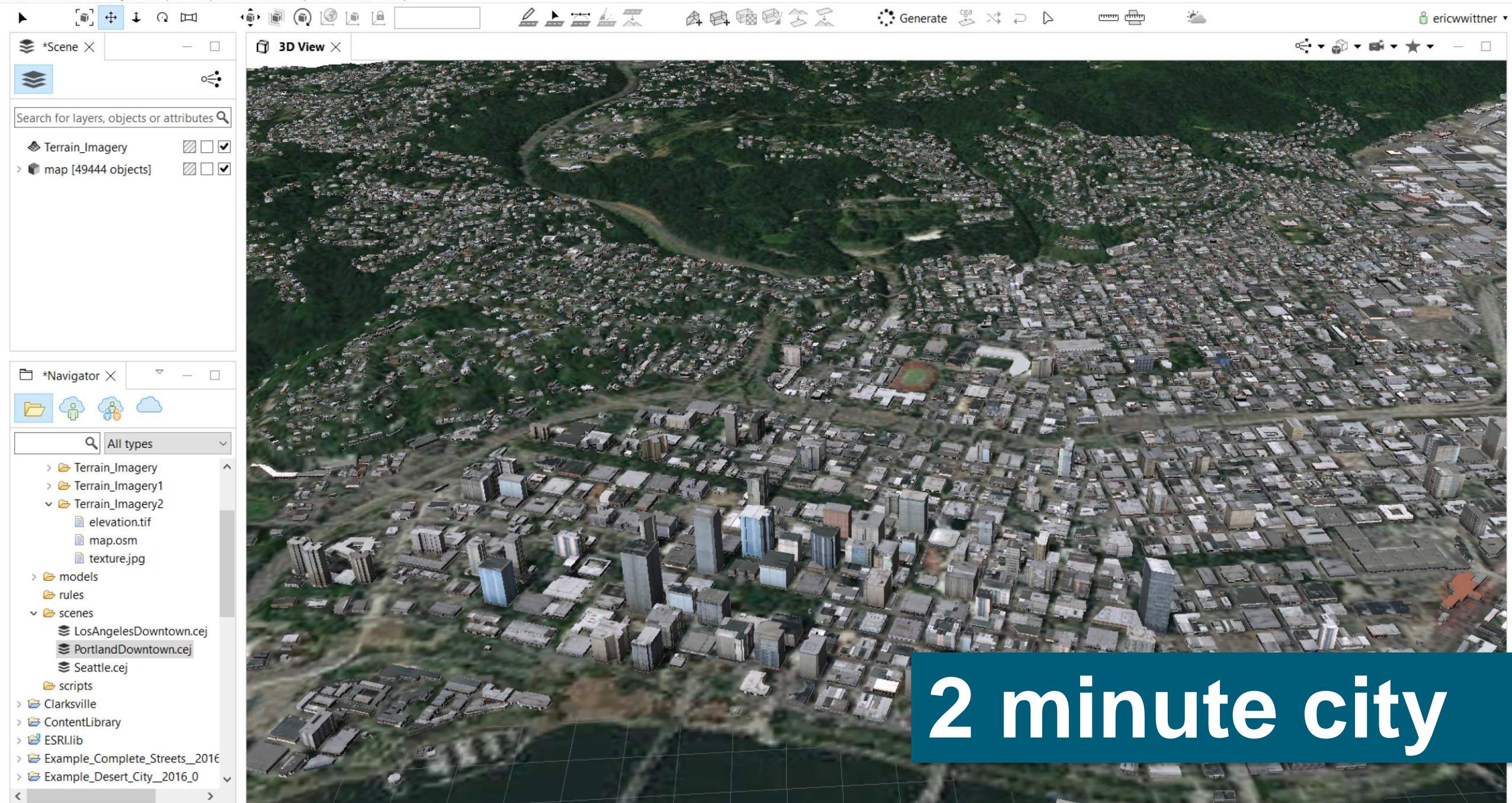


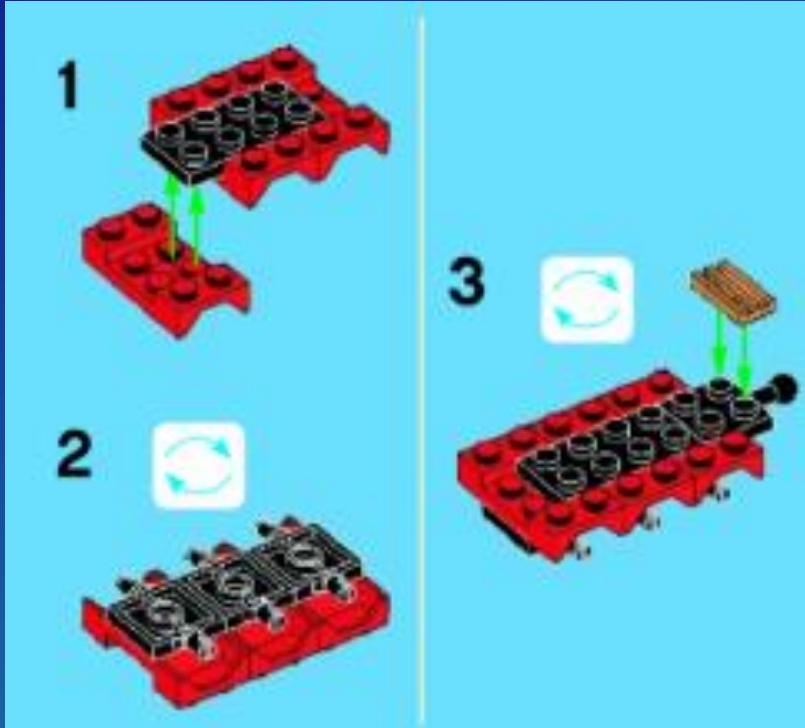
CityEngine: An Introduction

Eric Wittner

3D Product Manager



“LegoScript”

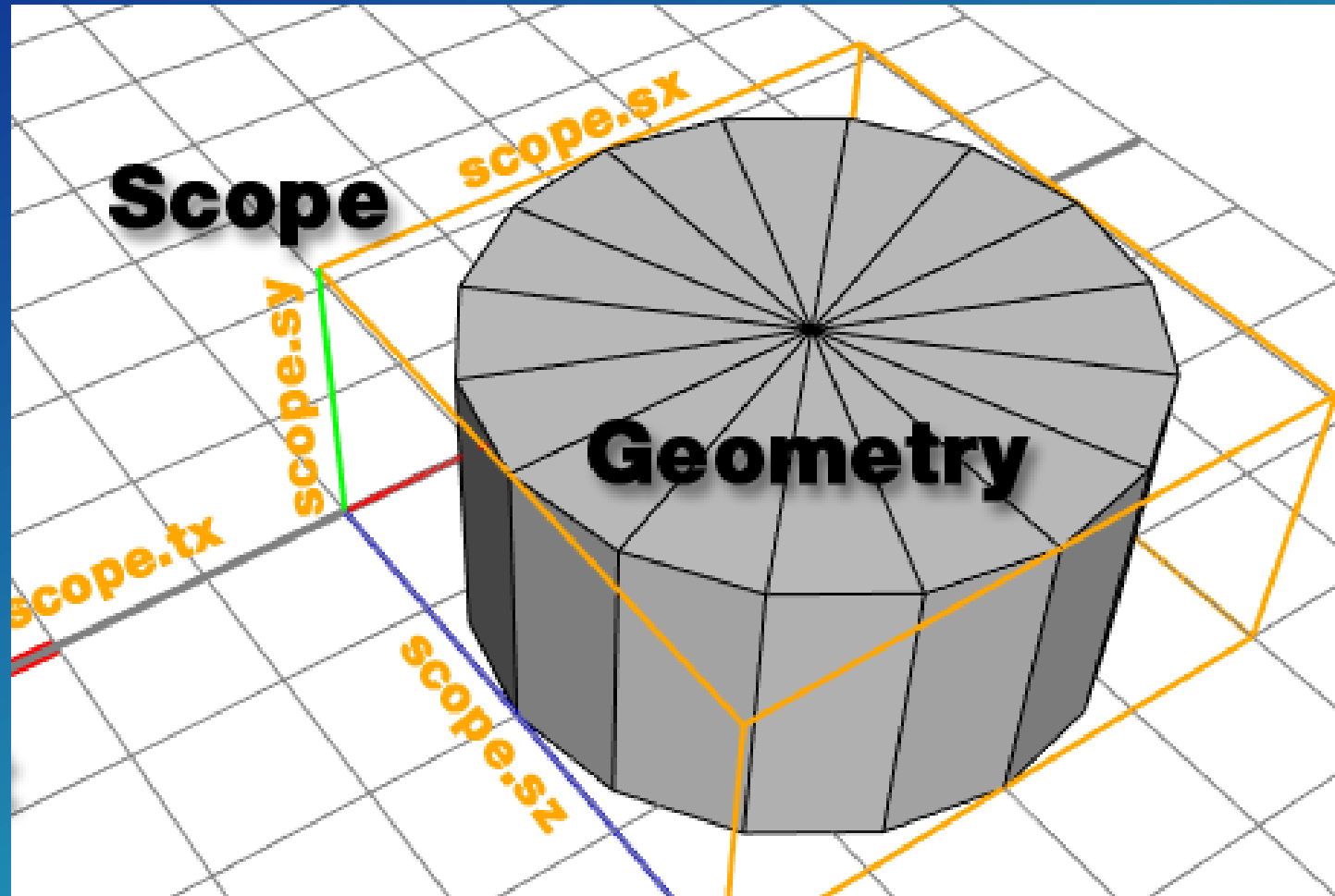


+

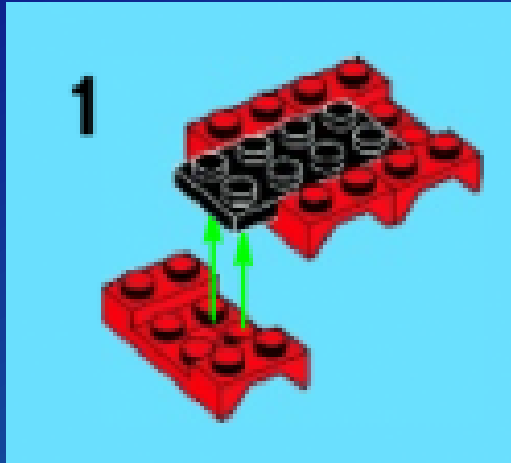


parameterized instructions + Legos

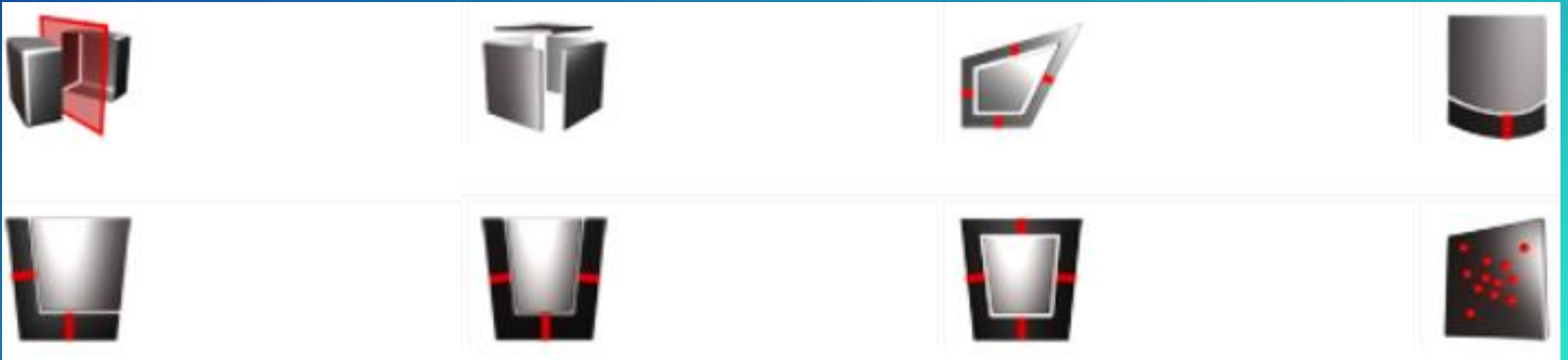
Shapes = Scope and Geometry



Shape Operations



modify scope and geometry



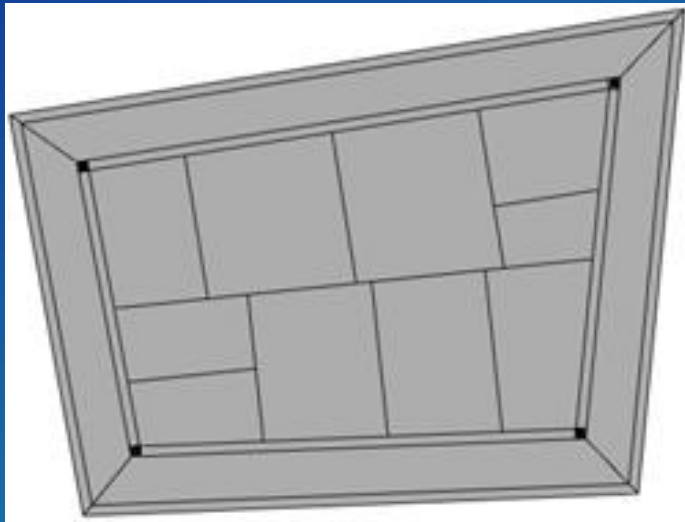
Rule = Sequence of Shape Operations

```
Envelope -->
  case scope.sx*scope.sz > 6000:
    15%: split(y) { '0.9 : Tower
                  | ~3   : s('0.8,'1,
                  | ~1   : s('0.6,'1,}
    15%: split(y) { 'rand68 : T
                  | ~rand(0.5,1.5): s
                  | ~1       : s
    15%: split(y) { 'rand48 : Tower
                  | ~1      : s('ran
    15%: split(y) { 'rand48 : Tower
                  | ~1      : t('ran
    else: Tower
  else: Tower
```

“Scripting for Shapes”

Procedural Model/Symbol

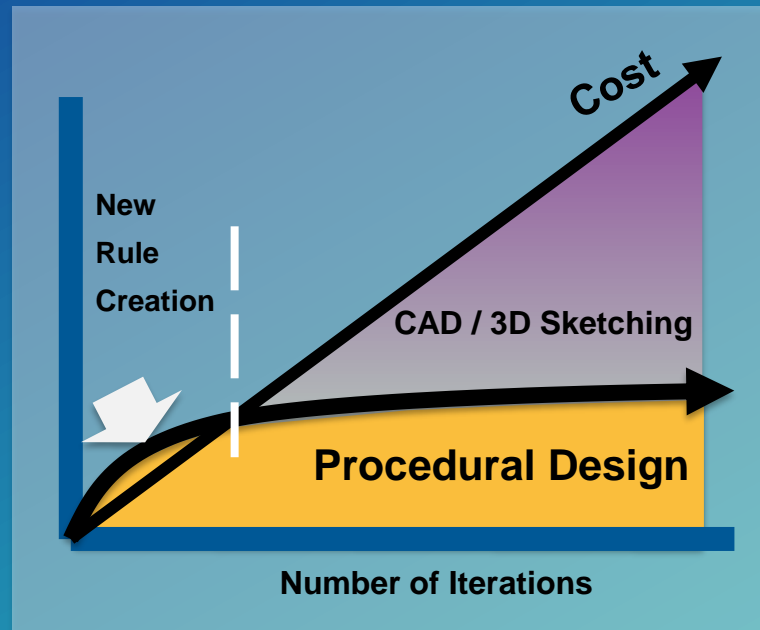
= Rules (CGA) + Assets on Shapes



Procedural Modeling Provides a Flexible 3D Design Environment Supporting a Rapid and Repeatable Process

Steps

- Author Rules (or use Library)
- Generate Multiple Design Scenarios
- Evaluate Alternatives



A



B



Particularly When Projects Require Many Iterations

Procedural Modeling is Intelligent Rule Based Database

- Interactive
- Multiple Views
 - Realistic Display
 - 3D Thematic Rendering
- Performance Reporting
 - Driven by Attributes
 - Visualized Dynamically



Design



Infiltration Rate



Design



3-D Zoning



Demo

Scene

Search for layers, objects or attributes

Scenario 1

Buildings [5]

Shape 1

Shape 2

Shape 3

Shape 4

Shape 5

Shape 6

Scenario 2

Buildings [6]

Shape 1

Shape 2

Shape 3

Shape 4

Shape 5

Shape 6

Shape 7

Shared

Terrain

Street Network

Buildings [245]

Base Map

Inspector

Shapes (5)

Name

Shape

Shape Parameters

Rules

Rule File

Buildings_Advanced_Building/Building

Assign...

Start Rule

Lot

Select...

Building Construction

Default Style

DISPLAY OPTIONS

Display_Textures

Enabled

Display_Thematics

Thematics Off

Solid_Color

FFFFFF

Transparency

1

Story_Edge_Display

Disabled

Story_Edge_Size

0.15

Story_Edge_Color

ffffff

BUILDING HEIGHT

Floor_Count_Min

2

Floor_Count_Max

8.705123

Variation_Mode

None

Upper_Floor_Height

3.8

Ground_Floor_Height

4.6

Foundation_Adjustment

0

Sidewalk_Height_Match

0

BUILDING SETBACKS

Street_Setback

1.83

Back_Setback

0.91

Side_Setback

0

Street_Setback_Mode

None

Street_Setback_Distance

2

FOOTPRINT LAYOUT



Dashboard (beta)

GFA

Total GFA (sq ft)

Scenario 1	150'312
Scenario 2	120'243

GFA by Type

Type	Scenario 1 (sq ft)	Scenario 2 (sq ft)
Residential	100,000	150,000
Office	40,000	40,000
Commercial	10,000	30,000

Energy Consumption

Total Consumption

Scenario 1	2'312 MWh/y
Scenario 2	2'043 MWh/y

The more compact design of scenario 2 results in considerable lower heating costs.

Consumption by Type

Type	Scenario 1 (MWh/year)	Scenario 2 (MWh/year)
Auxiliary	10,000	10,000
Cooling	45,000	40,000
Heating	80,000	60,000
Hot Water	25,000	20,000
Lighting	15,000	10,000
Power	50,000	45,000
Solar	15,000	15,000

Green Energy / Emissions

Total Carbon Emissions

Scenario 1	3.142 tons/y
Scenario 2	3.213 tons/y

Total Green Electricity

Scenario 1	0.142 MWh/y
Scenario 2	0.213 MWh/y

Carbon Emissions

Month	Scenario 1 (tons)	Scenario 2 (tons)
Jan	1,800	1,800
Feb	1,700	1,700
Mar	1,600	1,600
Apr	1,500	1,500
May	1,400	1,400
Jun	1,300	1,300
Jul	1,200	1,200
Aug	1,100	1,100
Sep	1,200	1,200
Oct	1,300	1,300
Nov	1,400	1,400
Dec	1,500	1,500

Neighboring Building Stock

Vacant

2'543 Buildings

Heritage Status

13 Buildings

Average Height

32.5 Meter



“Creating 3d faster, smarter, easier.”

“Enabling the rapid and interactive creation of 3D content, en masse or in situ, that is visually compelling, quantifiable, and sharable.”

New Capabilities in 2017

Scenario Management: Author, manage, and compare designs visually or through metrics represented in dashboards

Local Edits: Allows editing of individual parts of a procedurally generated feature, creating a powerful hand modeling tool

Interactive 3D Analytics: Live GPU based interactive analytics for viewshed, cumulative viewshed, line of sight, and cumulative shadows to guide design decisions

Improved Features

UI/UX Enhancements: Revised Workspace and Project Navigator, Improved in view navigation. GetMap UI redux.

Expanded Platform Support: Point and Line Feature Services import. Live Sync of feature service layers. TPK and MSPK generation.

Better setup/launch: CityWizard unified with GetMapData. Improved documentation, and better example projects.

Scenarios - Demo



Improved ease of use

less buttons

e.g. move type visibility to 2nd level access

modern icons

lets not look like windows xp anymore

DPI sensitive

+ more spacing

simpler tools

e.g. better UI for get map data

better toolbar

toolbar in viewport as in scene viewer

simpler 3D navigation

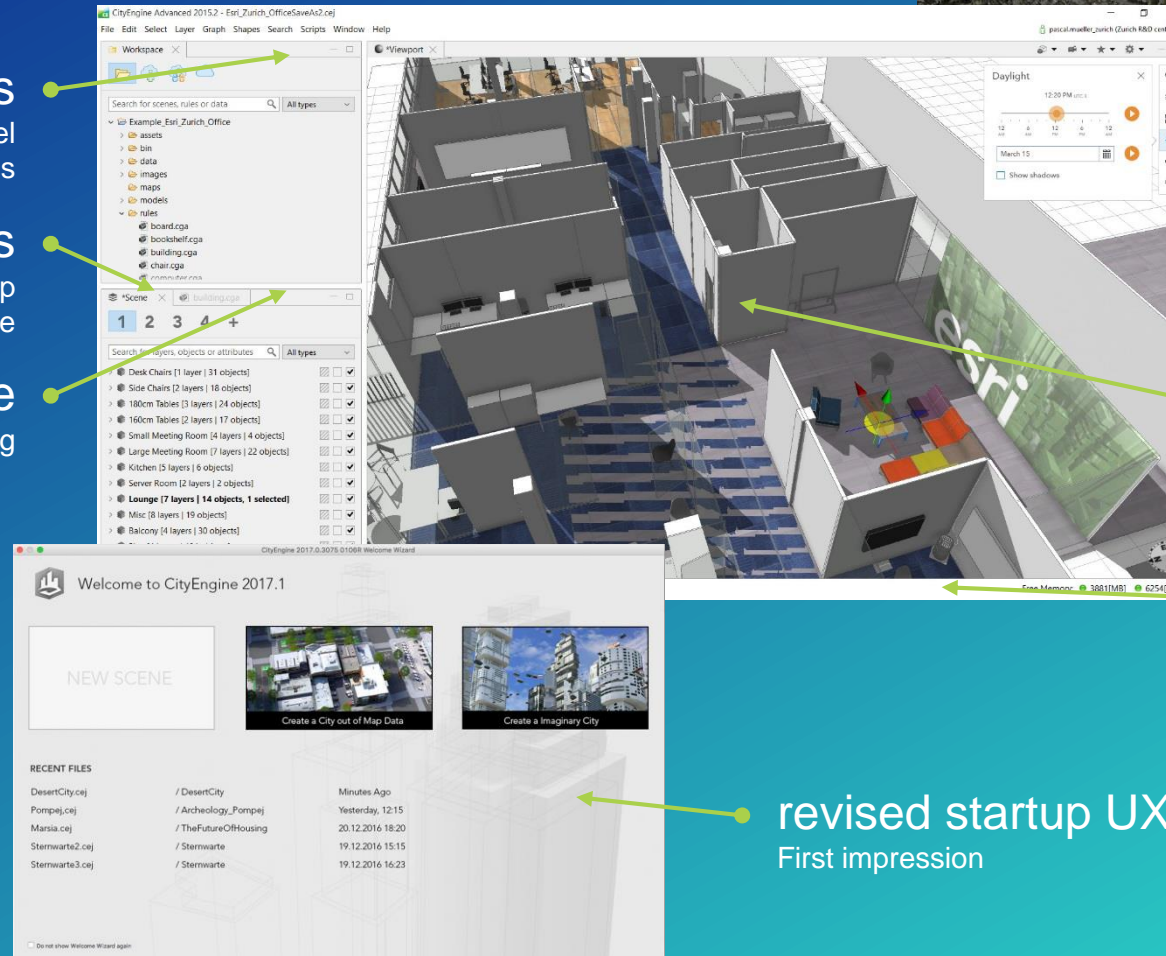
no more 'press-first-frame' to tumble

feedback

Use status bar

revised startup UX

First impression



Esri.lib: 3D Rule Library

- What are they?

- Rules usable out of the box
- For: Footprints, 3D models, streets
- Built in support for OSM

- Additional rules as examples

- Published per CityEngine Version
- Wide range of domains and focuses
- Downloadable through CityEngine



3D Model Library

- 3D models for use in visualization and publishing
 - Core urban environment: People, cars, street furniture, etc.
 - Multi-LOD version
 - Custom colors for parts of model
- Available as ...
 - 3D styles in ArcGIS Pro
 - 3D symbology in webviewer
 - 3D Assets for CityEngine



Export to ArcGIS 360 VR



Later half
of 2017

Web-Based Viewer
GearVR Controller Support



Esri CityEngine Roadmap

Available

Scenario Management
Dashboards
Local Edits (Custom 3D models)
3D Measurement
Better startup / launch
Ease of use / user experience enhancements

Later half of 2017

Computer Generated Architecture
enhancements for zoning
New interactive analytic tools
360 Photos Publishing for 360 VR

Beyond

Named User Support
Extended Platform Support
Additional interactive analytic tools

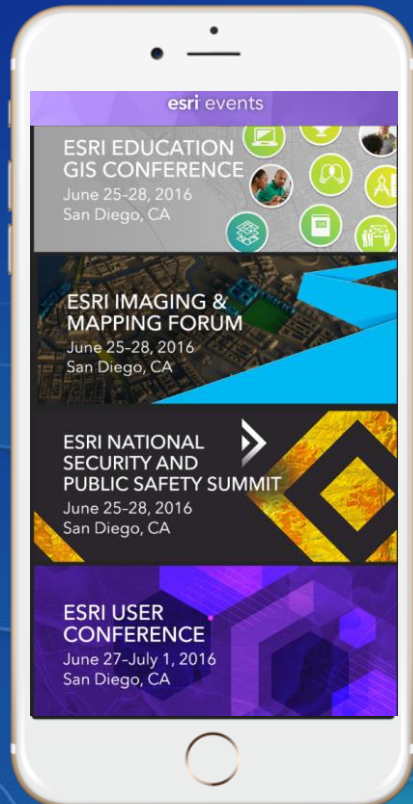


3D Island @ Esri Showcase

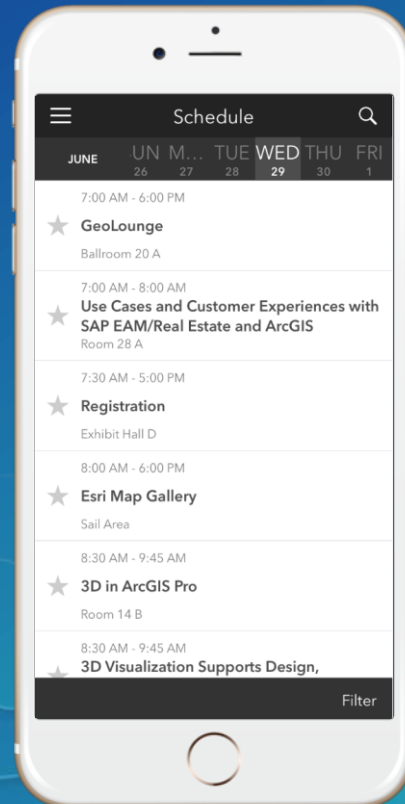
Please take our Survey

Your feedback allows us to help maintain high standards and to help presenters

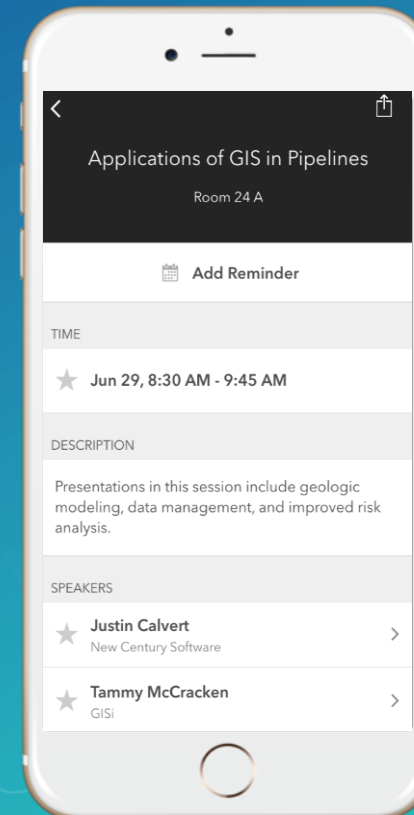
Find your event in the
Esri Events App



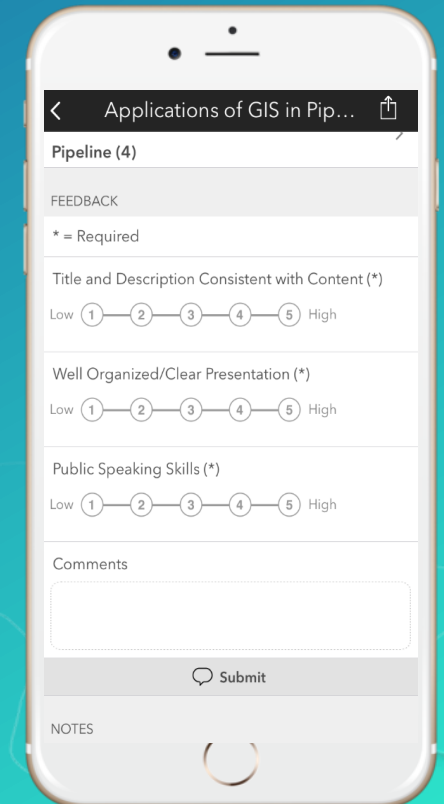
Find the session
you want to review



Scroll down to the
bottom of the session



Answer survey
questions and submit



Questions?



esri

THE
SCIENCE
OF
WHERE