



2014 Esri China
Developer Summit



2014 Esri 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

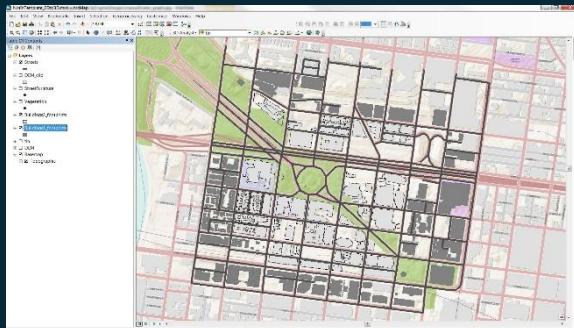
Esri中国 慕晓燕



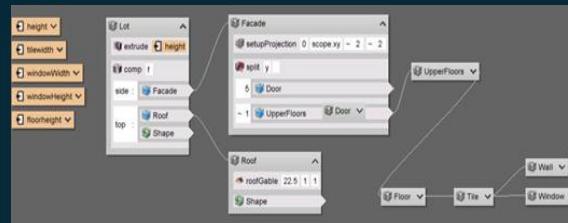
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3D 城市内容创建

程序化的自动建模



几何



规则

OBJECTID	Z_Min	Z_Max	Ridge_Frm	Ridge_Ht	Eave_Ht	Z	Bldg_ID	SHAPE_F	SHAPE_Length	SHAPE_Area
1	20.232	95.412	flat	8.4	9.25	21.616448	25	Polygon	99.69535	818.85395
2	21.2697	65.6358	sheet	9.85	8.85	22.552911	26	Polygon	59.555267	159.85954
3	20.232	95.412	flat	89.3037	89.3037	20.232	100	Polygon	48.492002	48.492002
4	22.5226	57.7937	sheet	9.4	1.91	24.854243	34	Polygon	89.537074	376.840912
5	23.8041	65.9352	sheet	12.83	12.23	28.073111	26	Polygon	23.98914	32.165714
6	23.8041	65.9352	sheet	12.83	3.73	28.073111	33	Polygon	93.779179	382.779179
7	19.1574	188.1927	flat	42	42	22.616424	111	Polygon	78.485338	27252.421244
8	13.6932	65.5997	butterfly	15.7	14.3	13.733857	9	Polygon	175.636887	1892.267114
9	17.2831	65.412	flat	20	20	17.432115	112	Polygon	133.66024	48.06713
10	17.2831	589.394	flat	159	159	27.332445	113	Polygon	372.055693	4966.96074
11	13.6932	65.5997	butterfly	11.84	10.29	17.432115	9	Polygon	148.859954	1394.938745
12	6.3995	305.196	flat	97.19	96.5025	109.64	141	Polygon	193.426243	1512.87396
13	22.5226	65.7937	sheet	16.59	8.5	22.522454	14	Polygon	93.779179	491.652073
14	40.5076	69.0967	flat	8.769692	8.769692	40.39333	116	Polygon	48.69123	146.67435
15	28.6532	104.4985	flat	23.37125	23.37125	41.944639	148	Polygon	1039.27795	63296.95068
16	23.8041	65.9352	sheet	5.71	4.62	23.804242	14	Polygon	1039.27795	421.67435
17	35.9163	69.258	flat	16.161513	16.161513	37.655568	116	Polygon	48.728326	146.963561
18	20.232	65.412	flat	11.94	10.29	21.585775	25	Polyface	159.421615	1290.80047

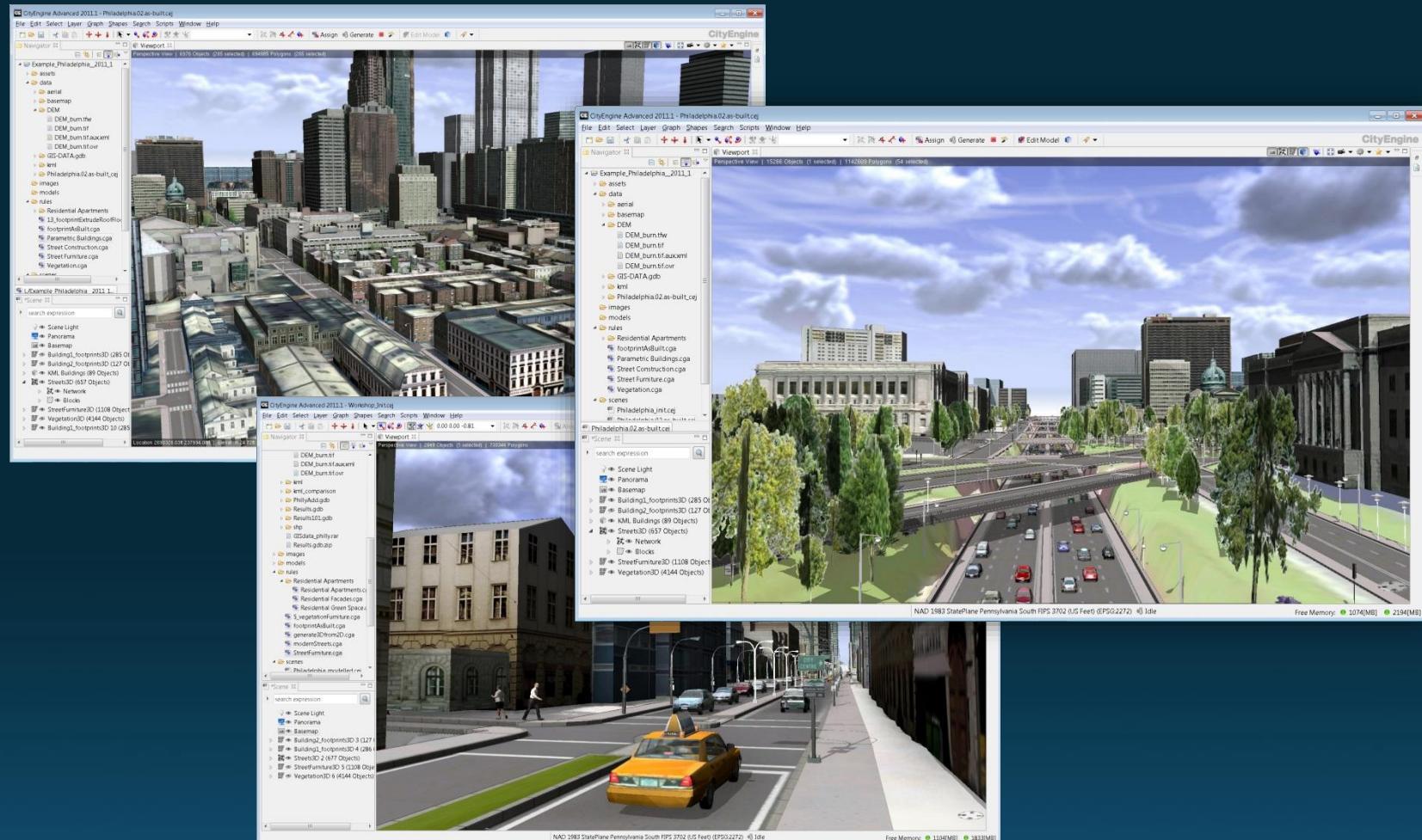
(0 out of 285 Selected)

属性



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3D 城市内容创建





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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





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内容

- CGA 基础
- 实用3D建模示例
- 分享 Rule Package



CGA 基础



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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。





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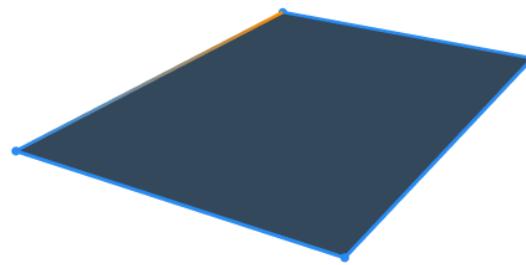
CGA : 基础

规则

- 基于shape的操作。

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

```
Roof-->
    roofHip(30)
```





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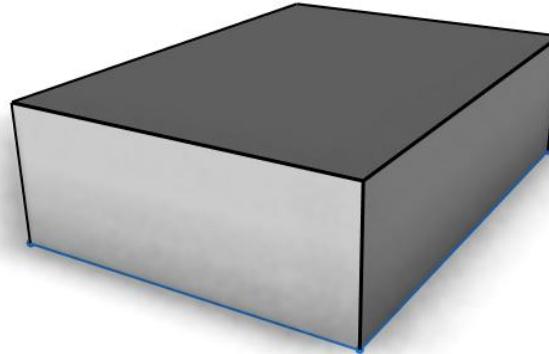
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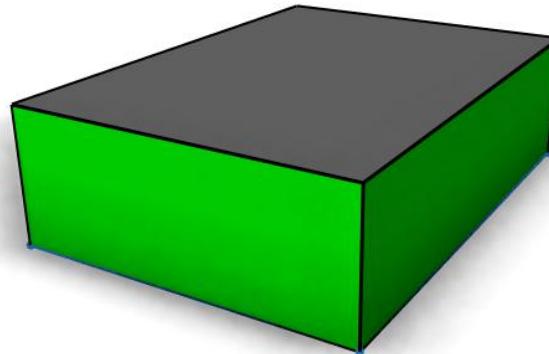
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        side : Facade.
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```
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    roofHip(30)
```





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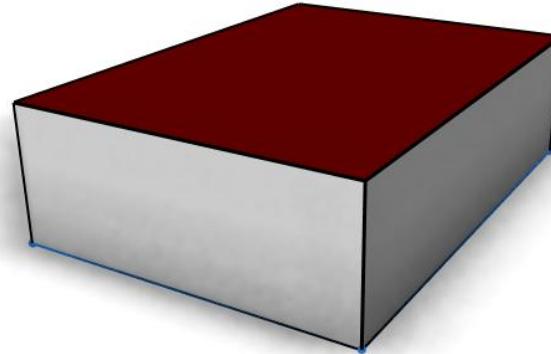
CGA : 基础

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            side : Facade.
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        }
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    roofHip(30)
```





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CGA : 基础

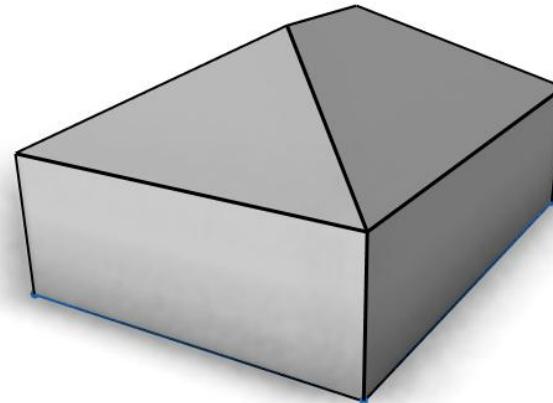
规则

- 基于shape的操作。

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

Roof-->
```

roofHip(30)





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CGA : 基础

定义属性

```
height = 15
angle   = 35
```

```
Init-->
```

```
    extrude(height)
    comp(f) {
        side : Facade.
        top  : Roof
    }
```

```
Roof-->
```

```
    roofHip(angle)
```



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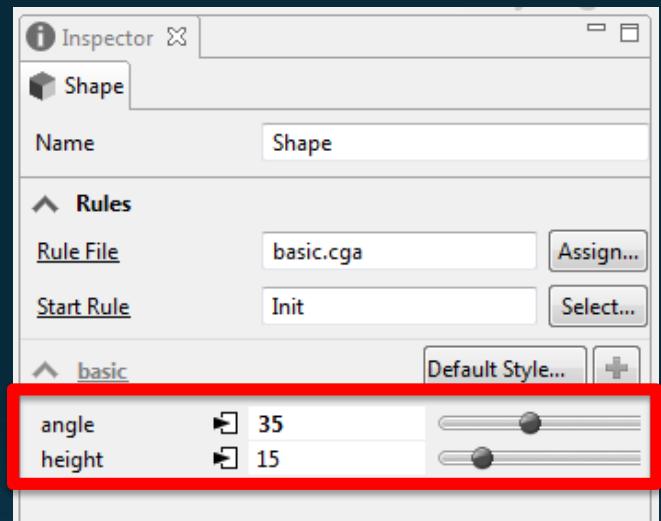
CGA : 基础

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)
```





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CGA : 条件规则

Roof-->

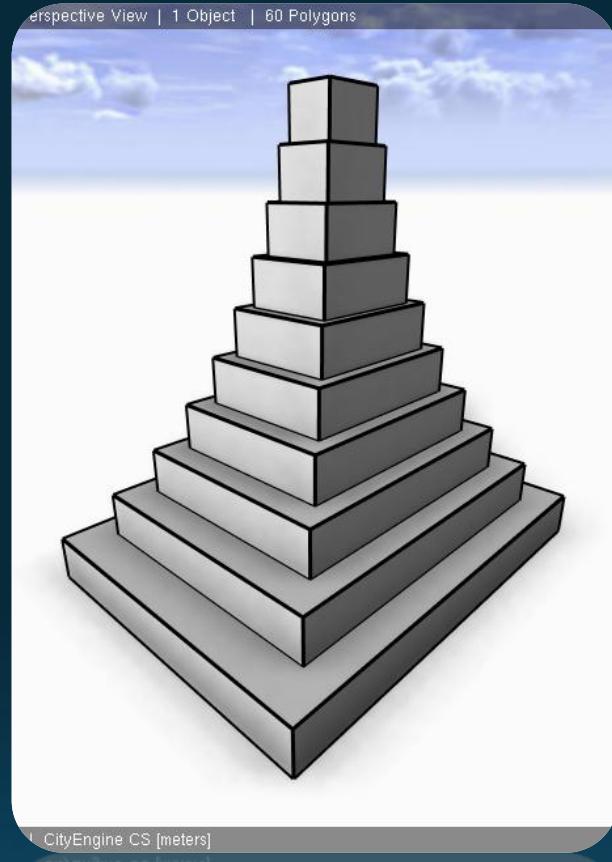
```
case geometry.area > 1000:  
    color(1,0,0)  
    X.  
  
case geometry.area > 500:  
    color(1,0.5,0)  
    X.  
  
else:  
    print(geometry.area)  
    X.
```



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```
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
```





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CGA : 随机规则

```
PredecessorShape -->  
    percentage%: Successor1  
    percentage%: Successor2  
    ...  
else: Successor3
```





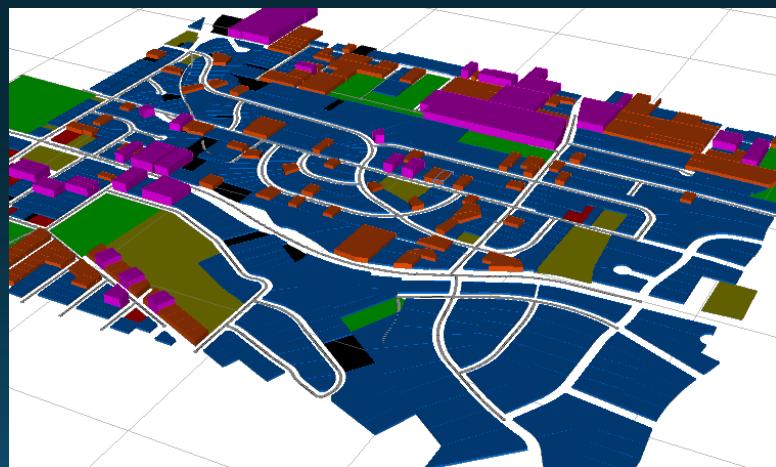
实用3D建模示例



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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



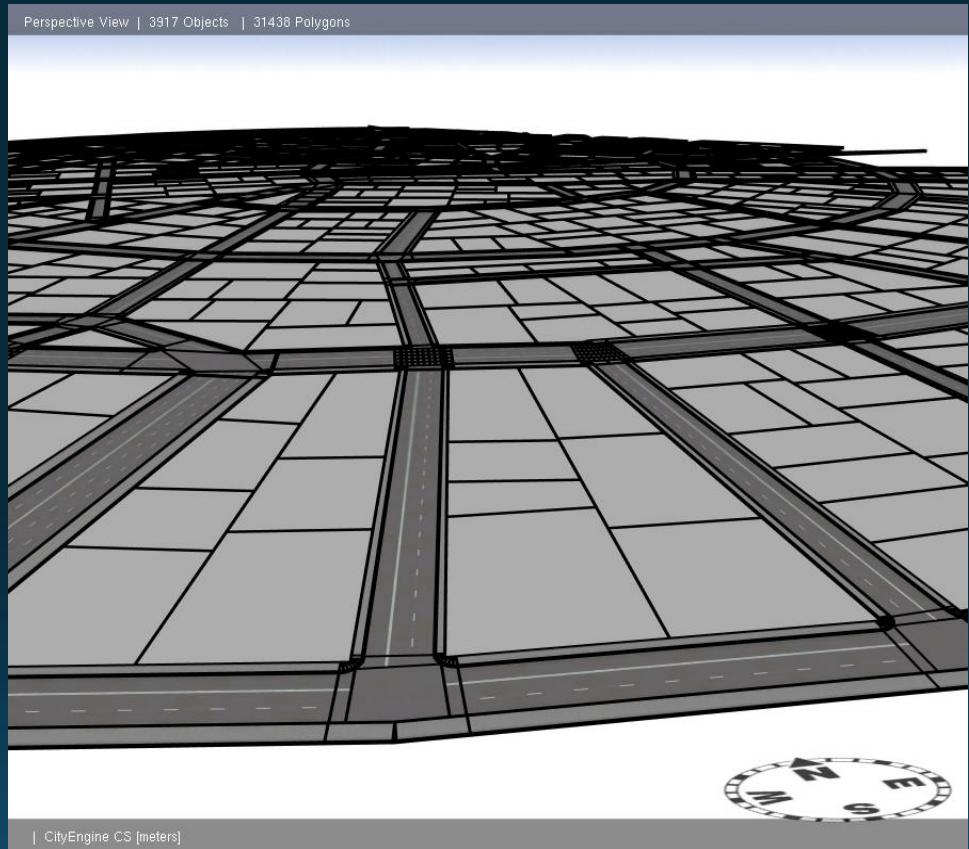
```
attr usage = ""  
attr totalHeight = 0  
  
Init-->  
    case usage == "Public":  
        color(0.1,0.8,0.1)  
        X  
    case usage == "Educational":  
        color(0,0.5,1)  
        X  
    ...  
  
X-->  
    extrude(totalHeight)
```



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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。





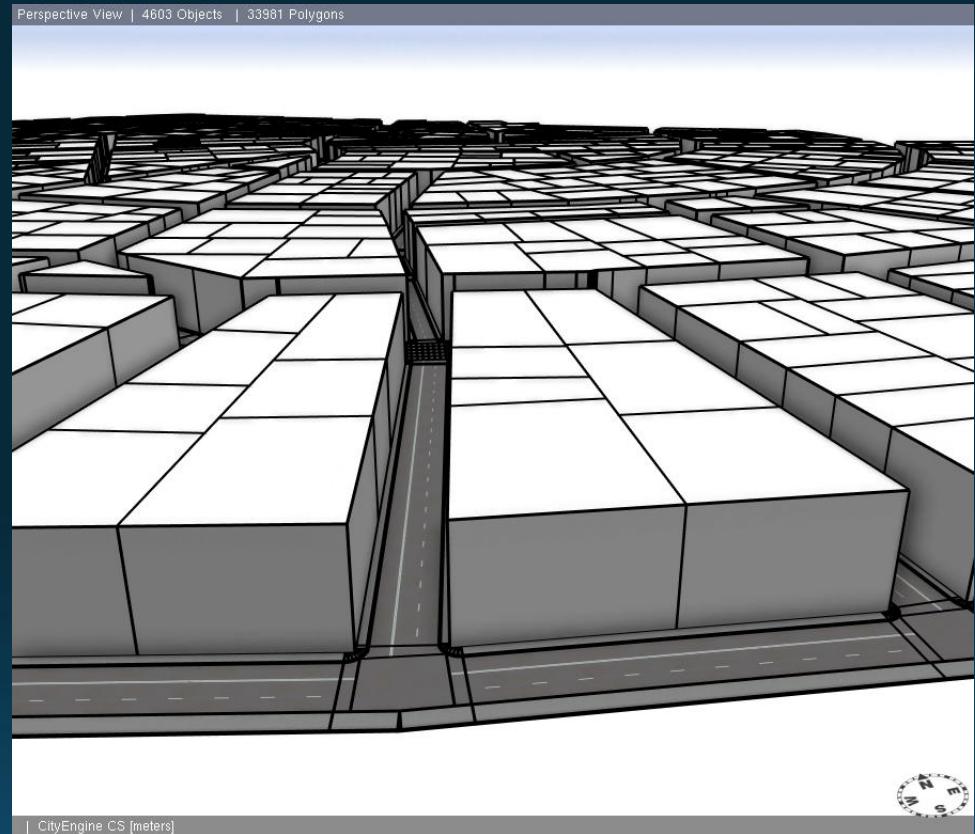
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实用场景2：城市规划

简单拉伸

Lot-->

extrude (20)





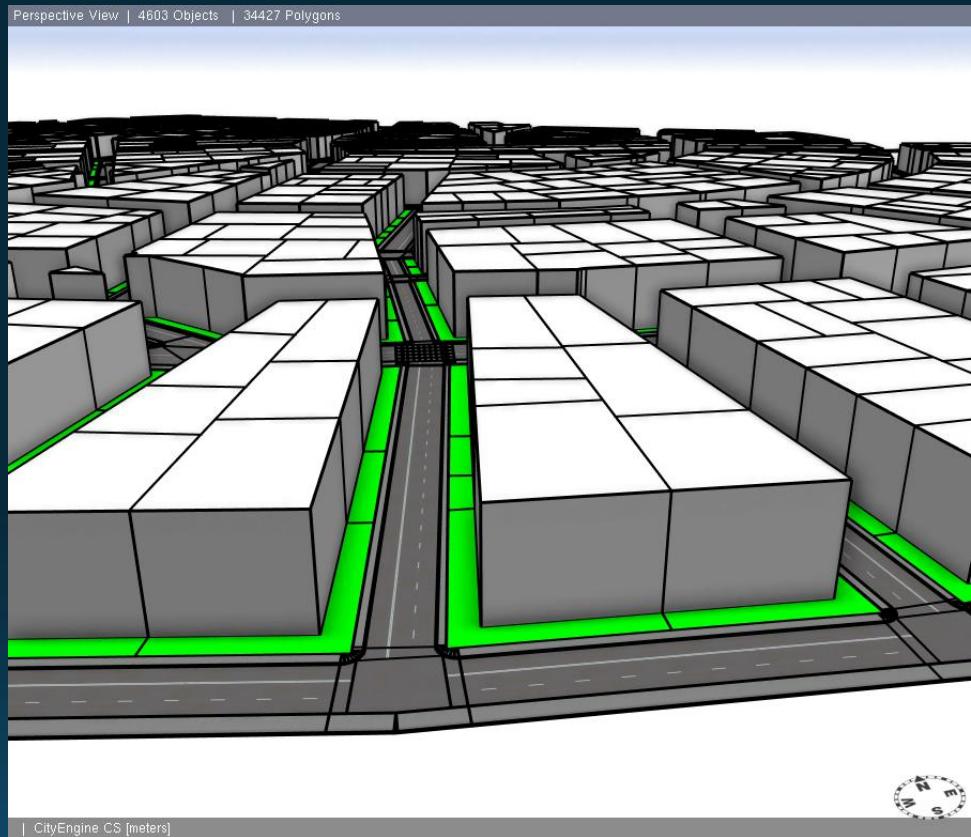
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实用场景2：城市规划

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.  
}
```





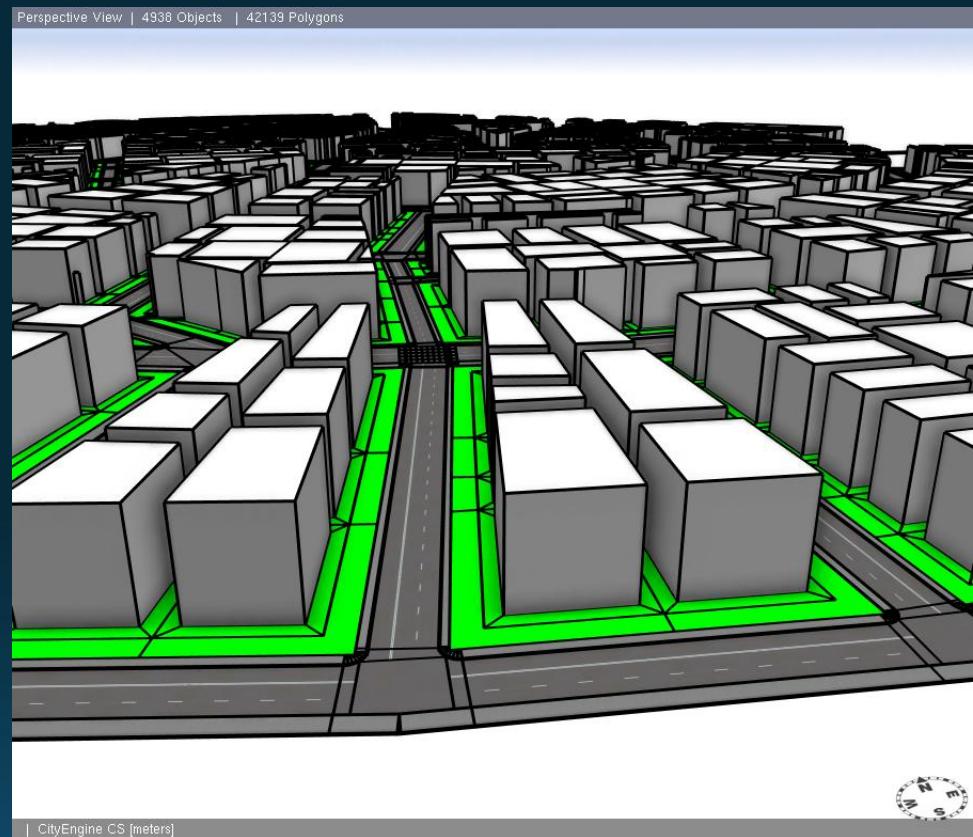
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实用场景2：城市规划

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.  
        }  
    }  
}
```

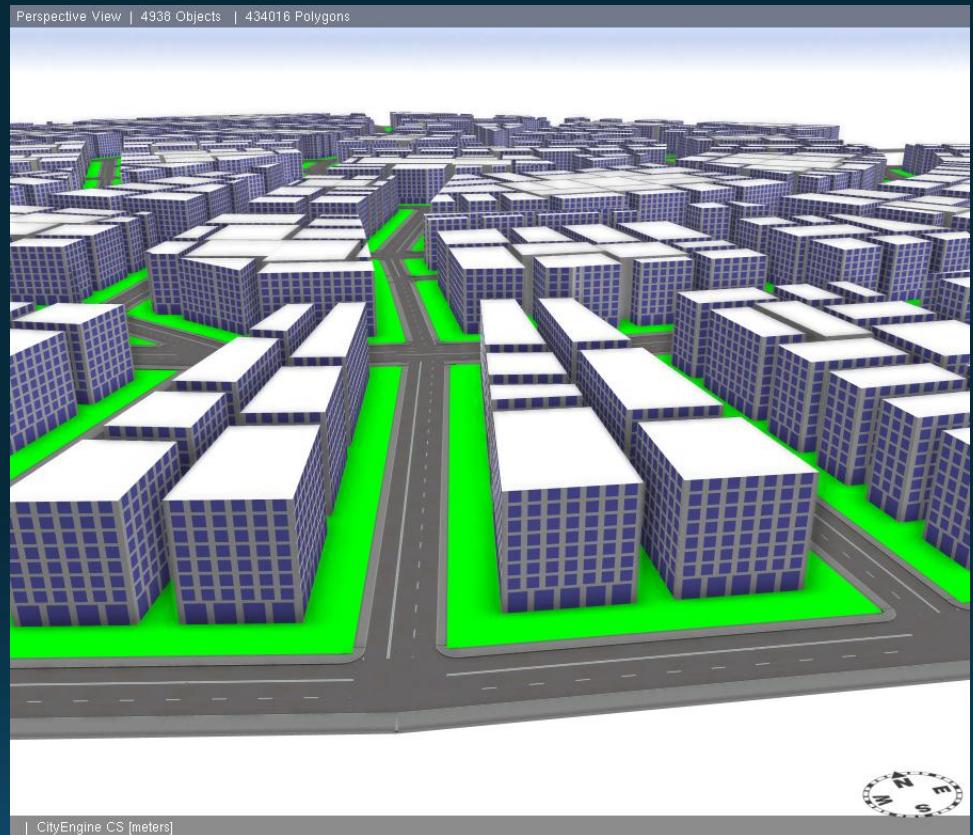




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实用场景2：城市规划

表面细化建模



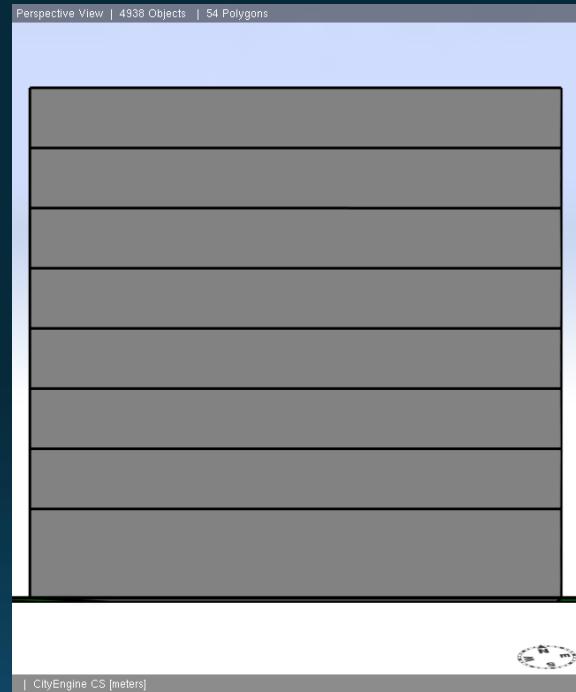


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实用场景2：城市规划

建筑物物体 → 楼层

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





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实用场景2：城市规划

楼层 → 窗户 + 墙体

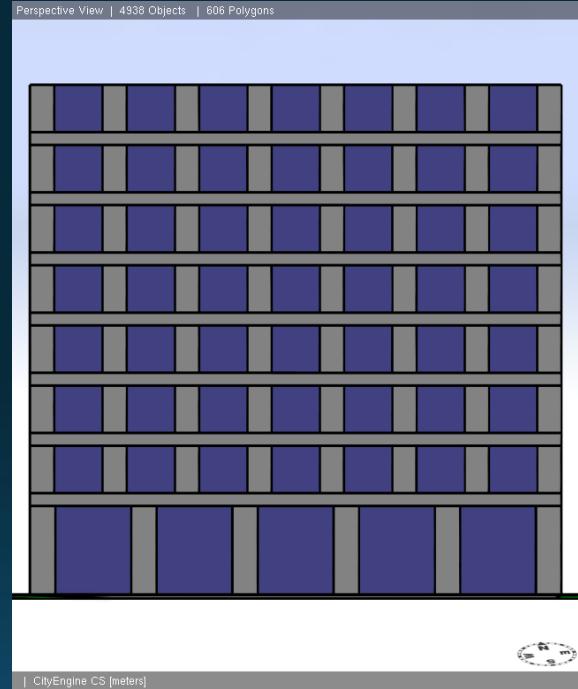
```
GroundFloor-->
comp(f) { side : GFFacade }

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)
```





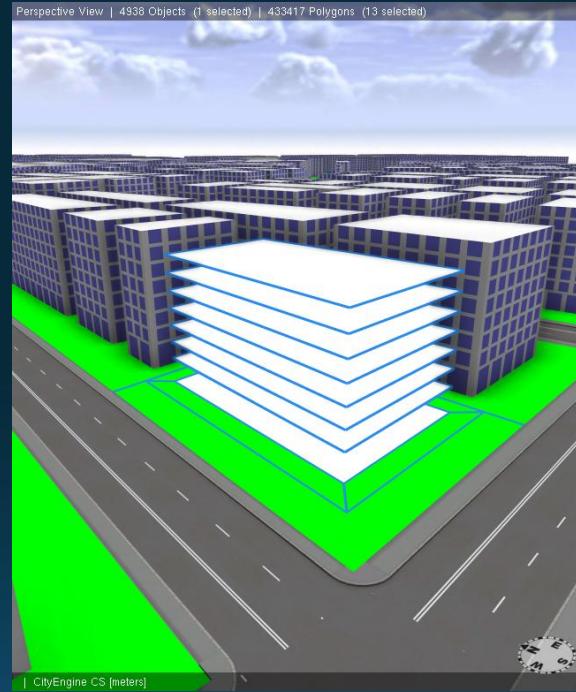
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实用场景2：城市规划

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

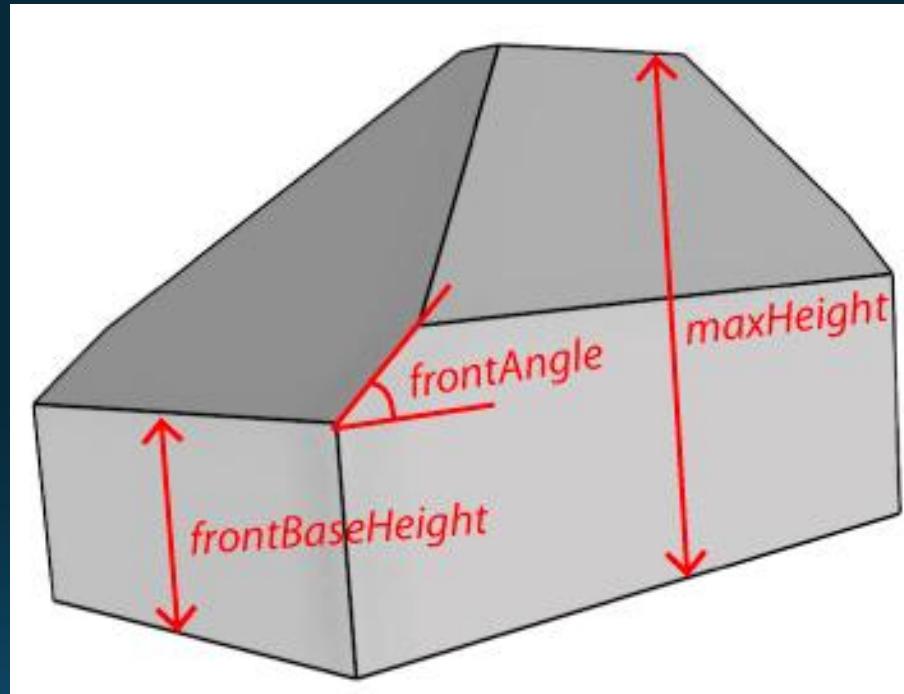




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实用场景3：模型控制检测

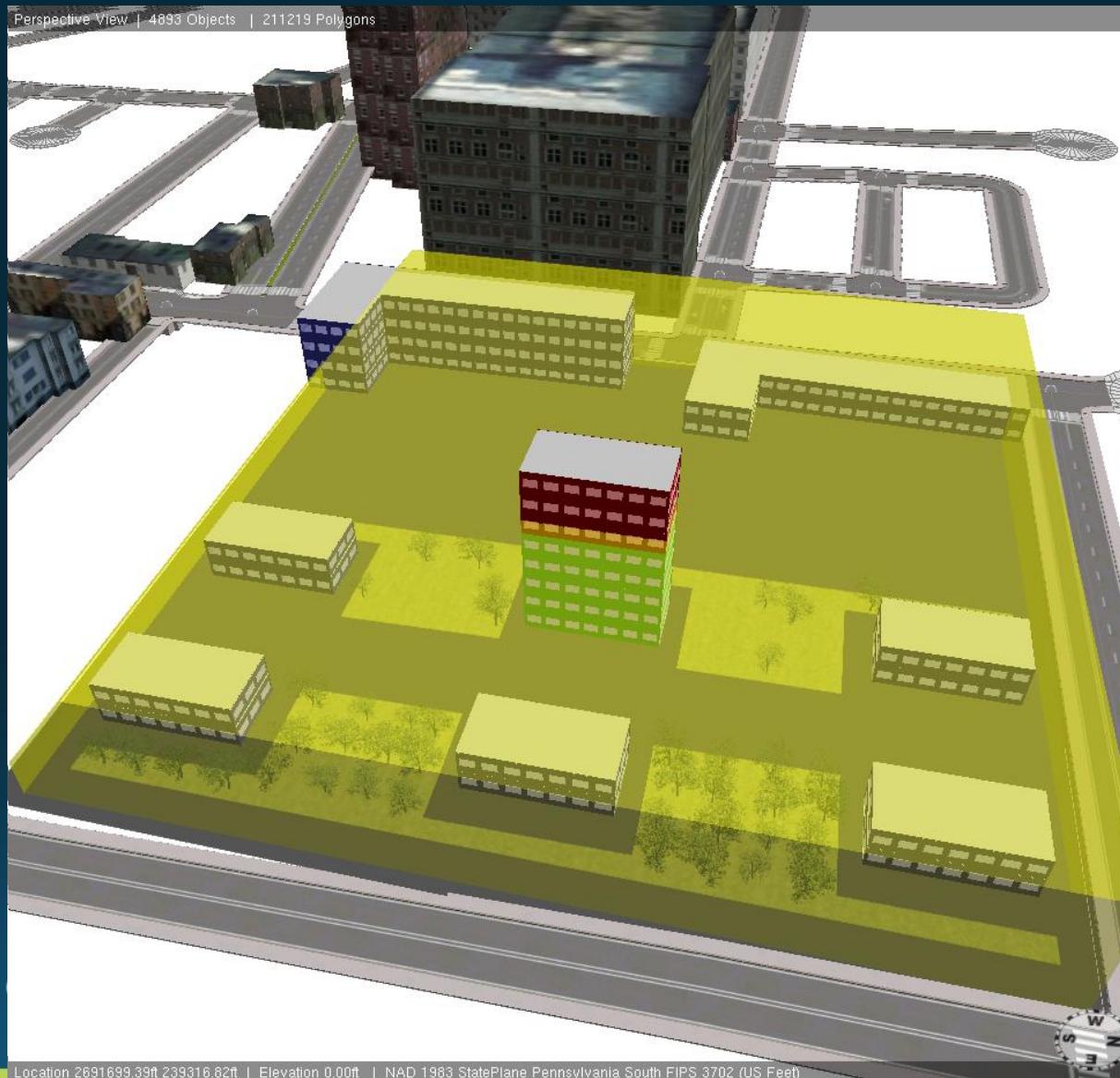
**envelope (*direction*, *maxHeight*, *frontBaseHeight*,
frontAngle , ,)**





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实用场景3：模型控制检测





分享规则包

Rule Package



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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 **编译** → 二进制的CGB
基于Java 类文件
- 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



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规则包/RPK

创建规则包

The screenshot shows the ArcGIS 3D Analyst interface with the 'Rule Package' dialog box open. The dialog box is titled 'Rule Package' and contains three tabs: 'Rule Package' (selected), 'Item Description', and 'Sharing'. Under 'Rule Package', there are two radio button options: 'Upload package to my ArcGIS Online or Portal account' (selected) with a text input field containing 'International City', and 'Save package to file' with a text input field showing the path 'C:\Users\dec\workspace_examples\examples_scratch_Dec\working_for_devsummit\my_city\data\International City.rpk'. A checkbox for 'Include CGA source code' is also present. At the bottom right of the dialog are 'Share' and 'Analyze' buttons. The background shows a 3D cityscape scene and a Navigator and Viewport toolbar.



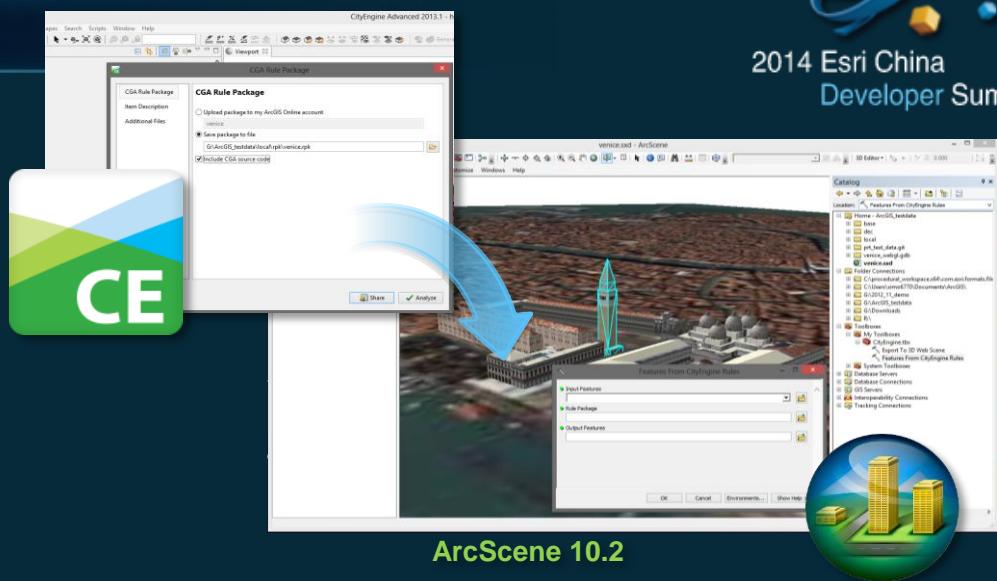
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规则包/RPK

CityEngine : 编写规则文件

将规则包分享于 :

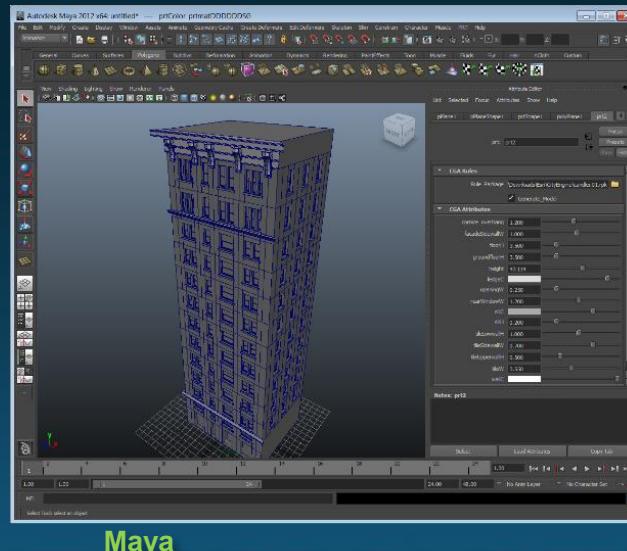
- 组织内部
- Portal for ArcGIS
- ArcGIS Online



ArcScene 10.2

使用规则包 :

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



Maya



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Rule Packages on AGOL

User item on AGOL

Esri Rule library

The screenshot shows a user item titled "Esri Vegetation Library with LumentRT 3D Plants - Plant Loader". It includes a thumbnail image of green plants, a description, and a properties table.

Properties	Value
Item Type	Rule Library
Created	January 22, 2014
Last Modified	January 22, 2014
Author	Esri
Views	1,402
Downloads	2,000
Comments	0

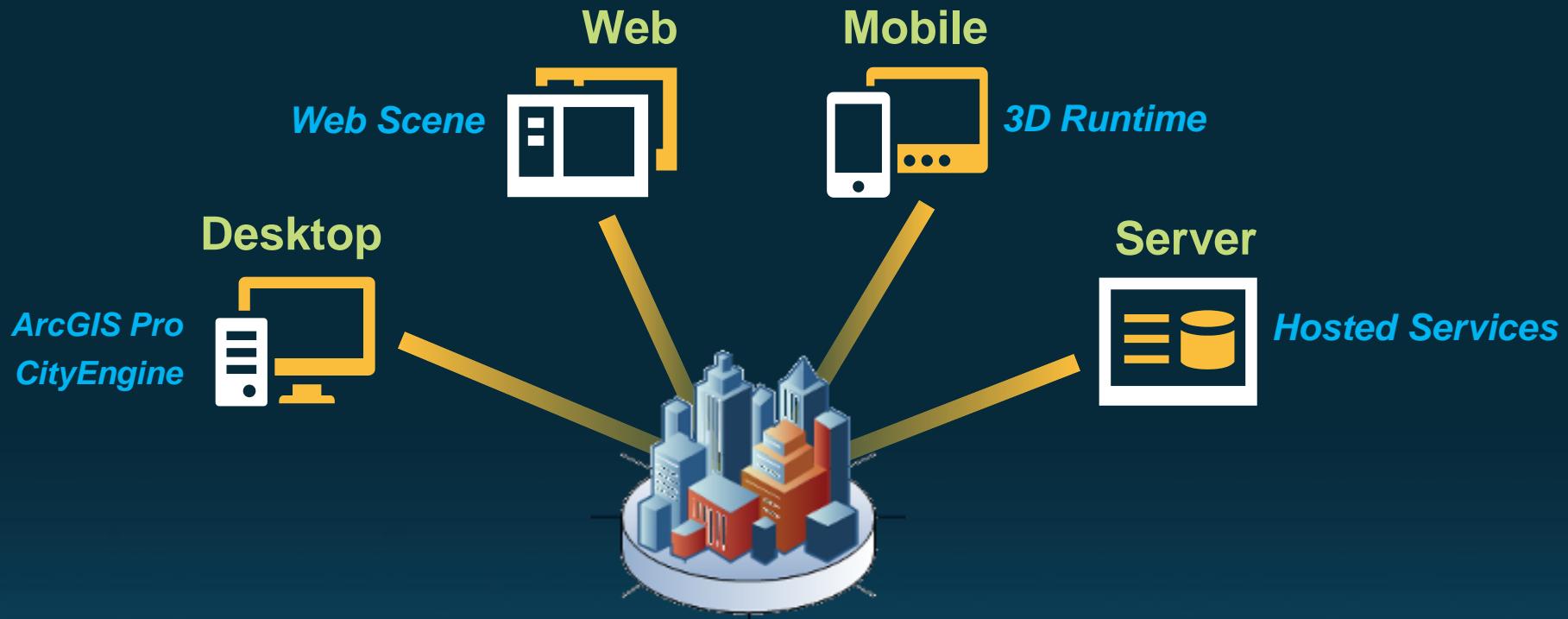
ArcGIS Marketplace
– 未来版本

The screenshot shows the ArcGIS Marketplace interface, displaying various items and search results.



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多平台的 3D





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获取学习软件

试用CityEngine 最新版本：

– *<http://www.esri.com/cityengine>*





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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 !



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BEIJING

分 享 地 理 价 值