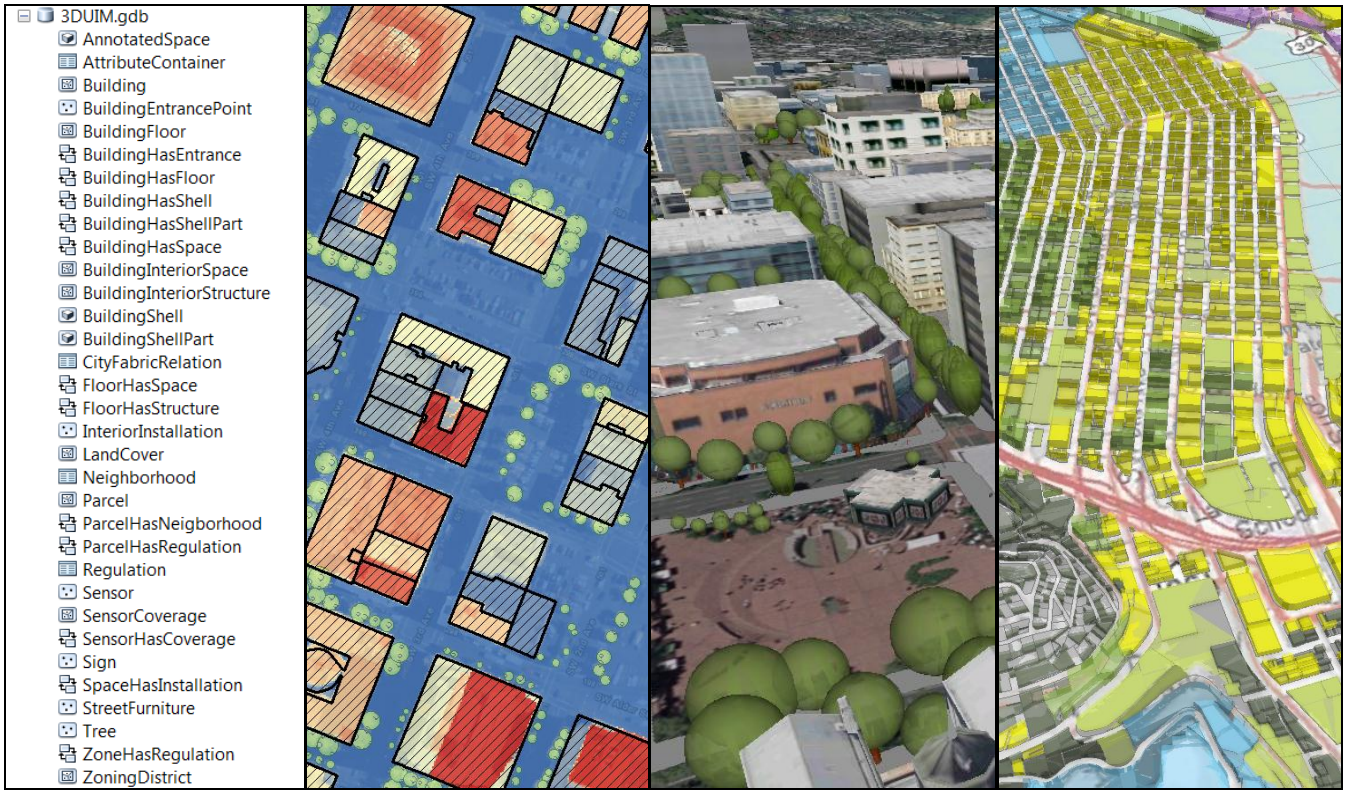
Template: Getting Started with the 3D City
Version: 1.0 Beta
Date: November 30, 2012

Introduction

The 3D City Template is a collection of workflows and tools for importing, creating, and managing common city features. It includes a complete sample data set for downtown Portland, Oregon. The included workflows provide a methodology for taking existing 2D features and using LiDAR-derived surfaces to "3D-enable" them for visualization and analysis.

This template includes the following:

- A set of tools for importing existing city GIS data and land use regulations
- An editing map and geoprocessing models for calculating feature heights from LiDAR point cloud data
- CityEngine projects for parcel-based buildable volumes and procedural facades from 2D building footprints
- An ArcGlobe document for 3D visualization of city data



The 3D Urban Information Model (3DUIM) supports several 3D data management and analysis workflows

The "backbone" of the 3D City Template is the data structure, which is defined by the 3D Urban Information Model (3DUIM) geodatabase. This geodatabase stores features and their relationships for modeling city data at multiple scales and within three main themes:

1. **Built Environment**: Building footprints, shells, interior features, and installations (e.g., street furniture)
2. **Legal Environment**: Land ownership, land use zoning and constraints
3. **Natural Environment**: Land cover features

More information on the 3DUIM itself is available from the "Overview of the 3D Urban Information Model" document.

The 3DUIM is designed to be compact in its structure, making the core of the model easy to populate with data. At the same time, it is compatible with important exchange formats and standards such as CityGML and the ArcGIS Local Government Information Model. Furthermore, it can be extended and localized with minor effort.

Template Contents

The following files are provided in the template ZIP file:

Template Directory	Item	Description
MapsandGeodatabase	3DUIM.gdb	The 3D Urban Information Model (3DUIM) geodatabase with content from the city of Portland, OR
	Scratch.gdb	A scratch geodatabase for holding process and analysis features for the data maintenance workflows
	PortlandFeatureMaintenance.mxd	The map document used for maintaining building, vegetation, and land use zones and regulations
	3DCity_Portland.3dd	An ArcGlobe document for visualizing and analyzing 3D data in Portland, OR
	PortlandExample	A folder with original Portland data for building footprints, zoning districts and parcels.
Application	AttributeAssistant	A folder containing the ArcGIS Desktop Attribute Assistant Add-in and source code
	Configuration	A folder containing configuration files for setting up a 3DUIM geodatabase
	Schema	A schema-only XML Workspace document of the 3DUIM, the accompanying data dictionary as well as an empty File Geodatabase.
	Tools	A folder containing all of the GP tools used in the 3D City template
Documentation	Workflow 1 – Data Management.pdf	Detailed workflow documentation for 3D Data import and database management
	Workflow 2 – Importing and Changing Regulations.pdf	Detaied workflow description dor defining, importing and editing regulations, as well as visualizing them using CityEngine and the Web Viewer.
	Workflow 3 – Feature Maintenance.pdf	Detailed workflow documentation for 3D Data Maintenance of buildings, trees and terrain
	Workflow 4 – 3D Building Creation and Editing.pdf	Detailed workflow documentation for 3D Building creation and editing (Multipatch and texture editing), using CityEngine
	Overview of the 3D Urban Information Model.pdf	Provides information on the purpose of all feature classes, object tables and domains that are found in the 3DUIM.
/	Getting Started.pdf	This document. Describes how to configure template and changes made with each release.

Software Environment

The following software must be installed:

- ArcGIS Desktop 10.1 SP1 with: (60 day trial available HERE)
  - 3D Analyst and Spatial Analyst
  - Data Interoperability Extension (or FME 2012)
- ArcGIS Server (Workgroup or Enterprise) with the following extensions, or ArcGIS Online Organization subscription
  - Image Server and 3D Analyst
- ArcGIS CityEngine 2012.1 or later (30 day trial is available HERE)
- Microsoft Excel or LibreOffice/OpenOffice Calc

Configure the 3D City Template

You can configure the 3D City Template in your environment using the sample data provided by the City of Portland. In doing so, you'll learn how to update and maintain 3D City features using ArcGIS Desktop and your organization's data. Once you're familiar with the workflows using the Portland data, use the included workflows and models to localize and apply these methodologies to your own city.

Creating a 3D City from Scratch

If you're starting from square 1, there is a rough order of operations you should follow to construct a 3D City. These are the steps:

1. Create localized 3D urban information model geodatabases to hold your 3D City features. Import your existing 2D and 3D GIS data, such as building footprints, land parcels, land use regulations, trees, land cover, street furniture or transport networks you have. For specifics, please refer to the "Workflow 1 - Data Management" and "Workflow 2 - Importing and Changing Regulations" documents.

2. Create a Digital Terrain Model (**DTM**), Digital Surface Model (**DSM**), and normalized Digital Surface Model (**nDSM**) from LiDAR data. For specifics, please refer to the "Workflow 3 – Feature Maintenance" document.

3. Create and calculate building and tree heights for your city, using the **nDSM** raster from step 2. Refer to the "Workflow 3 – Feature Maintenance" document for detailed step-by-step guidance.

4. Calculate base elevations for building footprints according to the **DTM**. Part 4 of the "Workflow 3 – Feature Maintenance" document explains the process in detail.

5. Serve the **DTM** & any high-resolution aerial imagery as ArcGIS Imagery services. If you don't have recent imagery for your city, the Esri World Imagery service can be used.

6. Use the accompanying CityEngine projects & CGA rules to:

    a. Using the Portland project, create typified building facades based on building height & number of floors > Export these to multipatch features > Import these to the 3DUIM BuildingShell features (details described in the "Workflow 4 – 3D Building Creation and Editing" document)

        i. Create/apply manual textures to select buildings of interest

        ii. Modify multipatch geometry as needed

    b. Using the PortlandBuildableVolumes project, apply zoning regulations to the parcels to create buildable volumes and export these to multipatch features for further analysis ("Workflow 2 – Importing and Changing Regulations" document)

7. Construct your 3D City Globe scene: building facades, volumetric trees, street furniture, etc.

8. Share your CityEngine scenes via the web with others on ArcGIS Online. (Free signup available HERE)

Release Notes

The November 30, 2012 release is the first release of 3D City Template.

New Functionality

N/A

Resolved Problems

N/A

Known Issues

N/A