Getting started with MATSim

Technical introduction to the framework

Dominik Grether

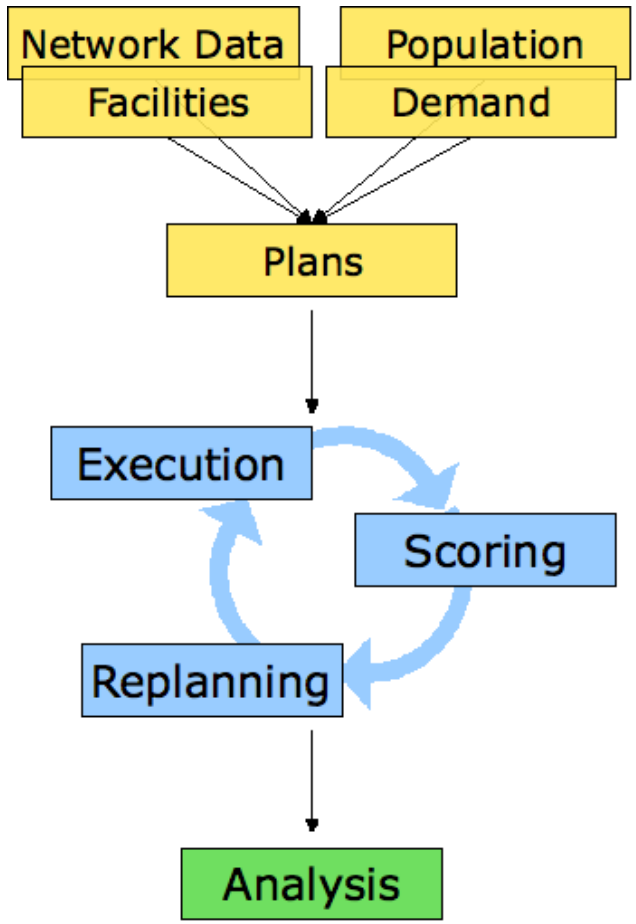
Transport System Planning and Transport Telematics
Berlin Institute of Technology

19.02.2008

MATSim
Multi-Agent Transport Simulation

Introduction

- MATSim toolbox for large–scale agent–based transport simulations
- Several modules
  - Demand modeling
  - Mobility–simulation
  - Re–planning
  - Controler for simulation runs
  - Analysis tools
- Modules can be replaced by own implementations



Introduction

What you'll learn

- How to run and simulate the provided sample scenario
- To understand the configuration settings so you can change them correspondingly for your own scenarios
- How to integrate an external, custom mobility simulation
- How to integrate a custom, external re-planning module
- How to analyse simulation results

Introduction

Requirements

- Java 5 or higher – Java Development Kit, JDK, Java SE (http://java.sun.com/javase/downloads)
- A subversion client (http://subversion.tigris.org/)
- An IDE, Eclispe recommended (http://eclipse.org)
- A subversion plugin – depends on IDE
- For Eclipse: Subclipse (http://subclipse.tigris.org/) or use Eclipse update site: http://subclipse.tigris.org/update_1.0.x

Introduction

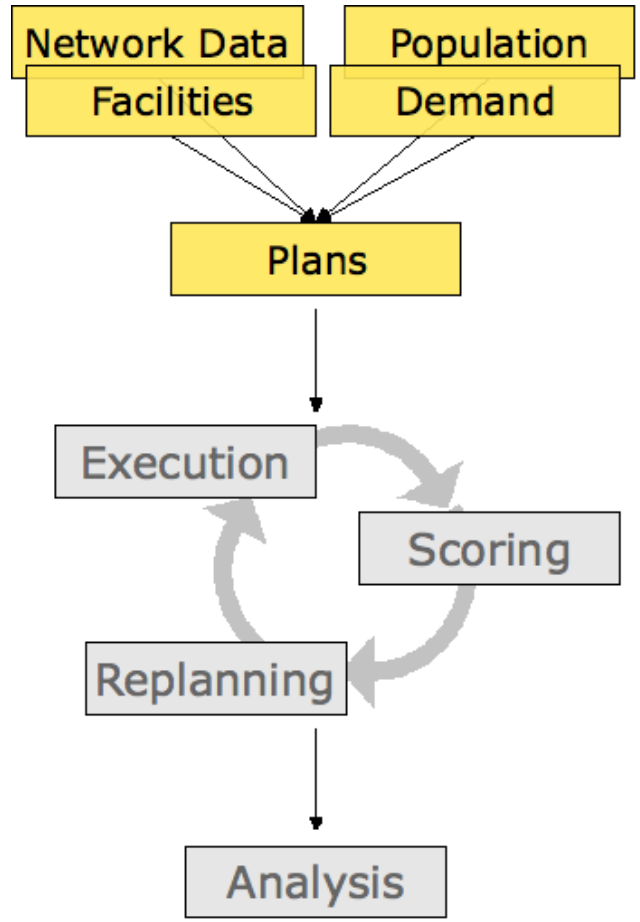
Checking out

- Command line:
  - `svn co https://matsim.svn.sourceforge.net /svnroot/matsim matsim`
- Eclipse:
  - File → New Project
  - Category SVN → Checkout Projects from SVN
  - URL: `https://matsim.svn.sourceforge.net/svnroot/matsim`
  - Folder: `matsim/trunk`
  - Configure project using wizard
  - In wizard select “new java project”

Scenarios

Description of a Scenario

- Parts of Scenario:
  - Network: Road network
  - Population: Description of agents
- Configuration of scenario by XML–File



Scenarios

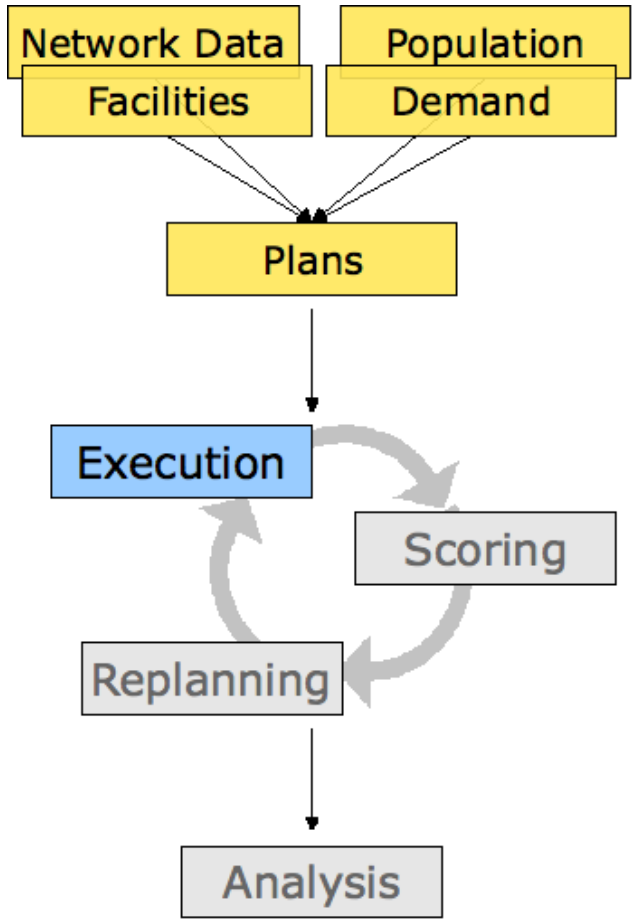
Equil Network

- Equil scenario:
  - `./examples/equil/`
- Start visualizer
  - Main method in `org.matsim.utils.vis.netvis.NetVis`
- Take a look at network
  - `./examples/equil/network.xml`

Running the examples

Running a single iteration

- 100 Agents from link 1 to 20
- Later from link 20 to 1
- Have a look at equil_plans.xml
- Run `org.matsim.run.Controler` with argument `examples/tutorial/singleIteration.xml`
- Examine the log for errors



Running the examples

Visualizing the simulation results

- Start Netvis again
- Open file `output/ITERS/it.0/SnapshotCONFIG.vis`
- Change daytime to 06:00 o'clock
- Increase linewidth
- Press play
- Read corresponding events at `output/ITERS/it.0/0.events.txt`

Running the examples

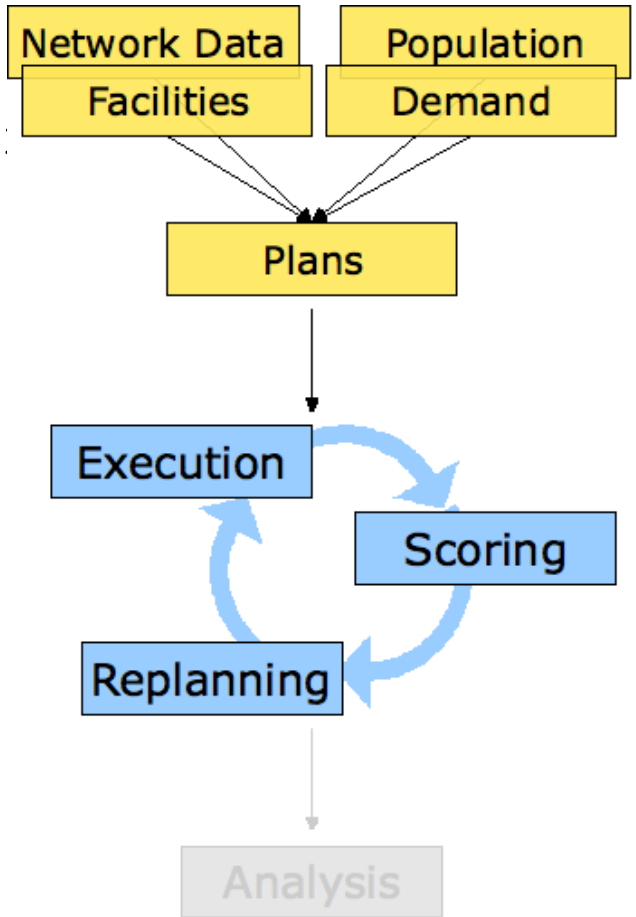
Modifying the settings

- Open `examples/tutorial/singleIteration.xml`
- Try to change settings in the module simulation, e.g. endTime of 07:00 or snapshotperiod
- Run the simulation again
- Be aware of the error:
  `The simulation will not overwrite files`
- Make snapshots in “googleearth” mode

Running the examples

Running multiple iterations

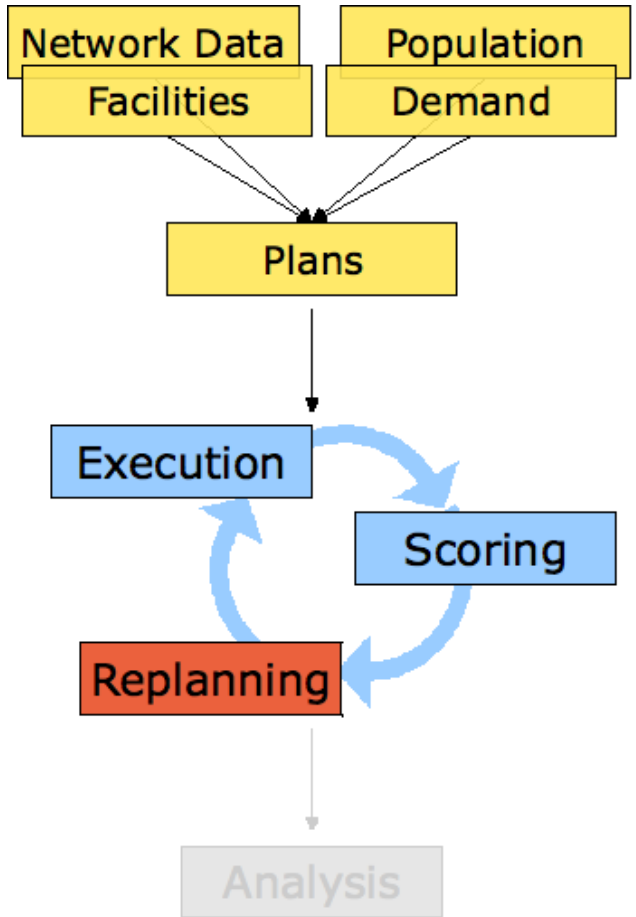
- Use configuration `examples/tutorial/multipleIterat`
- Run controler
- 10 Iterations run with 10 % agents replanning
- Take a look at results
- Compare configuration files
- Increase number of iterations



Running the examples

Modifying the re–planning

- Change `ModuleProbability_2` in `multipleIterations.xml` to 0.9
- Change `ModuleProbability_1` to 0.1
- Run simulation again and look at results
- Replace value of `Module_2` with `TimeAllocationMutator`
- Examine results
- Combine the 3 re–routing strategies



Creating a custom controler

Introduction

- Custom controler for
  - Integration of own code
  - Customized analysis
  - More complex scenarios which require special modules
- Only rewrite the parts you need, but try!

Creating a custom controler

First, helpful steps

- Inherit from `Controler` and add main(String[] args)
- Create an instance and call `setOverwriteFiles(true)`
- Call the `Controler.run()` method
- Open visualizer after `run()` is terminated

```
String[] visargs = {"../output/ITERS/it.0/Snapshot"};
NetVis.main(visargs);
```

Creating a custom controler

Handling simulation events

- Simulation events output of simulation (physical world)
- Controler attribute `protected final Events events`
- Handler interfaces in `org.matsim.events.handler`

Creating a custom controler

Handling simulation events

- Write own handler

```
MyHandler implements EventhandlerLinkLeave {
  public void handleEvent (EventLinkLeave event) {
      ...do something...
  }
  public void reset(int iteration) {
      ...reset something...
  }
}
```

Creating a custom controler

Handling simulation events

- Create an instance

```
MyHandler handler = new MyHandler();
```

- Register at Events instance

```
events.addHandler(handler);
```

Creating a custom controler

Handling controler events

- Controler events output of simulation process, e.g.
  - Startup complete
  - Begin iteration
  - End iteration
  - Replanning
  - Shutdown

Creating a custom controler

Handling controler events

- Interfaces in `org.matsim.controler.listener`
- Implement and add by

```
Controler.addControlerListener(myListenerInstance);
```

Creating a custom controler

Analyse results

- Controler generates some analysis
  - Score statistics
  - Plans (per 10th iteration)
  - Snapshots (per 10th iteration)
  - Leg histograms (per iteration)
- Customized charts via Event handler / listener
- Useful tool:
  `org.matsim.utils.charts`