



FFMP

Source Definitions

OB8.3.*

Tom Filiaggi : August 4, 2008

NOTE: See the Examples section – it helps understand this format quite a bit – and provides an additional tip for HPE data sources.

As of AWIPS OB8.3, FFMP Advanced allows for custom definition of data sources in FFMP. If the user wants FFMP to recognize and make use of a data source (be it QPE, QPF, or Guidance), that data source needs to be defined **properly** in the source configuration file and FFMP must be re-localized. Of course, that data also needs to be ingested into AWIPS, but that is accomplished outside of FFMP.

This document will provide guidance on how to properly define the domain settings in FFMP Advanced. Of course, editing a very format-specific file manually can very easily result in typing errors or format errors. Once time allows, we'd like to move this function into a full GUI, thus direct file editing would not be necessary. But until then, this is what we have to deal with.

FFMPsourceConfig.dat

The text file used for defining FFMP data sources is called “**FFMPsourceConfig.dat**” and is located in the **\$FXA_DATA/ffmp** directory. This file will be automatically created the first time FFMP Advanced localizes (from the old configuration file), assuming you still have the old configuration files on your system.

Define only one data source per line in this file. Use the format defined below, in the “Entry Format” section.

After you have made changes to this file, execute the following steps:

- 1) As **fxa** on **dx1**, localize for FFMP. (Note that this will delete all FFMP output data files, including any Forced FFG.
`cd /awips/fxa/data/localization/scripts`
`./mainScript.csh -ffmp`
- 2) Make sure the FFMPprocessor is running (as **fxa** on **px1**). If it was running before the localization, the localization will restart it, but if it was not running, then it will not be started.
`startFFMPprocessor`
- 3) Re-start the notificationServer as **fxa** on **dx1**:
`stopNotificationServer`
`startNotificationServer`

CWA Coverage

The very first line of the FFMPsourceConfig.dat file (flagged by the “+” character) lists the CWAs you want FFMP to ‘see’. This list should include your primary CWA and any potential Service Backup CWAs. This list should be pipe (|) delimited only. Here is an example:

```
+ |LWX|AKQ|RLX
```

Entry Format: Order!

FFMP Advanced expects the data sources listed in FFMPsourceConfig.dat to be in a certain order: QPE data sources always come before non-QPE sources and ‘Relate Key’ sources. (See the Relate Key section below for a description of what Relate Keys are.)

Entry Format: Shortcuts!

The descriptions below go into detail regarding what the format needs to be for manually created data source entries. However, for certain sources, there are short-cuts of which to take advantage, for which the FFMP Advanced localization can recognize and convert automatically for you. These sources currently include **radars** (both WSR88D and TDWR) and ‘normal’ **RFC-issued FFG**.

For radars, all you have to do is create a new text line immediately after the “+” line in this configuration file with the lower-case radar identifier, like this:

```
k.lwx
```

For RFC-issued FFG, you need to also provide the time duration, separated by a pipe (|), like this:

```
MARFC3 | 3
```

Entry Format

The following **pipe-delimited** format must be used for each data source listed in FFMPsourceConfig.dat:

```
SourceKey | IsRelKey | Durations | Types | DepictKey | DataKey | Transform | Expiration | RelKey
```

Entry Format Descriptions	
Format Item	Format Item Description
SourceKey	All upper-case text name for the Data Source of interest. If the data source represents only one duration, it can be useful to put that duration in the SourceKey. <i>Do not use spaces or special characters.</i>
IsRelKey	If this key is a Relate Key, define as “1”, otherwise, leave empty. (See discussion below regarding use of Relate Keys.)
Durations	A comma (,) delimited list of durations that are valid for the Data Source. This will depend on the

Entry Format Descriptions			
Format Item	Format Item Description		
	Type (see below), but generally speaking, this is blank for QPE sources, and will have a single entry for nonQPE sources, unless the source is a Relate Key.		
Types	This is a list of 4 sub-types used by FFMP, comma -delimited (.). The four types and value definitions are:		
	Sub-Type name	Description	Values
	Data	QPE, QPF, or Guidance	0 = QPE
			1 = Guidance
			2 = QPF
	Source	Domain: ie Radar Polar, Cartesian Lat/Lon (color in doc. coordinated with Transform below)	0 = Radar Polar grid
			1 = Radar azeq (VIL) grid
			2 = HRAP grid
			3 = LatLon Cartesian
	Unit	Accumulation vs. 'Instantaneous' rate	4 = GIS shape files
			0 = rate
	File	Type of file data is stored in.	1 = accumulation
0 = ORPG radar product			
1 = netCDF			
2 = GIS .dbf file			
DepictKey		3 = Volume Browser netCDF	
DepictKey	The Depict Key for the data source. It is likely you will need to look this up in the various depict key files that get created upon localization of AWIPS. If you add a radar, remember to use the post-localization key. If you are unfamiliar with how AWIPS and the D2D use depict and data keys, ask around on awipsinfo, or look on the FFMP webpage for more info, or (lastly) contact FFMP support. NOTE: For Volume Browser data sources, be sure to use the gridDepictKey found in \$FXA_LOCALIZATION_ROOT/\$FXA_LOCAL_SITE/gridDepictKeys.txt		
DataKey	Same as for Depict Keys (above) except for Data Keys. NOTE: For Volume Browser data sources, be sure to use the gridDataKey found in \$FXA_LOCALIZATION_ROOT/\$FXA_LOCAL_SITE/gridDepictKeys.txt or gridDataKeys.txt.		

Transform	This is a list of a number of colon -delimited (:) items that get used to transform the incoming data so that it can be assigned to small basins. The following are the elements of the Transform Format Item and what each means. (Note that some elements have meanings that depend on other configuration elements.):			
	Sub-Transform Name	Description		Values (when applicable)
	Source Type	Same as Source Type above for 'Types'		
	Units	Units of the data in the data source. This can also have a multiplier if the data stored in the Data Source is not of full units. Use an upper case X to separate units from multiplier. If this is 'byte', then a separate conversion file needs to be made available. Examine the byteConv.dat file for one of your RFC FFG sources to see an example. Basically, the following rules need to be followed: <ol style="list-style-type: none"> 1. The file is to be named byteConv.dat and placed in \$FXA_DATA/ffmp/srcA/(srcB)/lookupFiles (srcB may or may not exist, depending on the Data Type.) 2. All items in the file are delimited by a space 3. The first item in the file is the number of subsequent items in the file. 4. The subsequent items are byte value conversions. For example: the 5th item after the first item is the precipitation value to be used for a byte value of 5. 		ie: byte, in, mm/hr, inX0.1
	Domain Pairs (Western Longitudes are negative)	There are 3 Domain Pairs that have different impacts depending on the Source Type. They are used to help FFMP manage data ingest and transformations from raw data domains to the small basin domain used by FFMP internally. It is expected these transforms will evolve and improve over time. (The color coding relates to the colored Types above.)		
	Origin Pair	0 (Radar Polar Grid)	Radar lat/lon	

		1 (Radar VIL grid)	Radar lat/lon	
		2 (HRAP Grid)	Lat/lon of lower left corner (southwest) Except RFC FFG: upper left (northeast)	
		3 (Lat/lon Cartesian)	Lat/lon of lower left corner (southwest)	
		4 (GIS shape files)	Lat/lon of lower left corner (southwest)	
	Limit Pair	0 (Radar Polar Grid)	Max degrees, max radius (km)	360,240
		1 (Radar VIL grid)	Cartesian dimensions (_nx, _ny)	
		2 (HRAP Grid)	Cartesian dimensions (_nx, _ny)	
		3 (Lat/lon Cartesian)	Lat/lon of upper right corner (northeast)	
		4 (GIS shape files)	Lat/lon of upper right corner (northeast)	
	Resolution Pair	0 (Radar Polar Grid)	Degree azimuth gate, range gate(km)	1,1
		1 (Radar VIL grid)	Grid cell width (km) in x/y directions	
		2 (HRAP Grid)	Grid cell width relative to standard HRAP (~4x4km)	1,1 0.25,0.25
		3 (Lat/lon Cartesian)	Grid cell width in degrees	0.01,0.01
		4 (GIS shape files)	Not used: define as "0:0".	
	Extra	Comma delimited list, that can be blank and can be optional, depending on the factors mentioned below. Note the comma element position noted with the examples.		(blank)
		File Type = 1 or 3 (netCDF or VB netCDF)	This is the name of the attribute that holds the pertinent data in the netCDF files.	1 image pr

		File Type = 2 (GIS dbf file)	This must be two names separated by a comma. The first is the name of the basin identifier attribute and the second is the name of the data value attribute.	1,2 PFAF_ID,myQPF
		Any grid	This can also have a row- or column- (or azm- or rng-) major indication, preceded by a comma. If no –major indication is made, row/rng-major is assumed.	1,2 ,2 pr,col image,row ,row
		NOTE: “row-major” means the data is stored row-by-row and “column-major” means the data is stored column-by-column.		
Expiration	Number of minutes, after which the data is to be considered ‘too old’ to be used. This may mean the data is ignored (in the case of Unit Type of 1 (accumulation)), or the applicable time duration of the data is trimmed to this value if data time interval is bigger than this value (in the case of Unit Type of 0 (rate)). This value should of course be something greater than the data interval expected, but not too much greater so as to render the values misleading.			
RelKey	Relate Key - when defined, the Source Key is to be considered one part of the Relate Key data. See the section on Relate Keys below.			

Here are some **example entries** and what they dictate to FFMP Advanced:

`klwx||0,0,0,0|1080411808|1080411808|0:byte:36.9839:-77.0072:360:230:1:1|8|`

Source Key	<code>klwx</code>	The KLWX WSR-88D
IsRelKey		Blank = this source is not a Relate Key source
Durations		None – this source is of Unit Type 0 (see below)
Types	<code>0,0,0,0</code>	
Data	<code>0</code>	QPE
Source	<code>0</code>	Radar Polar Grid
Unit	<code>0</code>	Rate
File	<code>0</code>	ORPG Radar Product
Depict Key	<code>1080411808</code>	Unique depict key for DHR from klwx
Data Key	<code>1080411808</code>	Unique data key for DHR from klwx
Transform	<code>0:byte:36.9839:-77.0072:360:230:1:1:</code>	
SourceType	<code>0</code>	Radar Polar Grid
Units	<code>byte</code>	Data is stored as bytes and must be converted from byte values to usable data via a conversion file*.
Origin Pair	<code>36.9839:-77.0072</code>	Latitude and longitude of the radar's location
Limit Pair	<code>360:230</code>	Polar grid is 360 degrees by 230 km.
Resolution Pair	<code>1:1</code>	Azimuthal increment is 1 degree and radial increment is 1 km.
Extra		blank
Expiration	<code>8</code>	When determining the duration for which this rate data applies, if the time between the current data and the previous data is greater than this, this value will be used.
RelKey		Blank, no Relate Key in use for this source

HPE || 0,2,0,3 | 12345 | 12345 | 2:mm/hr:37.89994:-80.91356:396:360:0.25:0.25:pr | 7 |

Source Key	HPE	High-resolution Precipitation Estimator
IsRelKey		Blank = this source is not a Relate Key source
Durations		None – this source is of Unit Type 0 (see below)
Types	0,2,0,3	
Data	0	QPE
Source	2	HRAP Grid
Unit	0	Rate
File	3	netCDF, Volume Browser
Depict Key	12345	(bogus) depict key for the raw HPE data
Data Key	12345	(bogus) data key for the raw HPE data
Transform	2:mm/hr:37.89994:-80.91356:396:360:0.25:0.25:pr	
SourceType	2	HRAP Grid
Units	mm/hr	Raw data is in mm/hr (and will be converted by FFMP, if needed, into internal units)
Origin Pair	37.89994:-80.91356	Latitude and longitude of the southwest corner of the data grid.
Limit Pair	396:360	Cartesian dimensions of the grid: x = 396, y = 360
Resolution Pair	0.25:0.25	This grid is at ¼ HRAP. For each single HRAP grid cell, this data grid has 4 grid cells.
Extra	pr	The name of the netCDF attribute that contains the pertinent data in the data file is “pr”.
Expiration	7	When determining the duration for which this rate data applies, if the time between the current data and the previous data is greater than this, this value will be used.
RelKey		Blank, no Relate Key in use for this source

NOTE: For HPE, you can use the file </awips/fxa/data/localizationDataSets/XXX/localHPE.txt> as a quick reference to get the proper values for the Transform Origin and Limit pairs.

MARFC1 | 1 | 1,2,1,1 | 25050 | 25050 | 2:byte:45.0159:-79.2525:200:200:1:1:image | 1080 | RFCFFG

Source Key	MARFC1	RFC-issued FFG from the Mid-Atlantic RFC (MARFC)
IsRelKey		Blank = this source is not a Relate Key source
Durations	1	This data is in 1-hour durations already.
Types	1,2,1,1	
Data	1	Guidance data
Source	2	HRAP Grid
Unit	1	Accumulation (the data already represents a duration)
File	1	netCDF
Depict Key	25050	Unique depict key for RFC FFG from MARFC
Data Key	25050	Unique data key for RFC FFG from MARFC
Transform	2:byte:45.0159:-79.2525:200:200:1:1:image	
SourceType	2	HRAP Grid
Units	byte	Data is stored as bytes and must be converted from byte values to usable data via a conversion file*.
Origin Pair	45.0159:-79.2525	Latitude and longitude of the northwest corner of the data grid. (This is usually southwest, but not for RFC FFG.)
Limit Pair	200:200	Cartesian dimensions of the grid: x = 200, y = 200
Resolution Pair	1:1	This grid is at full HRAP.
Extra	image	The name of the netCDF attribute that contains the pertinent data in the data file is "image".
Expiration	1080	If the Data from this source is older than the defined time (in minutes), it will not be used.
RelKey	RFCFFG	This source is to be considered a part of the Relate Key "RFCFFG". It is expected that other sources are also of the Relate Key RFCFFG and that these will be combined in some fashion. See the Relate Key section below.

RFCFFG|1|1,3,6|1,2,1,1|0|0|999::0:0:0:0:0:0:0:0:0|0|

Source Key	RFCFFG	This is the RFCFFG Source Key.
IsRelKey	1	This is a Relate Key entry!
Durations	1,3,6	These are the durations available for this Source Key (1, 3, and 6 hours durations)
Types	1,2,1,1	
Data	1	Guidance data
Source	2	HRAP Grid
Unit	1	Accumulation (the data already represents a duration)
File	1	netCDF
Depict Key	0	No Depict Key is necessary for Relate Keys.
Data Key	0	No Data Key is necessary for Relate Keys.
Transform	999::0:0:0:0:0:0:0:0:0	
SourceType	999	Void Type value – Relate Keys do not make use of this.
Units		Blank – no units for Relate Keys .
Origin Pair	0:0	Relate Keys do not use Transform pairs.
Limit Pair	0:0	Relate Keys do not use Transform pairs.
Resolution Pair	0:0	Relate Keys do not use Transform pairs.
Extra		Blank – Relate Keys do not make use of this.
Expiration	0	Data expiration does not apply to Relate Keys .
RelKey		Blank – Relate Keys cannot use other Relate Keys.

gisqpe|||0,4,0,2|18313|18313|4:in/hr:37.89:-80.91:42.23:-72.78:0:0:PFAF_ID,QPE|10|

Source Key	gisqpe	An ESRI GIS shapefile QPE source
IsRelKey		Blank = this source is not a Relate Key source
Durations		None – this source is of Unit Type 0 (see below)
Types	0,4,0,2	
Data	0	QPE
Source	4	GIS shape files
Unit	0	Rate
File	2	GIS .dbf file
Depict Key	18313	(bogus) depict key for the raw gisqpe data
Data Key	18313	(bogus) data key for the raw gisqpe data
Transform	4:in/hr:37.89:-80.91:42.23:-72.78:0:0:PFAF_ID,QPE	
SourceType	4	GIS shape files
Units	in/hr	Raw data is in in/hr (and will be converted by FFMP, if needed, into internal units)
Origin Pair	37.89:-80.91	Latitude and longitude of the southwest corner of a rectangular bounding domain of the shapes contained in the dbf file.
Limit Pair	42.23:-72.78	Latitude and longitude of the northeast corner of a rectangular bounding domain of the shapes contained in the dbf file.
Resolution Pair	0:0	Not used for shape file data sources.
Extra	PFAF_ID,QPE	The name of the small basin identifier attribute is “PFAF_ID” and the name of the data value attribute is “QPE”.
Expiration	10	If the Data from this source is older than the defined time (in minutes), it will not be used.
RelKey		Blank, no Relate Key in use for this source

Relate Keys

Some data sources can be combined inside FFMP Advanced and considered to be a single source. The best example is RFC FFG. RFC-issued Flash Flood Guidance (FFG) comes from multiple River Forecast Centers (RFCs), yet FFMP considers them as a single source of Guidance data. For example: the LWX CWA requires FFG from 3 RFCs (MARFC, SERFC, OHRFC), so, each of the configuration entries for these 3 RFCs will define a Relate Key to use, then that Relate Key will have a separate entry itself.

RFC-issued FFG also comes in various durations (1-, 3-, 6-hour). Because of the ways that AWIPS handles data, each of these durations also needs a separate configuration entry in FFMP Advanced, but can still use the same Relate Key in order to instruct FFMP that all of this data is to be considered one source, with multiple durations available for use. Examine your FFMPsourceConfig.dat file – FFMP Advanced will automatically handle the construction of configuration entries for RFC FFG for you when it first localizes.

Relate Key usage tells FFMP Advanced to ‘combine’. Combining multiple durations makes intuitive sense, but combining multiple geographic regions can be complex. For FFMP Advanced’s initial release, any geographic combinations will be a simple overlay – the most recent data to be ingested will be overlaid on top of whatever data is already in memory. For RFC FFGs, there is no down side, as, even though their grids overlap, the data they provide in those grids does not overlap. If you wanted to use a Relate Key to combine the data from all of your dedicated radars, the geographic combination will still be a simple overlay, which, as I am sure you can see, can be a bad mosaic method for certain radar combinations. It is expected that FFMP Advanced’s mosaicking methods will mature as time goes on.

It is expected that the use of Relate Keys will be very limited. If you’d like to use Relate Keys, and are not sure how to apply them (or if they even apply at all), you can check the FFMP webpage for more info or contact Tom.Filiaggi@noaa.gov (303 497-6578).