

**Federal GIS Conference**

February 9–10, 2015 | Washington, DC

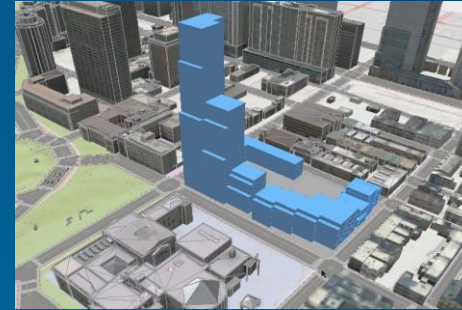


# Creating 3D Content with Esri's City Engine

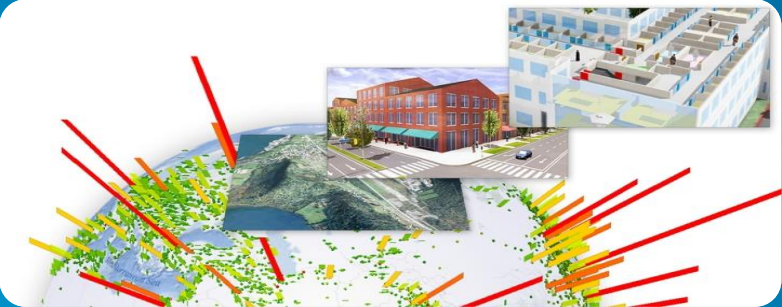
# Why 3D GIS?

Because our world is 3D

- **Improve understanding**  
3D is easy for everyone to understand
- **Better communication**  
3D makes it easier to articulate ideas
- **Solve 3D problems**  
Some spatial problems can only be solved in 3D



# 3D GIS Features



Multiscale 3D Models



3D Geodesign



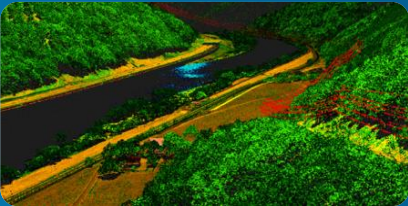
ArcGIS for 3D Cities



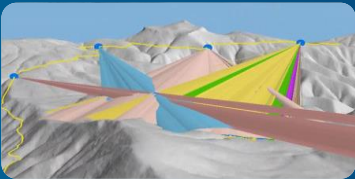
Share 3D scenes



Surface modeling



Native lidar support



3D Analysis



Integrated 3D



# CityEngine



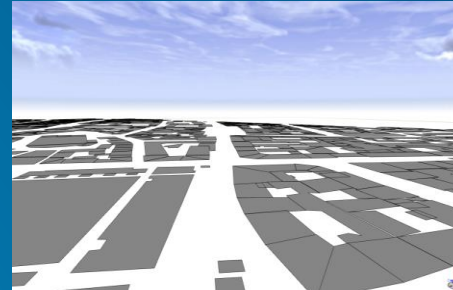
Transform 2D GIS Data into Smart 3D City Models

# CityEngine

Transforms 2D GIS Data into Smart 3D City Models

## 3D City Creation

2D GIS data + rules



*Geometry + Attributes + Rules*

## 3D City Design

Interactive and rule driven  
design in 3D



*Dynamic + Parametric editing*

# Demo - City Engine

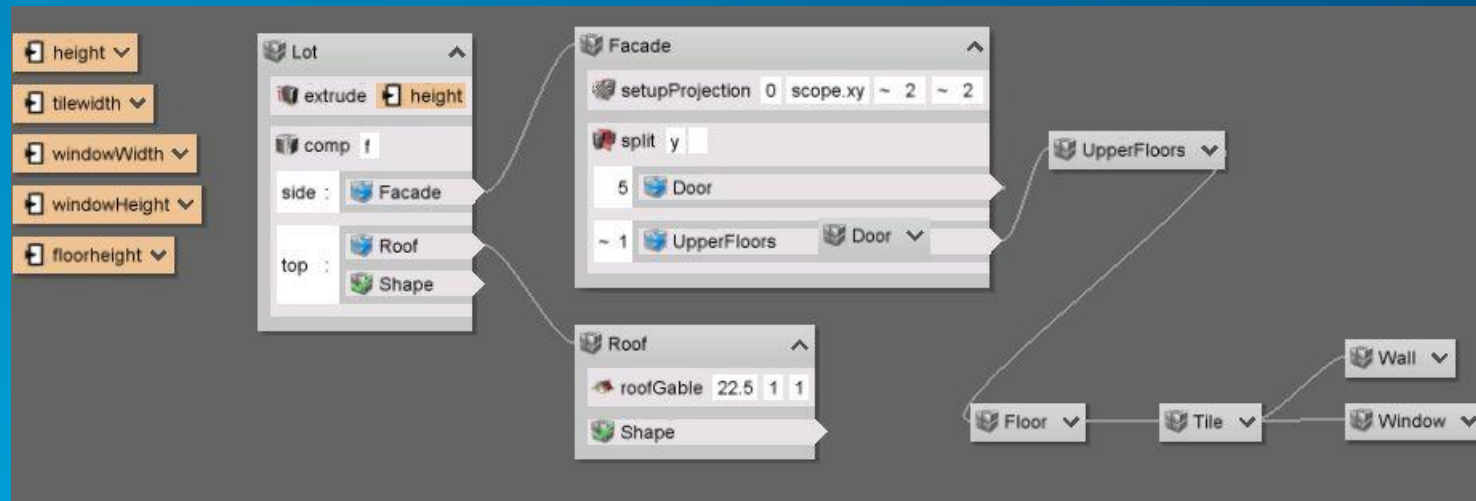
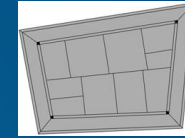
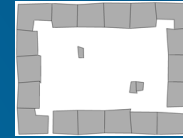
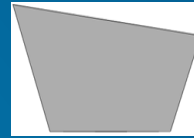
- Introduction to City Engine



# Procedural modeling

3D model creation using rules / algorithms

## - Base geometry



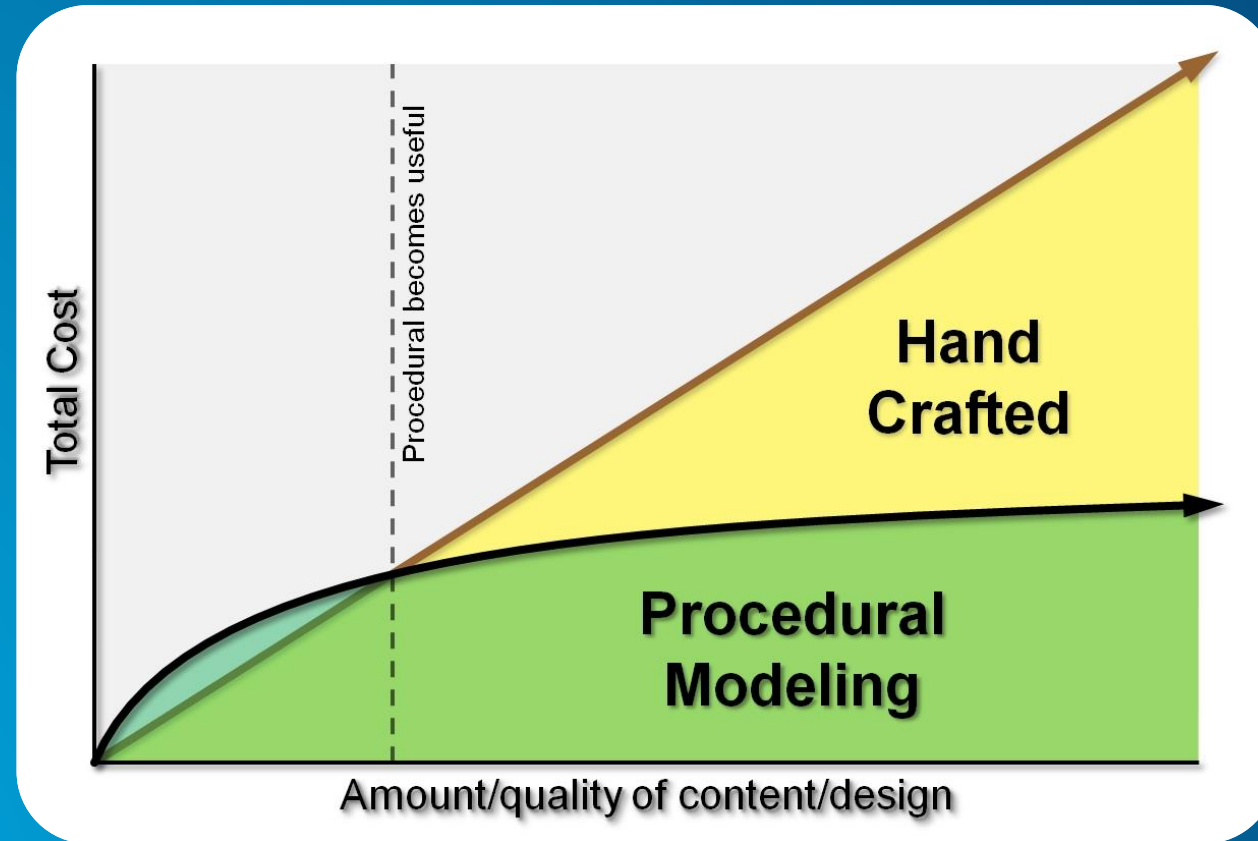
Base geometry



Iterative refinement

Final 3D model

# Procedural modeling vs. Manual modeling

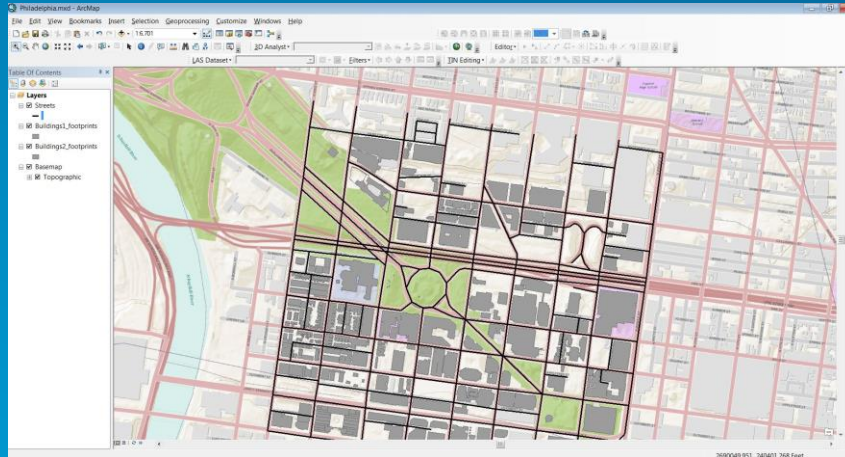


*Time reduction / cost saving*



# 2D GIS Data + Rules

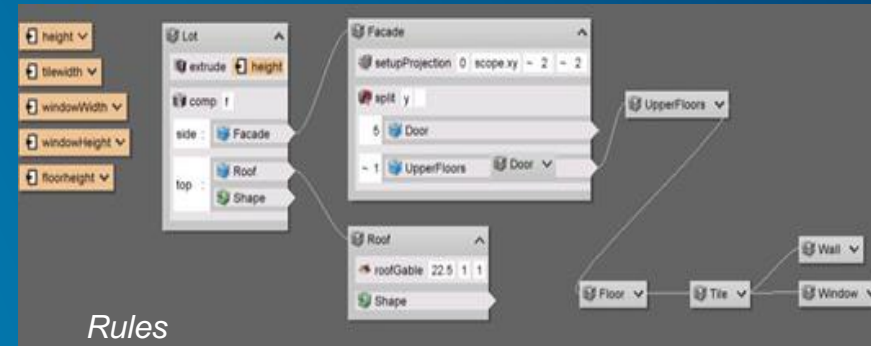
## Procedural city modeling



Geometry

OBJECTID	Z_Min	Z_Max	Roof_Form	Ridge_Ht	Eave_Ht	Z	Bldg_ID	SHAPE	SHAPE_Length	SHAPE_Area
1	20.2522	65.412	flat	8.4	9.25	21.816448	25	Polygon	99.888535	618.683569
2	21.2607	65.6358	shed	9.85	9.85	22.632911	26	Polygon	50.555297	159.659564
3	36.9982	326.6508	flat	88.308716	88.308716	37.212535	120	Polygon	406.10474	10202.325473
4	22.3236	57.7997	shed	9.4	7.91	24.864243	34	Polygon	85.537074	376.840012
5	23.8041	66.9352	shed	12.83	12.23	28.073111	20	Polygon	23.69814	32.105874
6	25.6566	63.536	flat	3.73	3.73	28.926017	33	Polygon	63.137759	135.929382
7	19.7574	188.1827	flat	42	42	22.610424	111	Polygon	787.48338	27252.421244
8	13.8502	66.5997	butterfly	15.7	14.3	13.733657	9	Polygon	175.636887	1869.287114
9	17.2831	588.782	flat	32	32	33.992004	113	Polygon	133.450688	958.184113
10	17.2831	588.782	flat	159	159	27.132445	113	Polygon	373.955593	4960.000774
11	13.8502	66.5997	flat	11.04	10.29	17.432316	9	Polygon	148.859964	1384.638745
12	8.3995	305.2566	flat	91.79	90.505211	42.189004	141	Polygon	1931.428243	151219.733606
13	22.3236	57.7997	gable	10.59	8.5	22.605454	34	Polygon	93.104492	491.056073
14	40.5078	69.0667	flat	8.706982	8.706982	40.395333	118	Polygon	48.690123	146.674535
15	28.0523	104.5985	flat	23.337257	23.337257	41.944003	148	Polygon	1098.27766	63200.996068
16	22.3236	57.7997	gable	6.71	5.82	24.665042	34	Polygon	109.817427	744.40796
17	35.9163	69.258	flat	10.165153	10.165153	37.865566	118	Polygon	48.728326	146.903501
18	20.2522	65.412	flat	11.04	10.29	21.585776	25	Polygon	150.421816	1290.800047

Attributes



Rules



# 3D City Creation

## Procedural city modeling



- Rule based 3D cities

# Demo - 3D City Creation

- 3D City generation







# 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

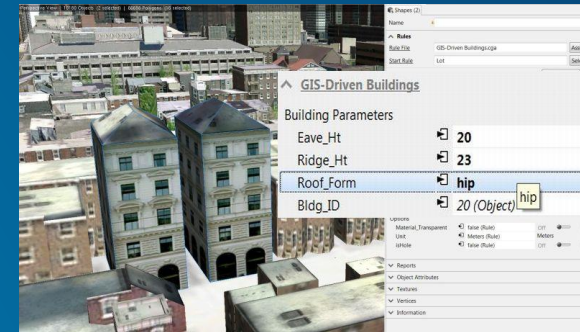
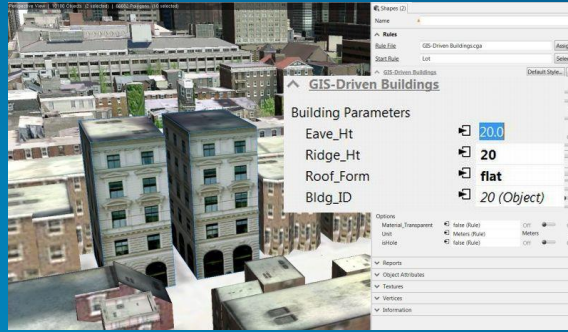
- Approximation of reality
- Based on GIS data
- Rule driven
- Exteriors and interiors
- Dynamic models

-> City planning / design

# 3D City Design

## 3D procedural design

### Parametric editing



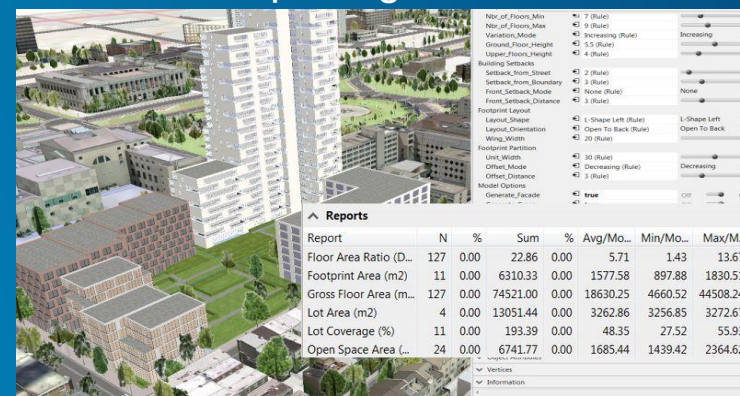
Add a floor

Add a roof

### Dynamic editing



### Procedural reporting



Rule based design



## Demo - 3D City Design

- **Dynamic editing**
- **Manual editing**

# ArcGIS & CityEngine

Store  
Analyze  
Visualize  
2D-to-3D  
Share

ArcGIS

CityEngine

ArcGIS  
Online

2D-to-3D  
Edit & Design  
Share

# ArcGIS & CityEngine

Store  
Analyze  
Visualize  
2D-to-3D  
**Share**

ArcGIS

CityEngine

ArcGIS  
Online

2D-to-3D  
**Edit & Design**  
Share



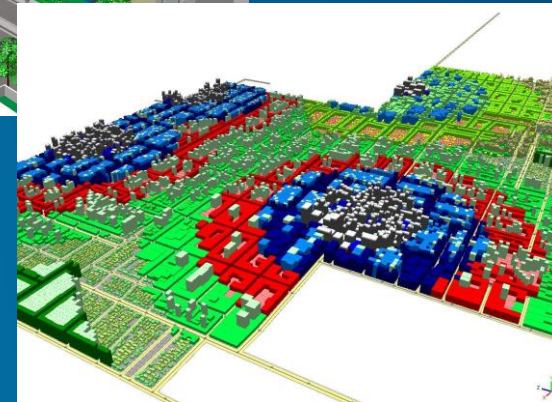
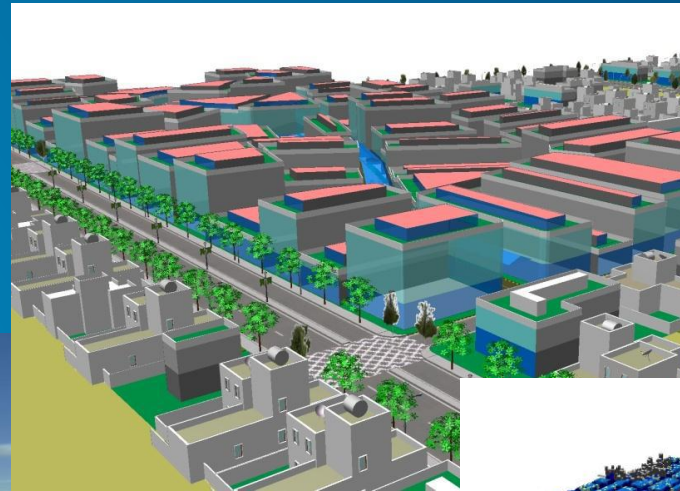
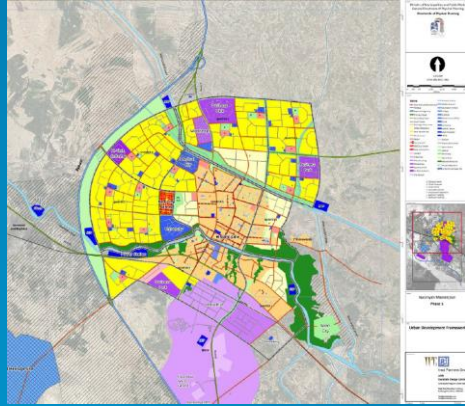
# CityEngine Examples

- Urban Planning & Architectural Visualization
  - Foster & Partners, Grimshaw,...
- Local government
  - Singapore, Brisbane, ...
- Simulation & Defense
  - Thales, CS, Raytheon,...
- Entertainment
  - Pixar, DreamWorks, Weta Digital,....
- Academia
  - MIT, ETH, Stanford,....



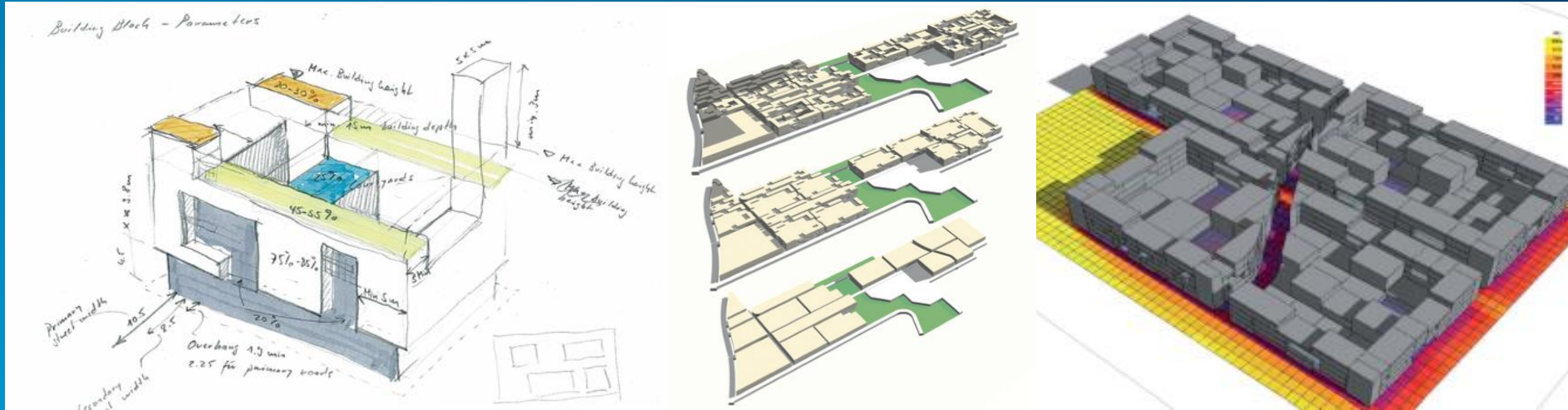
# Master Planning in Iraq

Garsdale Design Limited

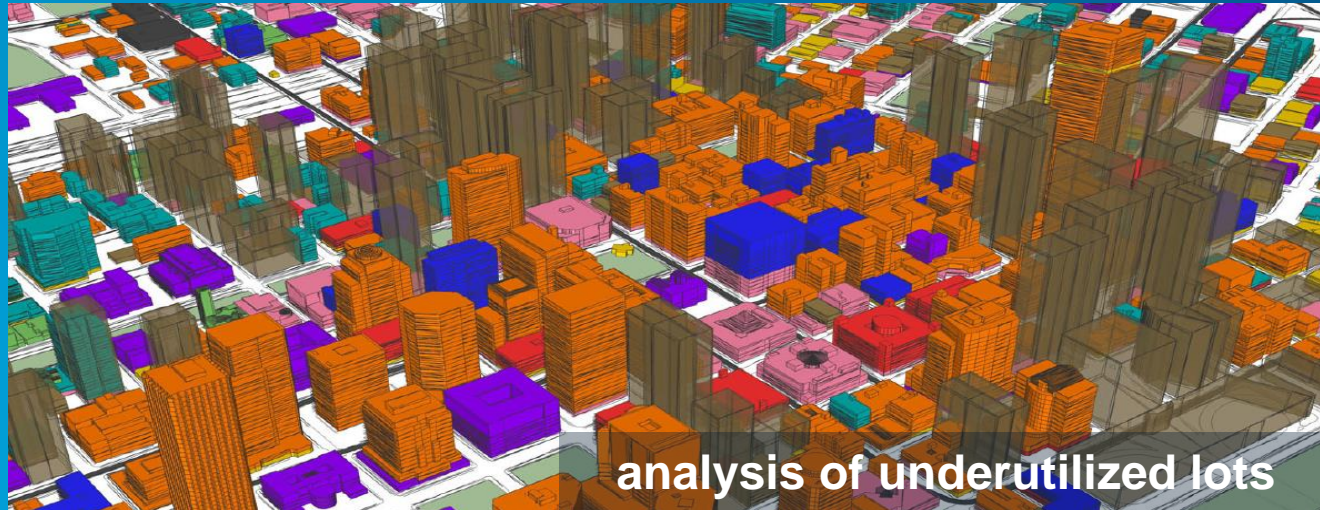
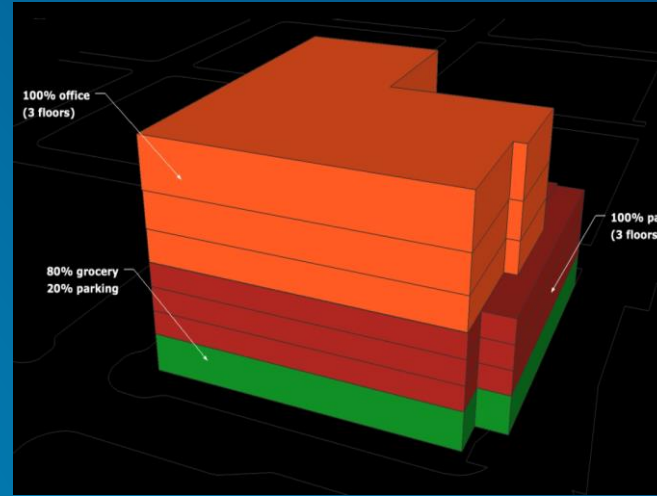




# Urban Design: Masdar



# Portland – 3D land use inventory



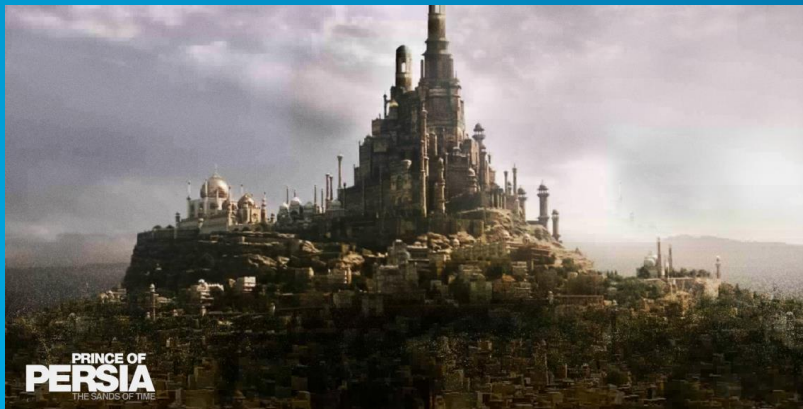
analysis of underutilized lots



# Simulation and Defense



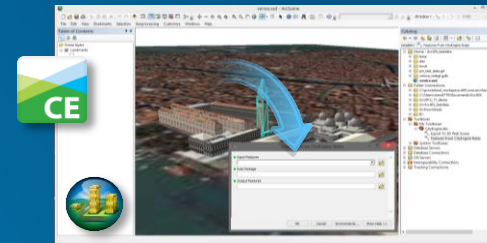
# Entertainment



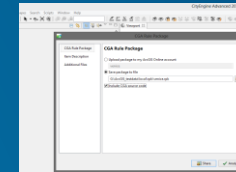


# CityEngine 2013.1

- Rule packages



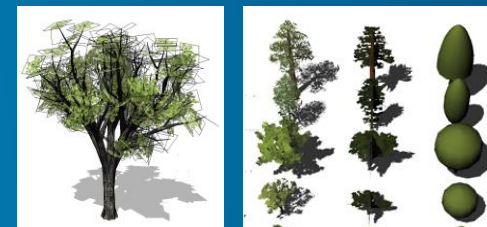
- SDK



- Improved Streets



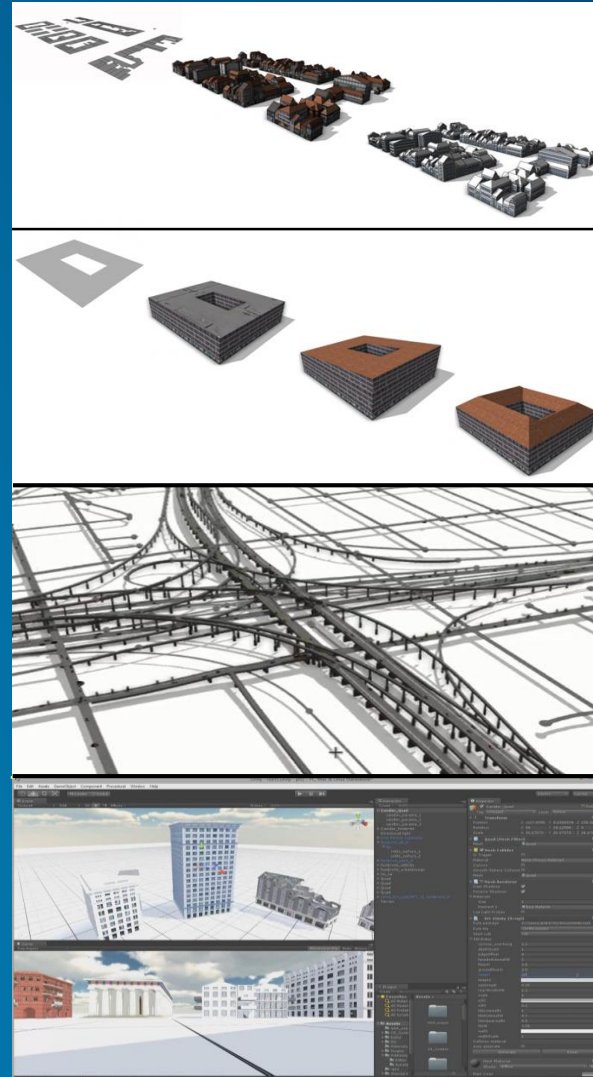
- 3D plant library





# CityEngine 2014.0

- Built-in Esri rule library
- Improved hole support
- Improved streets
- Unity example plugin



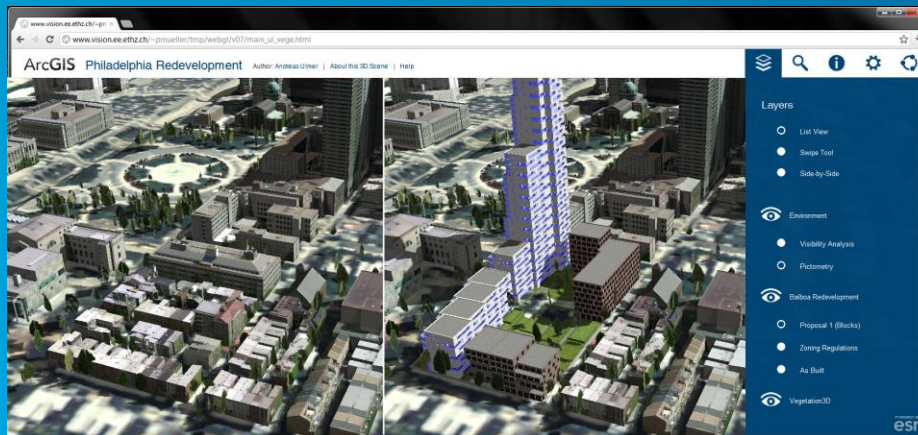
## Demo - beyond CityEngine

- Rule Package

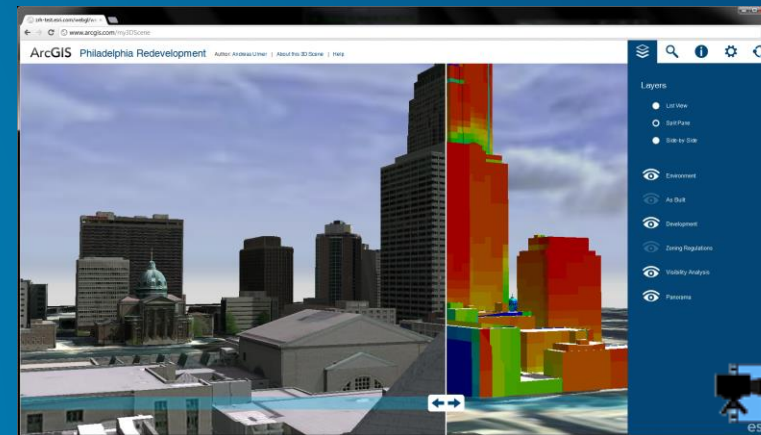
# Share 3D Web Scenes



- 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)



# Share your 3D Scenes

3D models in the browser and on mobile devices

Share your ArcScene  
Project as a Web Scene  
“Clip and Share”

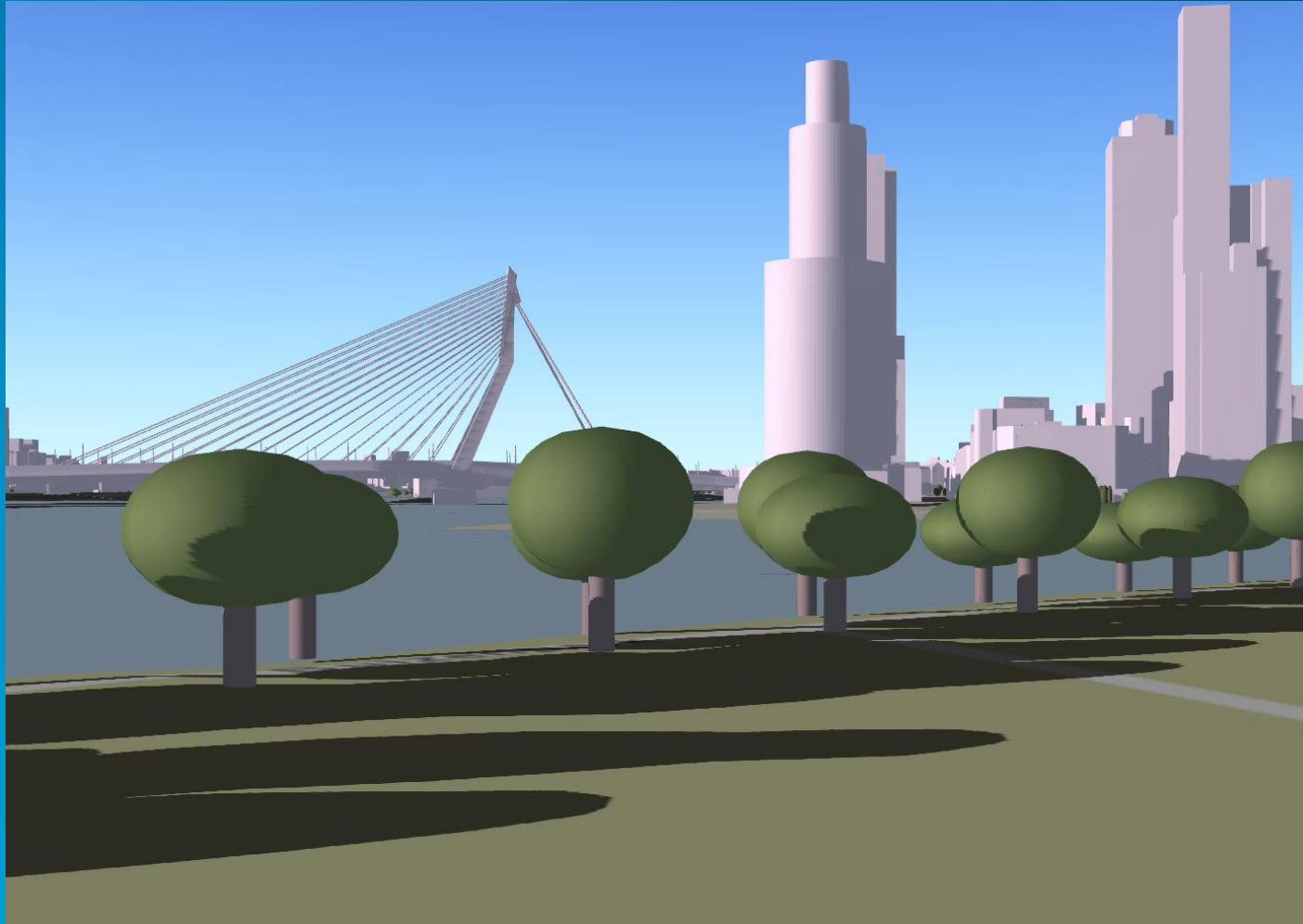


Stream 3D Scenes to  
the Browser and Mobile  
Devices



*Supporting Defense, Local Government, Scientists, Urban Planners,  
Facilities Managers, Geologists, Architects, Landscape Planners...*

## DEMO – Let's make a Web Scene...



# P.S... There is an SDK

The screenshot shows a web browser window displaying the GitHub repository for `Esri/esri-cityengine-sdk`. The browser's address bar shows the URL `https://github.com/Esri/esri-cityengine-sdk`. The repository page includes a description: "Develop 3D applications using the procedural geometry engine of Esri CityEngine." It also displays statistics: 435 commits, 1 branch, 2 releases, and 3 contributors. A commit history table is visible, with the most recent commit by `matthias-specht` on Sep 24, 2014, updating the version to 1.2. The repository contains files such as `examples`, `license`, `.gitignore`, and `README.md`. On the right side, there are options to clone the repository via Desktop or download it as a ZIP file.

GitHub This repository Search Explore Features Enterprise Blog Sign up Sign in

Esri / `esri-cityengine-sdk` ★ Star 28 🍴 Fork 11

Develop 3D applications using the procedural geometry engine of Esri CityEngine.

📄 435 commits 🌿 1 branch 📦 2 releases 👤 3 contributors

🔄 branch: master `esri-cityengine-sdk` / +

updated version to 1.2 so it can be loaded with CE2014.1 sdk

`matthias-specht` authored on Sep 24, 2014 latest commit 39275fb1e7

<code>examples</code>	updated version to 1.2 so it can be loaded with CE2014.1 sdk	5 months ago
<code>license</code>	updated all examples to release 1.1.1471	8 months ago
<code>.gitignore</code>	merged changes directly made on github	5 months ago
<code>README.md</code>	added note about example data	5 months ago

📖 README.md

## Esri CityEngine SDK Examples

📄 Code  
🔔 Issues 2  
🔗 Pull Requests 0  
📊 Pulse  
📈 Graphs

HTTPS clone URL  
`https://github.com/Esri/esri-cityengine-sdk`

You can clone with HTTPS or Subversion.

📁 Clone in Desktop  
📦 Download ZIP



# Useful links

- **CityEngine trial**
  - <http://www.esri.com/software/cityengine>
  
- **Resources**
  - Resource Center:  
<http://resources.arcgis.com/en/communities/city-engine/index.html>
  
  - Forum: <http://forums.arcgis.com>
  - Ideas: <http://ideas.arcgis.com>
  
- **Support**
  - <http://support.esri.com>
  
- **Training**
  - <http://training.esri.com>

**Federal GIS Conference**

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**Don't forget to complete  
a session evaluation form!**

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# **Print your customized Certificate of Attendance!**

Printing stations located on L St. Bridge, next to registration



## Federal GIS Conference

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# GIS Solutions EXPO, Hall D

Monday, 12:30pm – 6:30pm

Tuesday, 10:45 AM–4:00 PM

- Exhibitors
- Hands-On Learning Lab
- Technical & Extended Support
- Demo Theater
- Esri Showcase

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## **Networking Reception:**

# ***National Museum of American History***

Tuesday, 6:30 PM–9:30 PM  
Bus Pickup located on L Street

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## **Interested in diving deeper into Esri technology?**

Add a day to your Fed GIS experience and register to attend the Esri DevSummit Washington DC. Stop by the registration counter to sign up.





Understanding our world.