Flash-Flood Guidance for Countries/Areas

(Gridded FFG)

FFH and Gridded FFG share many common features. Please see the document for both programs: Common Features Shared by FFH and Gridded FFG

1. Description of Algorithm

https://vlab.ncep.noaa.gov/documents/207461/1893022/291_oper.pdf

2. Utility Parameters

Gridded FFG uses an xml representation of model parameters where each parameter is captured within a separate xml tag. The tags are closely related to the NWSRFS definition of Gridded FFG defined at

https://vlab.ncep.noaa.gov/documents/207461/1893022/533ffg.pdf

The table below shows the available parameter tags. For the parameters with type of string, the values are case-insensitive. For example, "YES" and "Yes" are treated by the program as the same value, but "Y" will be treated as error. The sequence of parameters in the table below or in the xml file has no any significance.

1) Common Features Shared by FFH and Gridded FFG

2) Gridded FFG specific parameters:

Name	Type	Required [Yes/No]	Comment
FFG_BASIN_BOUNDARY_ID	String	Yes	Basin Boundary Identifier. Metadata. Not used by model computation.
FFG_OVERBANK_FACTOR	Double [Inch]	No	Overbank factor – default is 1.10
FFG_USER_CTRL_GBANK_FACTOR	Double [Inch]	Yes	When FFG_OVERBANK_FACTOR is less than 0.6 or greater than 1.5, use FFG_USER_CTRL_GBANK_FACTOR instead.
FFG_THRESHOLD_RUNOFF_1_HOUR FFG_THRESHOLD_RUNOFF_3_HOUR FFG_THRESHOLD_RUNOFF_6_HOUR FFG_THRESHOLD_RUNOFF_12_HOUR FFG_THRESHOLD_RUNOFF_24_HOUR	Table [Inch]	Yes	One or more row with four columns: HRAP_ROW with int values FIRST_HRAP_COLUMN with int values LAST_HRAP_COLUMN with int values and

			THRESHOLD_RUNOFF_VALUE_IN_INCHES with double values.

3. Utility States

Please see: Common Features Shared by FFH and Gridded FFG

4. Utility Time Series

Please see: Common Features Shared by FFH and Gridded FFG

5. Notes about configuring Utility in FEWS workflow

Gridded FFG in FEWS uses the following FEWS configuration files

Workflow Configurations	
Configuration File	**Description**
GriddedFFG_Forecast.xml	Used to run N GriddedFFG modules (where N represents the number of basins) and one module named "GriddedFFGResult"
GriddedFFGToScalar.xml	A workflow used to run GriddedFFGToScalarAverage, and/or GriddedFFGToScalarMinimum, and/or GriddedFFGToScalarFixed
Module Configurations	
Configuration File	**Description**
GriddedFFG_*.xml	1 to N module configurations (where N represents the number of basins) used to execute the Gridded FFG algorithm
GriddedFFGResult.xml	A "simple" FEWS transformation to copy the last grid created by GriddedFFG_* configuration into a grid named GriddedFFGResult
GriddedFFGToScalarAverage.xml	A FEWS transformation module configuration used to compute an average FFG over an area. It uses the result of GriddedFFGResult.xml and a shapefile of the area/zone boundaries as input
GriddedFFGToScalarMinimum.xml	A fixed FEWS transformation module config file used to compute the minimum FFG over an area using an FFG grid
GriddedFFGToScalarFixed.xml*	N transformations for locations (where N is a subset of FFG area ids) defining FFG using fixed values
Region Configurations	
Configuration File	**Description**

WorkflowDescriptors.xml	Used to provide a description of the workflows listed above
ModuleInstanceDescriptors.xml	Used to provide a description of modules listed above
ModuleInstanceSets.xml	Used to define a set of modules used to compute a scalar value from a grid (GriddedFFGToScalarAverage, GriddedFFGToScalarMinimum, and GriddedFFGToScalarFixed)
LocationSets.xml	Used to define 4 new location sets • FFG_AREAS • FFG_AVERAGE, • FFG_MINIMUM, • FFG_FIXED
Locations.xml	1 Fixed location (named FFG) and N varying locations (based on the number of FFG area ids) – note if the location already exist, no need to add it
Parameters.xml	Used to add "FFG" type
Cold State Configurations*	
FFG netcdf template (xxrfc_template.nc)	An netcdf file containing predefined static values (e.g. x and y coordinates, durations, etc..). All the FFG values are initially set to MISSING
Module Parameter Configurations	
GriddedFFG_*_*_Forecast.xml	1 to N (where N represents the number of basins) parameter configurations containing the parameter information for each basin
Display Configurations	
SpatialDisplay.xml	1 new gridPlotGroup consisting of 2 gridPlots; 1 to show the RFC FFG grid and 1 to show the RFC FFG average values; Note: the only thing that varies is the RFC name; 3 or 5 new esriAsciiGridLayer elements under the <geoMap> element to show the 1, 3, 6, 12, and 24 hour THRESH R grid
Polygons.xml**	1 new <esriShapeFile> element that maps N locations (based on the FFG area ids) to a counties shapefile
Grids.xml	Used to define the FFG grid projection parameters

*Only the first basin in the RFC has cold state configuration. It contains a template NetCDF file with the RFC grids and with FFG values being missing values in all pixels. The model will copy this blank NetCDF file to output/outputs.nc file and inserted all the calculated FFG values into the basin's pixels.

```
- <exportStateActivity>
  <moduleInstanceId>GriddedFFG</moduleInstanceId>
  <stateExportDir>%ROOT_DIR%/states</stateExportDir>
 <stateConfigFile>%ROOT_DIR%/states/statesGriddedFFG.xml</stateConfigFile>
- <stateLocations type="file">
- <stateLocation>
  <readLocation>MBRFC_template.nc</readLocation>
  <writeLocation>outputs.nc</writeLocation>
    </stateLocation>
    </stateLocations>
- <stateSelection>

- <exportRunFileActivity>
  <exportFile>%ROOT_DIR%/run_info.xml</exportFile>
- <properties>
  <int key="printDebugInfo" value="0" />
  <string key="ffgParameters" value="%ROOT_DIR%/input/paramsGriddedFFG.xml" />
  <string key="griddedFfgStates"
    value="%ROOT_DIR%/states/statesGriddedFFG.xml"/>
```

For the other basins, not the first basin in RFC, there will not be cold state configuration. There will be an input NetCDF file located in input directory. The NetCDF file contains some FFG values inserted by previous basins' model computation.

```
- <exportNetcdfActivity>
  <exportFile>inputFFG.nc</exportFile>
- <timeSeriesSets>
- <timeSeriesSet>
  <moduleInstanceId>GRIDDEDFFG_ZLPP1_ZLPP1_Forecast</moduleInstanceId>
  <valueType>grid</valueType>
  <parameterId>FFG</parameterId>
  <locationId>FFG</locationId>
  <timeSeriesType>temporary</timeSeriesType>
  <timeStep unit="nonequidistant" />
  <relativeViewPeriod unit="hour" start="0" end="24" />
  <readWriteMode>read only</readWriteMode>
    </timeSeriesSet>
    </timeSeriesSets>
  <omitMissingValues>false</omitMissingValues>
  <omitEmptyTimeSeries>false</omitEmptyTimeSeries>
    </exportNetcdfActivity>
```

So, in the basin's run_info.xml file, there will be inputNetcdfFile element, due to exportNetcdfActivity. In its properties section, there will not be griddedFfgStates element.

Please see: Common Features Shared by FFH and Gridded FFG

Examples:
Configuration Files:

1)BLM1S(first basin in MBRFC):
ConfigFiles\GRIDDEDFFG_BLMN1S_101_Forecast.xml

2)ZONI3(not first basin in RFC):
ConfigFiles\GRIDDEDFFG_ZONI3_ZONI3_Forecast.xml

Parameter File
ParameterFiles\GRIDDEDFFG_ZONI3_ZONI3_UpdateStates.xml

6. FEWS Adapter Used

The FFH utility uses the OHDFewsadapter to communicate. Information about this adapter can be found at OHDFewsadapter.