Advanced Data Interoperability: LiDAR, 3D, and BIM

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ArcGIS Data Interoperability Extension

- Convert and transform data in 100+ formats
- Graphical workflow authoring

LiDAR

Overview of point cloud scenarios

Converting point cloud formats

Import point clouds and automatically generate .lasd for quick LAS use in ArcGIS.

- ASPRS Lidar Data Exchange Format (LAS)
- Point Cloud XYZ
- RIEGL Laser Scan Database (RDB)
- Mojang Minecraft
- ASTM E57
- Oracle Spatial Point Cloud
- Terrasolid TerraScan
- Z+F LaserControl ZFS

Demo

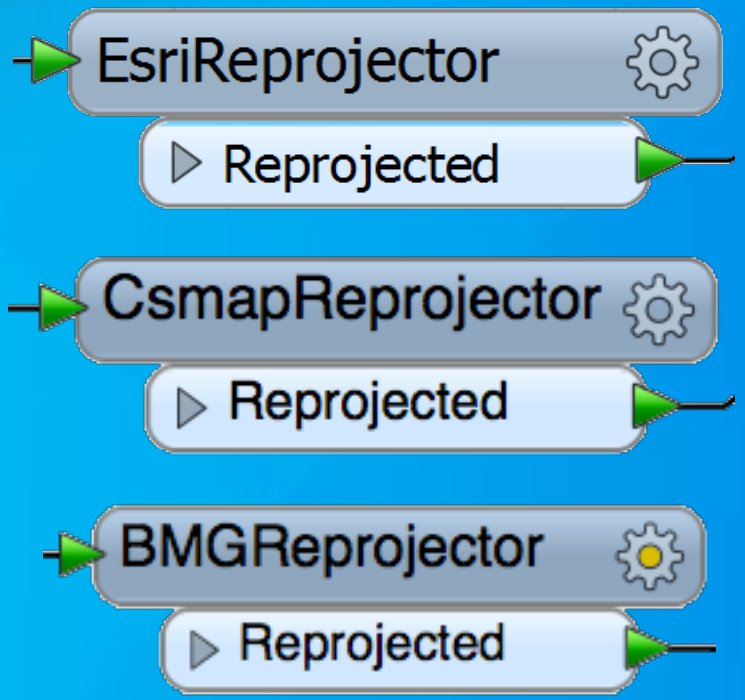
Convert TerraScan directory to LAS

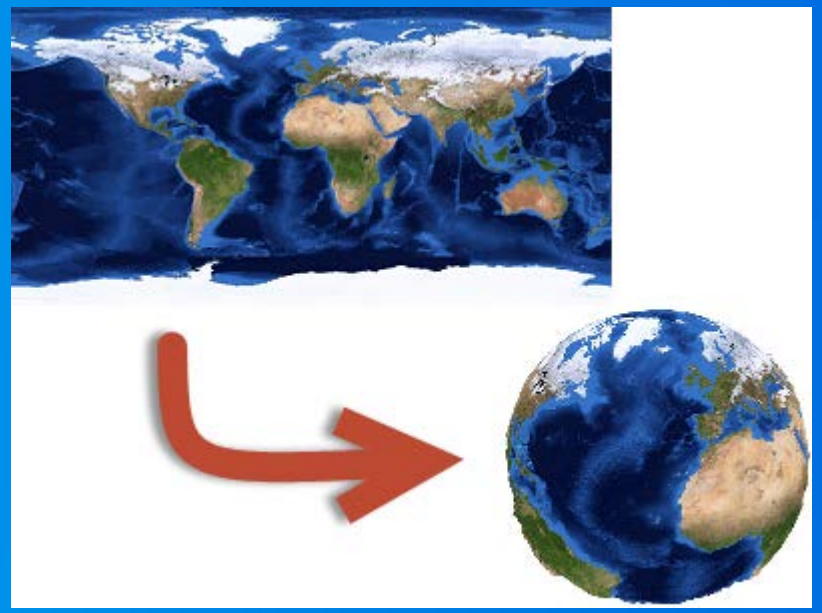
Transforming point clouds

- Thinning
- Drape to create a surface model
- Slicing/profiling to divide along a line
- Update extents
- Combine
- Set components manually
- Point-by-point calculations
- Point-by-point filtering
- …

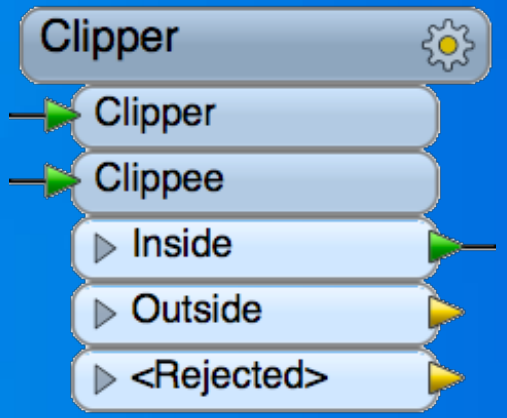
Reprojection

- Change a point cloud’s coordinate system
- Support for geocentric coordinates and orthometric heights

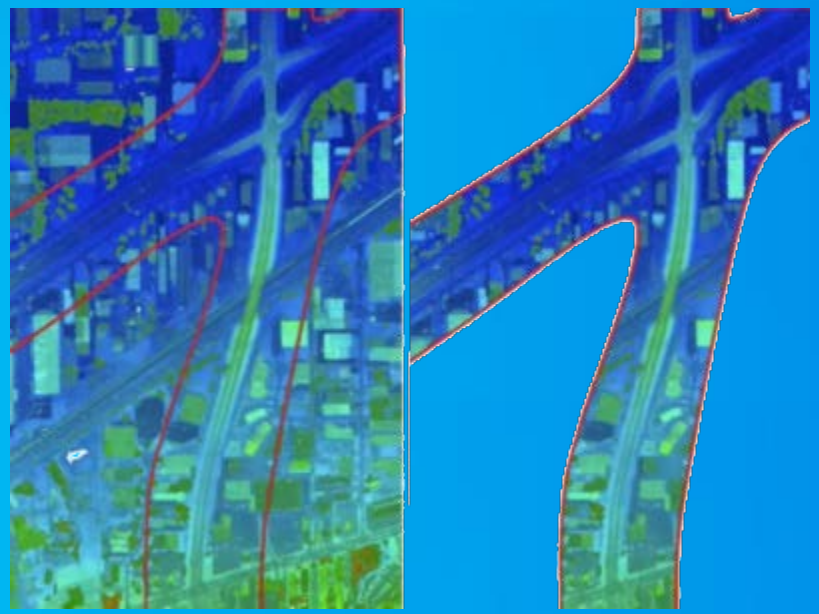




Clipping

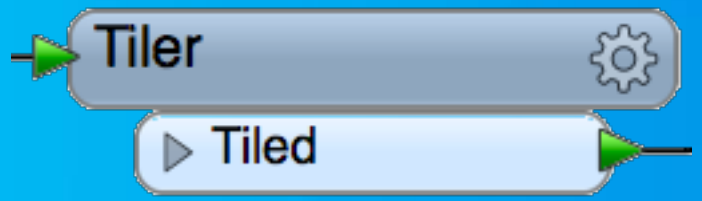


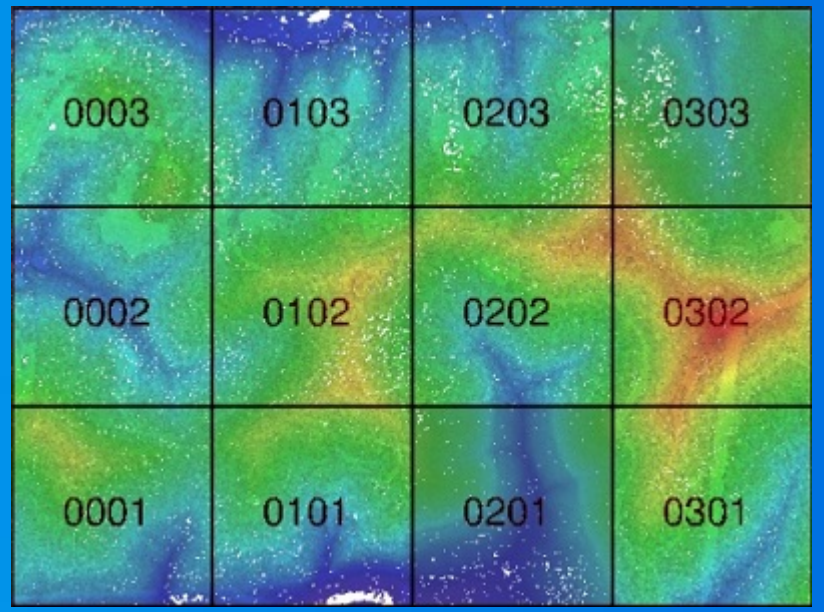
- Toss away points outside a defined area
- Cubic clipping: clip to a 3D solid
- Clip to just the area you need
- Data becomes more manageable to work with



Tiling

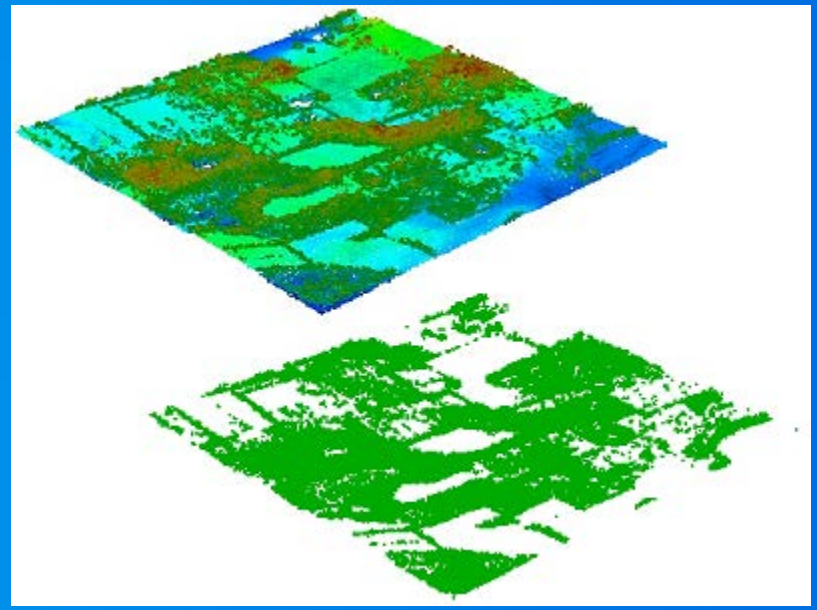
- Chop points into a series of tiles
- Speed up processing time using parallel processing on tiles
- Easier delivery for large point clouds





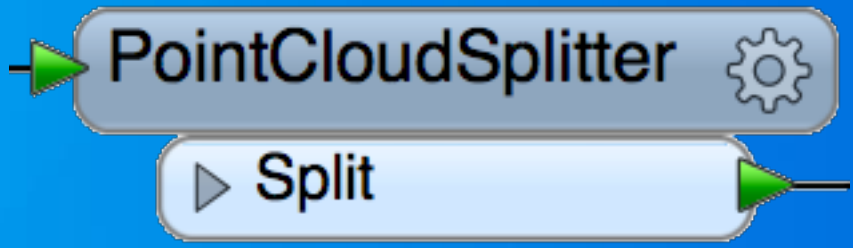
Splitting

- Extract points based on the value of any component
- E.g. color, classification, intensity
- Can split based on exact value or range



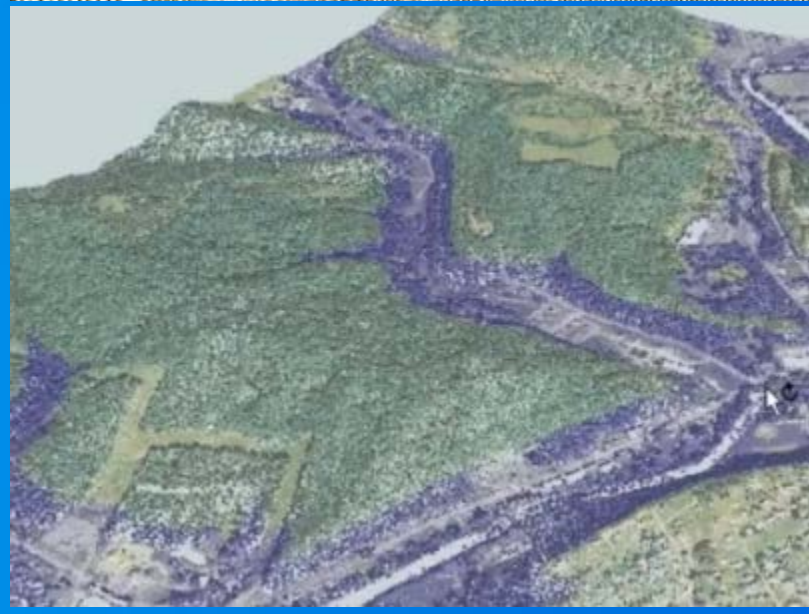
Demo

Split a point cloud



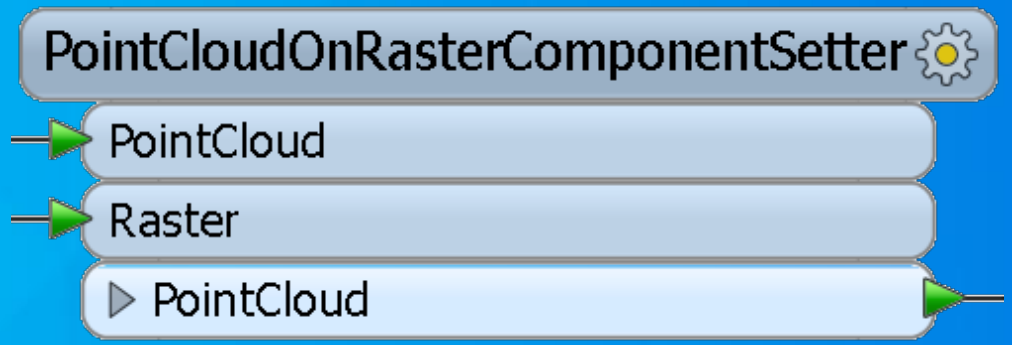
Colorization

- Automatically set color components
- Overlay point cloud on raster



Demo

Colorize point cloud with orthophoto

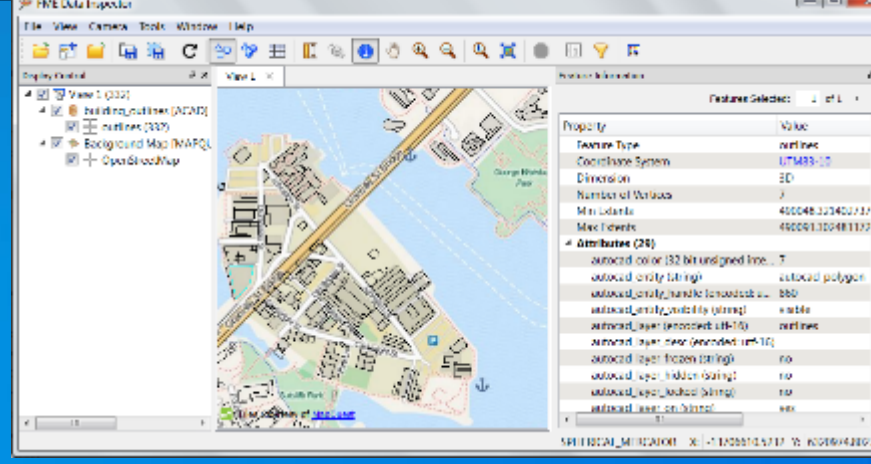


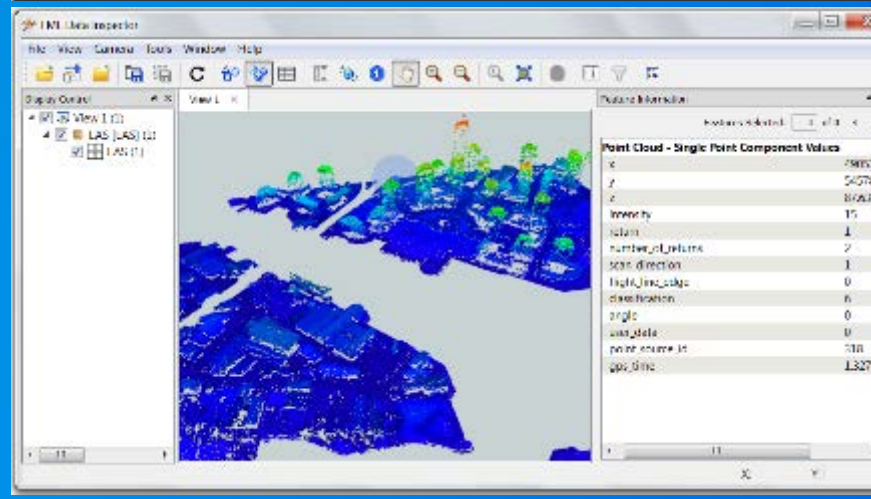
3D GIS

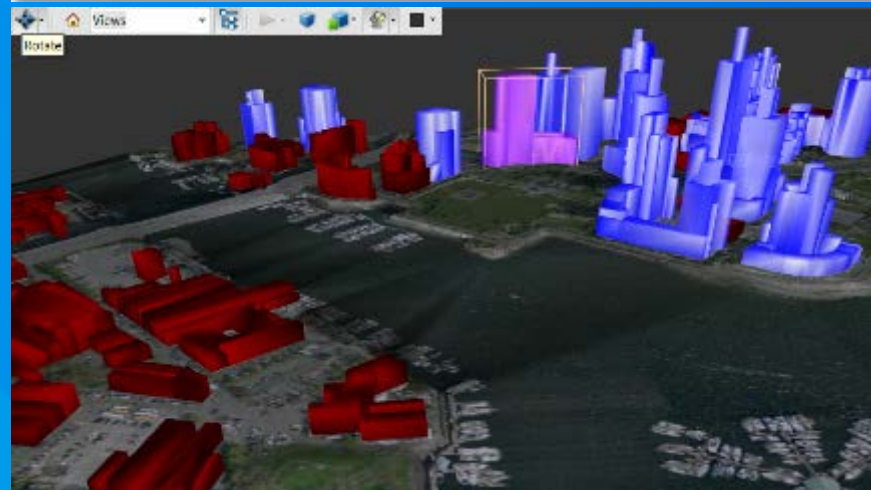
Working with 3D data

Working with 3D data

- Converting 2D building outlines to 3D
  - FeatureMerger joins outlines with tabular data containing building heights
  - Extruder adds 3rd dimension to create 3D solids
  - 3DForcer to set base heights for 3D
- TINGenerator creates TIN from a point cloud
- AppearanceSetter defines details of 3D surface







Demo

- Convert Shapefile to Sketchup
- Create surface model TIN using height information from a point cloud

BIM and GIS

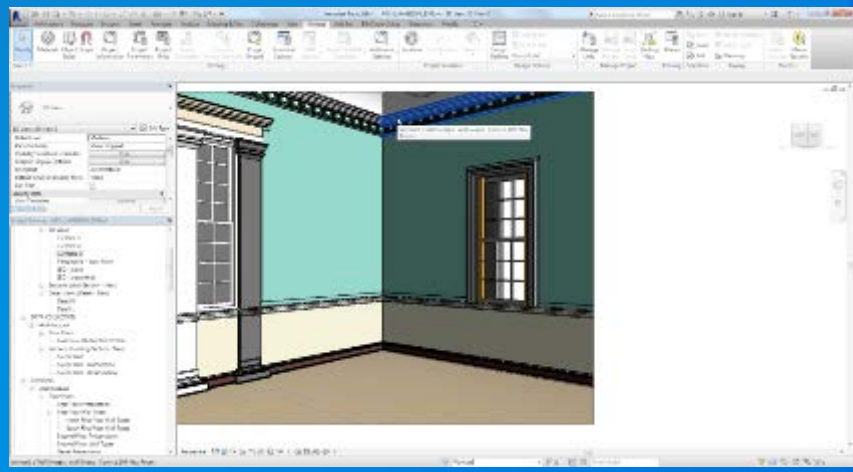
Working with BIM data

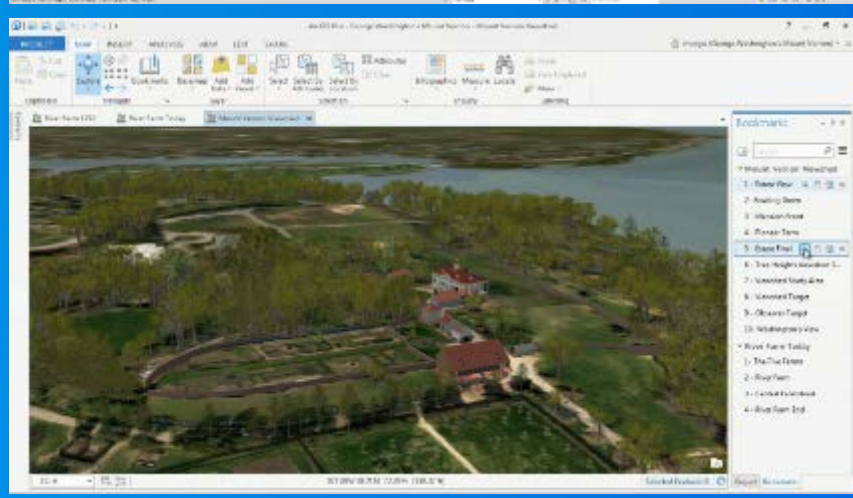
Working with BIM

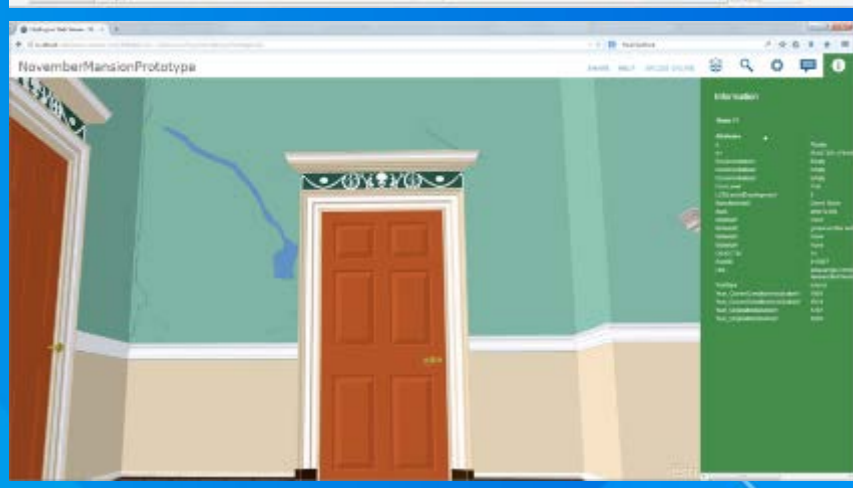
- File size and complexity make BIM data hard to repurpose
- BIM exports IFC (too complex) or DWG (too simple)
- Key: keep what you need, discard what you don’t

BIM to GIS: Mount Vernon

- George Washington's home laser scanned to create high quality BIM in Revit
- Data Interoperability extension used to convert BIM to GIS
  - Export Revit data (plus added georeferencing) with FME Revit Exporter
  - Import to ArcGIS with Data Interoperability extension
  - Reconnect attribution
- Browser delivery – easy sharing
- Rich detail of BIM with spatial context of GIS







BIM to GIS Scenarios

- Translate Revit floorplan to Geodatabase
- Extract/use BIM georeferencing
- Complete control over IFC hierarchies
- Reduce BIM data volumes
- Update BIM from Excel tables
- Webinar: GIS and BIM Interoperability - fme.ly/gisbim

Exporting to Minecraft

Working with Minecraft

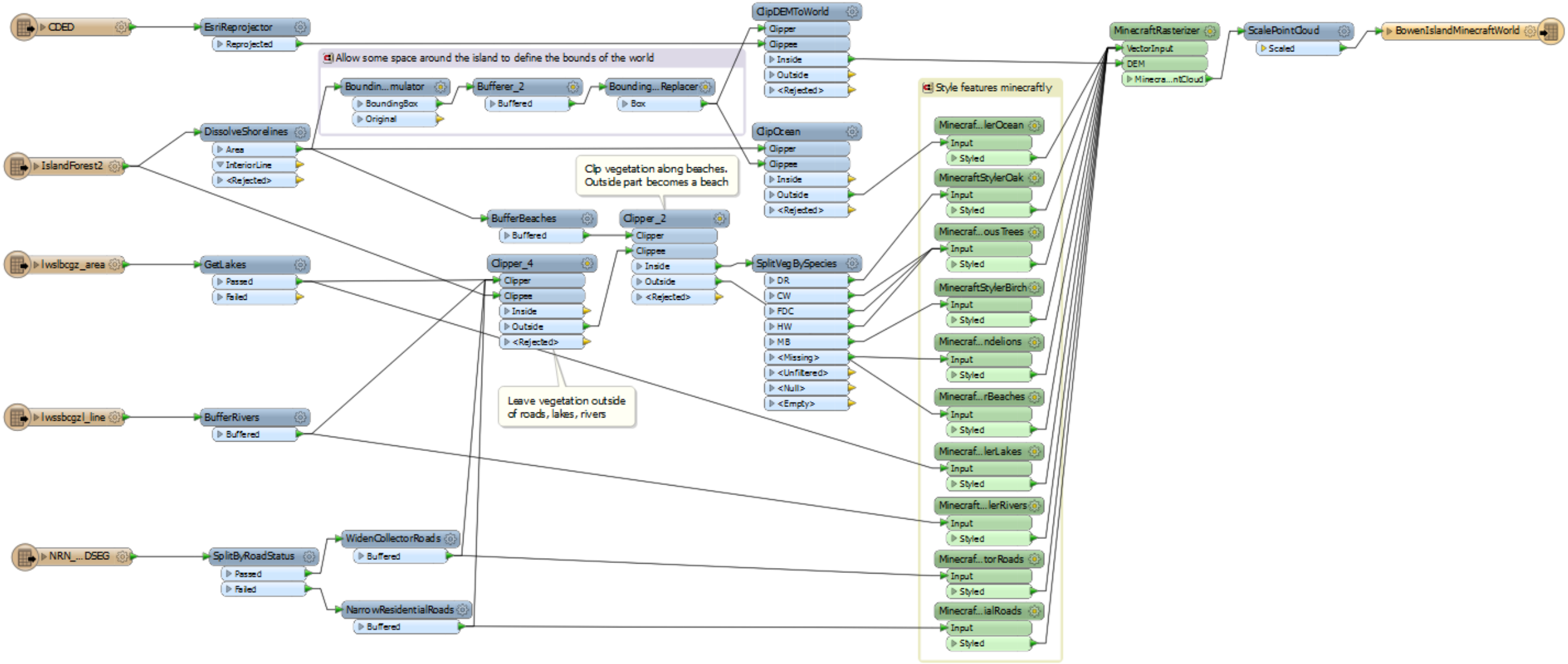
- A Minecraft world is a point cloud
- blockID and blockData components
- Convert any data to Minecraft
  - Vector
  - Raster
  - LiDAR
  - BIM
  - etc.

Example

Bowen Island: GIS + DEM to Minecraft

Workspace summary

1. Read road lines (Shapefile), forest polygons (MapInfo), and raster DEM
2. Buffer and clip vectors to avoid overlap
3. Rasterize vector layers
   - Make numeric rasters for Z, blockID, blockData
4. Convert raster pixels to points
   - Set Z value and point cloud components


CDED
EsriReprojector
Reprojected
Allow some space around the island to define the bounds of the world
Boundin... mulator
BoundingBox
Original
Bufferer_2
Buffered
Bounding... Replacer
Box
ClipDEMToWorld
Clipper
Clippee
Inside
Outside
<Rejected>
IslandForest2
DissolveShorelines
Area
InteriorLine
<Rejected>
ClipOcean
Clip vegetation along beaches. Outside part becomes a beach
BufferBeaches
Buffered
Clipper_2
lwslbcgz_area
GetLakes
Passed
Failed
Clipper_4
SplitVegBySpecies
DR
CW
FDC
HW
MB
<Missing>
<Unfiltered>
<Null>
<Empty>
Leave vegetation outside of roads, lakes, rivers
lwssbcgzl_line
BufferRivers
NRN_... DSEG
SplitByRoadStatus
WidenCollectorRoads
NarrowResidentialRoads
Style features minecraftly
Minecraf... lerOcean
Input
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MinecraftStylerOak
Minecraf... ous Trees
MinecraftStylerBirch
Minecraf... ndelions
Minecraf... rBeaches
Minecraf... lerLakes
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VectorInput
DEM
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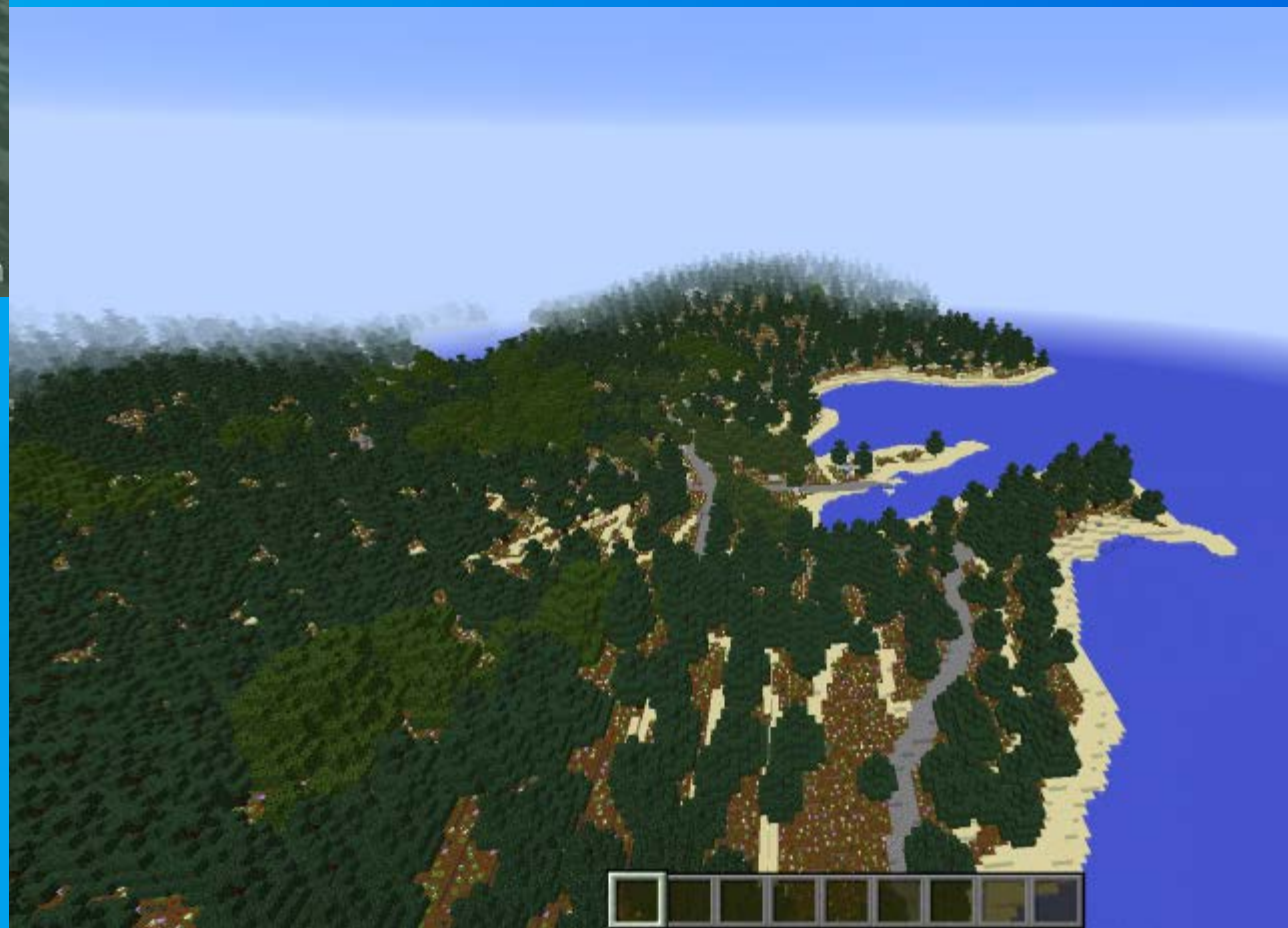
ScalePointCloud
Scaled
BowenIslandMinecraftWorld


Google earth



Minecraft and the real world

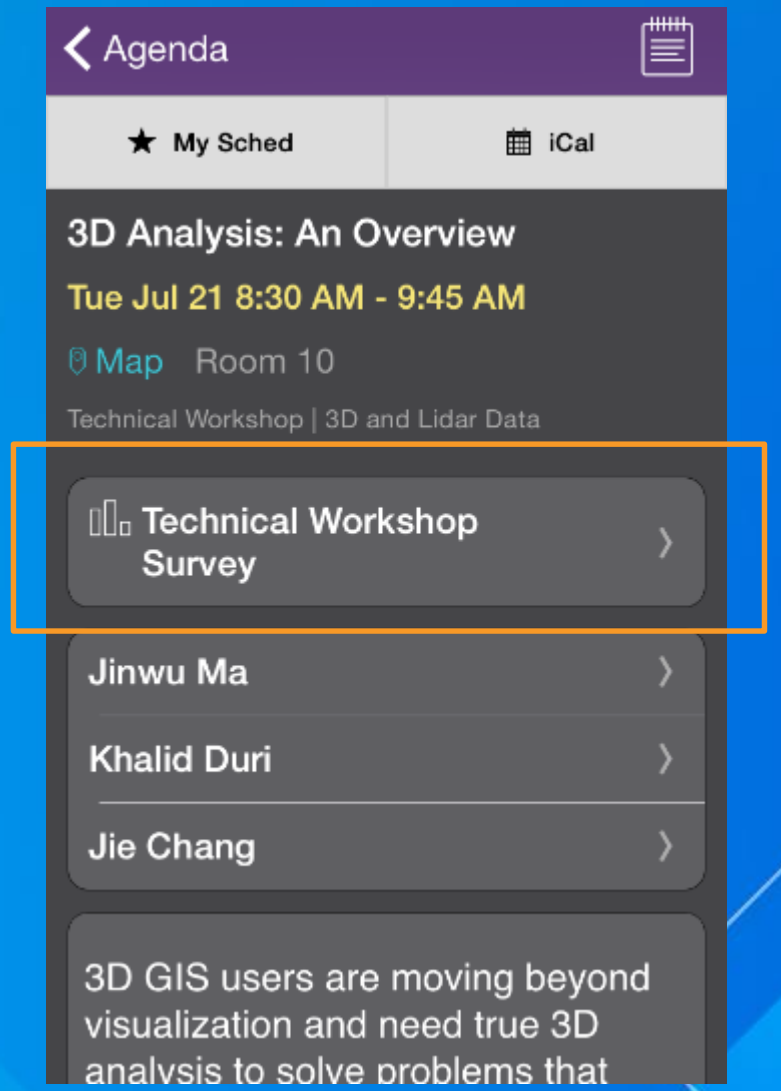
- Hypothetical scenarios
  - Lava flow
  - Forest fires
  - Rising sea levels
- Geodesign
  - Sweden used Minecraft for public urban planning
- Fun: fme.ly/MazeGenerator

Resources

- Download a trial at esri.com/datainteroperability
- Esri Virtual Campus – search “Spatial ETL” on training.esri.com
  - Transforming Data Using Extract, Transform, and Load Processes
  - Controlling Data Translations Using Extract, Transform, and Load Processes
- Webinar: GIS and BIM Interoperability - fme.ly/gisbim
- Webinar: LiDAR and ArcGIS - fme.ly/interoplidar
- Tutorial: How to make Minecraft worlds in FME - fme.ly/minecraft

Thank you…

- Please fill out the session survey in your mobile app
- Select Data Interoperability Extension: Advanced Use
  - Use the Search Feature to quickly find this title
- Click “Technical Workshop Survey”
- Answer a few short questions and enter any comments



Understanding our world.