Run manually or automatically

Conclusion

- OpenDCS
  - Heavily used in many forms
    - Computation Processor and SQL Database storage
  - Open Source project
  - Community support and contributions welcome
  - Decoding scripts can be challenging
- Demo heavy training - hope it was useful

Questions?

- OpenDCS mailing list:
  - https://www.freelists.org/list/opendcs
- GitHub for code and issues
  - https://github.com/opendcs/opendcs
- andrew[@]precisionwre.com