2014 Esri China
Developer Summit

esri China BEIJING
分 享 地 理 价 值

2014Esri空间信息技术开发者大会

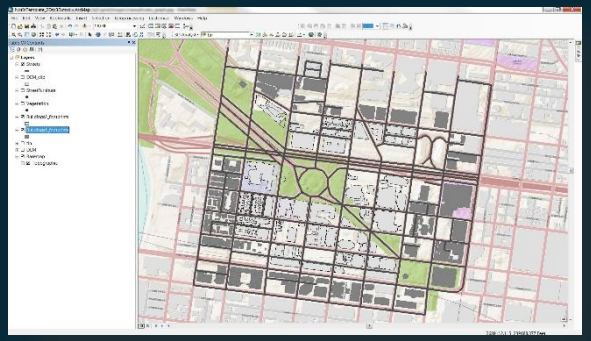
——超务实的地图应用开发者聚会

CityEngine规则创建与分享

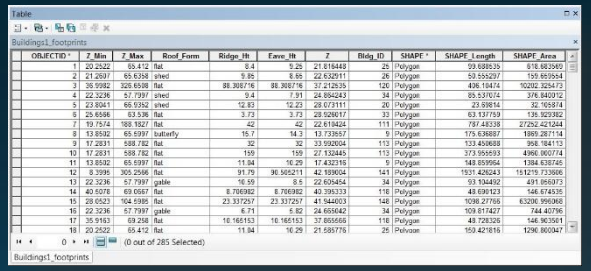
Esri中国　　慕晓燕

3D 城市内容创建

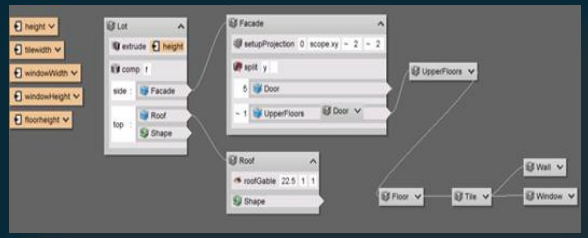
程序化的自动建模



几何

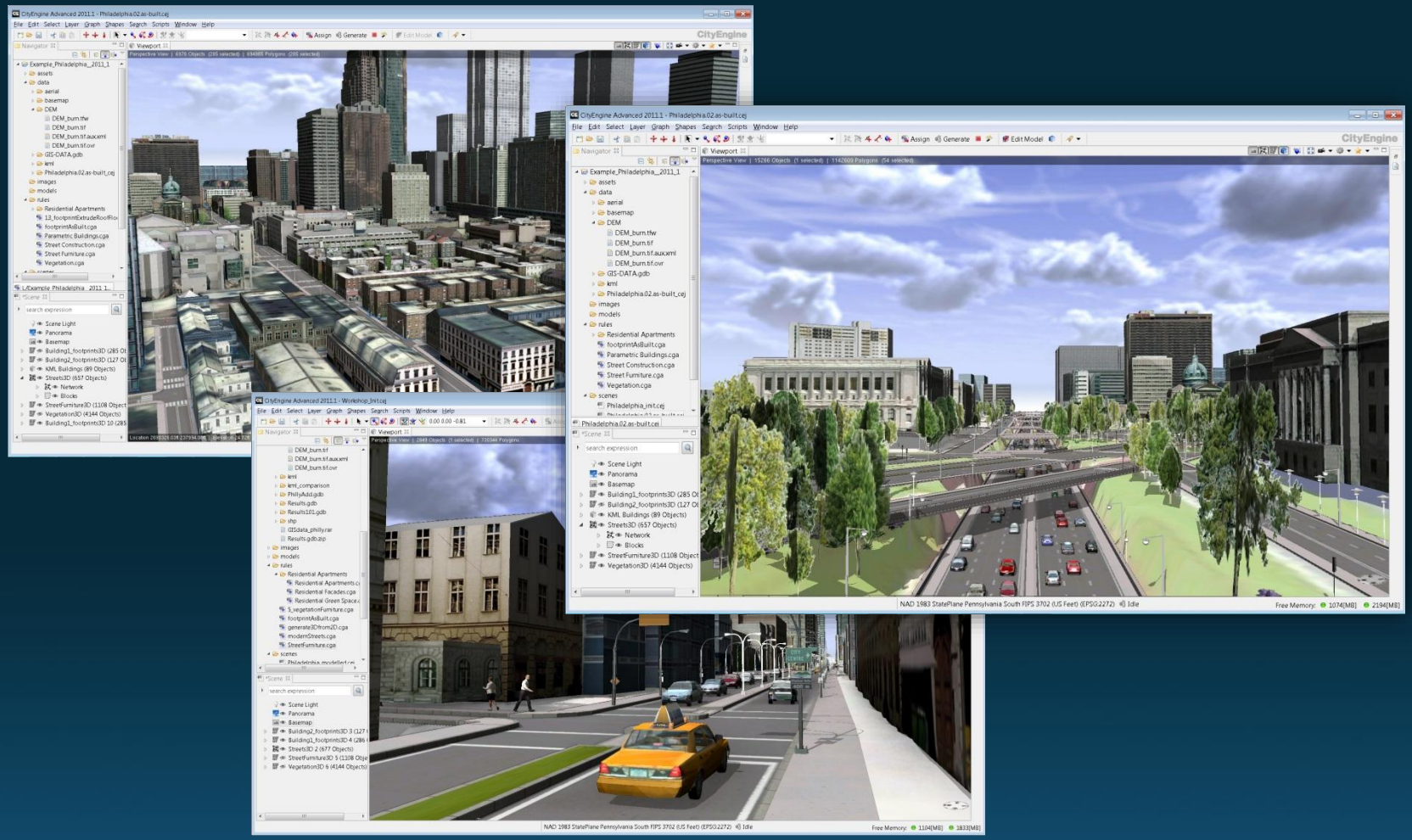


属性



规则

3D 城市内容创建



2014 Esri China Developer Summit

esri China BEIJING

3D 城市设计

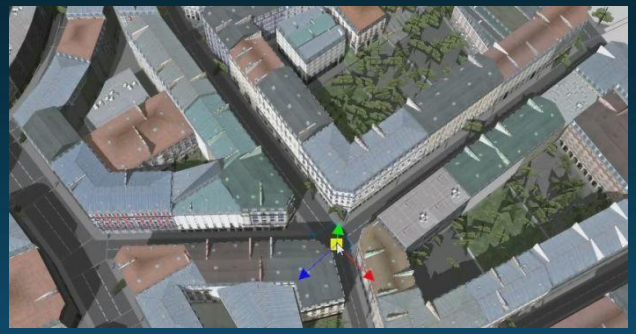
程序化、参数化、动态设计

参数化编辑

添加楼层

添加屋顶

动态编辑



报表

内容

- CGA 基础
- 实用3D建模示例
- 分享 Rule Package

CGA 基础

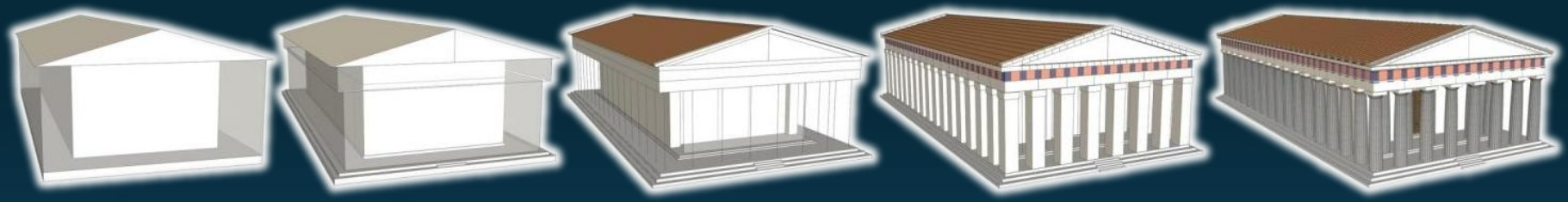
esri China BEIJING

CGA：基础

CGA = Computer Generated Architecture；

CityEngine的独特语言；

越来越详细地迭代“进化”模型。



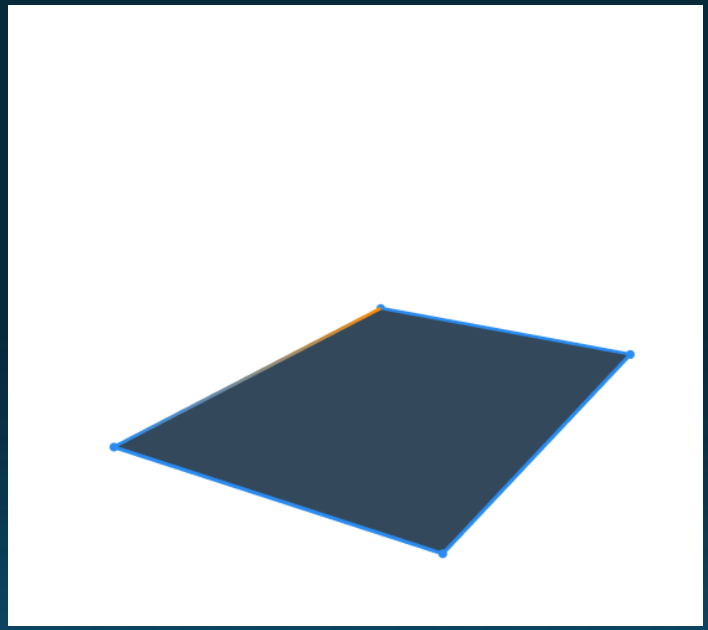
CGA：基础

规则

– 基于shape的操作。

```
Init-->
  extrude(10)
  comp(f) {
    side : Facade. |
    top  : Roof
  }

Roof-->
       roofHip(30)
```



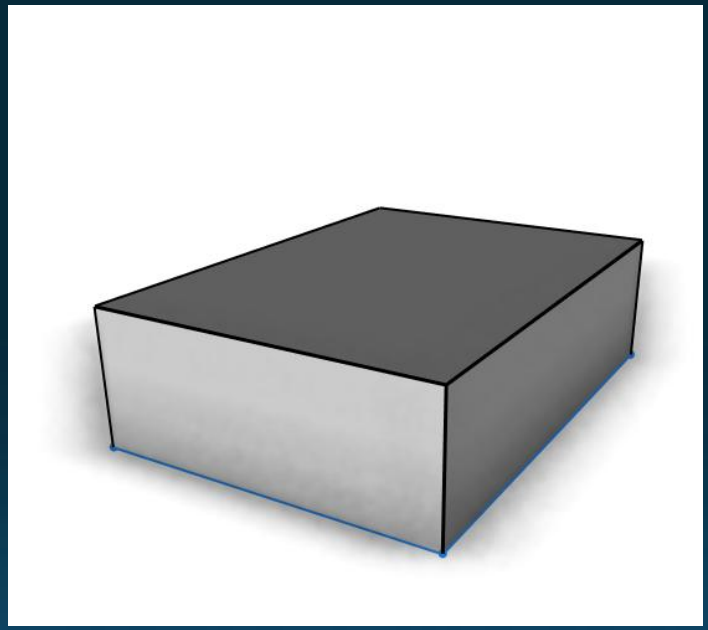
CGA：基础

规则

– 基于shape的操作。

```
Init-->
  extrude(10)
  comp(f) {
    side : Facade. |
    top  : Roof
  }

Roof-->
       roofHip(30)
```



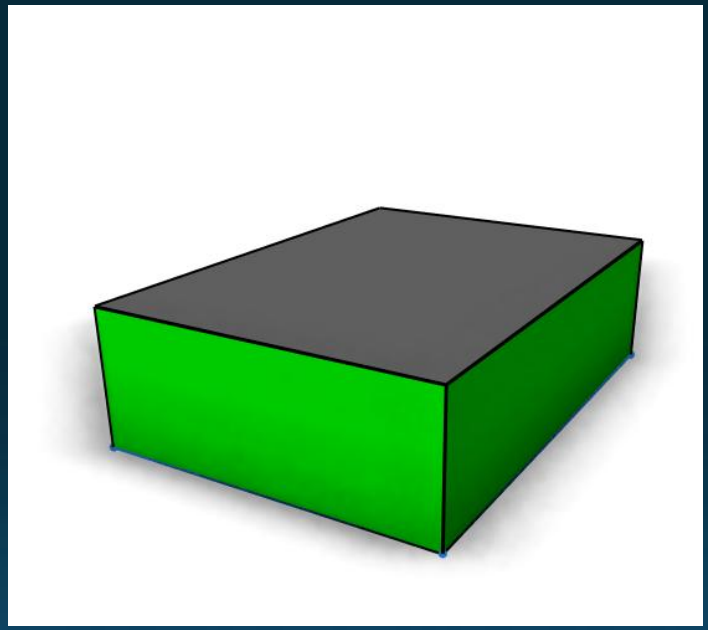
CGA：基础

规则

– 基于shape的操作。

```
Init-->
  extrude(10)
  comp(f) {
    side : Facade. |
    top  : Roof
  }

Roof-->
       roofHip(30)
```



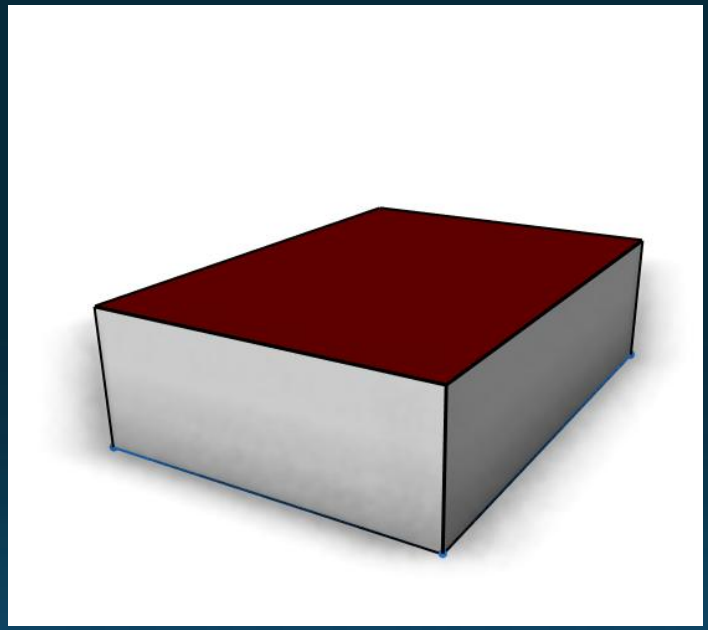
CGA：基础

规则

– 基于shape的操作。

```
Init-->
  extrude(10)
  comp(f) {
     side : Facade. |
     top  : Roof
  }

Roof-->
       roofHip(30)
```



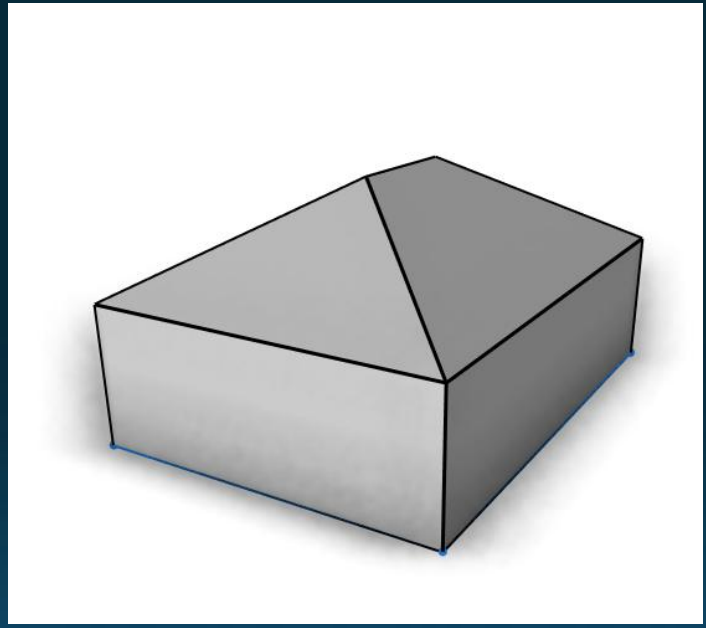
CGA：基础

规则

– 基于shape的操作。

```
Init-->
  extrude(10)
  comp(f) {
    side : Facade. |
    top  : Roof
  }

Roof-->
      roofHip(30)
```



CGA：基础

定义属性

```
height = 15
angle  = 35

Init-->
      extrude(height)
      comp(f) {
      side : Facade. |
      top  : Roof
      }

Roof-->
      roofHip(angle)
```

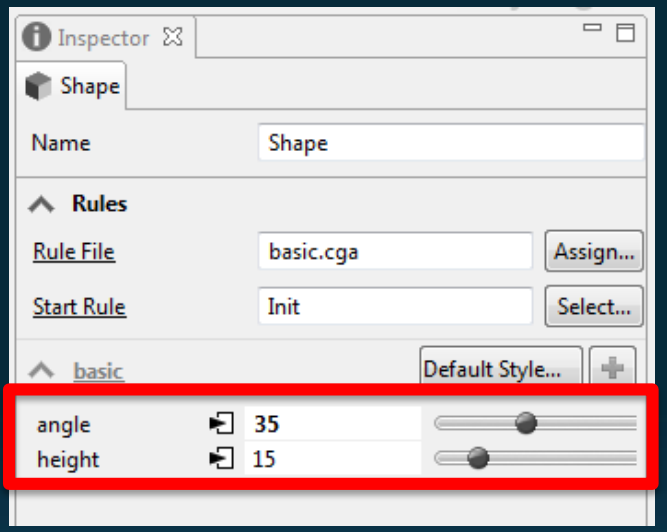
CGA：基础

attr 函数可以将参数显示到外部，如，Inspector界面。

```
attr height = 15
attr angle  = 35

Init-->
        extrude(height)
        comp(f) {
                side : Facade. |
        top   : Roof
        }

Roof-->
        roofHip(angle)
```



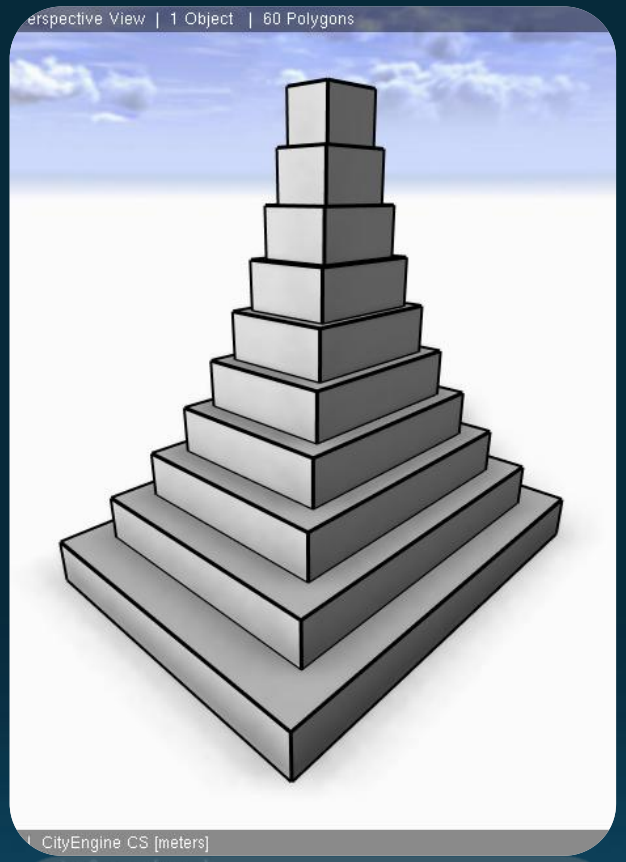
CGA：条件规则


```
Roof-->
        case geometry.area > 1000:
                color(1,0,0)
                X.
        case geometry.area > 500:
                color(1,0.5,0)
                X.
        else:
                print(geometry.area)
                X.
```

CGA：迭代

```
Init-->
  Steps(10)

Steps(n)-->
  case n > 0:
    extrude(4)
    X
    s('0.8, '1, '0.8)
    center(xz)
    comp(f) {
      top: Steps(n-1)
    }
  else:
    NIL
```



CGA：随机规则

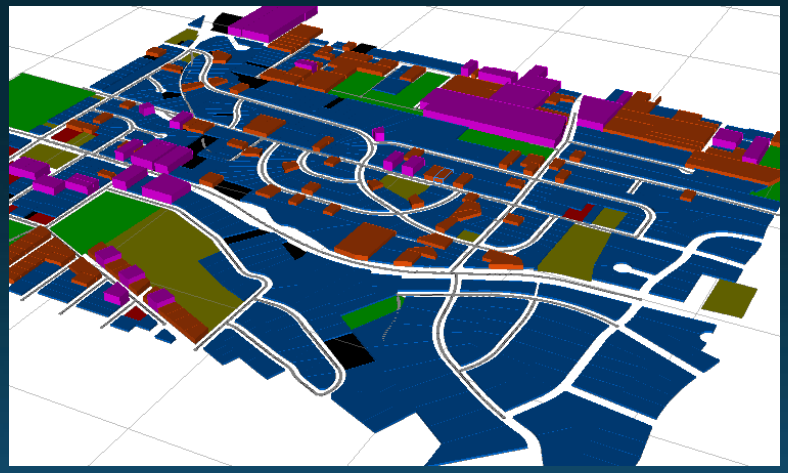
```
PredecessorShape -->
        percentage%: Successor1
        percentage%: Successor2
        ...
        else:    Succ
```

实用3D建模示例

esri China BEIJING

实用场景1：专题可视化

Object Attributes	
LANDUSE	Multi
OBJECTID	721
SERIAL_NUM	37760996
STNAME	EDGEWOOD
STYPE	DR
Shape_Area	38585.014204
Shape_Length	789.337689



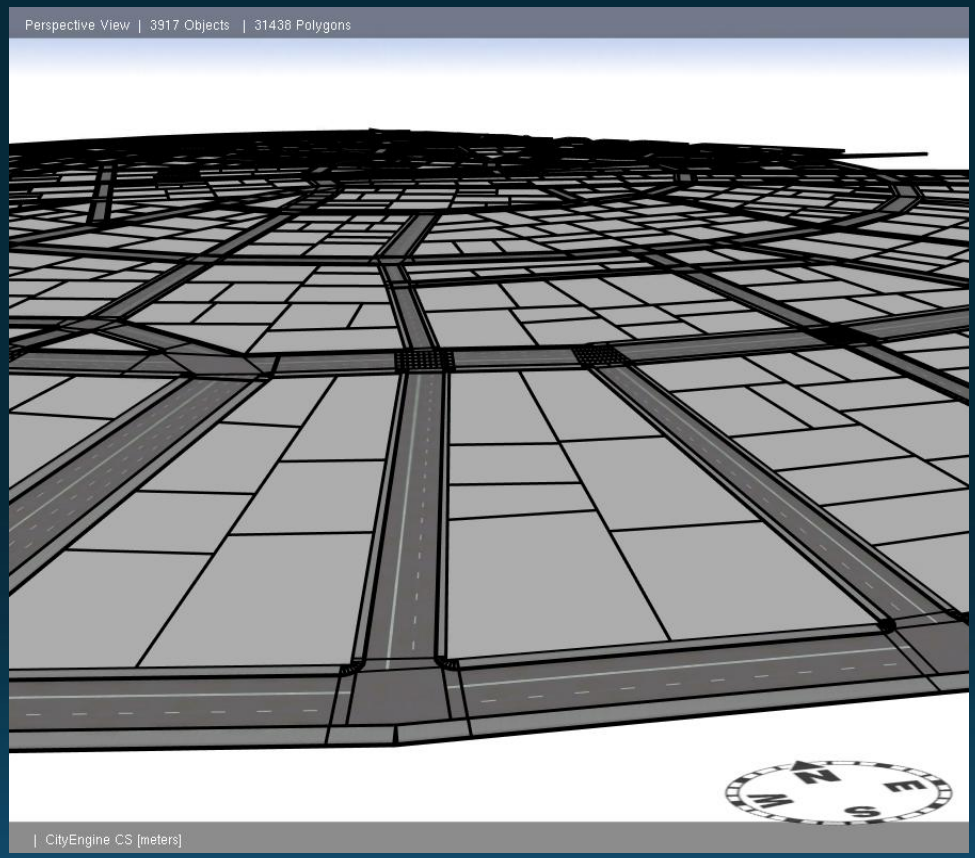
```
attr usage = ""
attr totalHeight = 0

Init-->
   case usage == "Public":
        color(0.1,0.8,0.1)
        X
   case usage == "Educational":
        color(0,0.5,1)
        X
   ...

X-->
    extrude(totalHeight)
```

实用场景2：城市规划

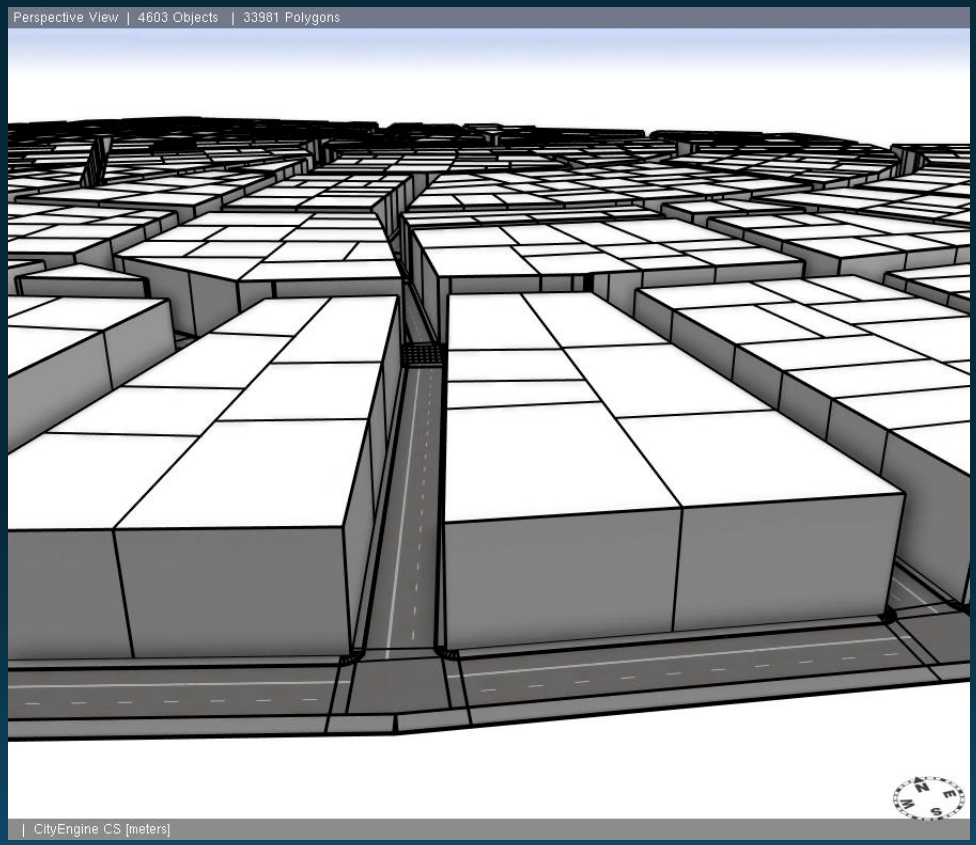
基于现有的街道和地块，进行城市规划。



实用场景2：城市规划

简单拉伸

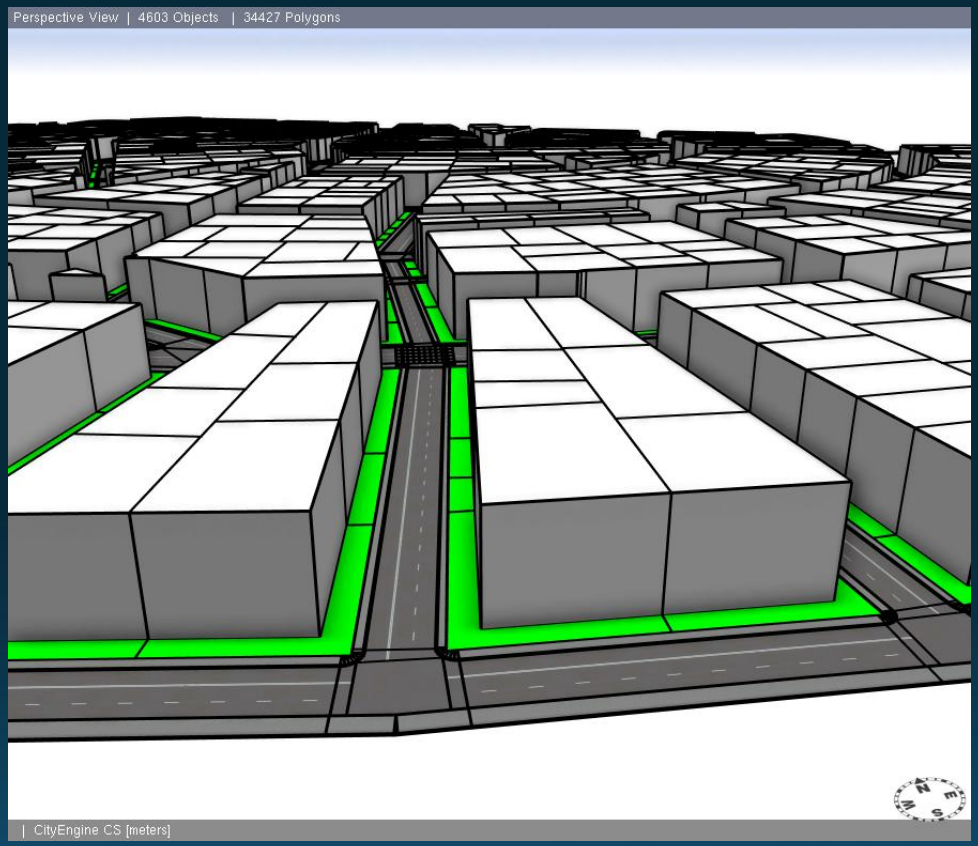
```
Lot-->
        extrude(20)
```



实用场景2：城市规划

setback 操作；以相邻街道为参照。

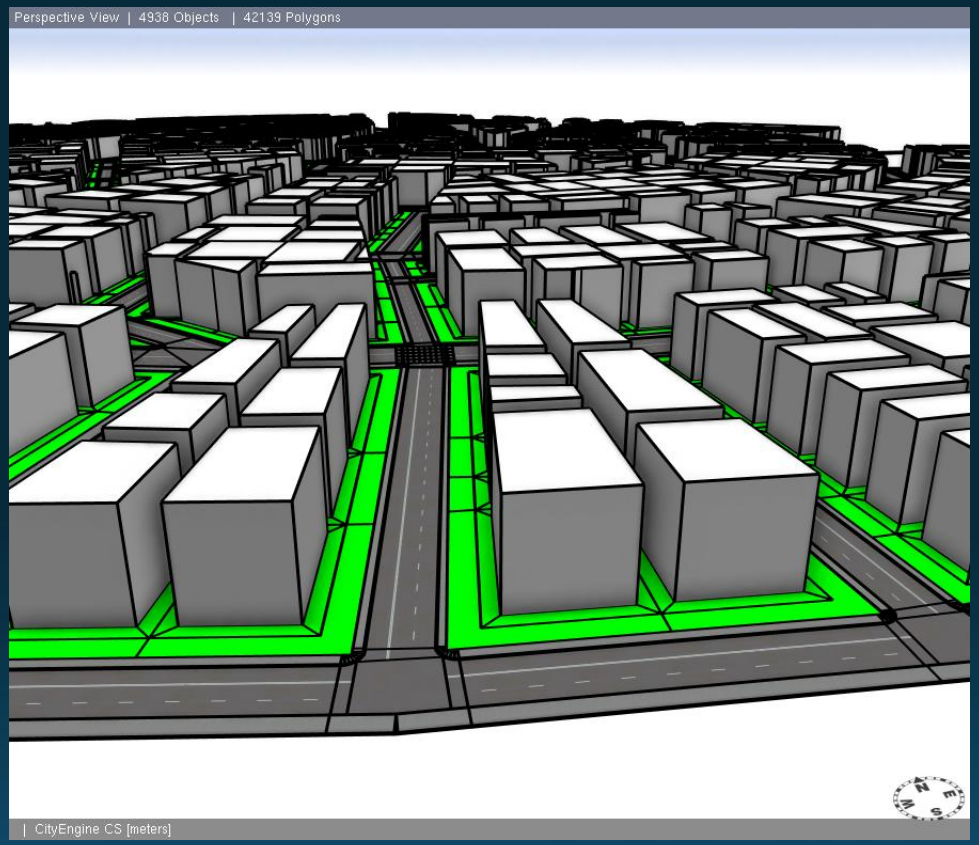
```
Lot-->
    setback(5) {
        street.front:
            color(0,1,0)
            X. |
        remainder:
            extrude(20)
            X.
    }
```



实用场景2：城市规划

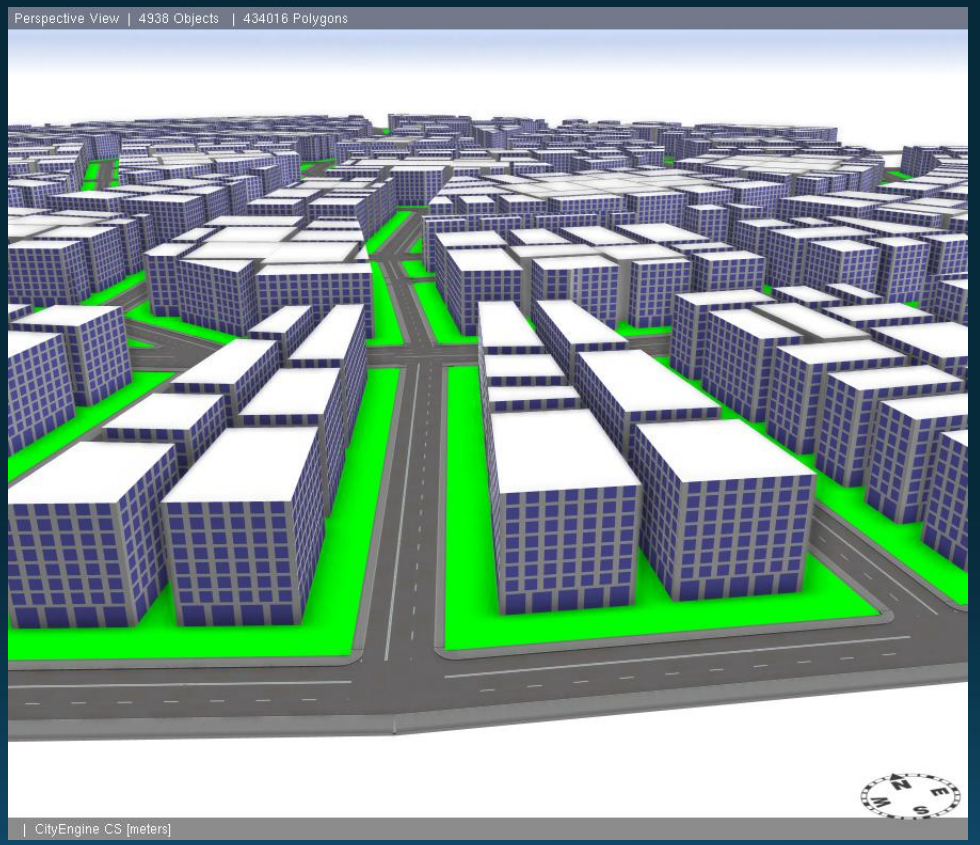
使用 offset 分割地块。

```
Lot-->
    setback(5) {
        street.front:
            color(0,1,0)
            X. |
        remainder:
            offset(-3)
            comp(f) {
                border:
                    color(0,1,0)
                    X. |
                inside:
                    extrude(20)
                    X.
            }
    }
```



实用场景2：城市规划

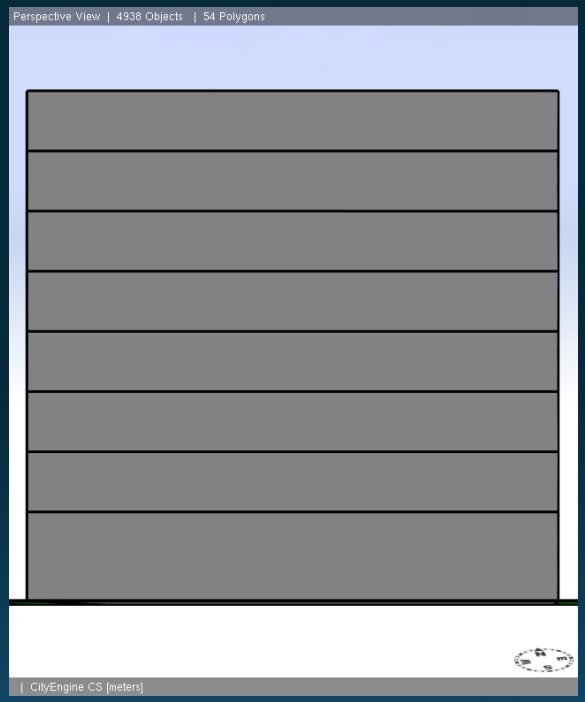
表面细化建模



实用场景2：城市规划

建筑物体 → 楼层

```
Mass-->
   split(y) {
          3.5 : GroundFloor. |
      { ~2.5 : Floor. }*
   }
```



实用场景2：城市规划

楼层 → 窗户 ✚ 墙体

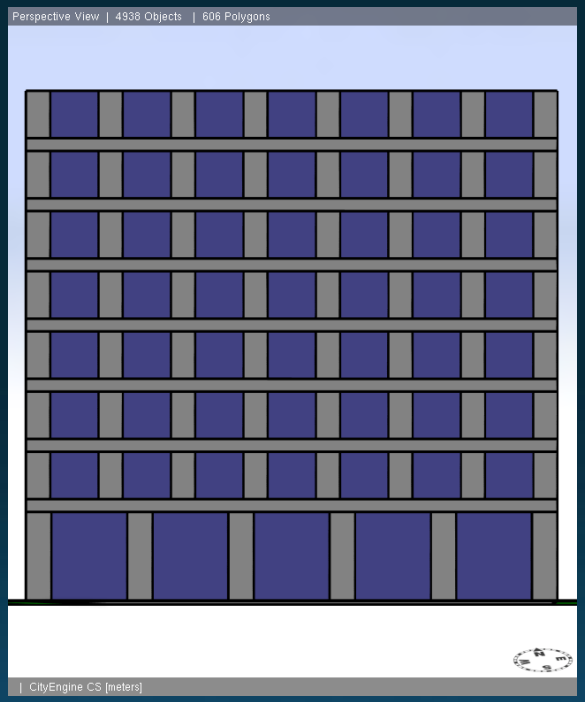
```
GroundFloor-->
  comp(f) { side : GFFacade }

GFFacade-->
  split(x) {
    { ~1 : Wall. | ~3 : Window }* | ~1 : Wall.
  }

Floor-->
  comp(f) { side : FloorFacade }

FloorFacade-->
  split(y) {
    0.5 : Wall. | ~1  : split(x) {
      {~1 : Wall. | ~2 : Window }* | ~1 : Wall. }
  }

Window-->
  color(0.5,0.5,1)
```

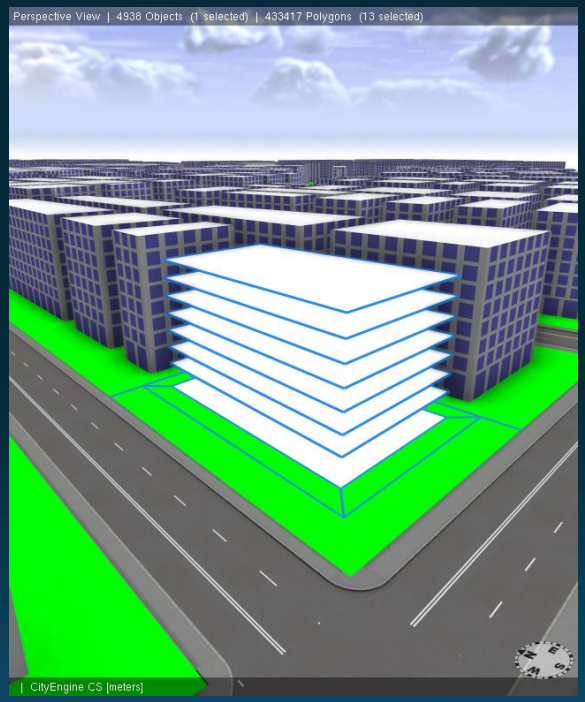


实用场景2：城市规划

分析报表，例如：GFA，FAR

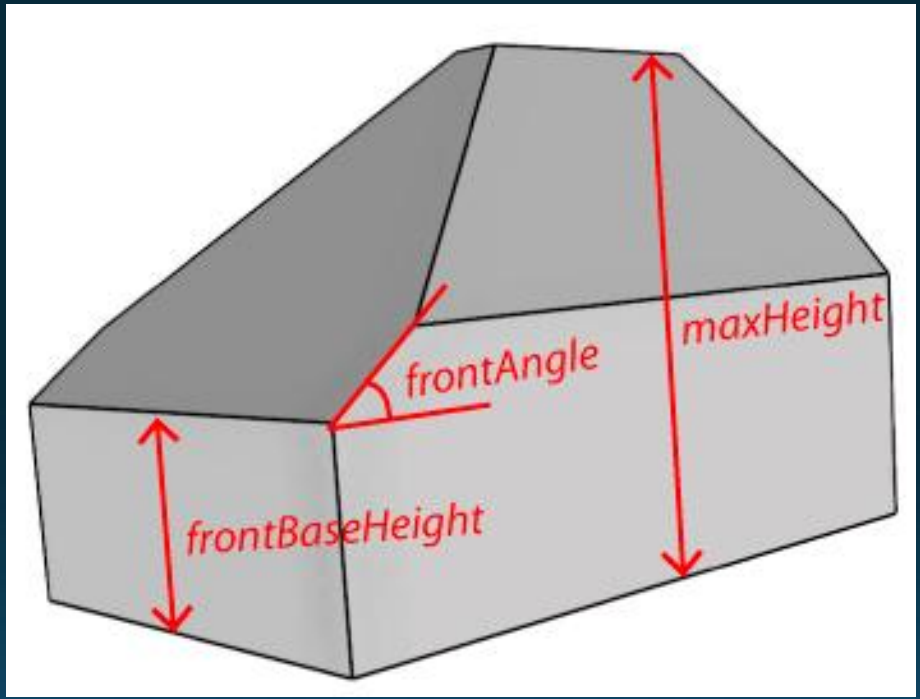
```
FloorGFA-->
  comp(f) {
    bottom:
      report("GFA", geometry.area)
  }
```

Report	N	%	Sum	%	Avg	Min	Max	NaNs
GFA	8	0.00	4997.25	0.00	624.66	624.66	624.66	0

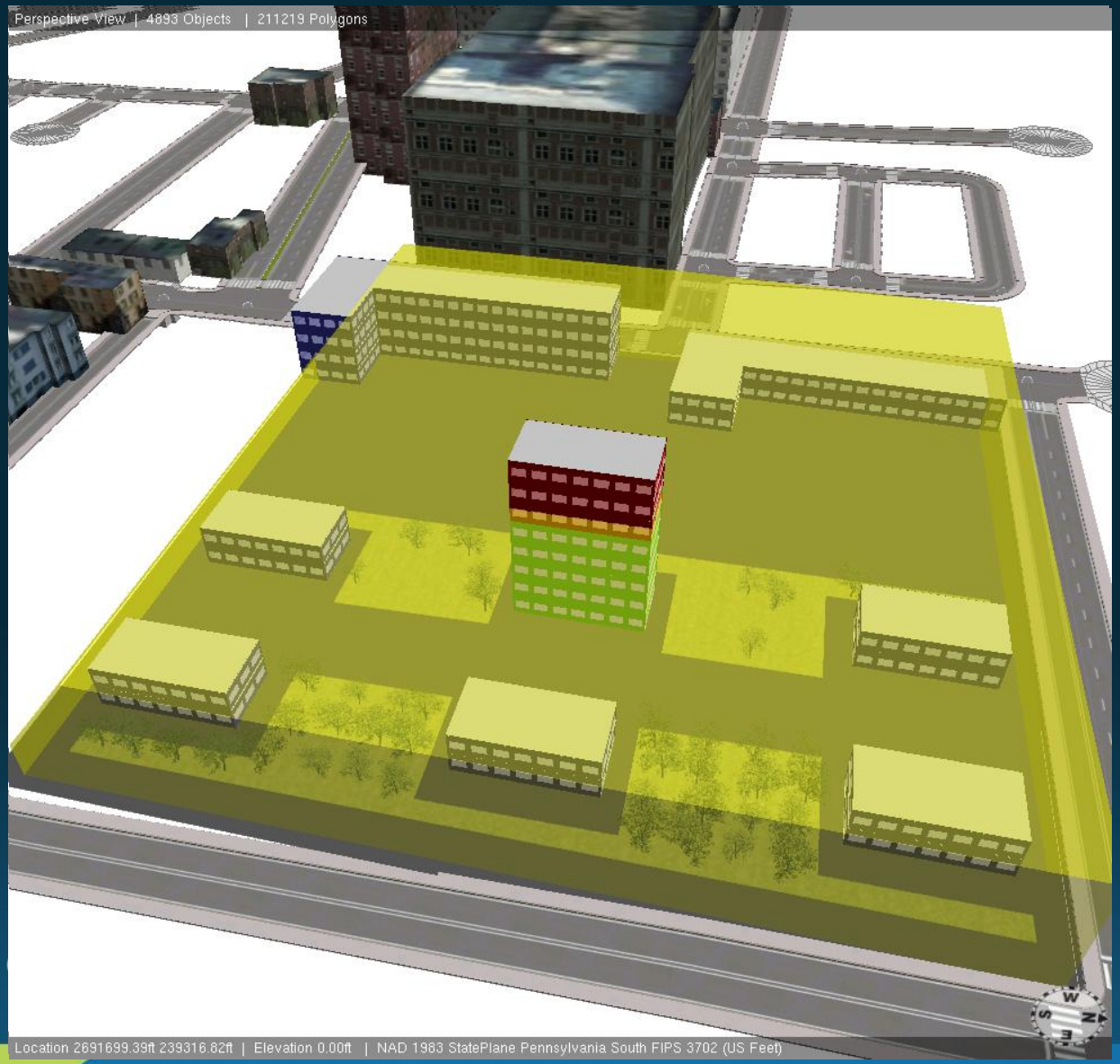


实用场景3：模型控制检测

envelope (*direction*, *maxHeight*, *frontBaseHeight*, *frontAngle* , ... , ...)



实用场景3：模型控制检测

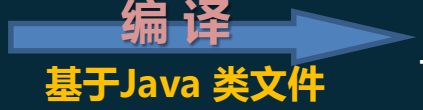


分享规则包

Rule Package

esri China BEIJING

规则包/RPK

- 分享与交互CGA代码与资源的格式， *.rpk
- 文本的CGA代码 

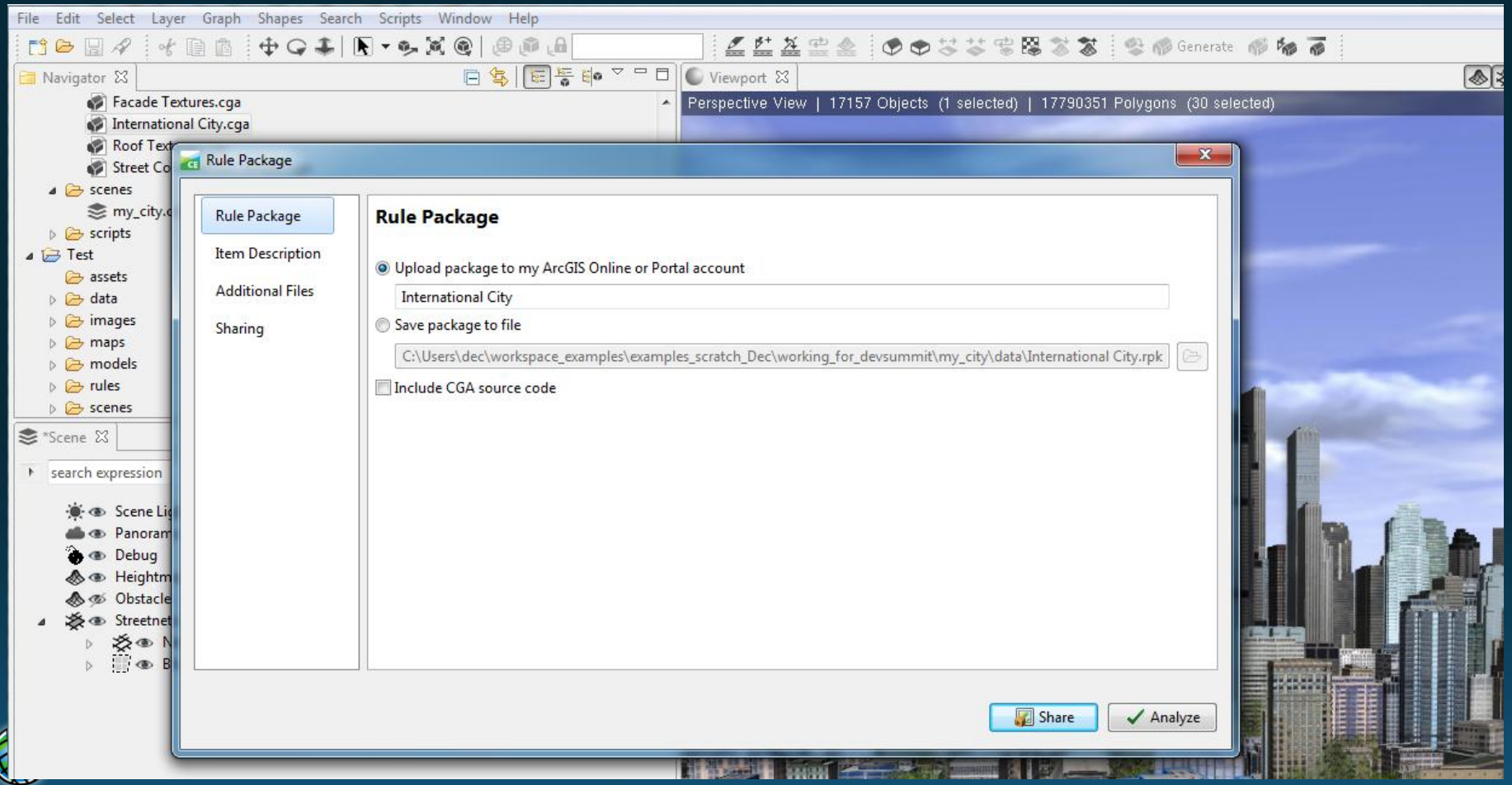
二进制的CGB
- 平台独立

- 程序运行时 = 执行CGB的虚拟机； RPK = 可执行文件
- 可用于：
  - GPTool （ArcGIS 10.2）
  - ARCGis Pro
  - Maya plugin
  - 自定义应用

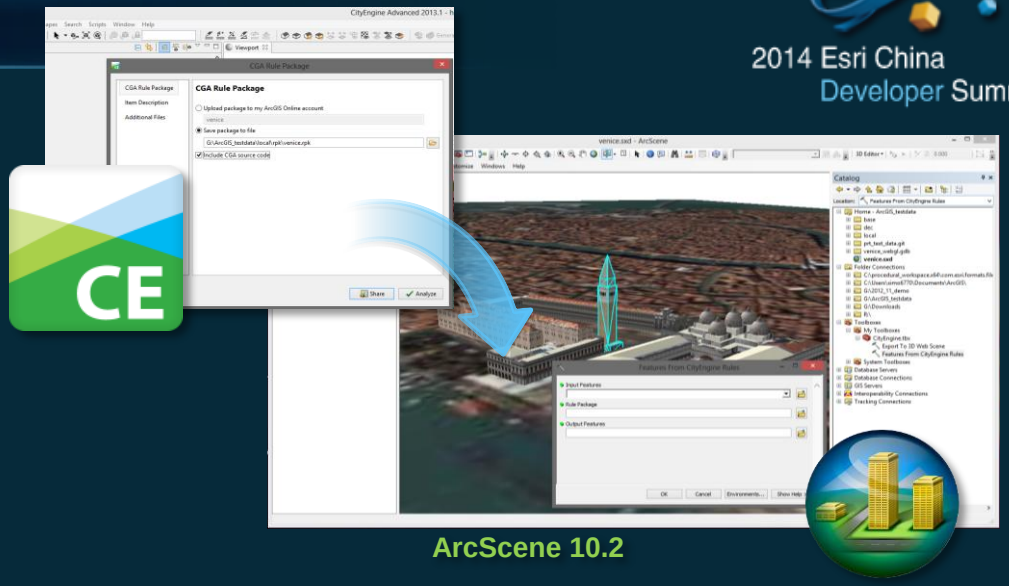
规则包/RPK

2014 Esri China Developer Summit

创建规则包



规则包/RPK



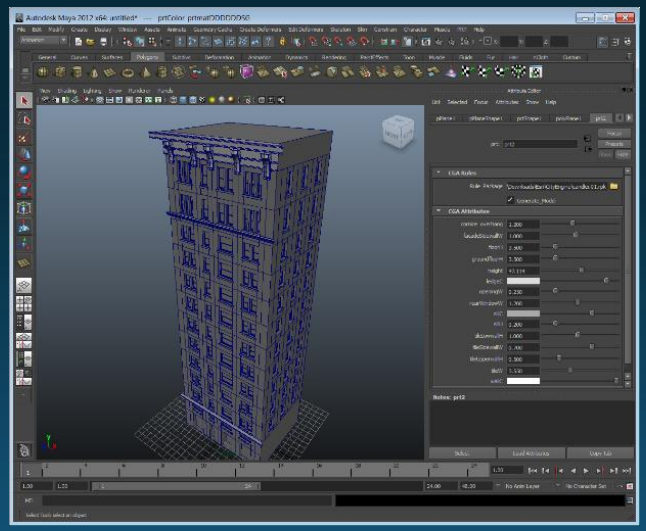
CityEngine：编写规则文件

将规则包分享于：

- 组织内部
- Portal for ArcGIS
- ArcGIS Online

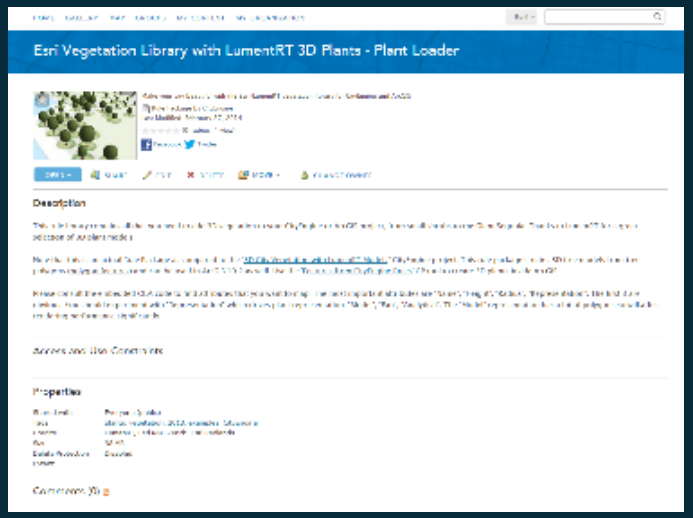
使用规则包：

- ArcGIS 10.2
- ArcGIS Pro
- 3rd party 3D apps
  - CityEngine SDK



Rule Packages on AGOL

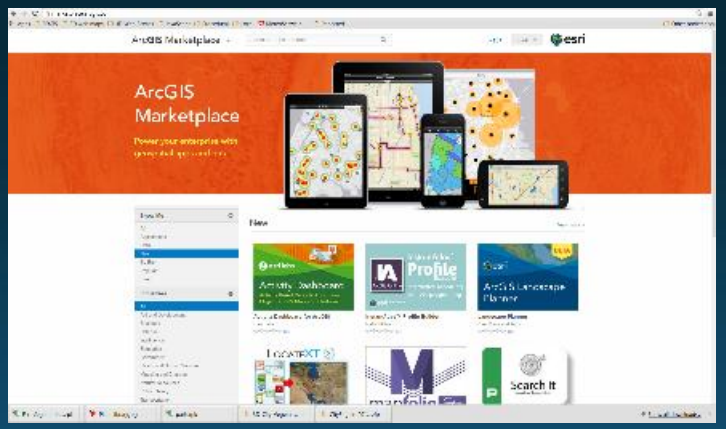
User item on AGOL



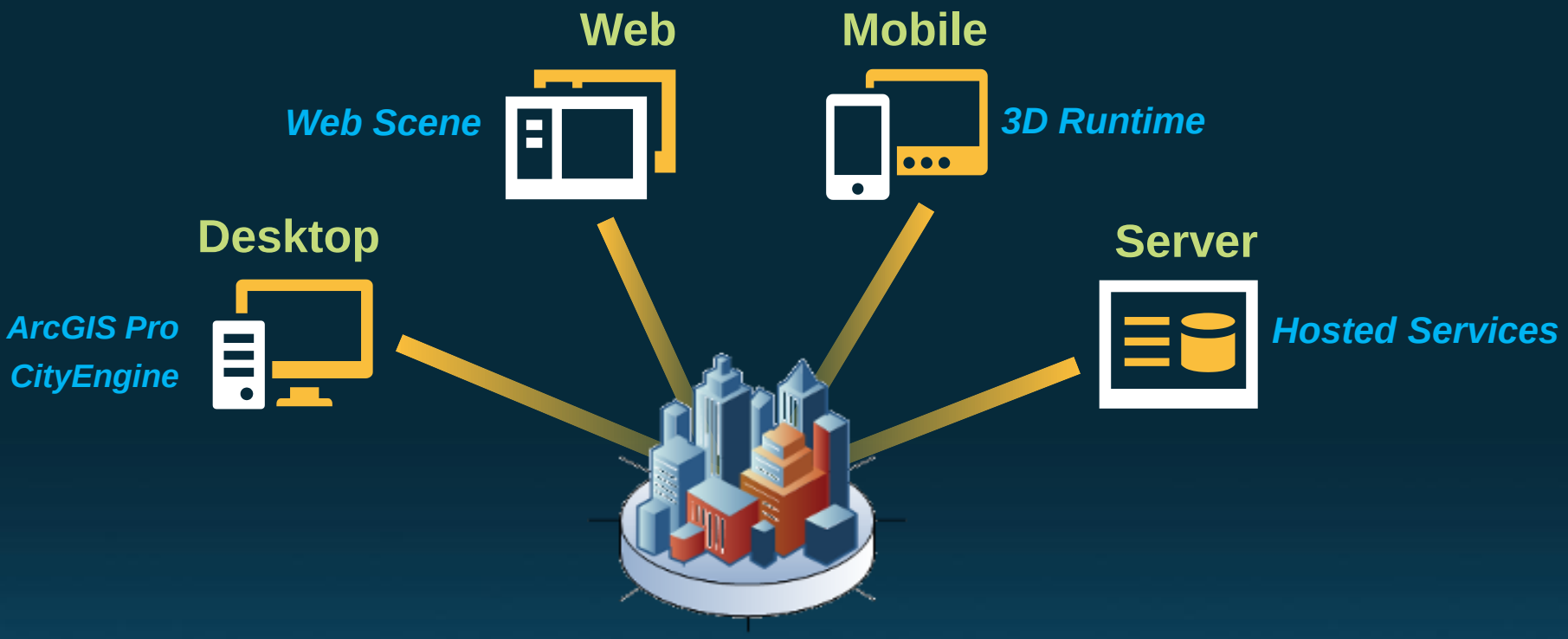
Esri Rule library

ArcGIS Marketplace

– *未来版本*



多平台的 3D


Web
Mobile
Web Scene
3D Runtime
Desktop
Server
ArcGIS Pro
CityEngine
Hosted Services

获取学习软件

试用CityEngine 最新版本:

– *http:// www.esri.com/cityengine*

获取学习资源

跟着教程动手实练：

http://resources.arcgis.com/en/help/cityengine/10.2/index.html#/Introduction_to_the_CityEngine_tutorials/02w100000016000000/

CityEngine Web Help：

http://cehelp.esri.com/help/index.jsp

THANK YOU !

esri China
BEIJING

分 享 地 理 价 值