Procedural Modeling With **CityEngine**

Patrick Gahagan

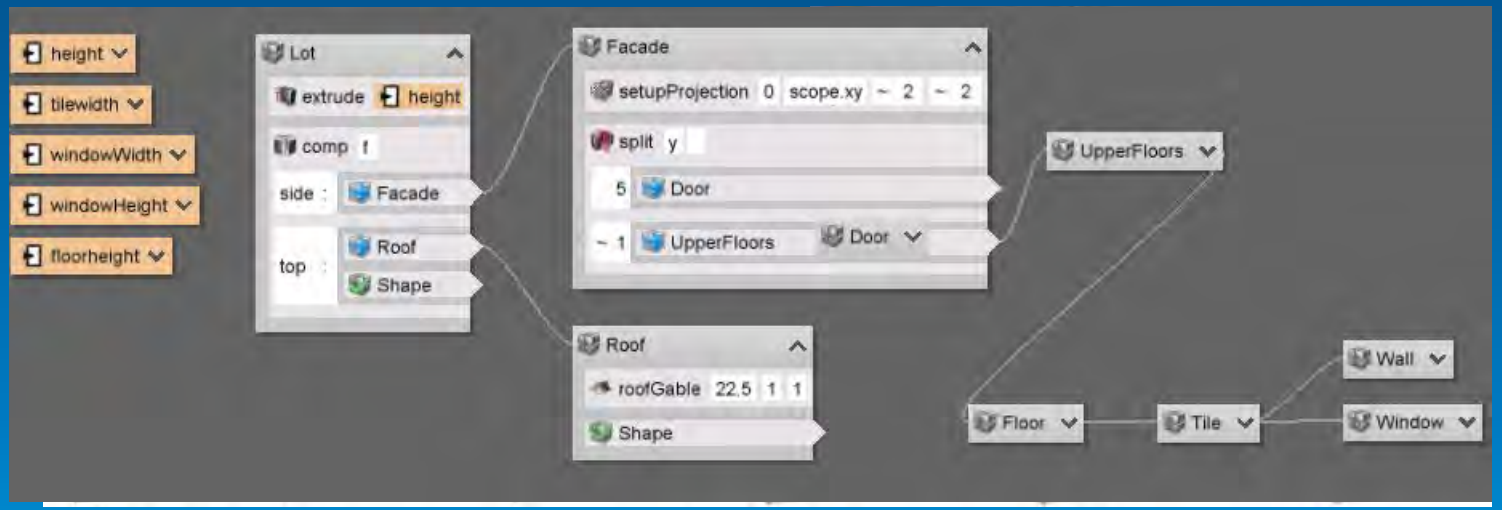
Solutions Engineer

CityEngine

Procedural modeling

3D model creation using rules / algorithms

- **Base geometry**



Base geometry

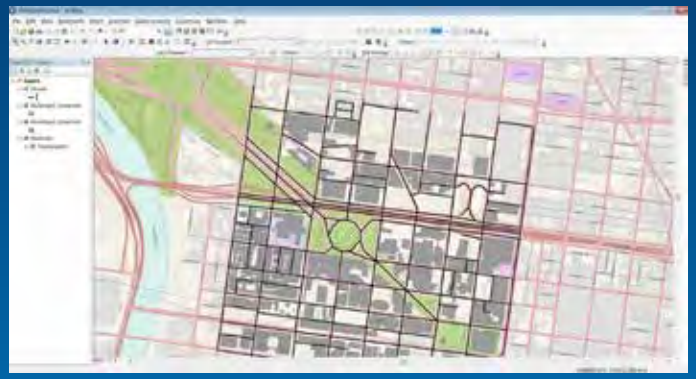
Final 3D model

Iterative refinement

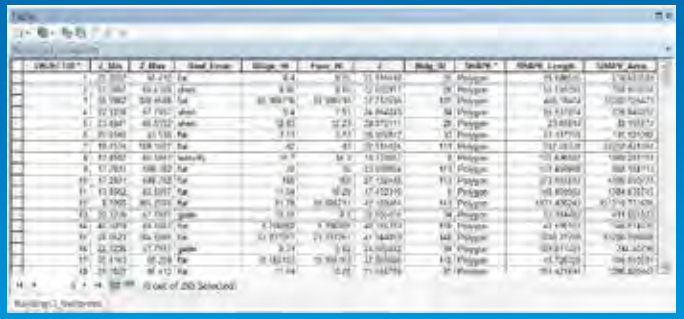
iteratively refine a design by creating more and more detail

2D GIS Data + Rules

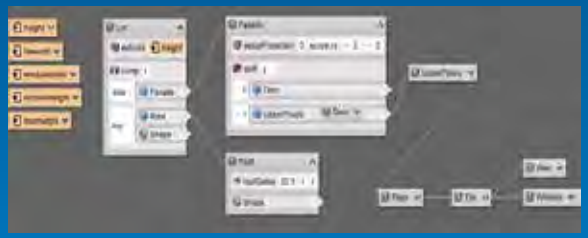
Procedural city modeling



Geometry



Attributes

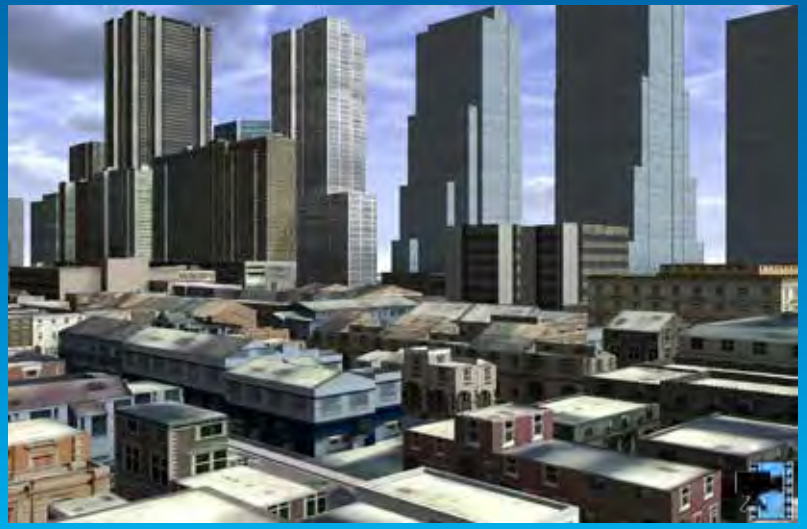


Rules

Aggregate As-built and Procedural Cities

As-built models
- Reality at time of data capture
- Sensor derived
- Exterior shells
- Static models

-> Visualization of existing city

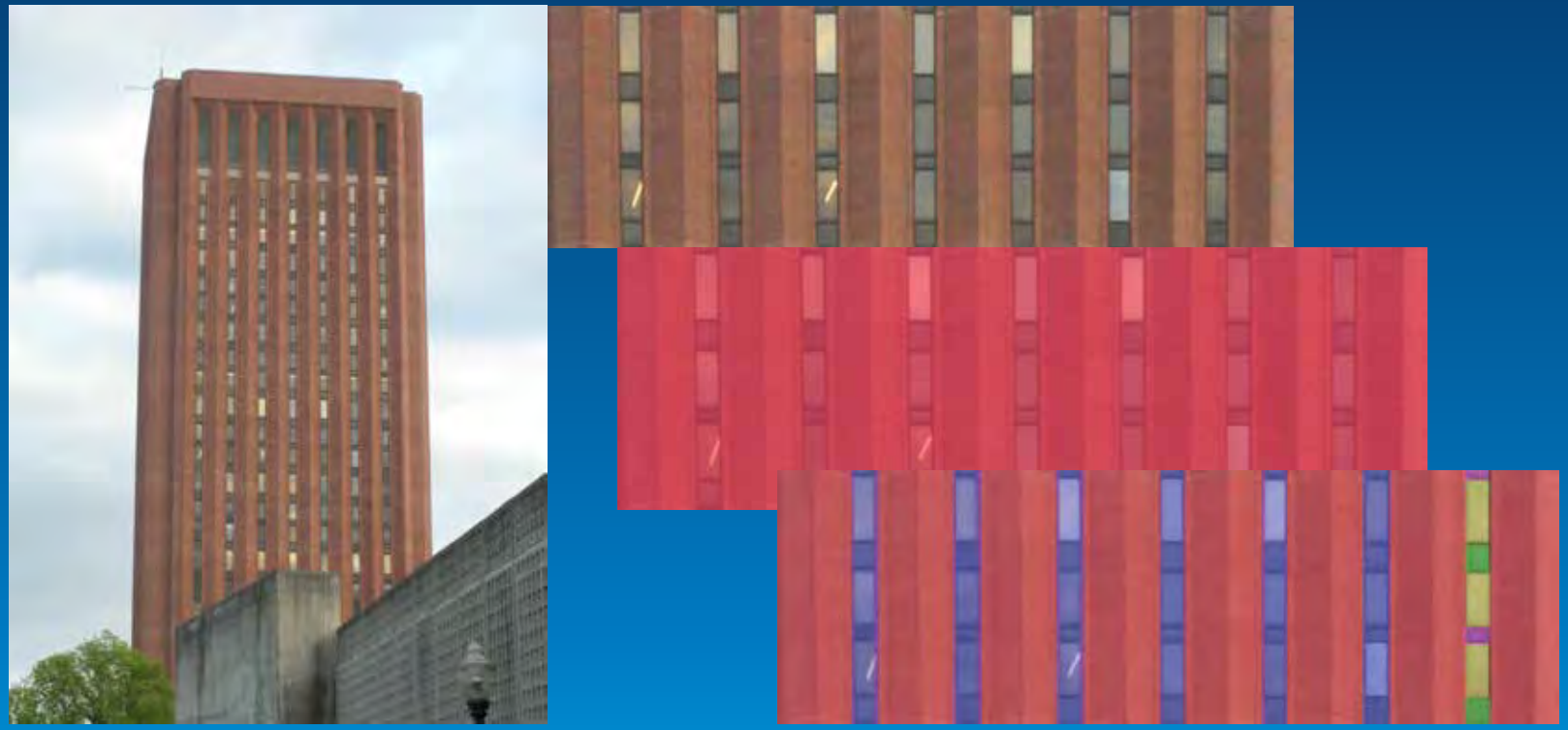


Procedural models
- Approximation of reality
- Based on GIS data
- Rule driven
- Exteriors and interiors
- Dynamic models

-> City planning / design

Architectural Rhythm

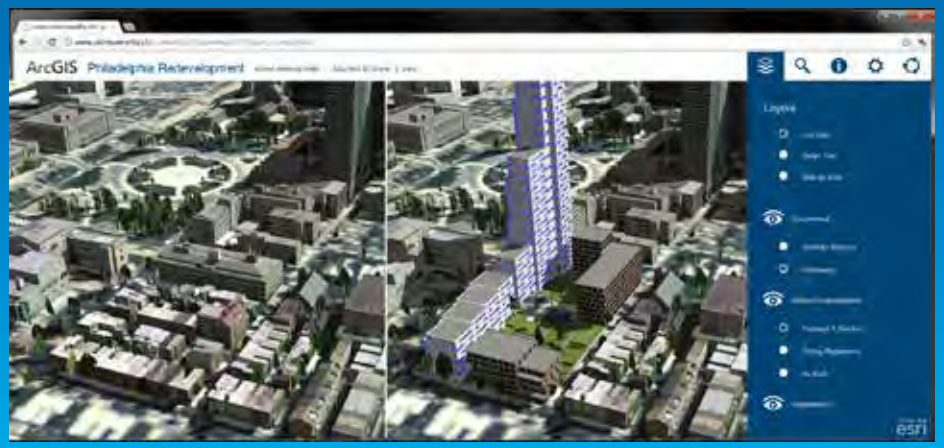
Key concept in procedural modeling



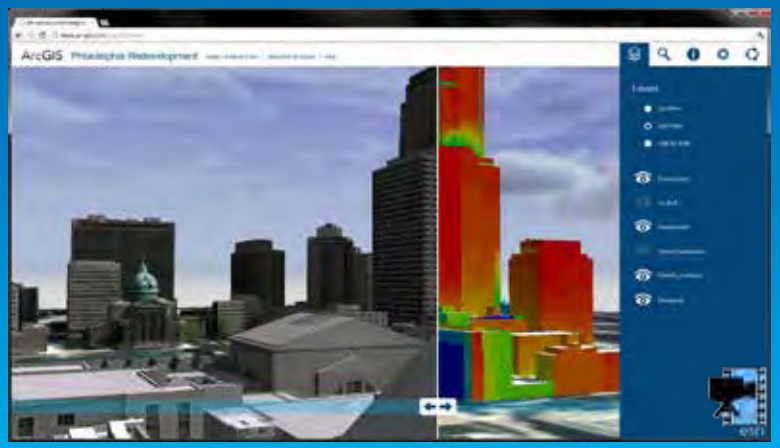
Repeatable patterns that guide creation of procedures

Share 3D Web Scenes

- 3D in the browser
- Easy-to-use (cloud solution)
- For Chrome, Firefox & Safari
- Modern GUI & graphics



Example: Side-by-side view to compare before/after



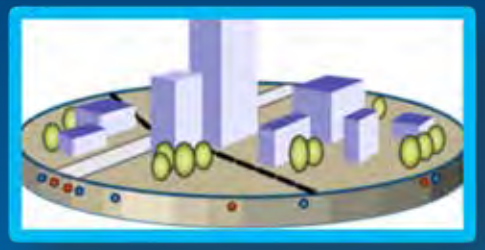
Example: Share analysis results (Swipe tool)

Road ahead

- ArcGIS for 3D Cities
- More 3D on the Web

3D Cities Information Model: Common Data Themes

The 3DCIM simplifies the initial creation, maintenance and usage of 3D cities.



Built Environment

- ***Created and actively managed by people***
  - **Structures, utilities, transportation networks, installations**

Legal Environment

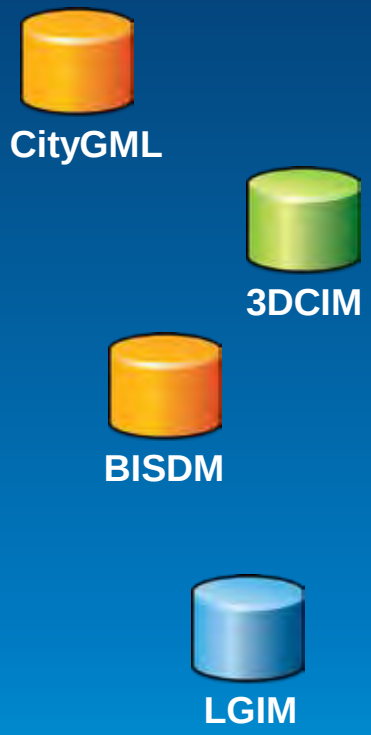
- ***Defines restrictions on land use***
  - **Land use zones, property ownership boundaries, regulations**

Natural Environment

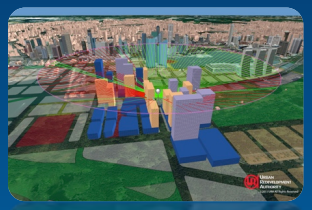
- ***Naturally occurring features on, above, or below the earth's surface***
  - **Land cover, subsurface geology, atmosphere/climate/weather**

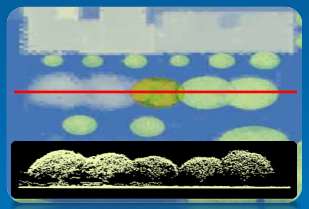
Why is there a new information model?

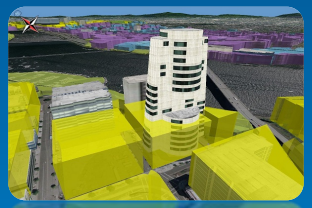
Basis for common development by esri, partners and users	
Provide an Information Model that supports users around the globe and is easy to adapt	Support existing standards such as CityGML
Simplify usage of 3D city models	Provide Apps and Maps that can be used out of the box and adapted as necessary
Define workflows and new requirements	Foundation for the ArcGIS for Cities Solution
Improve integration of compontens (CE, ArcGIS)	Establish best practices in 3D cartography

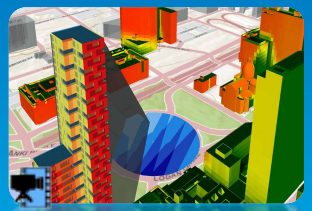


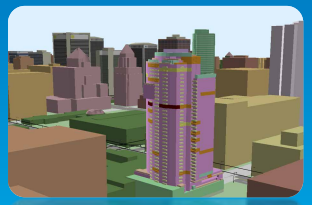
ArcGIS for 3D Cities

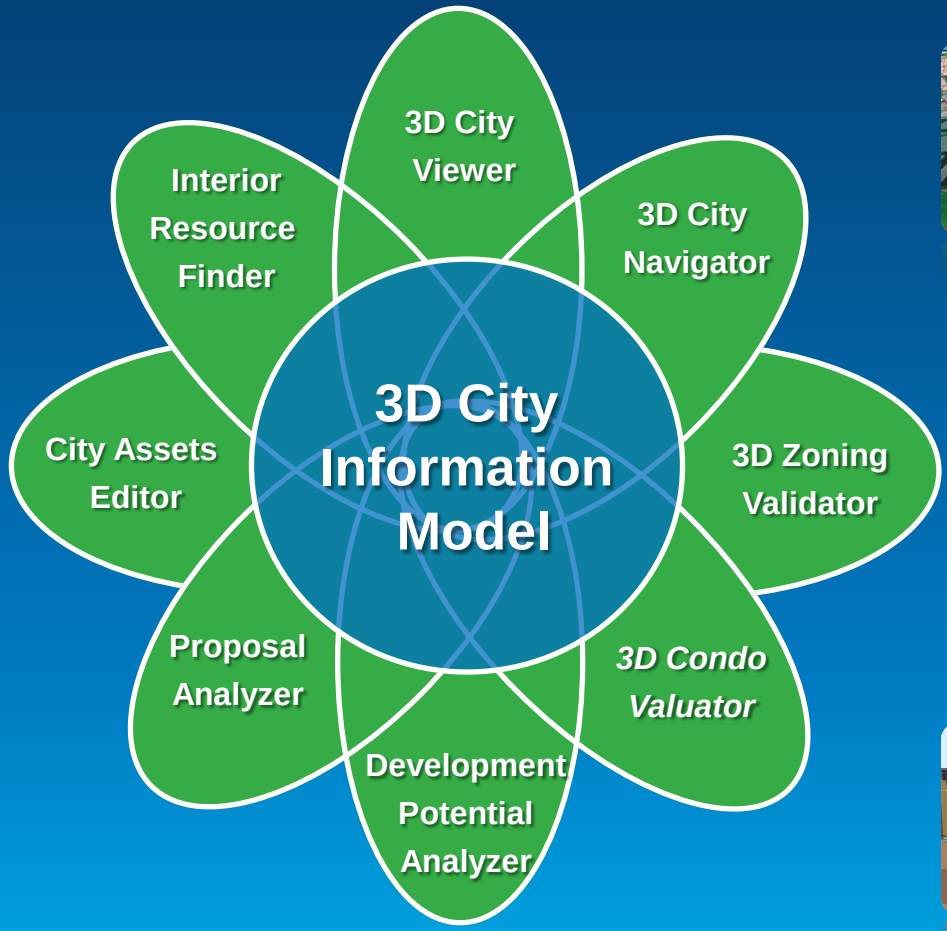








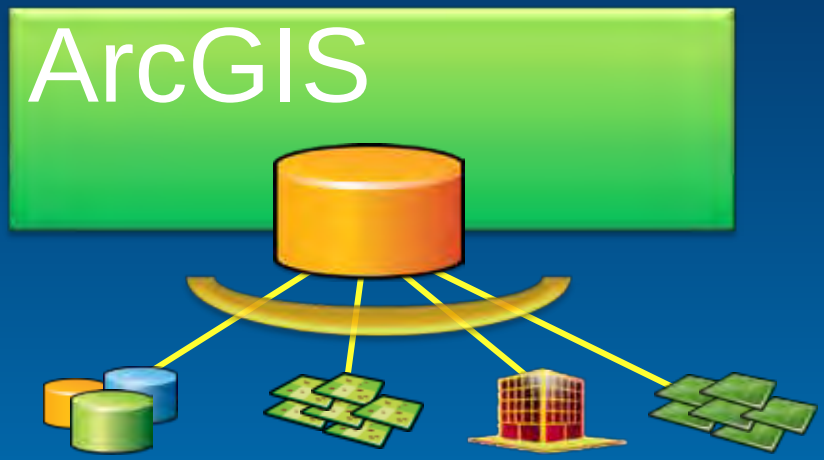




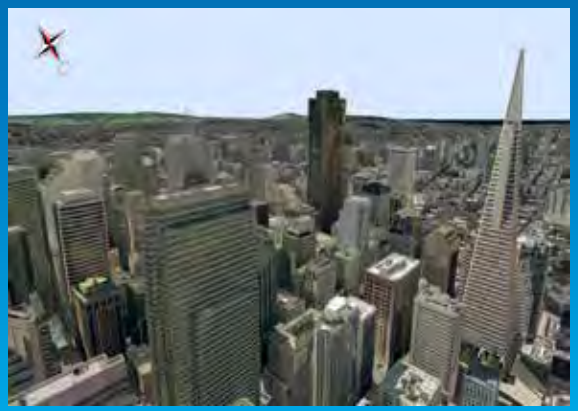
Plug ‘n Play solution for city administrators, facilities managers…

Store
Analyze
Visualize

Store 3D City Model (ArcGIS)



- **3D Cities Information Model**
  - **Maps, apps, analytics**
- **Different Levels of Detail**
  - **Exterior**
  - **Interior**



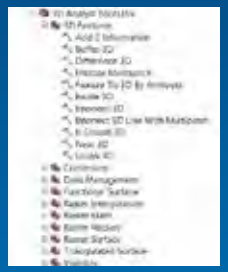
Building level

Floor level

Street level

Store
Analyze
Visualize

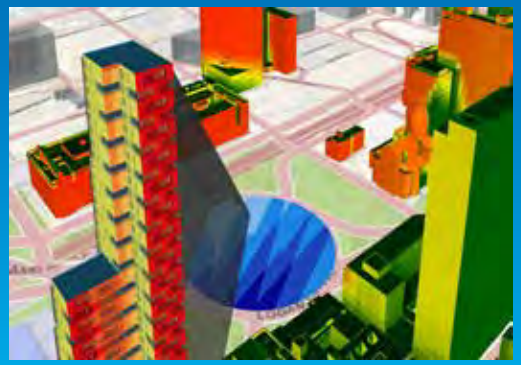
Analyze 3D City Model (ArcGIS)



ArcGIS Resource Center

- **Model based approach**
- **Iterative analysis**
- **Time aware**
- **Quantitative results**

Soil Analysis



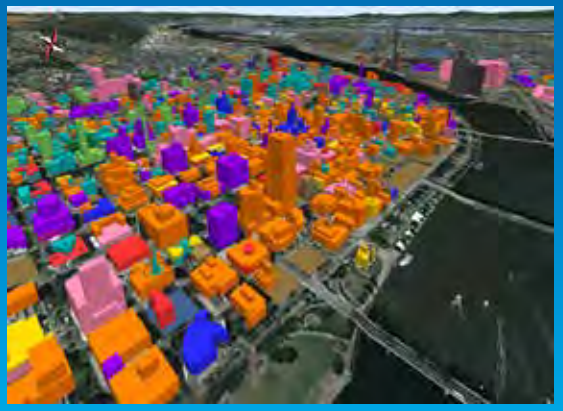
Visual impact

3D routing

Store
Analyze
Visualize

Visualize 3D City Model (ArcGIS)

- Desktop / Web */ Mobile **
- Massive 3D city models
- View cities in larger contexts
- Semantic / realistic views
- Incorporate sensor data



Thematic city

Photo-realistic city

Sensor data

Share your 3D Scenes

3D models in the browser and on mobile devices

Share your ArcScene Project as a Web Scene

"Clip and Share"

Web Scene

ArcScene

Stream 3D Scenes to the Browser and Mobile Devices

(*End of 2013*)

Useful links

CityEngine 2013

- Resource Links
  - 3D Resource Center - http://resources.arcgis.com/en/communities/city-engine/index.html
  - Tutorial 14 Polygonal Modeling 2012 - http://www.arcgis.com/home/item.html?id=c930635e31ee4c5298a82c8f4be013b8
  - 3DCity Information Model: http://www.arcgis.com/home/search.html?q=3DCity&t=content
- Training
  - http://training.esri.com
  - http://training.esri.com/gateway/index.cfm?fa=search.results&searchterm=City+Engine

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Office

Understanding our world.