McIDAS –XCD Status Update

2023 McIDAS Users' Group Meeting

McIDAS-XCD Team

- Kevin Baggett, Kaba Bah, Jonathan Beavers, Dan Forrest, Jay Heinzelman, Dave Parker, 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 2022.1- 3 annual releases since the last MUG Meeting

- 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 an optional LDM CONDUIT feed monitor

- Added support for the display of GRIB variables such as Potential Vorticity (PV), Soil Temperature (STEM), Sigma Levels (SIGM) and Entire Atmosphere (EATM) categories that had up to the point of the fixes were displaying as "duplicate" grids

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

McIDAS-XCD Beta: Packaging and Installation

- Existing servers and decoders (compiled code) have been migrated into McIDAS-X 2022.1

- McIDAS-XCD Beta GRIB and text software have been packaged as Podman containers and tested on multiple Linux RHEL 8 multiprocessor machines

- We utilize Unidata LDM that is packaged as a Docker container

- Podman/Docker has the goal of simplifying the installation, running, and upgrading of the rep McIDAS–XCD Beta components for the benefit of system administrators.

McIDAS-XCD Beta: Requirements

- Linux (RHEL 8)
- Podman (most recent version)
- Unidata LDM or LDM Docker container
  - The following LDM-specific files for McIDAS–XCD Beta are supplied with the package
    - pqact.conf
    - ldmd.conf
    - registry.xml
  - Except for a few instances, the above files can be changed to what the –XCD site needs

-XCD Replacement System
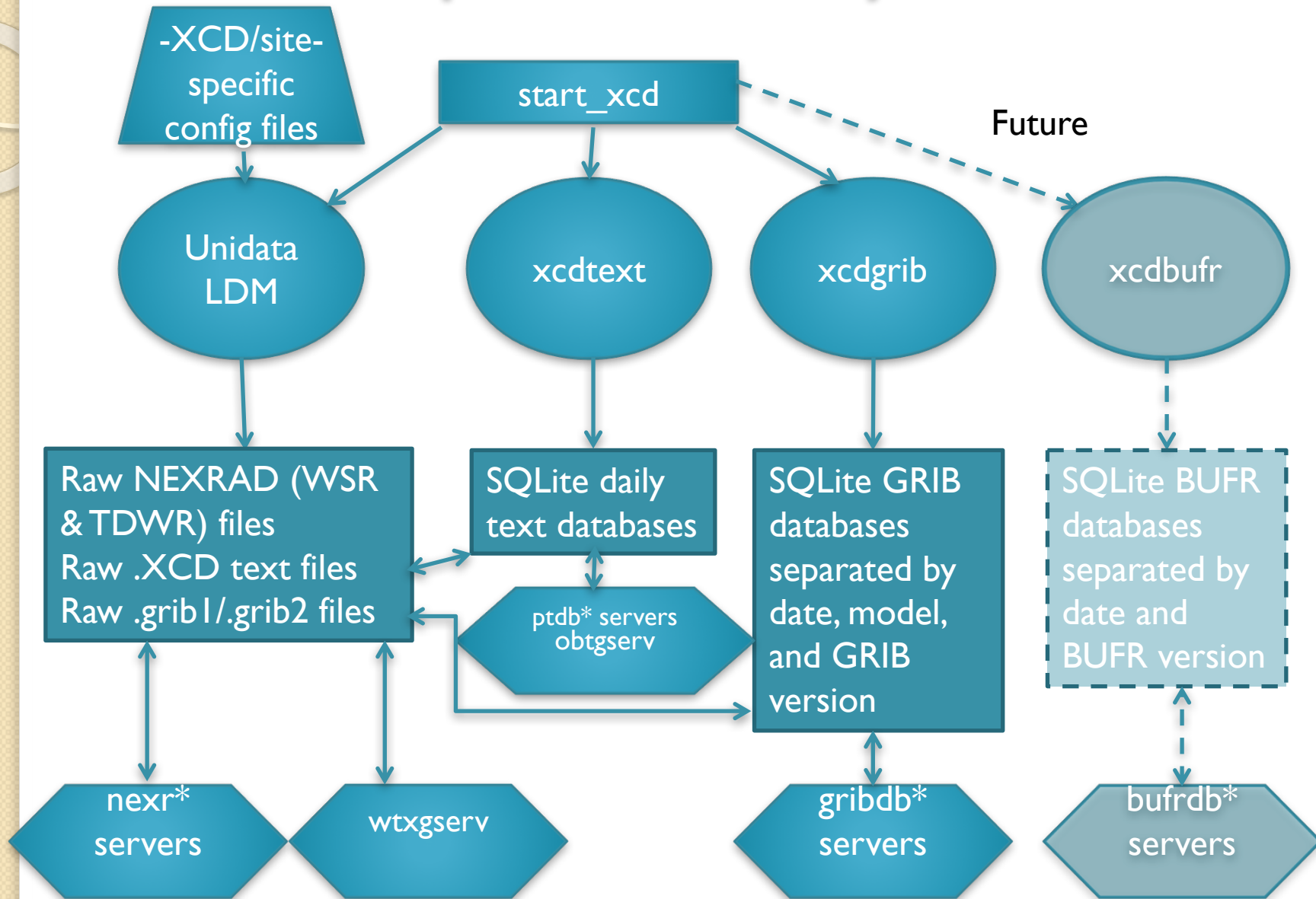
McIDAS-XCD Beta: GRIB Data

- 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 650 GB/day (with CONDUIT feed)over the last few years

McIDAS-XCD Beta: 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

McIDAS-XCD Beta: 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

McIDAS-XCD Beta: 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 daily 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

- McIDAS–XCD Beta captures more surface hourly data than existing –XCD

```
PTLIST RTPTSRC/SFCHOURLY SEL='ID KFPR; DAY 2023262; TIME 17' PARAM=DAY TIME HMS ID T
  DAY[CYD] TIME[HMS]   HMS[HMS]    ID       T[K]       TD[K]    SPD[MPS]   DIR[DEG]  WX1
 ————————— ————————— ——————————— ————— ——————————— ——————————— —————————— —————————— —————
   2023262    170000      165300 KFPR      299.26      297.56        4.6         90 TR+F
   2023262    170000      173100 KFPR      298.16      297.06        4.1         30 TR-F
   2023262    170000      171800 KFPR      298.76      298.16        4.1         70 TRF
Number of matches found = 3
PTLIST: Done
   IMA GRA Bounds Switches                                       Date        Time    T
    1    1 random                                           19 Sep 2023262 22:05:35  0
```

- Replacement –XCD: Hourly & All Specials

```
PTLIST RTPTSRC/SFCHOURLY SEL='ID KFPR; DAY 2023262; TIME 17' PARAM=DAY TIME HMS ID T
  DAY[CYD] TIME[HMS]   HMS[HMS]    ID       T[K]       TD[K]    SPD[MPS]   DIR[DEG]  WX1
 ————————— ————————— ——————————— ————— ——————————— ——————————— —————————— —————————— —————
   2023262    170000      165000 KFPR      299.16      297.16        5.1        100 TR+F
   2023262    170000      165300 KFPR      299.26      297.56        4.6         90 TR+F
   2023262    170000      170300 KFPR      298.76      297.06        4.1         70 TR+F
   2023262    170000      170800 KFPR      298.76      297.56        3.6         90 TR+F
   2023262    170000      171800 KFPR      298.76      298.16        4.1         70 TRF
   2023262    170000      173100 KFPR      298.16      297.06        4.1         30 TR-F
Number of matches found = 6
PTLIST: Done
   IMA GRA Bounds Switches                                       Date        Time    T
    1    1 random                                           19 Sep 2023262 22:02:46  0
```

Point Data Issues

- Number of hourly records of PTCOPY for SFCHOURLY data has been increased and can be a variable number up to 60 readings per hour (every minute)
  - Usually, shouldn't be more than 2 or 3 specials per hour
- Certain searches in McIDAS–XCD Beta take longer than in McIDAS–XCD 2022.1
  - SFCLIST CO=US DAY=21/MAY/2018 TIME=0 23 SEL='T[F] 60 90' takes about **2-3** seconds in –XCD 2022.1 due to MD file storage of a temperature data. This is in contrast to **20+** seconds using McIDAS-X servers for McIDAS–XCD Beta as the servers have 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 McIDAS-XCD Beta package but this will be a focus of future releases

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.

McIDAS-XCD Beta Monitoring

- Command line
  - ◦ ldmadmin watch from within the xcdldm container
- Graphical
  - ◦ HTML based
  - ◦ Does not require apache to be installed
  - ◦ Need to open a port to the McIDAS-XCD Beta Machine in order to display

McIDAS-XCD Beta Monitoring

MODELS
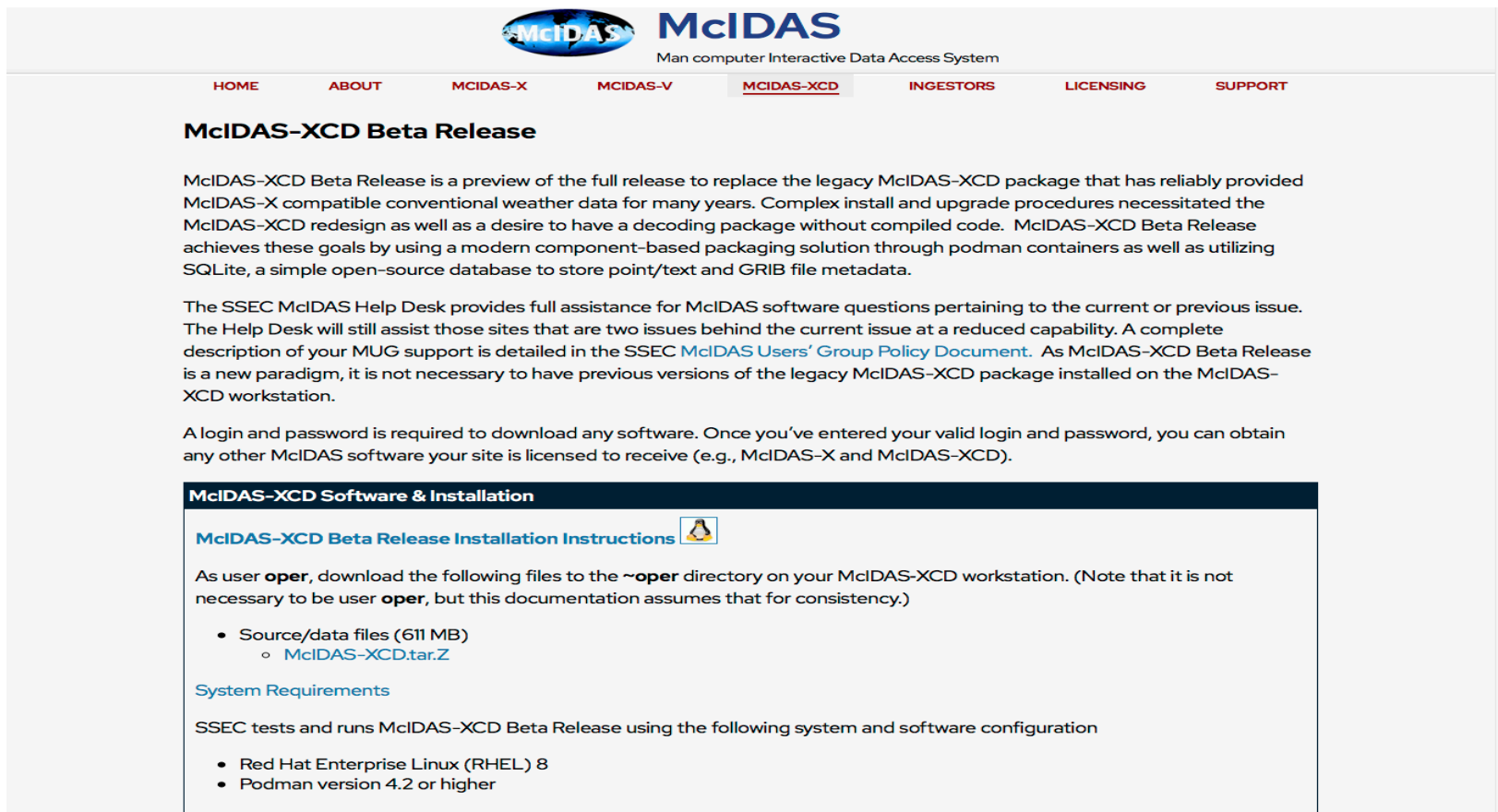
Model	Total	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00
AIRCRAFT	17,757	805	929	939	849	1,105	981	804	669	597	469	587	451	549	1,357	1,166	1,13
GFSMOS	9,287	1				2,323				3		4,634					
NAMMOS	4,056			2,021						8			1			2,021	
SFCHOURLY	395,511	18,456	18,622	18,674	18,818	21,082	18,737	19,298	25,799	23,909	35,273	32,622	19,548	19,192	17,764	12,846	12,84
SHIPBUOY	166,063	7,292	7,225	6,990	6,998	7,647	6,989	7,703	8,479	11,884	11,571	11,488	6,938	7,788	7,058	6,841	7,22
SYNOPTIC	197,889	16,467	6,595	6,752	14,064	8,303	6,861	17,348	7,710	11,568	19,314	10,256	7,407	18,716	7,183	4,250	7,63
TERMFCST	25,899	592	352	814	394	1,133	5,022	549	463	1,386	1,035	1,386	5,278	618	418	572	30
UPPERAIR	34,601	5,356	3,304	1,598	912	1,154	1,012	1,222	921	665	501	647	614	5,099	3,768	1,796	1,18
UPPERMAND	6,366	1,758	898	284	20	13	1	160	93	19		8	17	1,745	923	274	1
UPPERSIG	9,742	2,748	1,419	353	21	17	8	231	129	19		20	33	2,748	1,431	332	1
TOTAL	867,171	53,475	39,344	38,425	42,076	42,777	39,611	47,315	44,263	50,058	68,163	61,648	40,287	56,455	39,902	30,098	30,37

GRAPH - ALL POINT CATEGORIES
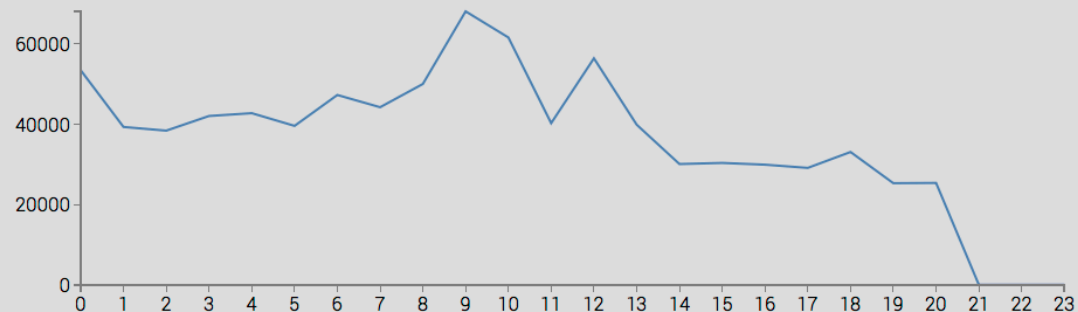
McIDAS-XCD Beta Release Webpage

- https://www.ssec.wisc.edu/mcidas/software/xcd/xcd-beta/

McIDAS-XCD Beta Meeting

- -XCD member sites can meet with our team tomorrow at this location from 9:15 to 9:45 am
  - Sample download and installation process of McIDAS–XCD Beta and the related McIDAS-X servers
  - Bring any questions you may have