



Travelling Salesman: Planning with Drools

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Agenda

- A Bit of Theory
- Drools Planner
- Travelling Salesman Problem
- The Solution



Scheduling and Planning

- Finding good enough solutions to complex problems.
- Typical problems: Nurse rostering, Bin Packing, Travelling Salesman.
- Techniques:
 - Brute force – impractical for large problems,
 - Branch and bound,
 - Local search
 - Tabu search
 - Simulated annealing



What's Drools?

- Rule-Based Programming
- Define rules (decision points) outside of program logic
- Makes code maintenance easier - change the rules, not the code

```
rule "a simple rule"  
  when  
    Some condition  
  then  
    Some action  
end
```

- Open-source project



Drools Planner

- Simple way to solve complex problems.
- Implementation of local search.
- You provide:
 - Starting solution,
 - acceptable moves (Java code),
 - scoring function (Rules).
- You get the best found solution.



Solution

- One possible result of the planning algorithm.
- Need not be optimal.
- Move may transform it into a better one.
- Score determines its usefulness.
- Starting solution:
 - Helps “guide” the algorithm.
 - Use appropriate heuristics or just intuition.



Scoring function

- Measure of solution quality.
- Simple score (X):
 - Single number,
 - Higher == Better.
- Hard and soft score (-X/-Y):
 - Number of hard and soft constraints broken.
 - Hard constraints more important.



Travelling Salesman

- N places.
- Has to visit them all, return to start.
- Shortest route?

| N | Possible solutions |
|-----|---------------------------|
| 3 | 2 |
| 4 | 24 |
| 10 | 3,628,800 |
| 15 | 1,307,674,368,000 |
| 20 | 2,432,902,008,176,640,000 |

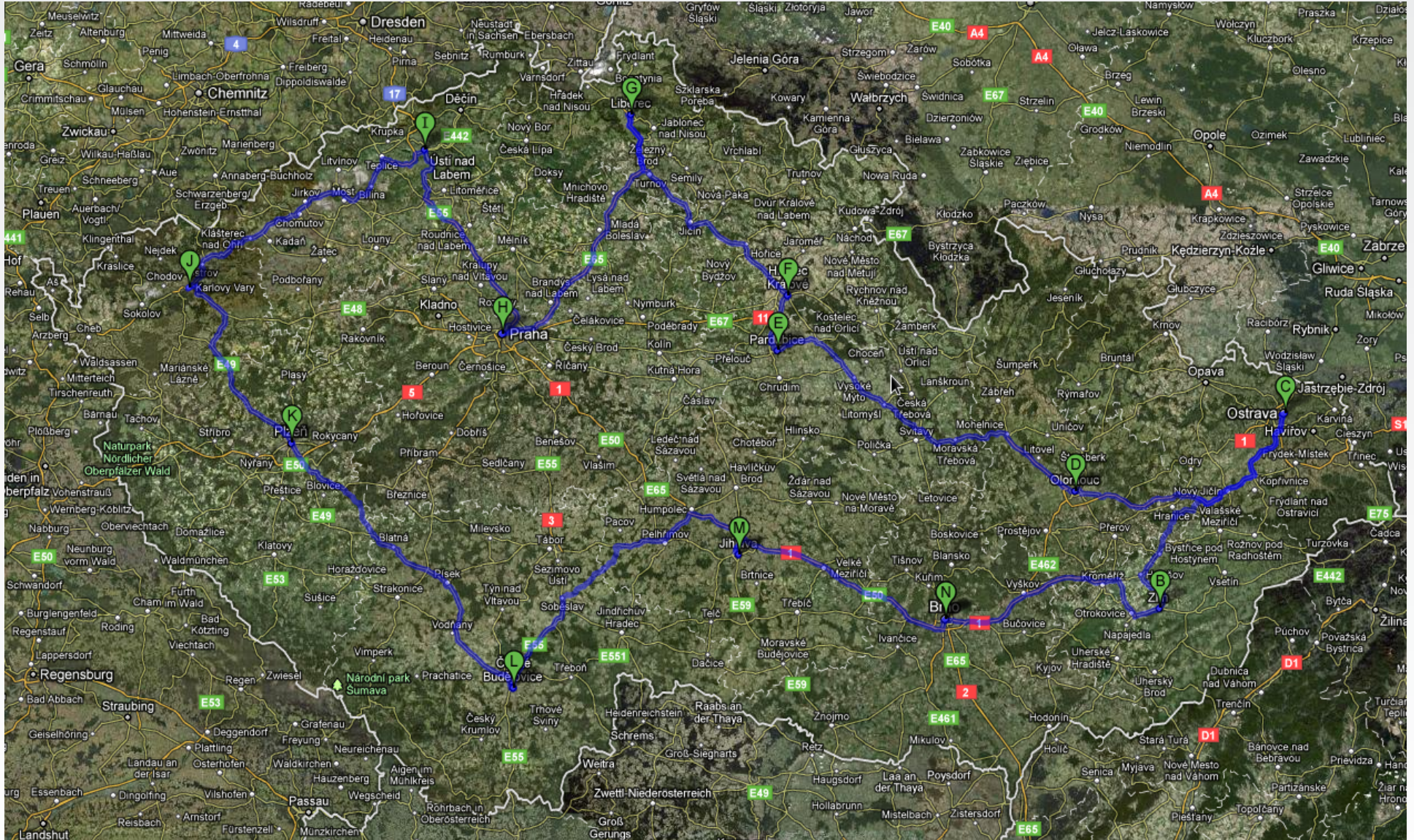


Demo time

- Is it a bird?
- Is it a plane?
- It's Eclipse!



The Result (\$N = 13)



Sources

- Planner documentation:
 - <http://www.jboss.org/drools/documentation>
- Google Maps
- and a little Wikipedia here and there...



Questions?

- Both these slides and demo will be available for download.
- More information about Drools and JBoss to be found on <http://www.jboss.org/>



Czech JBoss User Group

Now in your city!
Come to the first session on March 2nd
at 6 p.m., FI MU



Kick-off planned: RESTEasy



| Lecture room | D2 (80) | D3 (150) | A107 (50) |
|--------------|--|--|---|
| 9:00-9:45 | Perl packaging for developers – Marcela Mašláňová | MythTV - User view – Lukáš Doktor | |
| 9:50-10:35 | Java packaging for developers – Stanislav Ochotnický | Gnome 3.0 (r)evolution - Tomáš Bžatek | |
| 10:40-11:25 | JCR + ModeShape - Jozef Chocholáček | Plasma Workspaces 4 by KDE – Lukáš Tinkl, Jaroslav Řezník | Power management – Jaroslav Škarvada, Jan Včelák |
| 11:30-12:30 | lunch | lunch | lunch |
| 12:30-13:15 | Planning and Scheduling with Drools - Lukáš Petrovický | Spice - Jonathan Blandford | Introduction to Qt development – Jaroslav Řezník, Lukáš Tinkl |
| 13:20-14:05 | Teiid - data virtualization system - Boris Belovic | Beyond init: systemd - Lennart Poettering | Remote Desktop – Adam Tkáč |
| 14:10-14:55 | PicketLink and PicketBox - Peter Škopek | Discussion: Bootloader and Dracut Future Plans - Harald Hoyer (session ends 10 minutes sooner) | Bug hunting & static analysis – Ondřej Vašík and Petr Muller |
| 15:00-15:45 | Web Services for Remote Portlets - Michal Vančo | XXX | System vs Session - Lessons learned - David Zeuthen |
| 15:50-16:35 | Infinispan 4 - Data Grids – Radoslav Husar, Michal Linhard | XXX | SysVinit, upstart and systemd in Fedora and RHEL – Petr Lautrbach |
| 16:40-17:25 | Deltacloud API – Michal Fojtik | XXX | Modern Linux Desktop alphabet – Tomáš Bžatek, Jaroslav Řezník |