McIDAS –XCD Status Update

2025 McIDAS Users' Group Meeting

McIDAS-XCD Team

- Kevin Baggett, 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 2024.1
  - 2 annual releases since the last MUG Meeting
- Updates to code so that it compiles with gfortran 10+
- Additions/updates to RTGRIDS datasets
- Improvements to add more levels to RTPTSRC UPPERMAND and UPPERSIG products
- Added new definitions of RADAR/WSR datasets to handle super resolution NEXRAD Level 3 products with improved dataset naming with input from the McIDAS-X Team

McIDAS-XCD 2024.2

- McIDAS –XCD has been reliably providing data to McIDAS-X users for many years
- The last release of the legacy system will be McIDAS-XCD 2024.2 in the coming months with some minor changes from the 2024.1 release from December.
- The replacement will be the previous McIDAS-XCD Beta, first released in 2023.
- McIDAS-XCD 2025.1, released later this year, and beyond will be the new system

Goals of McIDAS-XCD 2025.1

- 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

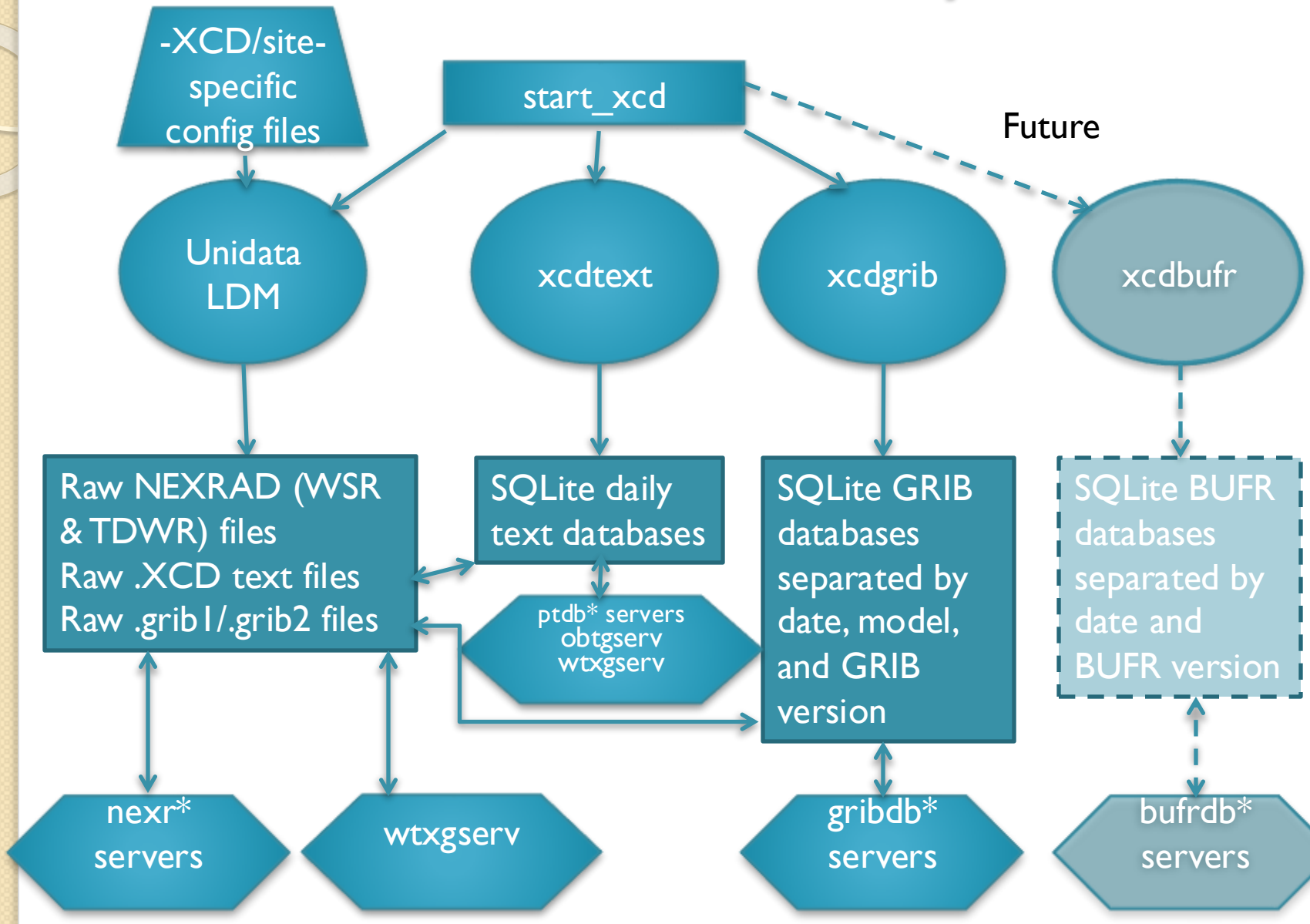
McIDAS-XCD 2025.1: Packaging and Installation

- Existing servers and decoders (compiled code) have been migrated into McIDAS-X since 2022.1
- McIDAS-XCD 2025.1 GRIB and text software have been packaged as Podman containers and tested on multiple Linux RHEL 8/9 multiprocessor/multithreaded 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 McIDAS–XCD 2025.1 components for the benefit of system administrators.

McIDAS-XCD 2025.1 Requirements

- Linux (RHEL 8 or 9)
- Podman (most recent version, currently 5.0 with RHEL 9)
- 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 McIDAS–XCD site needs

McIDAS-XCD 2025.1 System



McIDAS-XCD 2025.1: 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 SQLite databases
  - SQLite databases are separated by version, model and date
- Volume of GRIB data has increased greatly over the last few years especially with CONDUIT feed additions

McIDAS-XCD 2025.1: 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 2025.1: 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 2025.1: 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 2025.1 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
```

- McIDAS–XCD 2025.1: 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
```

Point Data Issues

- Number of hourly records of PTCOPY for SFCHOURLY data has been increased and can be a variable number up to 3600 readings per hour (every second)
  - Usually not more than 2 or 3 specials per hour
- Certain searches in McIDAS–XCD 2025.1 are known to take longer than in McIDAS–XCD 2024.1
  - SFCLIST CO=US DAY=19/May/2026 TIME=0 23 SEL='T[F] 60 90' takes about **2-3** seconds from McIDAS-X servers for McIDAS–XCD 2024.1 due to MD file storage of temperature data. This compares to **about a minute** using McIDAS-X servers for McIDAS–XCD 2025.1 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 2025.1 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 been notified of a couple core – XCD code dependencies and have migrated those code modules to a library used for McIDAS-XCD servers in McIDAS-X
- Sites will continue to be able to use the legacy -XCD libraries, or may link to McIDAS-X libraries as needed. Contact Jerry Robaidek or Becky Schaffer if you have concerns.

McIDAS-XCD 2025.1 Monitoring

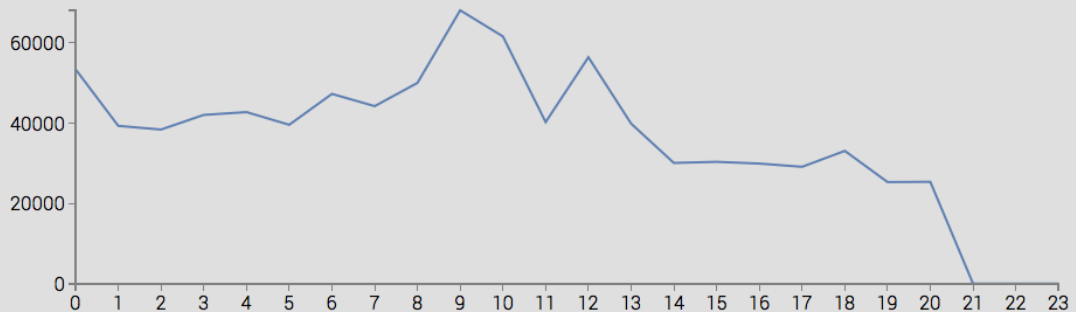
- Command line
  - ldmadmin watch from within the xcdldm container
- Graphical
  - HTML based
  - Does not require apache to be installed
  - Need to open a port to the McIDAS-XCD 2025.1 machine to display

McIDAS-XCD 2025.1 Point/Text 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 2025.1 Testing

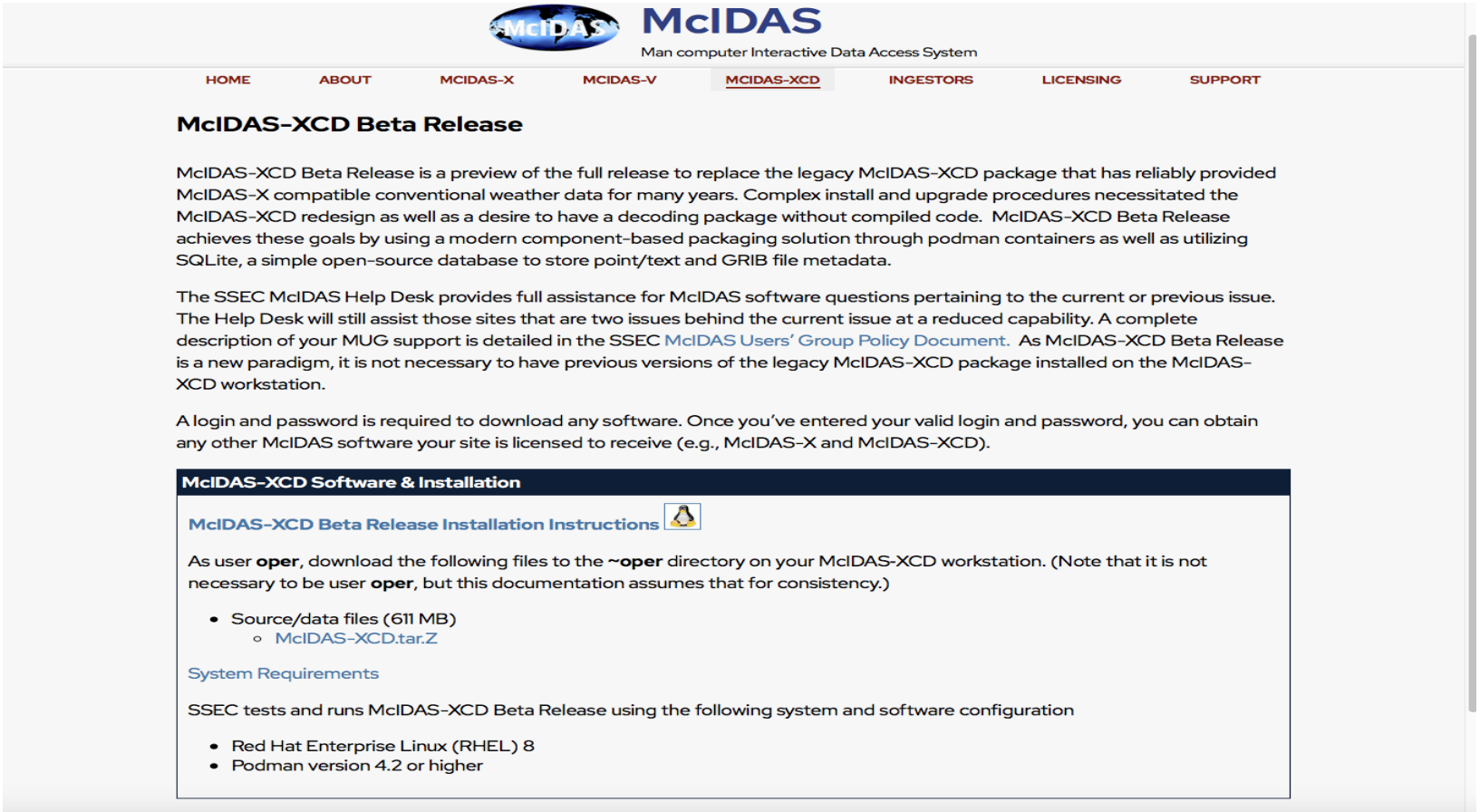
- We will be running through the McIDAS-XCD 2025.1 installation process one more time with a new machine in the coming weeks
  - Dell Poweredge 360, 16 GB RAM, 8 core/16 thread 3.2 GHz processors, 16 TB hard drive
  - RHEL 9 with Podman Version 5.0

McIDAS-XCD Issues for Discussion

- NWS has accelerated AWIPS migration to the cloud timetable to September 2026 from September 2028
  - NOAAPORT/SBN distribution commitment until that date but won't commit beyond that

McIDAS-XCD 2025.1 Webpage

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



McIDAS
Man computer Interactive Data Access System

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McIDAS-XCD Beta Release

McIDAS-XCD Beta Release is a preview of the full release to replace the legacy McIDAS-XCD package that has reliably provided McIDAS-X compatible conventional weather data for many years. Complex install and upgrade procedures necessitated the McIDAS-XCD redesign as well as a desire to have a decoding package without compiled code. McIDAS-XCD Beta Release achieves these goals by using a modern component-based packaging solution through podman containers as well as utilizing SQLite, a simple open-source database to store point/text and GRIB file metadata.

The SSEC McIDAS Help Desk provides full assistance for McIDAS software questions pertaining to the current or previous issue. The Help Desk will still assist those sites that are two issues behind the current issue at a reduced capability. A complete description of your MUG support is detailed in the SSEC McIDAS Users' Group Policy Document. As McIDAS-XCD Beta Release is a new paradigm, it is not necessary to have previous versions of the legacy McIDAS-XCD package installed on the McIDAS-XCD workstation.

A login and password is required to download any software. Once you've entered your valid login and password, you can obtain any other McIDAS software your site is licensed to receive (e.g., McIDAS-X and McIDAS-XCD).

McIDAS-XCD Software & Installation

McIDAS-XCD Beta Release Installation Instructions

As user **oper**, download the following files to the **~oper** directory on your McIDAS-XCD workstation. (Note that it is not necessary to be user **oper**, but this documentation assumes that for consistency.)

- Source/data files (611 MB)
  - McIDAS-XCD.tar.Z

System Requirements

SSEC tests and runs McIDAS-XCD Beta Release using the following system and software configuration

- Red Hat Enterprise Linux (RHEL) 8
- Podman version 4.2 or higher