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McIDAS-XCD Replacement
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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, GRID files, grib1 and grib2 files, NEXRAD files, and BUFR files.
The NOAAPORT broadcast system provides a one-way broadcast communication of NOAA environmental data and information in near-real time to NOAA and external users. This broadcast service is implemented by a commercial provider of satellite communications utilizing C-band.
The following 2 NOAAPORT channels supply data to be decoded by McIDAS-XCD:

- **NCEP/NWSTG Channel** *(NWS Telecommunications Gateway)*
  - model output from the National Centers for Environmental Prediction (NCEP)
  - observations, forecasts, watches and warnings from NWS Forecast Offices
  - WSR-88D radar products
  - most observational data over North America

- **NCEP/NWSTG2 Channel**
  - supplements the NWSTG channel
Users generally get NOAAPORT data in two ways:

1. Directly from DOMSAT (101° W)
2. Over the Internet via LDM
Why replace XCD?

- 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 (prototype done)
  - NEXRAD (prototype done)
  - Text (prototype nearing completion)
  - MD serving (prototype nearing completion)
- Utilize LDM direct filing
- Create simple interface to pqact.conf and ldmd.conf to select and edit data to be filed
- 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
GRIB Data

- LDM files GRIB messages to a temporary directory
- A GRIB daemon watches for directories, and moves it to a temporary directory name
- Another daemon watches for temporary directories and extracts information and files metadata into an SQLite DB
- One SQLite database per model per day
- See 2012 McIDAS-XCD presentation for details
NEXRAD Data

- LDM files NEXRAD files into a directory structure similar to existing XCD Decoder
- Data served by NEXRAD server
- See 2012 McIDAS-XCD presentation for details
LDM files data directly to disk
A script running as a daemon watches for new data and files data into a daily *.XCD file as data comes in
  - New -XCD:
    - A concatenation of the text from the LDM stream with no stripping out of start of text, carriage return, line feed, end of text characters
  - Current -XCD:
    - Starts with the date of the file (in binary) and a total 80-byte header
    - Padding (spaces) in the file - to make 80 character lines
    - Start of text character 0x01 and end of text character 0x03 are included, and also 80-character padded. Carriage returns/line feeds stripped out
  - Script extracts metadata to put into SQLite DB
  - Text server accesses SQLite DB to find data and return information to client
Point Data

- No MD files created, but structure created on the fly by the server
- PTLIST, PTDISP and PTCOPY get metadata from the SQLite database, then extract data from the *.XCD file created by the text filer
- Daily Station Database table included in same SQLite database file as the Daily Text Metadata table
- Station Database is retained for archived data
BUFR Data
(Binary Universal FoRmat)

- Filed directly using LDM
- No operational McIDAS-X server exists, only a prototype server
- Individual files can be loaded into McIDAS-V if they follow the standard BUFR tables
LDM pqact.cfg configuration assistant

- Allows user to select Models, stations, parameters, etc
- Web interface
- Cut and paste to pqact.cfg
# WMO expressions

WMO
```
... .... ([0-3][0-9])([0-2][0-9])
FILE /data/xcd/text/([1:yyyy])([1:ddd])/([1:yyyy])([1:ddd])0.XCD
```

WMO
```
"C... .... ([0-3][0-9])([0-2][0-9])
FILE /data/xcd/text/([1:yyyy])([1:ddd])/([1:yyyy])([1:ddd])1_2_cli.wmo
```

WMO
```
"A... .... ([0-3][0-9])([0-2][0-9])
FILE /data/xcd/text/([1:yyyy])([1:ddd])/([1:yyyy])([1:ddd])1_2_sum.wmo
```

WMO
```
"ASUSO1 .... ([0-3][0-9])([0-2][0-9])
FILE /data/xcd/text/([1:yyyy])([1:ddd])/([1:yyyy])([1:ddd])1_2_frt.wmo
```

WMO
```
"U[AB]... .... ([0-3][0-9])([0-2][0-9])
FILE /data/xcd/text/([1:yyyy])([1:ddd])/([1:yyyy])([1:ddd])1_2_pirep.wmo
```

# NEXRAD3 expressions

NEXRAD3
```
"SDUS5. .... ([0-3][0-9])([0-2][0-9])([0-6][0-9]).*/p(NCR|DSP|NVL|NOR|NGV|NOS)....
FILE /data/xcd/nexrad/5/4/([1:yyyy])([1:ddd])/2/5/([1:yyyy])([1:mm])([1:dd])_2/3.4
```

# HRS|HDS|NGRID expressions

HRS|HDS|NGRID
```
FILE /home/oper/file.sh /data/xcd/2-3.4/5/6_7_8.grib2
```
Local Data

- A couple -XCD sites have local feeds of data
- We have contacted those sites for test data
  - So far, they believe there are not any -XCD dependencies
- If there is local data that do depend on –XCD, we will add that into the existing framework
Reprocessing Data

- Script with a filename argument
- Script automatically determines data type (e.g. text, GRIB)
- Files data appropriately and updates SQLite DB
Fri Sep 6 20:23:00 UTC 2013

files to process files being processed
Grid products: 4(816K) 0(0)
Text products: 2(8.0K) 0(0)

XCD daemon statuses
Grid Active
Text Active

Last text file: SXXX03-KWAL.062022.txt (2013-09-06 20:22:58 UTC)
Performance (TEXT)

- TEXT lists
  - WXTLIST (no parameters)
    - Current -XCD: fastest=0.50 s  slowest=1.75 s
    - New -XCD: fastest=0.014 s  slowest=0.078 s
  - WXTLIST WMO=SA
    - Current -XCD: fastest=0.015 s  slowest=2.379 s
    - New -XCD: fastest=0.880 s  slowest=0.900 s
Performance (SFCRPT)

- SFCRPT
  - SFCRPT KGRB 9 (Current –XCD)
    - Fastest: ~.014s
    - Slowest: ~.983 s
  - SFCRPT KGRB 9 DAT=RTPTLITE/SFCHOURLY(New –XCD)
    - Fastest: ~.015s
    - Slowest: ~.036 s
Performance (PTLIST)

- **PTLIST**
  - **PTLIST RTPTSRC/SFCHOURLY SEL=‘DAY 2013246; TIME 12; ID KMSN’**
    - Current –XCD: fastest=.021 s slowest=.037 s
    - New –XCD: fastest=.024 s slowest=.148 s
  - **Remove ID: PTLIST RTPTLITE/SFCHOURLY SEL=‘DAY 2013246; TIME 12’**
    - New –XCD slows to: ~1.23 s
  - **Remove ID and Time: PTLIST RTPTLITE/SFCHOURLY SEL=‘DAY 2013246’**
    - New –XCD slows to: ~6.48 s
Performance (GRID)

- **GRID lists**
  - RTGRIB2/GFS-USLC2 DAY=2013246 TIME=6:00 PAR=U NUM=10
    - Current -XCD: ~0.031 s
    - New -XCD: ~0.040 s

- **GRID display**
  - RTGRIB2/GFS-USLC2 DAY=2013246 TIME=6:00 PAR=U FHOUR=12 LEV=500
    - Current -XCD: ~0.122 s
    - New -XCD: ~0.125 s

- **GRID copy**
  - RTGRIDS/NAM-USLC2 G/G.5700 DAY=2013246 TIME=0:00 PAR=T FHOUR=9 LEV=500
    - Current -XCD: ~0.074 s
    - New -XCD: ~0.078 s
Current Issues

- Dependency on existing compiled –XCD code for GRIB metadata decoding has not been eliminated
- Testing of the system with many multiple users has not been attempted thus far
- SQLite database queries and organization need to be optimized
- PTCOPY reveals MD file limitations (e.g. SFCHOURLY – 1 normal, 2 specials) when NOAA PORT datastream has more data available, including duplicates
Current Issues (continued)

- Existing text datasets do not always follow format rules, leading to some data not being decoded
- Better handling of data searches across multiple days
Prototype working – bugs and performance being addressed

Code sharing of individual pieces
- Bash scripts
- Server/decoding software
- SQLite table construction and queries

System Testing

Monitoring

Packaging

Beta release in 2014