

Digital Terrain Elevation Data (DTED) Reader/Writer

FORMAT NOTES:

This format is not supported by FME Base Edition.

DTED DEM Quick Facts

Format Type Identifier	DTED
Reader/Writer	Both
Licensing Level	Professional
Dependencies	None
Dataset Type	File or Directory
Feature Type	Feature role
Typical File Extensions	.dt0, .dt1, .dt2
Automated Translation Support	Yes
User-Defined Attributes	Through TAB files
Coordinate System Support	Yes
Generic Color Support	No
Spatial Index	Never
Schema Required	No
Transaction Support	No
Geometry Type	dted_type

Geometry Support			
Geometry	Supported?	Geometry	Supported?
aggregate	no	point	yes
circles	no	polygon	no
circular arc	no	raster	no
donut polygon	no	solid	no
elliptical arc	no	surface	no
ellipses	no	text	no
line	no	z values	no
none	no	grid	yes

Band Interpretations	Int16
Palette Key Interpretations	not applicable
Palette Value Interpretations	not applicable
Interleave Type	not applicable

Nodata Value	-32767
Cell Origin	0.5
Multi-Band	No
Multi-Palette	No
World File Support	No
TAB File Support	Yes

Overview

The Digital Terrain Elevation Data (DTED) Digital Elevation Map (DEM) Reader module provides the Feature Manipulation Engine (FME) with access to data in the DTED format. This format is documented in the U.S. military standard MIL-PRF-89020B.

DTED is a continuous numeric raster format whose data is stored in two byte signed integers. The value -32767 is considered to be "no data".

More information on the DTED format can be found on the NIMA website at:

<http://www.nga.mil/ast/fm/acq/89020B.pdf>

Reader Overview

FME considers a single DTED file, or a directory containing a list of DTED files, to be a dataset. DTED files are raster files containing elevation data. Each elevation sample in each file is translated to a three-dimensional (3D) FME point feature or translated into a single raster feature.

Reader Directives

The suffixes shown are prefixed by the current `<ReaderKeyword>` in a mapping file. By default, the `<ReaderKeyword>` for the DTED reader is `DTED`.

DATASET

Required/Optional: *Required*

This is the name of a directory containing one or more DTED files. They normally have an extension like `.dt0`, `.dt1` or `.dt2` depending on the DTED level.

Workbench Parameter: [<WorkbenchParameter>](#)

Example:

```
DTED_DATASET D:\DATA\DTED
```

IDs

This optional specification is used to limit the available and defined DTED files read. If no IDs are specified, then all available DTED files are read.

The syntax of the IDs keyword is:

```
> <ReaderKeyword>_IDs <baseName1> \
> <baseName2> ... \
```

> <baseNameN>

The example below selects only the W118N033.DT1 file for input during a translation:

```
DTED_IDS W118N033
```

[Workbench Parameter: <WorkbenchParameter>](#)

DEM_SAMPLE

DTED files can produce a lot of point features. A standard level 1 DTED file contains 1201 x 1201, or over 1.4 million features. Sometimes, it is desirable to extract only a subsample of the features, while maintaining a regular grid pattern of points. The `DEM_SAMPLE` keyword is used to specify a decimation factor that is applied in the horizontal and vertical directions.

A `DEM_SAMPLE` value of 3, for instance, results in only one in three points in the horizontal and vertical directions being returned from the reader, resulting in an 8/9^{ths} reduction in the total number of features.

Example:

```
DTED_DEM_SAMPLE 3
```

Default: 1 (no decimation)

[Workbench Parameter: <WorkbenchParameter>](#)

AS_DEMRASTER

Required/Optional: *Optional*

DTED files can be interpreted by FME as a group of associated point features or as a single raster feature. The `AS_DEMRASTER` keyword is used to specify which way FME will handle the raster. Raster files can be translated much more efficiently as raster features than as many point features.

An `AS_DEMRASTER` value of `no`, for instance, results in the handling of elevation values in a raster file as individual point features. A value of `yes`, conversely, results in the handling of each raster file as a single raster feature.

Example:

```
DTED_AS_DEMRASTER yes
```

Value: *yes (read as raster) | no (read as points)*

Default: *yes (read as an FME raster feature)*

[Workbench Parameter: <WorkbenchParameter>](#)

GROUP_BY_DATASET

Required/Optional: *Required*

The value for this directive is either Yes or No. When the value is set to No, the only feature type this reader will use is the reader type name, which in this case is DTED.

When the value is set to Yes, the feature type of each dataset is the filename (without the path or the extension) of the dataset. The default value for this directive is No.

An example of the `GROUP_BY_DATASET` keyword in use is:

```
GROUP_BY_DATASET "Yes"
```

Writer Overview

FME will write a set of point features or a set of raster features to one or more DTED cell files in a directory (the `DATASET`). The directory need not exist before the translation occurs. Any old files in the directory may be overwritten with the new feature data without warning. New cell files are created as needed depending on the locations of point features received by the writer.

The `LEVEL` (resolution), and various other metadata for the output files can be controlled with mapping file keywords.

If `AS_DEMRASTER` is 0, the Z coordinate of each point feature received by the writer will be applied to a single pixel in an output cell. Otherwise, the Z values at each point in the raster will each be applied to a single pixel in an output cell. Before finishing, the writer can optionally fill in missing values in the output file by inverse distance weighted interpolation.

Note that the DTED writer assumes that all incoming points and raster are in the LL-84 (lat/longWGS84) coordinate system. If this is not the case, the results will be inaccurate.

Writer Directives

The suffixes shown are prefixed by the current `<WriterKeyword>` in a mapping file. By default, the `<WriterKeyword>` for the DTED writer is `DTED`.

DATASET

Required/Optional: *Required*

The name of a directory into which the DTED files should be written. See `DIR_STRUCTURE` for more details on directory and file naming.

Example:

```
DTED_DATASET D:\OUTPUT\DTED
```

Workbench Parameter: [<WorkbenchParameter>](#)

LEVEL

Required/Optional: *Optional*

The product level to use. Near the Equator, products have the following resolutions for a one-degree square cell:

- Level 0: 121x121 (30 arc second postings)

- Level 1: 1201x1201 (3 arc second postings)
- Level 2: 3601x3601 (1 arc second postings)
- Auto: If the source format is DTED, "Auto" will use the resolution level of the source data. If the source format is not DTED, "Auto" sets the default resolution to "1" .

The resolution in latitude is reduced for cells near the North and South Poles.

Range: 0 | 1 | 2 | *Auto*

Default: *Auto*

Example:

```
DTED_LEVEL 0
```

Workbench Parameter: Resolution Level

DIR_STRUCTURE

Required/Optional: *Optional*

If set to *YES*, this keyword will create subdirectory structure with tiles stored in subdirectories by longitude with files named by latitude. If set to *NO*, this keyword will create files with no subdirectory naming structure.

For example, if the output is specified by data written to the 1 degree square at 80 degrees west, and 43 degrees north, with the option set to *NO* and *DATASET* is *C:\Output\Data*, the output would be a file written out to *C:\Output\Data\w080n043.dt1*. If the option is set to *YES*, the output would be written out to *C:\Output\Data\w80\n43.dt1*. By default, the value is set to *YES*, as this is the convention according to the specification.

Default: *YES*

Example:

```
DTED_DIR_STRUCTURE YES
```

[Workbench Parameter: <WorkbenchParameter>](#)

VERTACCURACY

Required/Optional: *Optional*

This keyword may be used to set the absolute vertical accuracy (User Header Label [UHL] record, characters 29 to 33) with 90% assurance that the linear errors will not exceed this value relative to mean sea level. Valid values are integral numbers in the range 0000-9999 with leading zeros. By default, the value *NA* is used indicating the vertical accuracy information is not available.

Default: *NA (not available)*

Example:

```
DTED_VERTACCURACY 0200
```

[Workbench Parameter: <WorkbenchParameter>](#)

SECURITYCODE

Required/Optional: *Optional*

This keyword may be used to set the security classification code field in the Data Set Identification (DSI) record (character 4). The default value is U (Unclassified) but any of the following values may be used:

- T – Top Secret
- S – Secret
- C – Confidential
- U – Unclassified
- R – Restricted

Default: *U (unclassified)*

Example:

```
DTED_SECURITYCODE R
```

[Workbench Parameter: <WorkbenchParameter>](#)

PRODUCER

Required/Optional: *Optional*

This keyword may be used to set the producer agency code (DSI record, characters 103 to 110) for the generated cells. The first two characters should be the DIA country code followed by additional code information provided by the national defense mapping agency.

Default: *blank*

Example:

```
DTED_PRODUCER US090078
```

[Workbench Parameter: <WorkbenchParameter>](#)

COMPILATION_DATE

Required/Optional: *Optional*

This keyword may be used to set the compilation date (DSI record, characters 160 to 163). This date should be the most descriptive date in YYMM format. Defaults to blank, indicating it is unknown.

Example:

```
DTED_COMPILATION_DATE 9609
```

[Workbench Parameter: <WorkbenchParameter>](#)

FME Raster Features

FME raster features represent raster data and use several concepts that are unlike those used in the handling of vector data. See *About FME Rasters* on page 13.

Feature Representation

In addition to the generic FME feature attributes that FME Workbench adds to all features (see *About Feature Attributes* on page 7), this format adds the format-specific attributes described in this section.

Features read from DTED are either 3D points with a feature type of `Elevation`, or 3D rasters with a feature type of `Elevation_raster`. Both types have a coordinate system of LL84 (WGS 84 Geographic coordinates). The DTED writer will write any features with an FME coordinate system that specifies a Latitude Longitude projection and a WGS 84 Geographic datum. These include LL84, LL-WGS84 and WPLL84.

DTED raster features specify a matrix of x , y , and z coordinates.

Attribute Name	Contents
<code>dted_type</code>	This will be set to <code>dted_point</code> or <code>dted_raster</code> depending on the value(s) of <code>AS_DEMRASTER</code> .
<code>dted_raster_filename</code>	This is a string that specifies a destination filename without the extension. It is used in other raster format writers as the basename of the destination file, when writing multiple files. If only one file is written, the destination dataset is used. The DTED writer does not use this attribute because it is a directory writer.
<code>dted_fill_distance</code>	<p>This is a non-negative integer that is used to fill unassigned pixels in output DTED files before flushing them to disk. The value is used to control how far values will be propagated by the fill algorithm. The distance is measured in pixels in the output file.</p> <p>The default value at the feature type level is 1. The maximum value is 16. A value of 0 may be used to disable use of the fill algorithm entirely. Larger values will slow processing substantially due to the nature of the fill algorithm. Pixels assigned values by the fill algorithm are assigned values based on the weighted average of the pixels within the bounding box defined by the fill distance centered on the empty pixel. The weighting is based on inverse square of the distance from the center.</p> <p>Pixels that are not assigned values by points sent to the writer or by the fill algorithm are assigned a "no data" value of -32767 as is defined in the DTED standard.</p>

