McIDAS –XCD 2018.1 and Replacement Update

2018 McIDAS Users' Group Meeting

McIDAS-XCD Team

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McIDAS-XCD

McIDAS X

Conventional Data

Decoder

McIDAS-XCD files, decodes and indexes the NOAAPORT data stream into formats that can be served by McIDAS-X ADDE servers.

Output formats include McIDAS MD files, Text files, McIDAS GRID files, GRIB Version 1 and 2 files, NEXRAD files, and BUFR files.

Recent Updates to McIDAS-XCD

- Latest version is 2018.1
- WMO headers SM, SN, SI contain hourly synoptic data for locations in Europe, Japan, and Australia.
  - Previous –XCD versions allowed for only 3 and 6-hourly synoptic data, so the hourly data was being overwritten.
  - -XCD 2018.1 allows for hourly synoptic data and for McIDAS-X to serve that data
- In versions previous to –XCD 2017.2, the raw text data .XCD files were not allowed to be greater than 2^{31} bytes (~2 G), the size of a positive 4-byte FORTRAN integer.
  - This resulted in missing archived text data as the file could not grow large enough
  - Now, -XCD text files can store up to 2^{32} bytes (~4 G) of data. Typically, the daily text data size is ~2.7 G.
  - A full archive text record from November 2017 onward.

Recent Updates to McIDAS-XCD

- Large updates to the STNDB.CORE file in McIDAS-X have required updates to the –XCD system
  - -X Version 2018.1 has station updates from NCAR Research Applications Laboratory and AWIPS National Dataset Maintenance
- Additions and deletions to GRIB model datasets as they arise on NOAAPORT
  - -XCD Version 2018.1 has added the following models in GRIB2 format
    - ETSS (Extratropical Storm Surge) and PETS (Probabilistic Extratropical Storm Surge)
    - GLSW (Great Lakes Short Range Wave)
    - HREF (High Resolution Ensemble Forecast)

Replace -XCD?

- McIDAS –XCD has been reliably providing data to McIDAS-X users for many years, but has its issues behind the scenes:
  - Installation is difficult
  - Upgrades are difficult
  - System is overly complex, large learning curve for operators, and very large learning curve for new programmer
  - System was written for a mainframe then ported to UNIX
  - A powerful system is needed to run -XCD, otherwise data can be lost
  - A data format change can mean bad data, and a fix can be difficult to implement, and is only effective for future data

Goals

- Replace 4 parts of -XCD filing and decoding:
  - GRIB
  - NEXRAD
  - Text
  - POINT/MD serving
- Utilize LDM direct filing
- Reduce or eliminate compiled code
- Remove legacy mainframe complexity
- Utilize simple open-source database, SQLite
- Match or exceed current filing and serving performance on existing hardware

-XCD Replacement: GRIB Data

- RTGRIDS dataset
- LDM files GRIB messages to a temporary directory
- A GRIB daemon written in Python watches for data, extracts information and files metadata into a SQLite database
- SQLite databases are separated by model and date
- Volume of GRIB data has increased greatly over the last several years increasing the challenge

-XCD Replacement: NEXRAD Data

- RADAR, WSR and TDWR datasets
- LDM files NEXRAD files (WSR and TDWR) into a directory structure similar to the existing -XCD Decoder
- Data served by NEXRAD server

-XCD Replacement: Text Data

- RTWXTEXT dataset
- LDM files text data directly to disk
- A bash script running as a daemon watches for new data and files data into a daily *.XCD file as data comes in
- The bash script extracts metadata for insertion into a daily SQLite database
- Text servers (wxtgserv and obtgserv) query the daily SQLite databases to find data and return information to client
- Commands: WXTLIST, WWLIST, WWDISP, *RPT

-XCD Replacement: Point Data

- RTPTSRC dataset
- Uses certain text data identified by WMO headers filed in the database (e.g. SA and SP for SFCHOURLY)
- No MD files are created, but structure created on the fly when serving via ADDE
- Commands such as PTLIST, PTDISP and PTCOPY get metadata from the SQLite database, then extract data from the *.XCD file created by the text filer
- At the start of each UTC day, the replacement – XCD will create a Station table in the database based on the current STNDB.CORE

Point Data Improvements

- Replacement –XCD captures more surface hourly data than existing –XCD
- Existing –XCD: Hourly & 2 Specials

```
PTLIST RTPTSRC/SFCHOURLY SEL='ID KEKN;TIME 20;DAY 314' PARAM=DAY TIME HMS ID  T TD SPD DIR WX1 TYPE NUM=ALL
 DAY[CYD] TIME[HMS]  HMS[HMS]   ID      T[K]     TD[K]  SPD[MPS]  DIR[DEG]  WX1      TYPE
--------- --------- --------- ---- --------- --------- --------- --------- ---- ---------
  2016314    200000    195100 KEKN    280.96    279.86       4.1       310 R-F          0
  2016314    200000    203600 KEKN    281.16    280.16       5.7       310 R-F          1
  2016314    200000    203800 KEKN    281.16    280.16       4.6       310 RF           2
Number of matches found = 3
PTLIST: Done
```

- Replacement –XCD: Hourly & All Specials

```
PTLIST RTPTSRC/SFCHOURLY SEL='ID KEKN;TIME 20;DAY 314' PARAM=DAY TIME HMS ID  T TD SPD DIR WX1 TYPE NUM=ALL
 DAY[CYD] TIME[HMS]  HMS[HMS]   ID      T[K]     TD[K]  SPD[MPS]  DIR[DEG]  WX1      TYPE
--------- --------- --------- ---- --------- --------- --------- --------- ---- ---------
  2016314    200000    194700 KEKN    281.16    280.16       5.1       310 R-F          1
  2016314    200000    195100 KEKN    280.96    279.86       4.1       310 R-F          0
  2016314    200000    201600 KEKN    280.96    279.86       4.6       320 RF           1
  2016314    200000    202400 KEKN    280.96    279.86       4.6       320 RF           1
  2016314    200000    203000 KEKN    280.96    279.86       4.1       310 R+F          1
  2016314    200000    203600 KEKN    280.96    279.86       5.7       310 R-F          1
  2016314    200000    203800 KEKN    280.96    279.86       4.6       310 RF           1
Number of matches found = 7
```

Point Data Issues

- Number of hourly records of PTCOPY for SFCHOURLY data needs to be increased, but can be a variable number
  - Up to 10 specials per hour?
- Certain searches in new –XCD take longer than in –XCD 2018.1
  - SFCLIST CO=US DAY=21/MAY/2018 TIME=0 23 SEL='T[F] 60 90' takes about 2-3 seconds in –XCD 2018.1 vs 60+ seconds in the replacement –XCD due to MD files storage of temperature data versus replacement –XCD having to calculate the temperature data on the fly from the raw text data

BUFR Data (Binary Universal FoRmat)

- Filed directly using LDM
- No operational McIDAS-X server currently exists, although a prototype server was created several years ago
- Individual BUFR files can be loaded into McIDAS-V if they follow the standard BUFR tables
- We aim to be ready as BUFR implementation proceeds and intend to use the ECMWF ecCodes package that decodes BUFR editions 3 and 4.

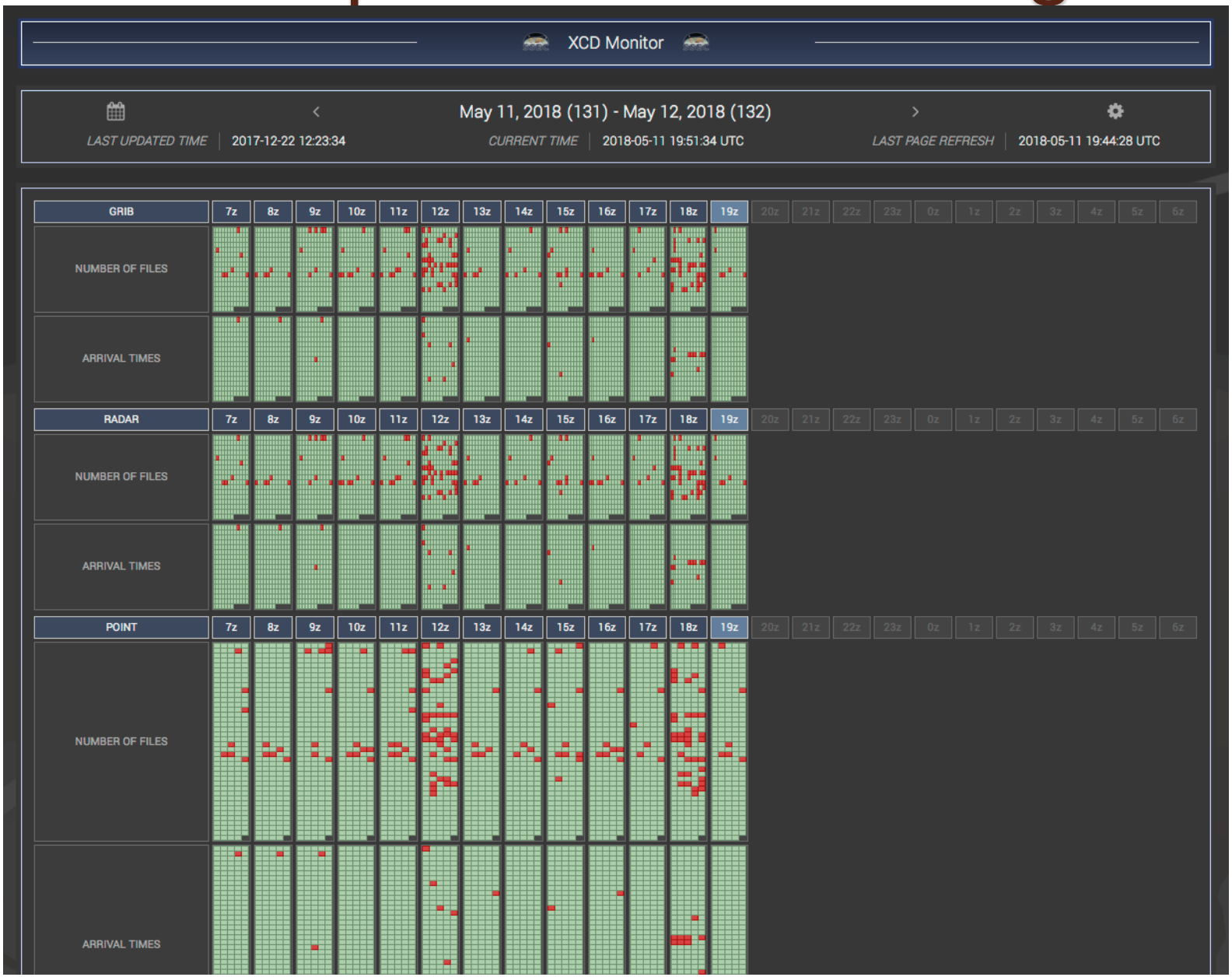
Local Data

- A couple -XCD sites have local (non-NOAAport) feeds of data
- We have contacted those sites in the past
  - So far, no core -XCD decoder dependencies are known i.e. sites have written their own decoders
- If there is local data that do depend on -XCD libraries, sites will be able to continue to use -XCD libraries, or may link to McIDAS-X libraries as needed. Contact Jerry Robaidek or Becky Schaffer if you have concerns.

-XCD Replacement Monitoring

- Command line
  - ldmadmin watch
  - gribadmin
- Graphical
  - HTML based
  - Does not require apache to be installed

-XCD Replacement Monitoring



Packaging and installation

- Existing servers and decoders (compiled code) will be migrated into McIDAS-X
- -XCD replacement beta GRIB software (python) has been packaged as a Linux container using Docker and tested on a RHEL 7 machine
- Text software (bash and python) will also be packaged as a Linux container using Docker
- Docker has the goal of simplifying the installation, running, and upgrading of the replacement –XCD components for the benefit of system administrators.

Schedule

- All ingest and serving components are in testing
  - Tested during the McIDAS-XCD 2017.2 and 2018.1 upgrade process with a RHEL 7 machine
  - Resulted in improvements in both –XCD 2018.1 and replacement -XCD
- System monitoring development continues utilizing the progress made with other SDS monitors
- Text packaging and other packaging improvements
- Beta release in 2018