

pyCity Demo

Demonstration of pycity package and its usage

What is pyCity?

- Python package
- Developed at EBC/ACS
- For city district generation and data handling
- Development via GIT on Github (<https://github.com/RWTH-EBC/pyCity>)

RWTH-EBC / **pyCity** PRIVATE

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Code Issues 6 Pull requests 0 Wiki Pulse Graphs Settings

Python package for data handling and scenario generation of city districts — Edit

157 commits 4 branches 0 releases 2 contributors

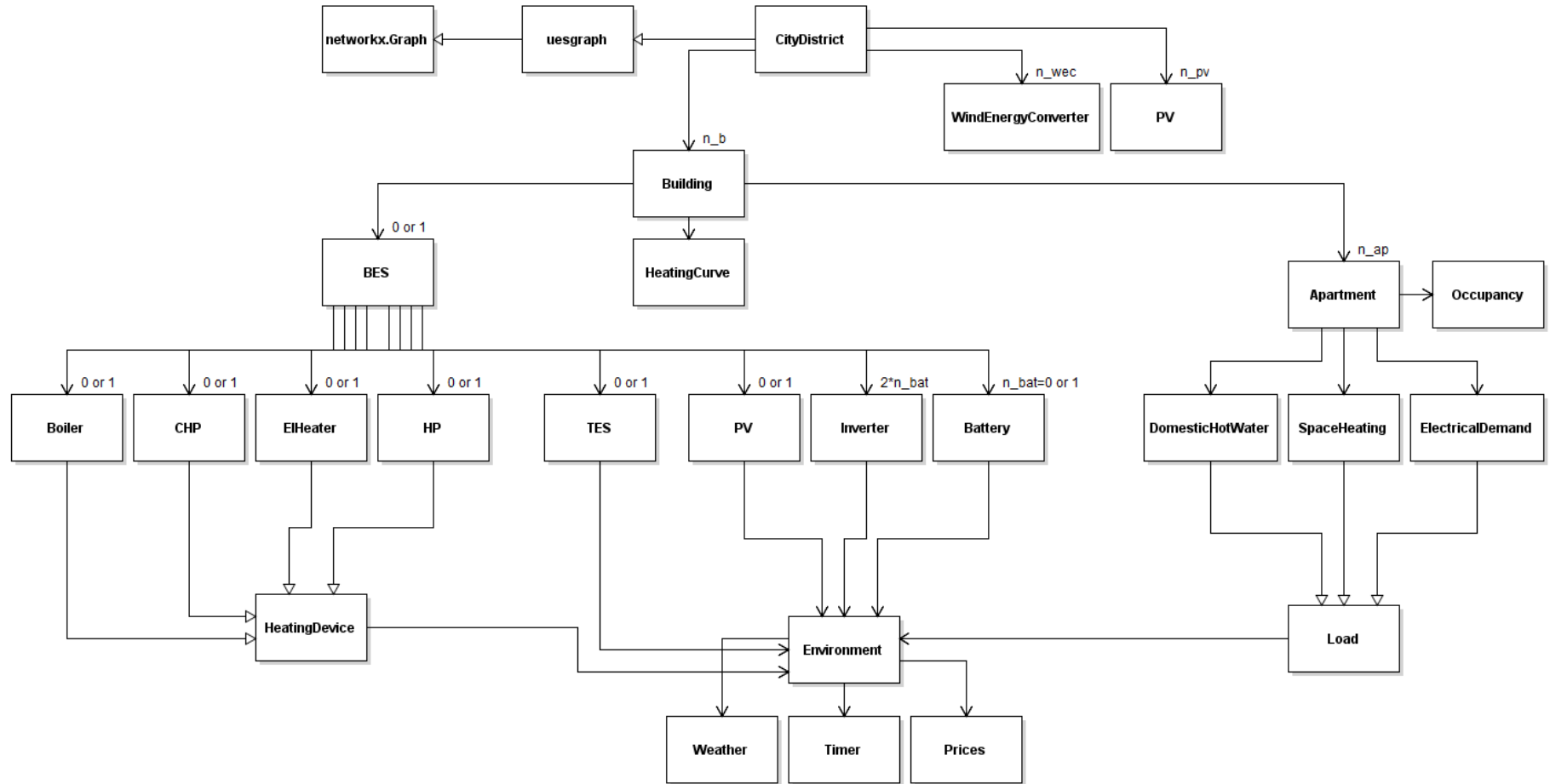
Branch: master New pull request New file Upload files Find file HTTPS https://github.com/RWTH-EBC/ Download ZIP

JSchiefelbein Add gitignore file to tutorial folder Latest commit 0081ae3 13 hours ago

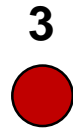
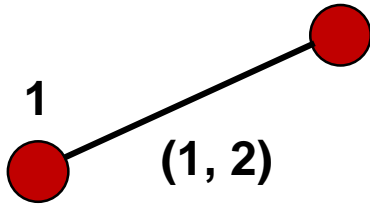
documentation	Add further info to UML (uesgraph)	3 months ago
pycity	Add gitignore file to tutorial folder	13 hours ago
.gitignore	Change Python 2 specific commands to be compatible with Python 3. Add...	5 months ago
License.txt	Add License.txt and data to README	5 months ago
README.md	Add pytest for function changeResolution.py	3 months ago
setup.py	Add further info to setup.py and __init__.py	3 months ago

README.md

pyCity UML-Structure



Networkx → Package for mathematical graphs (<https://networkx.github.io/>)



NetworkX

[NetworkX Home](#) | [Documentation](#) | [Download](#) | [Developer \(Github\)](#)

High-productivity software for complex networks

NetworkX is a Python language software package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.



[Documentation](#)
all documentation

[Examples](#)
using the library

[Reference](#)
all functions and methods

Features

- Python language data structures for graphs, digraphs, and multigraphs.
- Many standard graph algorithms
- Network structure and analysis measures
- Generators for classic graphs, random graphs, and synthetic networks
- Nodes can be "anything" (e.g. text, images, XML records)
- Edges can hold arbitrary data (e.g. weights, time-series)
- Open source [BSD license](#)
- Well tested: more than 1800 unit tests, >90% code coverage
- Additional benefits from Python: fast prototyping, easy to teach, multi-platform

Versions

Latest Release

networkx-1.11
30 January 2016
[downloads](#) | [docs](#) | [pdf](#)

Development

2.0dev
[github](#) | [docs](#) | [pdf](#)
build passing
coverage 93%

Contact

[Mailing list](#)
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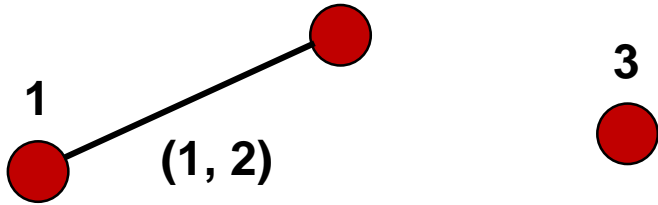


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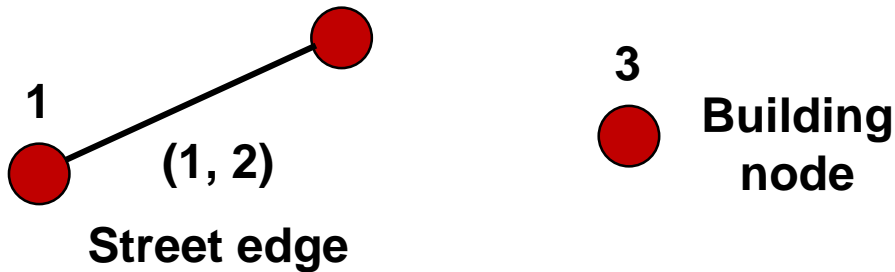
© Copyright 2014, NetworkX developer team. Last updated on Jan 31, 2016. Created using [Sphinx](#) 1.3.1.

pyCity dependencies

Networkx → Package for mathematical graphs



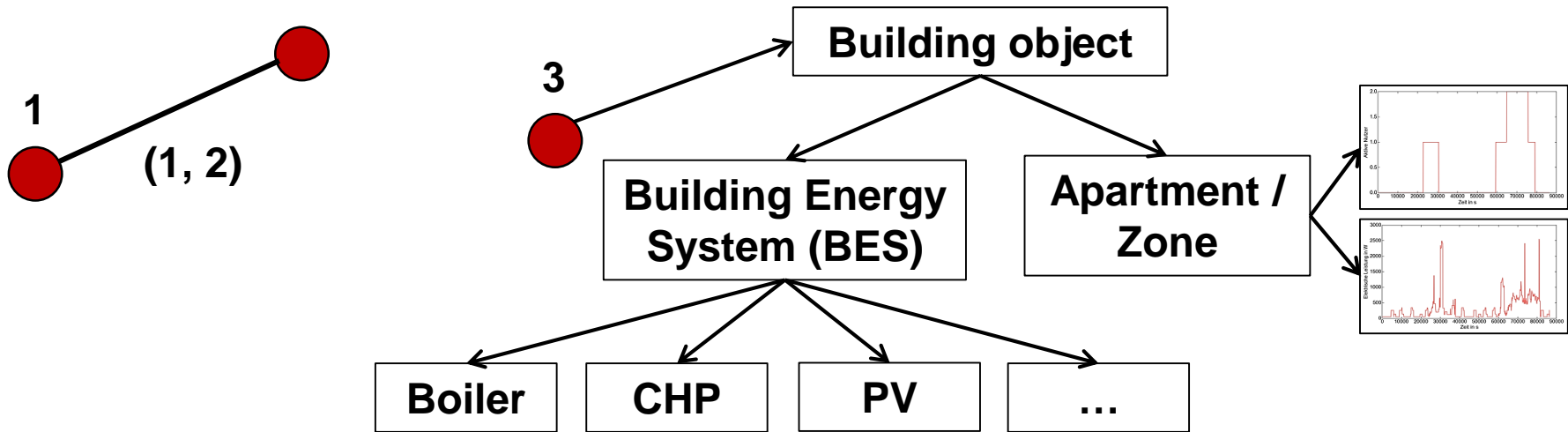
Uesgraphs → Topology of city district energy systems
(<https://github.com/RWTH-EBC/uesgraphs>)



pyCity dependencies

pyCity main package

→ City district generator and data handling

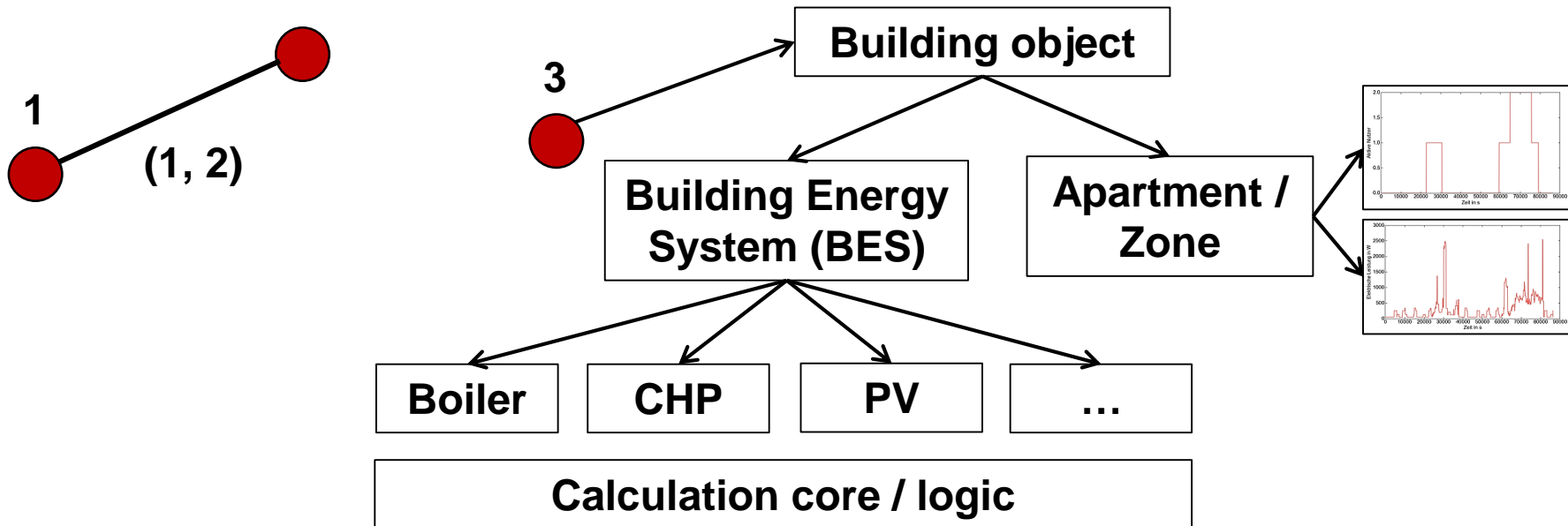


- Includes occupancy and load profiles as well as energy systems
- However: No calculation core! Only generation and data handling
- Everyone can extend pycity with own logic and functions
- High flexibility

Extensions

PyCity_Calc

→ PyCity Addon – Energiebilanz und Wirtschaftlichkeitsrechner

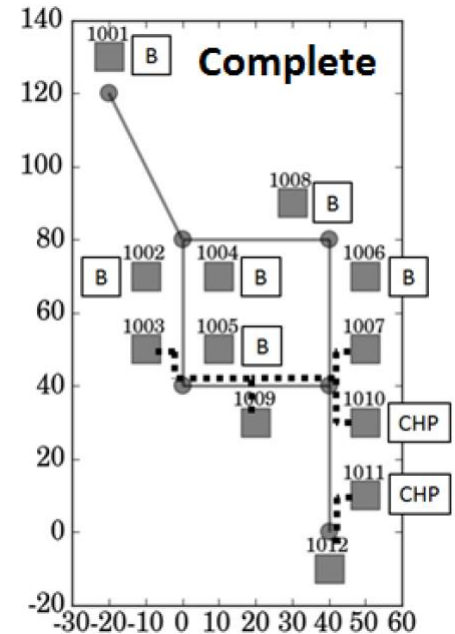


→ Logic (e.g. methods for energy system control, energy balance calculation...)

→ Annual basis (full year analysis)

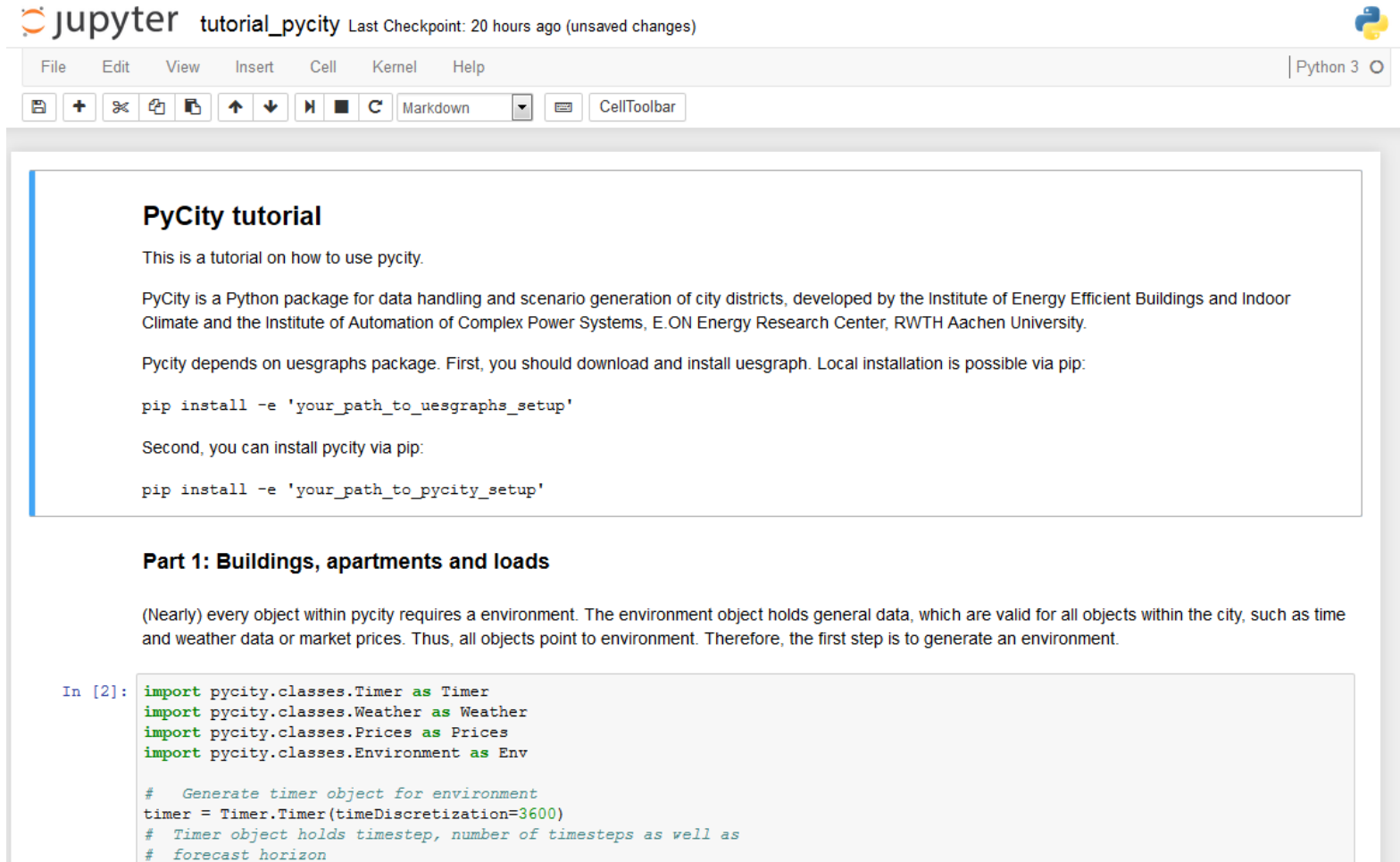
City district optimization

- Mixed integer linear programming (MILP) in gurobipy
- Objective function: Min. cost or min. CO₂ emissionen
- Input: City Objekt or city.csv + TRY + SLP
- Decision variables: Energysystems
 - ≡ Place
 - ≡ Type
 - ≡ Nominal power / capacity
 - ≡ Grid infrastructure (LHN, DEG)
- Constraints
 - ≡ Economic: VDI 2067
 - ≡ Technical: Efficiency-curves, part load behavior, power limitations, energy loss calculation, on-off-switching limits...



pyCity Tutorial via Jupyter Notebook

- Interactive python environment
- Test and modify code on the fly



The screenshot shows a Jupyter Notebook interface with the title 'tutorial_pycity' and a status 'Last Checkpoint: 20 hours ago (unsaved changes)'. The interface includes a menu bar (File, Edit, View, Insert, Cell, Kernel, Help) and a toolbar with icons for file operations, execution, and cell management. The main content area displays the 'PyCity tutorial' text, which explains the package's purpose and provides installation instructions. Below the text, a code cell is shown with Python code for importing classes and generating a timer object.

PyCity tutorial

This is a tutorial on how to use pycity.

PyCity is a Python package for data handling and scenario generation of city districts, developed by the Institute of Energy Efficient Buildings and Indoor Climate and the Institute of Automation of Complex Power Systems, E.ON Energy Research Center, RWTH Aachen University.

PyCity depends on uesgraphs package. First, you should download and install uesgraph. Local installation is possible via pip:

```
pip install -e 'your_path_to_uesgraphs_setup'
```

Second, you can install pycity via pip:

```
pip install -e 'your_path_to_pycity_setup'
```

Part 1: Buildings, apartments and loads

(Nearly) every object within pycity requires a environment. The environment object holds general data, which are valid for all objects within the city, such as time and weather data or market prices. Thus, all objects point to environment. Therefore, the first step is to generate an environment.

```
In [2]: import pycity.classes.Timer as Timer
import pycity.classes.Weather as Weather
import pycity.classes.Prices as Prices
import pycity.classes.Environment as Env

# Generate timer object for environment
timer = Timer.Timer(timeDiscretization=3600)
# Timer object holds timestep, number of timesteps as well as
# forecast horizon
```