McIDAS –XCD and –XCD Replacement Update

2019 McIDAS Users' Group Meeting

McIDAS-XCD Team

- Kevin Baggett, Jonathan Beavers, Dan Forrest, Jay Heinzelman, Dave Parker, Cameron Penne, Jerrold Robaidek, Becky Schaffer, Clayton Suplinski

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 2019.1
- Many station additions/updates to STNDB.CORE and accompanying MD files
- Additions/updates to RTGRIDS datasets with increased volume of GRIB data coming across NOAAPORT/CONDUIT data feeds
- Added TEMP SHIP data category, radiosonde observations from ships
  - Not many readings, but requested by Johnson Space Center
  - Mandatory levels only at this time

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

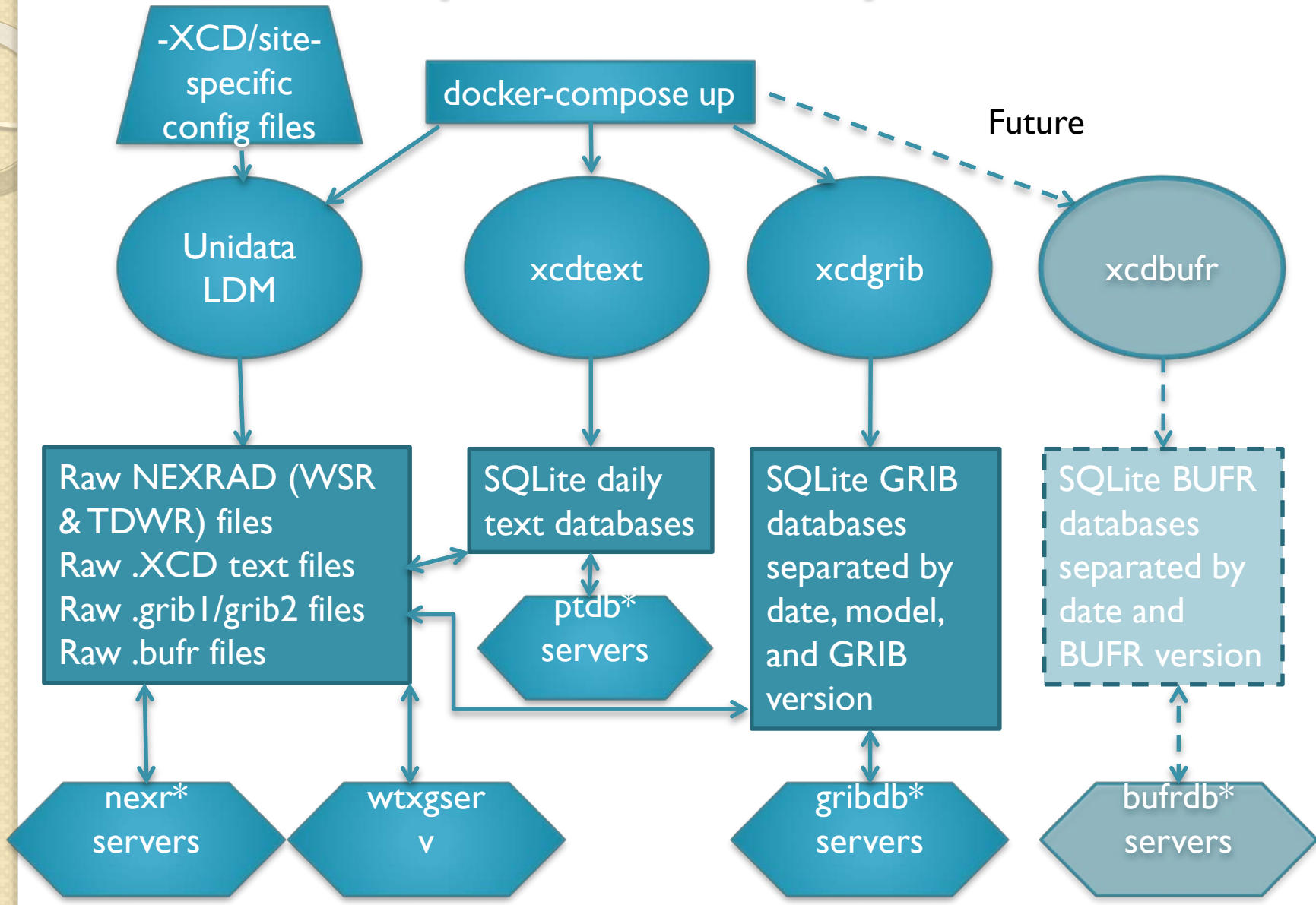
-XCD Replacement: Packaging and Installation

- Existing servers and decoders (compiled code) are to be migrated into McIDAS-X
- -XCD replacement beta GRIB and text software have been packaged as Docker containers and tested on a Linux RHEL 7 machine
- We utilize Unidata LDM that can be packaged as a Docker container as well
- Docker has the goal of simplifying the installation, running, and upgrading of the replacement –XCD components for the benefit of system administrators.

-XCD Replacement: Requirements

- Linux (RHEL 7)
- Docker (most recent version)
- docker-compose
- Unidata LDM or LDM Docker container
  - Need to modify with configuration files specific to –XCD and the site
    - pqact.conf
    - ldmd.conf
    - registry.xml

-XCD Replacement System



-XCD Replacement: GRIB Data

- RTGRIDS dataset
- LDM files GRIB messages to a temporary directory
- A Python daemon watches for GRIB data, extracts information and files metadata into a SQLite database
- SQLite databases are separated by version, model and date
- Volume of GRIB data has increased greatly to 500 GB/day over the last few years
  - A big challenge!

-XCD Replacement: NEXRAD Data

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

-XCD Replacement: Text Data

- RTWXTEXT dataset
- LDM files text data directly to disk as a daily .XCD file
- A bash daemon script watches for new data and 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 the client
- Commands: WXTLIST, WWLIST, WWDISP, *RPT

-XCD Replacement: Point Data

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

Point Data Improvements

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

```
PTLIST RTPTSRC/SFCHOURLY SEL='ID KMSN; DAY 2019255; TIME 1' PARAM=DAY TIME HMS ID T TD SPD DIR WX1 NUM=ALL
 DAY[CYD] TIME[HMS]  HMS[HMS]   ID      T[K]     TD[K]  SPD[MPS]  DIR[DEG]  WX1
--------- --------- --------- ---- --------- --------- --------- --------- ----
  2019255     10000      5300 KMSN    292.56    291.46       3.6        30 R-
  2019255     10000     12700 KMSN    292.16    291.16       4.6        10
  2019255     10000     14100 KMSN    292.16    291.16       4.1       360
Number of matches found = 3
PTLIST: Done
```

- Replacement –XCD: Hourly & All Specials

```
PTLIST RTPTSRC/SFCHOURLY SEL='ID KMSN; DAY 2019255; TIME 1' PARAM=DAY TIME HMS ID T TD SPD DIR WX1 NUM=ALL
 DAY[CYD] TIME[HMS]  HMS[HMS]   ID      T[K]     TD[K]  SPD[MPS]  DIR[DEG]  WX1
--------- --------- --------- ---- --------- --------- --------- --------- ----
  2019255     10000      4600 KMSN    292.56    290.96       3.1        40 R-
  2019255     10000      5300 KMSN    292.56    291.46       3.6        30 R-
  2019255     10000     11000 KMSN    292.56    290.96       3.6        30 TR-
  2019255     10000     12700 KMSN    292.06    290.96       4.6        10
  2019255     10000     14100 KMSN    292.06    290.96       4.1       360
Number of matches found = 5
PTLIST: Done
```

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 2019.1
  - SFCLIST CO=US DAY=21/MAY/2018 TIME=0 23 SEL='T[F] 60 90' takes about 2-3 seconds in –XCD 2019.1 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
- Using the ecCodes Python API from ECMWF, we have been able to set up a prototype BUFR Version 3 and 4 SQLite database system similar to the GRIB system with aspects of text data
- We have been able to serve BUFR data from this prototype using the PTLIST/PTDISP commands
- Not delivered with the current replacement - XCD package due to slow performance and other issues from what appears to be from the ecCodes side

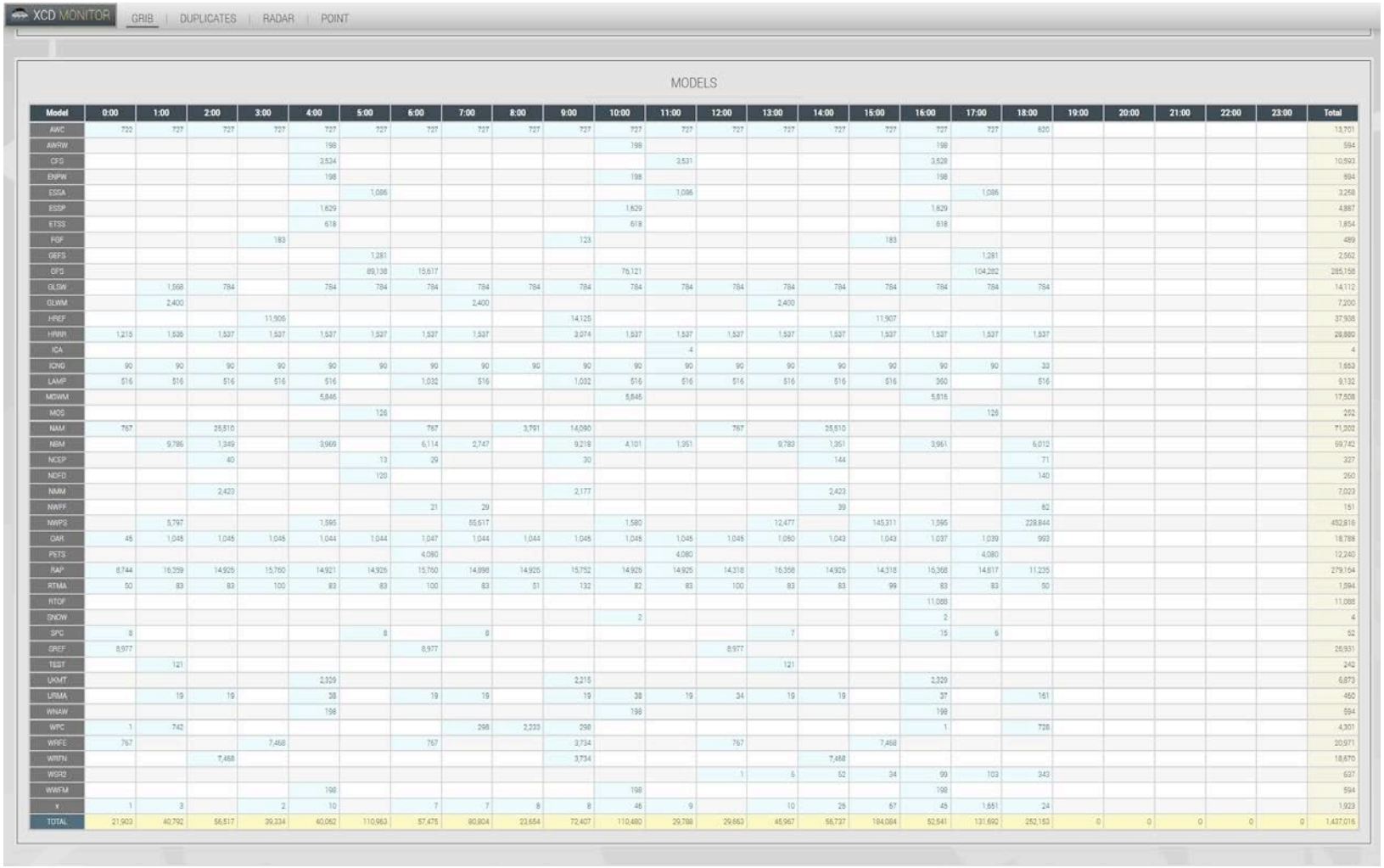
Local Data

- 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



Model	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Total
AWC	722	727	727	727	727	727	727	727	727	727	727	727	727	727	727	727	727	727	620						13,701
AWRW					198						198						198								594
CFS					3,534							3,531					3,528								10,593
ENPW					198						198						198								594
ESSA						1,086						1,086						1,086							3,258
ESSP					1,629						1,629						1,629								4,887
ETSS					618						618						618								1,854
FGF				183						123						183									489
GEFS						1,281												1,281							2,562
GFS						89,138	15,617				76,121							104,282							285,158
GLSW		1,568	784		784	784	784	784	784	784	784	784	784	784	784	784	784	784	784						14,112
GLWM		2,400						2,400						2,400											7,200
HREF				11,906						14,125						11,907									37,938
HRNR	1,215	1,536	1,537	1,537	1,537	1,537	1,537	1,537		3,074	1,537	1,537	1,537	1,537	1,537	1,537	1,537	1,537	1,537						28,880
ICA												4													4
ICNG	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	33						1,653
LAMP	516	516	516	516	516		1,032	516		1,032	516	516	516	516	516	516	360		516						9,132
MBWM					5,845						5,845						5,816								17,508
MOS						126												126							252
NAM	767		25,510				767		3,791	14,090			767		25,510										71,202
NBM		9,786	1,349		3,969		6,114	2,747		9,218	4,101	1,951		9,783	1,351		3,961		6,012					59,742
NCEP			40			13	29			30					144				71						327
NDFD						120													140						260
NMM			2,423							2,177					2,423										7,023
NWFF							21	29							39				82						151
NWPS		5,797			1,595			55,617			1,580			12,477		145,311	1,595		228,844						452,816
OAR	45	1,045	1,045	1,045	1,044	1,044	1,047	1,044	1,044	1,045	1,045	1,045	1,045	1,050	1,043	1,043	1,037	1,039	993						18,788
PETS							4,080					4,080						4,080							12,240
RAP	8,744	16,359	14,925	15,750	14,921	14,926	15,750	14,898	14,925	15,752	14,926	14,925	14,318	16,356	14,926	14,318	16,356	14,617	11,235						279,164
RTMA	50	83	83	100	83	83	100	83	51	132	82	83	100	83	83	99	83	83	50						1,094
RTOF																	11,088								11,088
SNOW											2						2								4
SPC	8					8		8						7			15	6							52
SREF	8,977						8,977						8,977												26,931
TEST		121												121											242
UKMT					2,329					2,215							2,329								6,873
URMA		19	19		38		19	19		19	38	19	34	19	19		37		161						460
WNAW					198						198						198								594
WPC	1	742						298	2,233	298							1		728						4,301
WRFE	767			7,468			767			3,734			767			7,468									20,971
WRFN			7,468							3,734					7,468										18,670
WSR2													1	5	52	34	99	103	343						637
WWFM					198						198						198								594
x	1	3		2	10		7	7	8	8	46	9		10	28	67	45	1,651	24						1,923
TOTAL	21,903	40,792	56,517	39,334	40,062	110,963	57,475	80,804	23,654	72,407	110,480	29,788	29,663	45,967	56,737	194,084	52,541	131,692	252,163	0	0	0	0	0	1,437,016

-XCD Replacement Meeting

- -XCD sites can meet with our team tomorrow at this location from 9:00 to 9:30 am
  - Sample download and installation process of beta version of –XCD replacement and the related McIDAS-X servers
  - Bring any questions you may have