# FME's Curvefitter Transformer for File Size Reduction and Line Smoothing
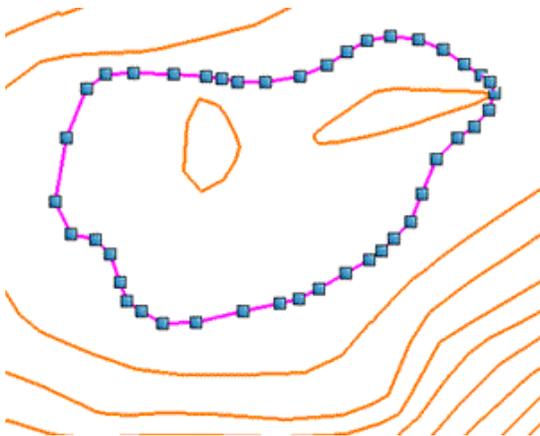
## Key Facts

*Feature:* FME Curvefitter Transformer

*Capabilities:* Smart linear optimization technology for line smoothing

*Benefits:* More visually appealing maps and reduced CAD/GIS file sizes

---

FME's Curvefitter transformer provides smart linear optimization technology that dramatically reduces CAD and GIS file sizes and creates more visually appealing maps by replacing jagged polylines with smooth, curving lines. When applied to datasets containing complex, convoluted map features, Curvefitter can reduce file sizes by up to 80%.



Applicable to all FME-supported formats that store arcs, Curvefitter combines linework processing technology made available by [TCI Software](#) of Oregon, USA, with the powerful data restructuring capability of FME's spatial ETL platform.

Curvefitter does not simplify data, but changes the data structure to conserve accuracy and content while reducing storage requirements. This unparalleled data transformation capability makes FME the only product available for processing area features with shared boundaries, in addition to simple line features.

*Figure: Curvefitter reduces reducing storage requirements by replacing multiple line segments with arc paths*

**Note:** Not all systems that are able to store arcs can process them efficiently, so users should ensure their complete workflows are capable of dealing with arcs before doing wholesale migration.

## Curvefitter Applications and Functionality

With FME 2007, you can take advantage of Curvefitter capability to:

- Reduce file sizes by up to 80%
- Smooth jagged polylines
- Process adjacent area features
- Recreate arcs in legacy data
- Automatically process data

## File Size Reduction through Smart Linear Optimization

Maps created in many CAD and GIS applications represent curved map features as a series of line segments. This proliferation of "polyline" data greatly inflates the file size of maps with many curved or highly convoluted features, such as topological maps showing contour data, or cadastral maps with multiple cul-de-sacs. The traditional approach to this problem is to apply a line generalization algorithm that replaces multiple line segments with fewer, longer line segments. Although file size is reduced, line generalization frequently degrades the accuracy of the linework by producing irregular, jagged lines.

FME's Curvefitter technology takes a unique approach that reduces file sizes without sacrificing line accuracy and smoothness. Guided by a fuzzy logic processor, Curvefitter replaces a series of line segments with the optimal combination of straight lines and embedded arc segments required to create smooth curving lines. The line optimization process is controlled by the user, and is based on a compromise between user-defined tolerances for file size reduction, line smoothness, and accuracy.

FME's Curvefitter capability can be applied to both 2D and 3D data, but only X and Y values are processed. Z values in 3D data are preserved.

## Smooth Boundaries of Contiguous Features

Of the handful of linear optimization tools available today, only FME's Curvefitter can preserve feature topology when smoothing boundaries of adjacent area features. With FME, indispensable data compression and line-smoothing capability can now be applied to cadastral data or spatial datasets depicting natural features such as vegetation and soil types, or other maps with a "patchwork" of contiguous features.

By decomposing the boundary of each area feature into segments, applying curvefitting to each segment, then reconstructing the area boundary, FME's sophisticated data transformation engine ensures processed boundaries join correctly, with no gaps or overlaps.

## Recreate Arcs in Legacy Data

Curvefitter's line smoothing capability can reduce file size and improve the visual aesthetics of legacy data by replacing original line geometry with arc segments. Curvefitter also recreates true mathematical arcs that were stroked out and stored as line segments during conversion from CAD formats to GIS formats that do not support arcs.
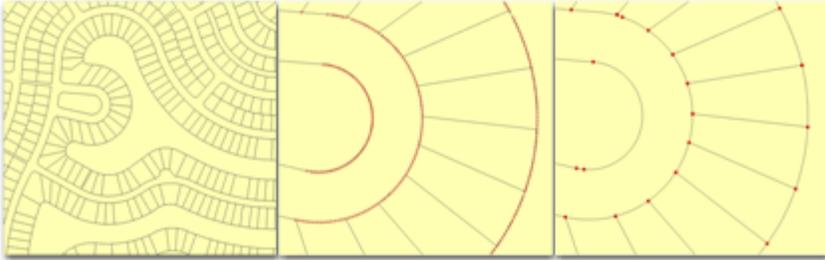
## Automated Processing

To optimize your productivity, Curvefitter can be operated in batch to automatically process multiple files.

## Example File Size Reductions Obtained using Curvefitter

The following results of tests conducted in Safe Software's labs are indicative of the dramatic file size reductions that can be achieved using Curvefitter. The three data types used in the test scenarios were parcel data, contour maps, and maps of geological formations. *

![SAFE SOFTWARE logo]
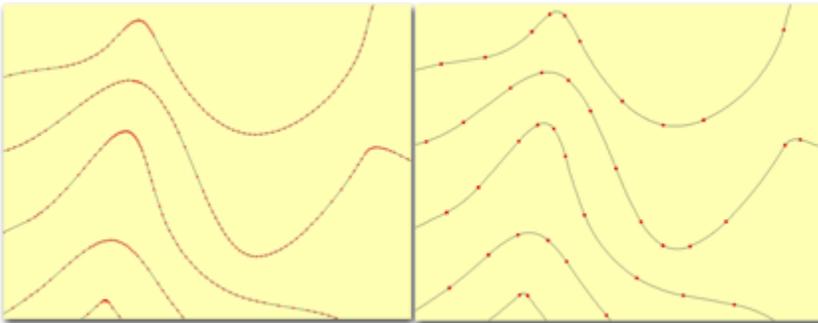
*Example 1:* **Parcel Data**



**Procedure:** A subset 6.1 Mb ESRI Shape file (provided by Grays Harbor County, in Washington State) was extracted and converted into four different formats: DWG file (3.8 Mb), MapGuide SDF (4.5 Mb), ESRI Personal Geodatabase (5.4 Mb) and ArcGIS 9.2 File Geodatabase (1.89 Mb).

Each file was then processed using the following Curvefitter settings: Precision 0.1 feet; Flattening 0.1; Compression Weight 1; Smoothness Weight: 1; Accuracy Weight: 1; Preserve Shared Boundaries: Yes.

**Parcel Data Test Results**

| Data Format | File Size before Curvefitter | File Size after Curve Fitter |
| --- | --- | --- |
| AutoCAD DWG | 3.8 MB | 1.6 MB |
| MapGuide SDF3 | 4.5 MB | 1.6 MB |
| ESRI Personal Geodatabase | 5.4 MB | 4.8 MB |
| ArcGIS 9.2 File Geodatabase | 1.89 MB | 1.07 MB |

*Example 2:* **Contour Data**



**Procedure:** A subset 35.9 Mb DWG file was extracted and converted into four different formats: MapGuide SDF 3 file (50.8 Mb), ESRI Personal Geodatabase (56.4 Mb) and ArcGIS 9.2 File Geodatabase (17.3 Mb).

Each file was then processed using the following Curvefitter settings: Precision 1.0 feet; Flattening 0.1; Compression Weight 1; Smoothness Weight: 1; Accuracy Weight: 1; Preserve Shared Boundaries: No.

![FME logo]

**Contour Data Test Results**

| Data Format | File Size before Curvefitter | File Size after Curvefitter |
|---|---|---|
| AutoCAD DWG | 35.9 MB | 7.8 MB |
| MapGuide SDF3 | 50.8 MB | 14 MB |
| ESRI Personal Geodatabase | 59.4 MB | 23.6 MB |
| ArcGIS 9.2 File Geodatabase | 17.3 MB | 10.5 MB |

*Example 3:* **Geological Formations**

Procedure: A subset 46.3 Mb ESRI Shape file publicly available through Natural Resources Canada (*www.nrcan.gc.ca*) was extracted and converted into four different formats: AutoCAD DWG file (3.8 Mb), MapGuide SDF (4.5 Mb), ESRI Personal Geodatabase (5.4 Mb) and ArcGIS 9.2 File Geodatabase (1.89 Mb).

Each file was then processed using the following Curvefitter settings: Precision 20 feet; Flattening 2; Compression Weight 0.1; Smoothness Weight: 10; Accuracy Weight: 10; Preserve Shared Boundaries: No.

**Geological Formations Test Results**

| Data Format | File Size before Curvefitter | File Size after Curvefitter |
|---|---|---|
| AutoCAD DWG | 28.5 MB | 5.8 MB |
| MapGuide SDF3 | 47.8 MB | 13.1 MB |
| ESRI Personal Geodatabase | 59.6 MB | 17.4 MB |
| ArcGIS 9.2 File Geodatabase | 43 MB | 9 MB |

**Note:** Not all systems that are able to store arcs can process them efficiently, so users should ensure their complete workflows are capable of dealing with arcs before doing wholesale migration.

## Accessing Curvefitter Capability in FME

Within FME's Workbench application, Curvefitter functionality is accessible through the Curvefitter transformer. (Users who prefer to run their FME data transformations using mapping files in the Universal Translator can access Curvefitter capability through the @curvefit function.)

## Learn More

For more information about Curvefitter, see the FME Functions, Factories and Transformers documentation available in our download center.

- Learn more about FME's *spatial data transformation capability*
- Take a *graphic tour* of the Curvefitter extension for FME