Assignment 1: PDDL

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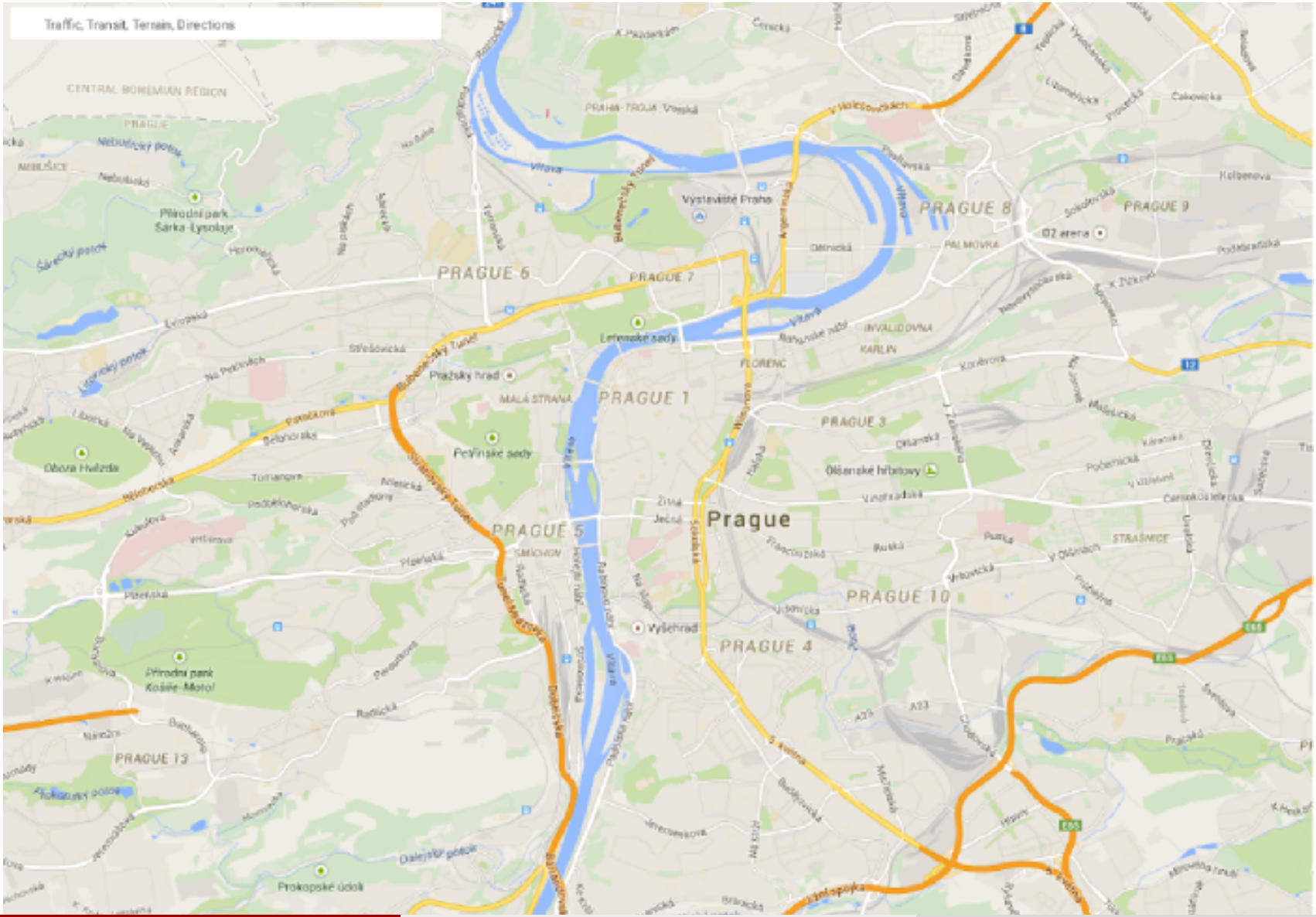
AiCENTER
Department of Computer Science, CTU

PUI (Planning in Artificial Intelligence)

A City


Traffic, Transit, Terrain, Directions
CENTRAL BOHEMIAN REGION
PRAGUE
Přírodní park Šárka-Lysolaje
Šárecký potok
Nebušický potok
Nebušická
Veletržní palác
Vltava
Výstaviště Praha
PRAGUE 8
PRAGUE 9
O2 arena
PALMOVKA
Kolbenova
PRAGUE 6
PRAGUE 7
Letenské sady
Pražský hrad
MALÁ STRANA
PRAGUE 1
PRAGUE 3
FLORENC
INVALIDOVNA
KARLÍN
Obora Hvězda
Petřínské sady
Olšanské hřbitovy
PRAGUE 5
SMÍCHOV
Prague
STRAŠNICE
PRAGUE 10
Vyšehrad
PRAGUE 4
Přírodní park Košíře-Motol
PRAGUE 13
Prokopské údolí
Barrandovský most
Hlavní nádraží
Dejvická
Evropská
Strahovský tunel
Libocká
Patočková
Radlická
Jeremenkova
Na Pankráci
Pražská
Jižní spojka
Nuselské údolí
Vršovická
Vinohradská
Francouzská
Ruská
Jičínská
Žitná
Na Slupi
Na Poříčí
Na Příkopech
Revoluční
Dlouhá třída
Křižíkova
Pobřežní
Českomoravská
Kbelská
Prosecká
Čakovická
Thámova
Sokolovská
Podbělohorská
Střešovická
Na Petřinách
Ostrčilovo nám.
Strossmayerovo nám.
Masarykovo nádraží
Wilsonova
Rašínovo nábř.
Smetanovo nábř.
Klárov
Mánesův most
Most Legií
Most Jiřího z Poděbrad
Most Závišovo
Most Štefánikův
Most Palackého
Most Hlávkův
Most Barikádníků
Most Generála Pattona
Most Milénia
Most Jana Palacha
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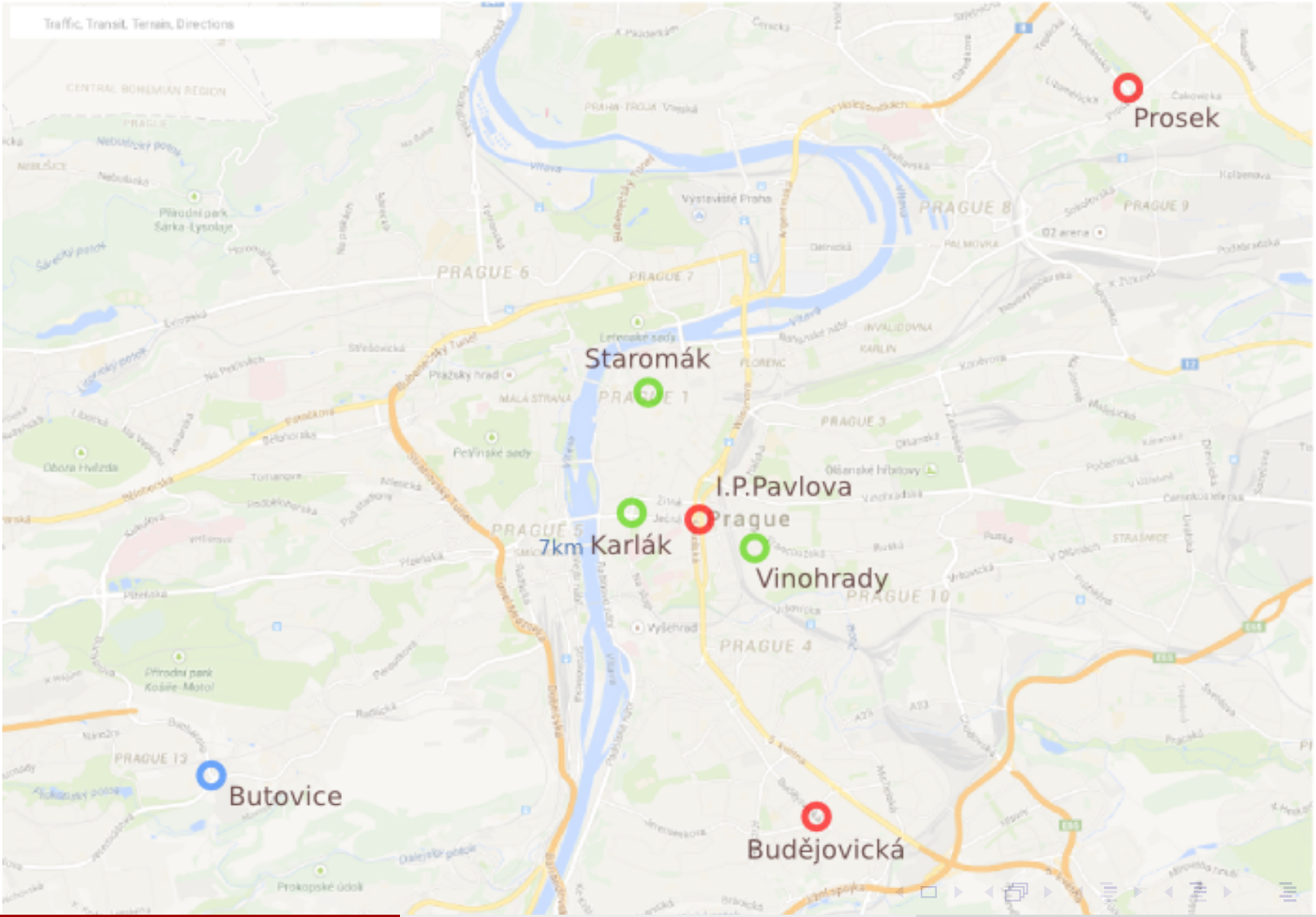
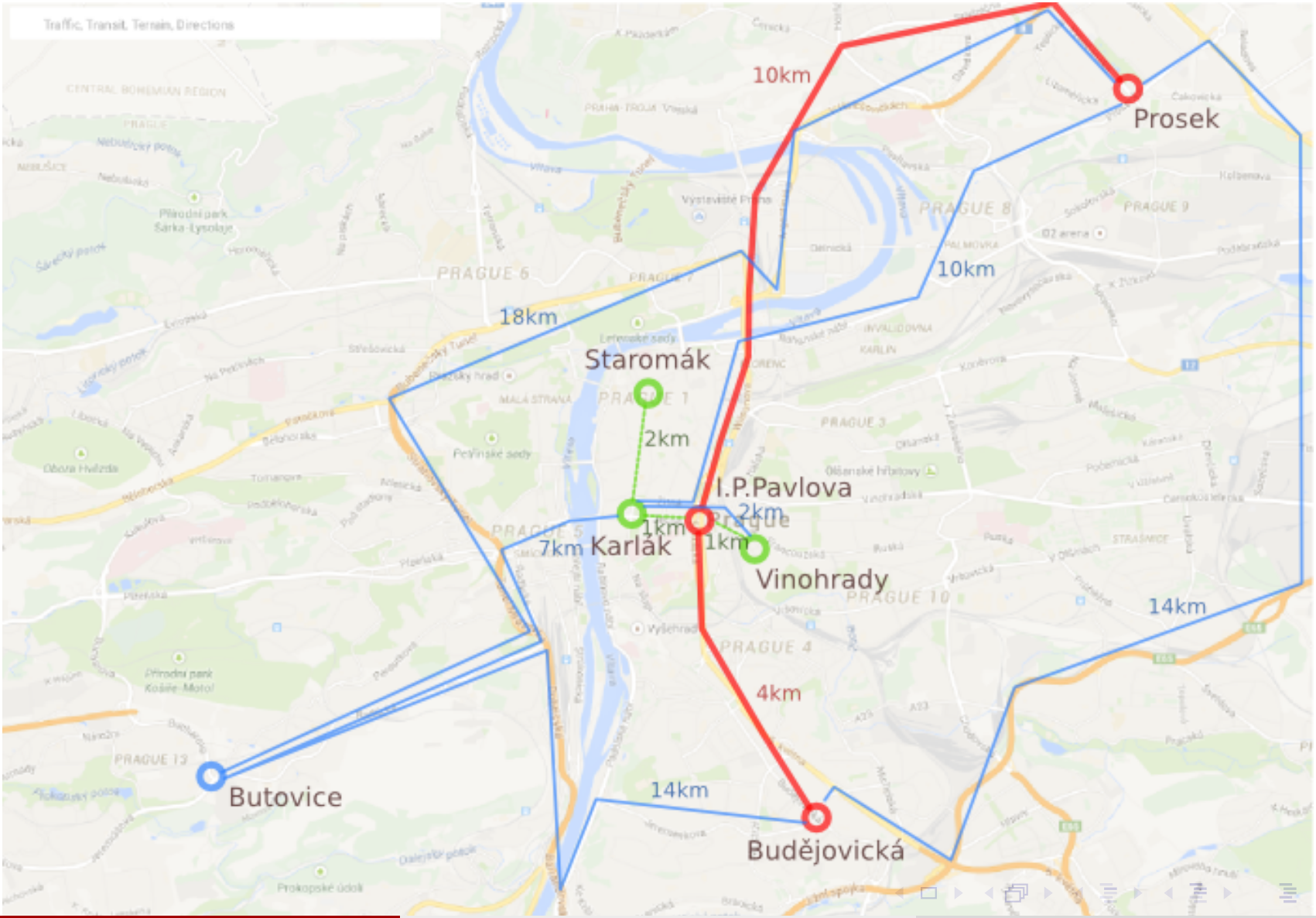
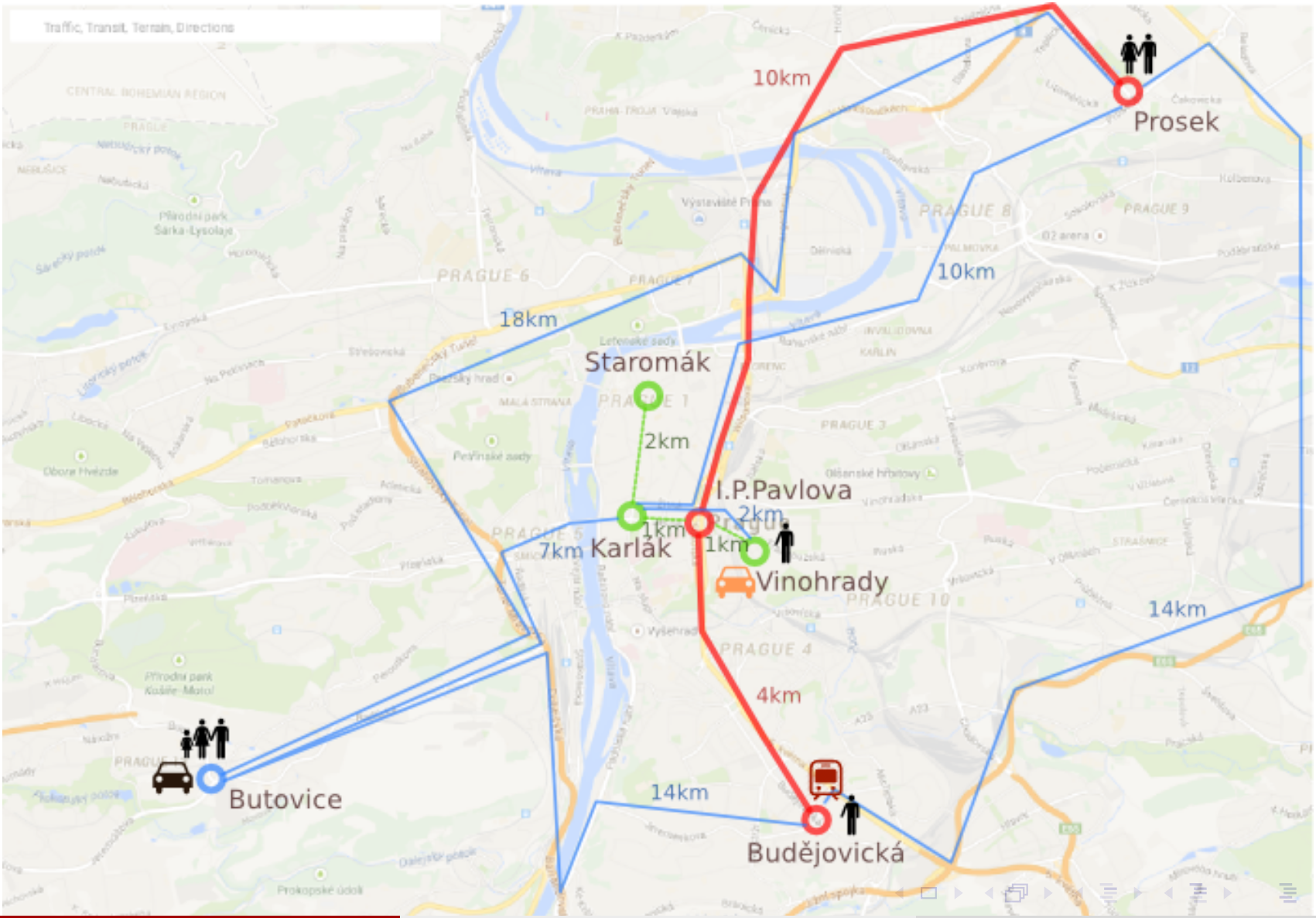
A City with Locations



A City with Transportation Graph



... and People


Traffic, Transit, Terrain, Directions
10km
Prosek
10km
18km
Staromák
2km
I.P.Pavlova
2km
1km
7km Karlák
1km
Vinohrady
14km
4km
14km
Butovice
Budějovická

Sim-City

- Formalize the “simcity” problem
  - Each person lives somewhere and works somewhere
  - Some people may be related (family)
  - Goal: Find a “day activity and transportation plan” for a set of people
  - The people travel on a multi-modal transport graph using various vehicles
- http://cw.fel.cvut.cz/wiki/courses/a4m36pah/assignments/assignment1

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Vehicles

- Each vehicle needs a driver to operate
  - (even public transport)
- Not all people can board all vehicles
  - (e.g. a family car)
- Driving a taxi or public transport counts as work

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Domains and problems

- For each level (described later) create
- Single domain file
- Two problem files
  - Smaller problem (<10 nodes, <10 people and vehicles)
  - Larger problem (10-20 nodes, 10-20 people and vehicles)

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Sim-City Level: Basic

Mandatory, 4 points

- Basic problem description
  - Some walk-only edges
  - At least one private transport type (e.g. cars)
  - At least one public transport type (e.g. underground)
  - At least one on-demand transport type (e.g. taxi)

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Sim-City Level: Costs

2 points

- Add costs
  - A cost of boarding a vehicle, a cost of riding a vehicle
    - Based on “real” distances
    - Not all vehicles have both
  - Try additional type of cost
    - E.g. money, time, CO_2, ...
    - Can be in separate domain/problem files
    - + 1 points

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Sim-City Level: Temporal

3 points

- Change actions to durative/temporal actions
  - At least the “drive” actions
  - You may use a smaller problem

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Sim-City Level: Extended

max 2 extensions

- Add some of the following:
  - Capacity of vehicles (1-2 points)
    - using only STRIPS or using numeric fluents
    - e.g. car have only 4 seats
  - Leave vs. Park (1 point)
    - Difference between leaving a vehicle and parking it (at a parking place)
  - Fuel (1-2 points)
    - using only STRIPS or using numeric fluents
  - Come-up with your own (non-trivial) extension (1-3 points)

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Your Task

- Formalize problem “Sim-City” in PDDL
  - Basic + chosen levels
- Evaluate
- Create PDF report

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Formalize problem “Sim-City” in PDDL

- For each Level:
  - 1x domain
  - 2x problem (small + large)
  - You may use the same problems (i.e., roadgraph, etc.) for all levels
  - Plan by at least one planner
  - Provide the output and the resulting plan
- Basic level is mandatory!

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Evaluate (+ 2 points)

- Select 3 of the provided planners
  - One should be optimal: fd-ms, fd-lmcut or symba
- Run all planners on both problems of the selected domain
- Plot comparison of the planners
  - Time dependent on problem
  - Quality dependent on problem
- Include in the report

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Your Task

Create PDF report

- (Ideally in LaTeX)
- Description of the location, transport graph, people, vehicles (brief)
- Specify which problem levels and features were formalized (and how)
  - Specify your own enhancements in-detail
- Brief description of (all) used predicates, actions and functions
- List of the selected planners, parameters of the testing env.
- (Execution time and solution quality plots)
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