ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

TRANSP-OR

Public defense

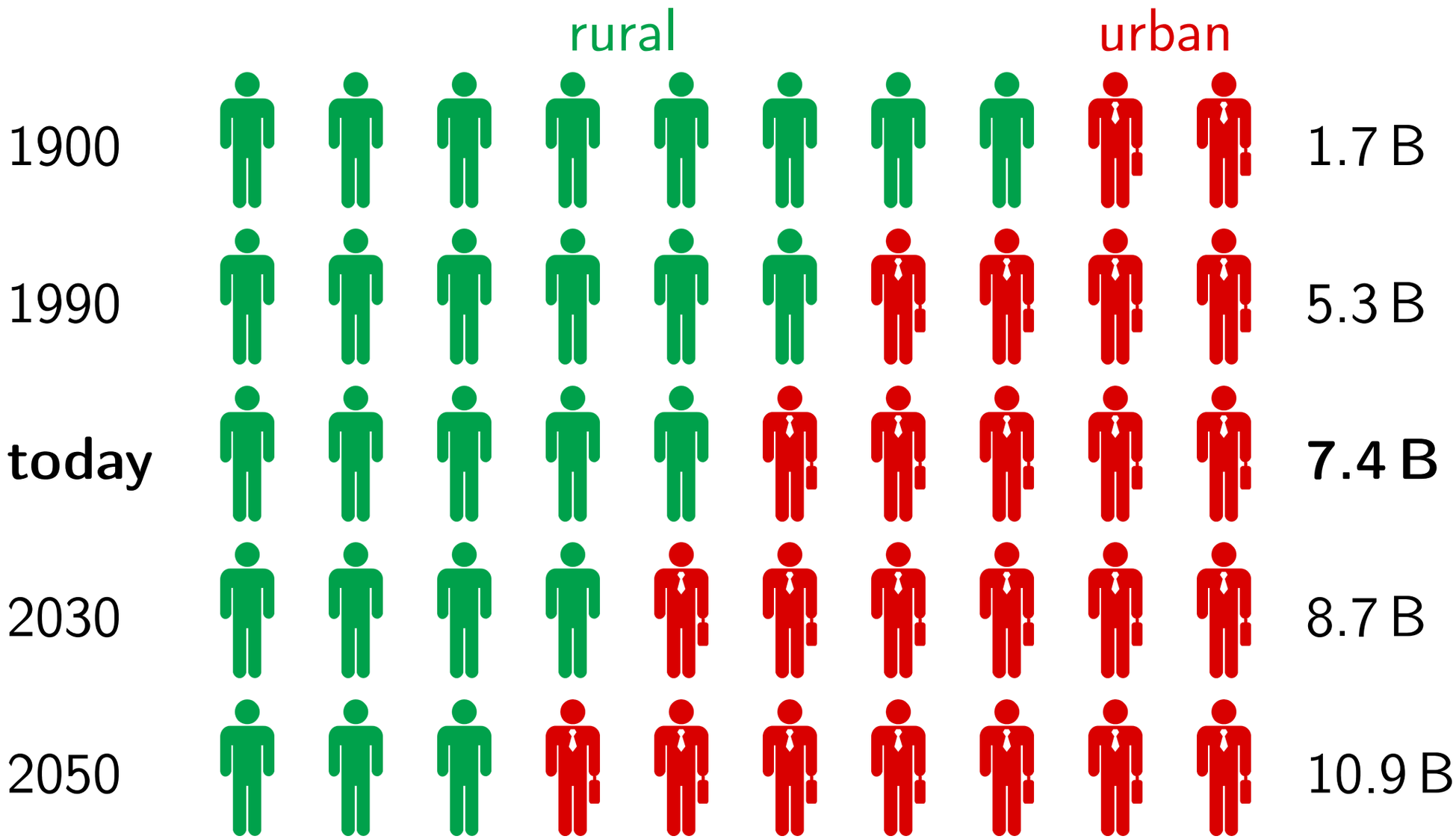
Modeling and estimation of pedestrian flows in train stations

Flurin S. Hänseler

Jury: M. Bierlaire, N. Geroliminis, S.P. Hoogendoorn,
W.H.K. Lam, U. Weidmann

Lausanne, March 18, 2016

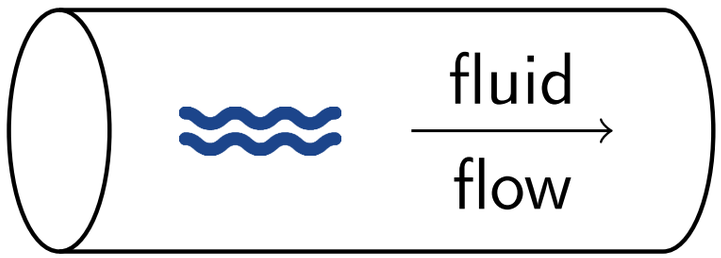
Population growth and urbanization

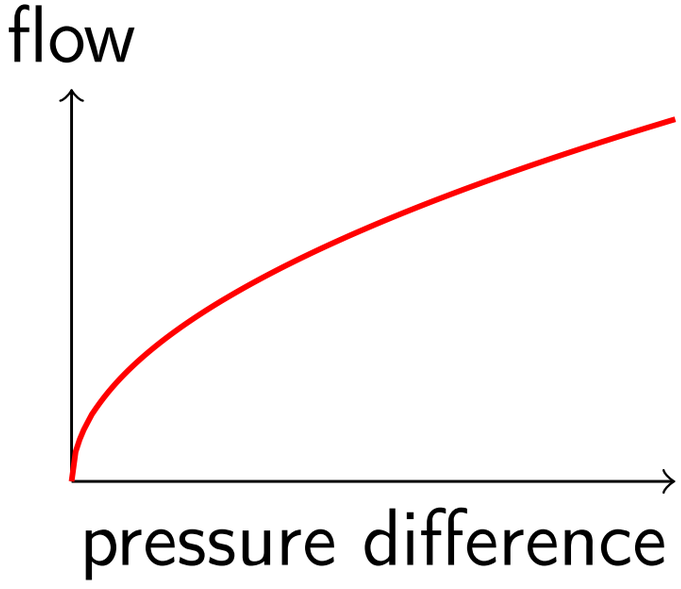


Mong Kok, Hong Kong

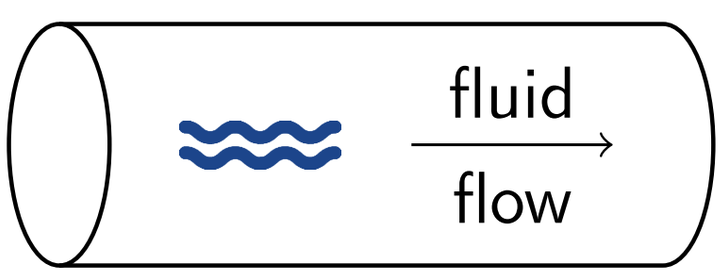
Increase in mobility

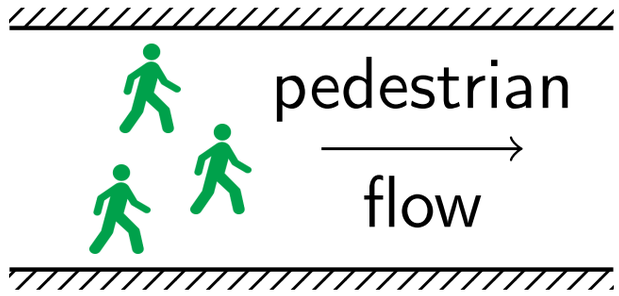
Flow performance

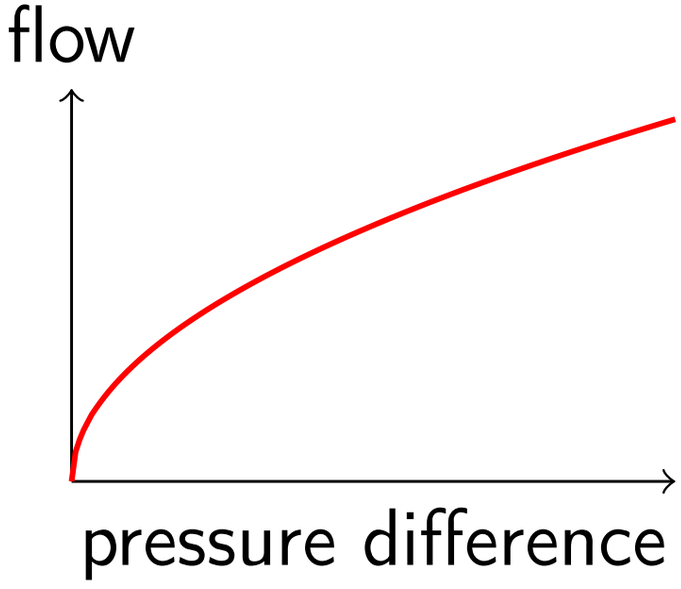


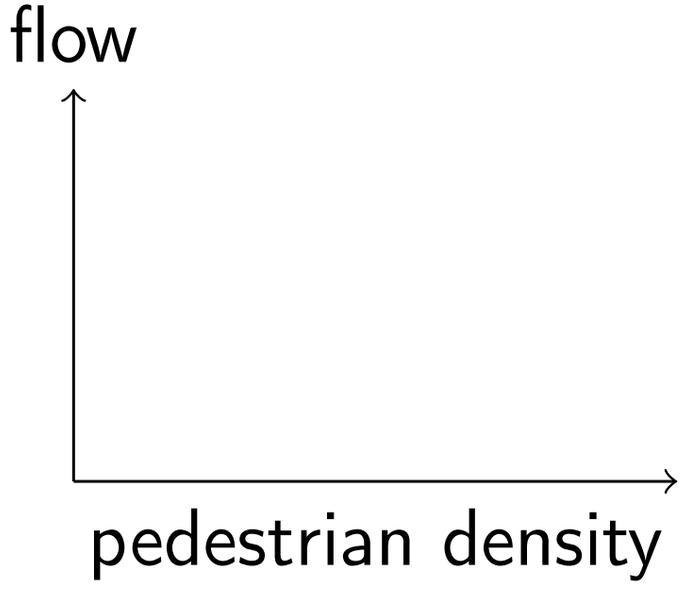


Flow performance

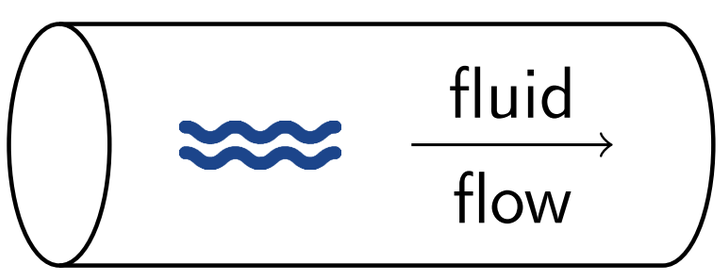


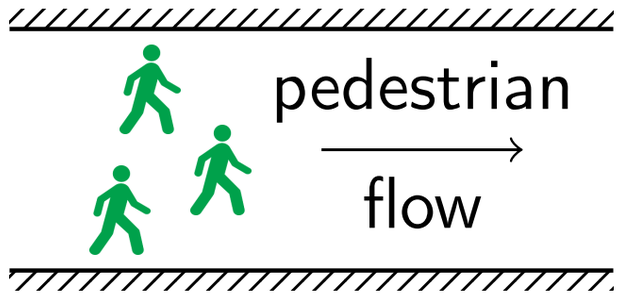


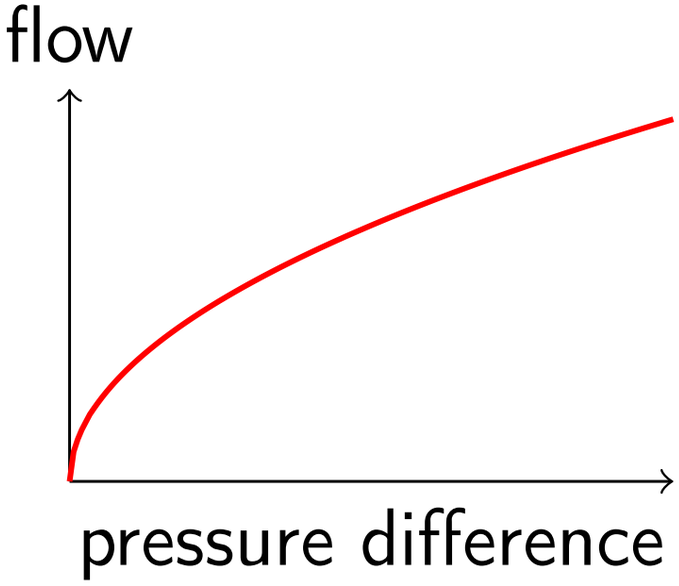


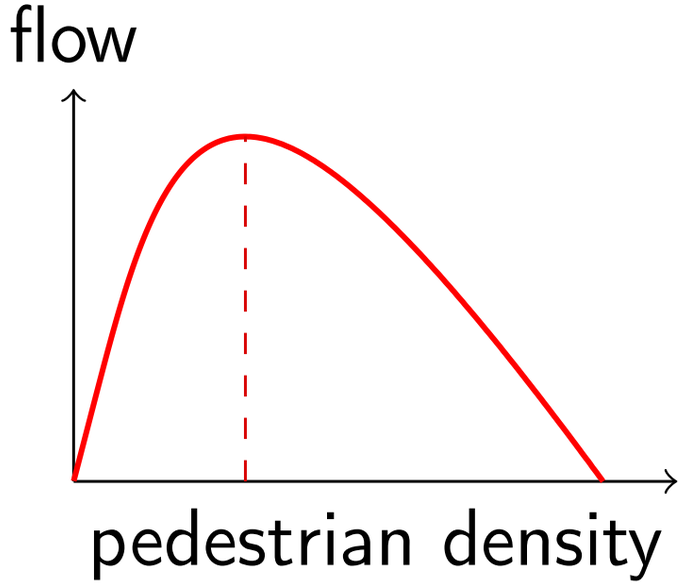


Flow performance



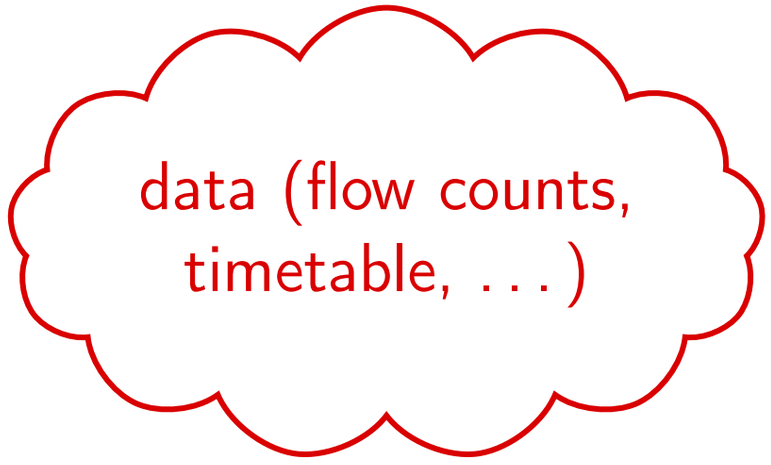




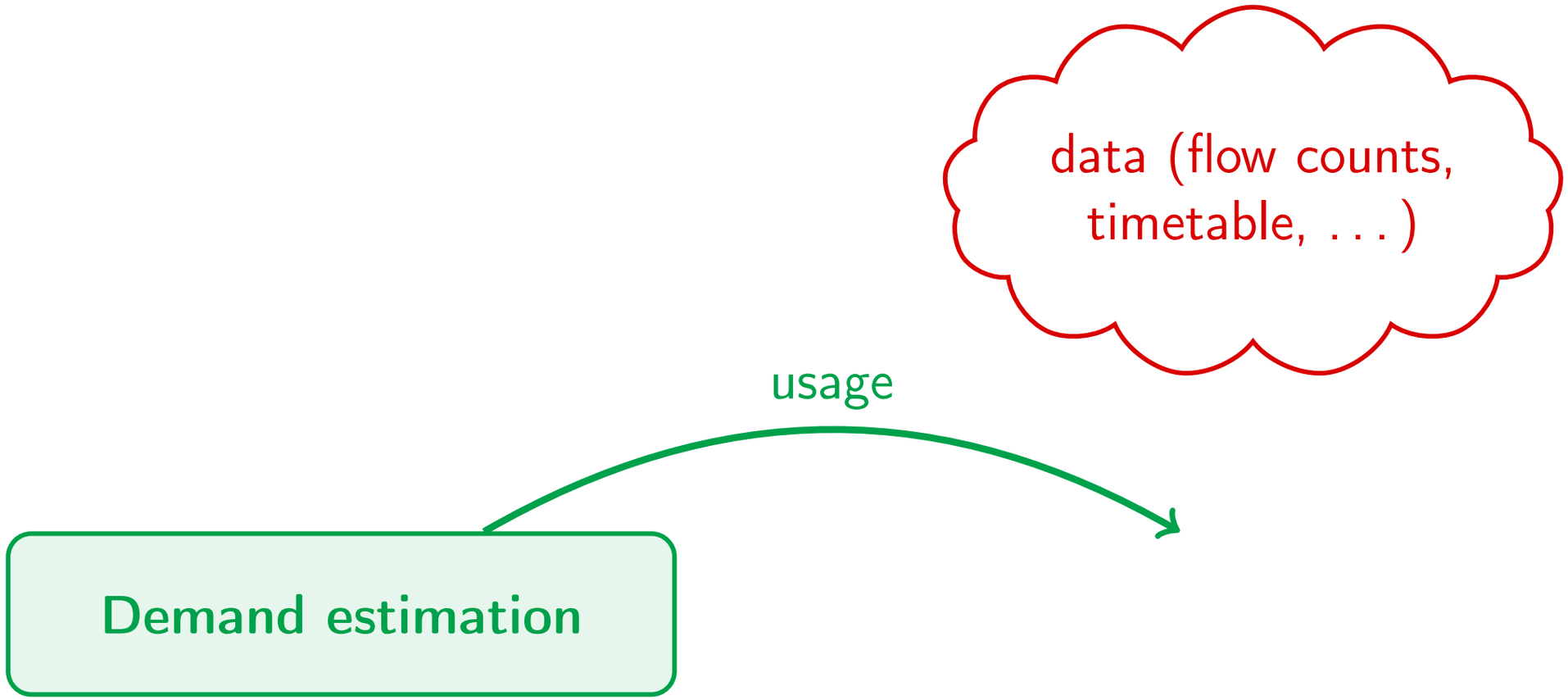


Modeling pedestrian flows in train stations

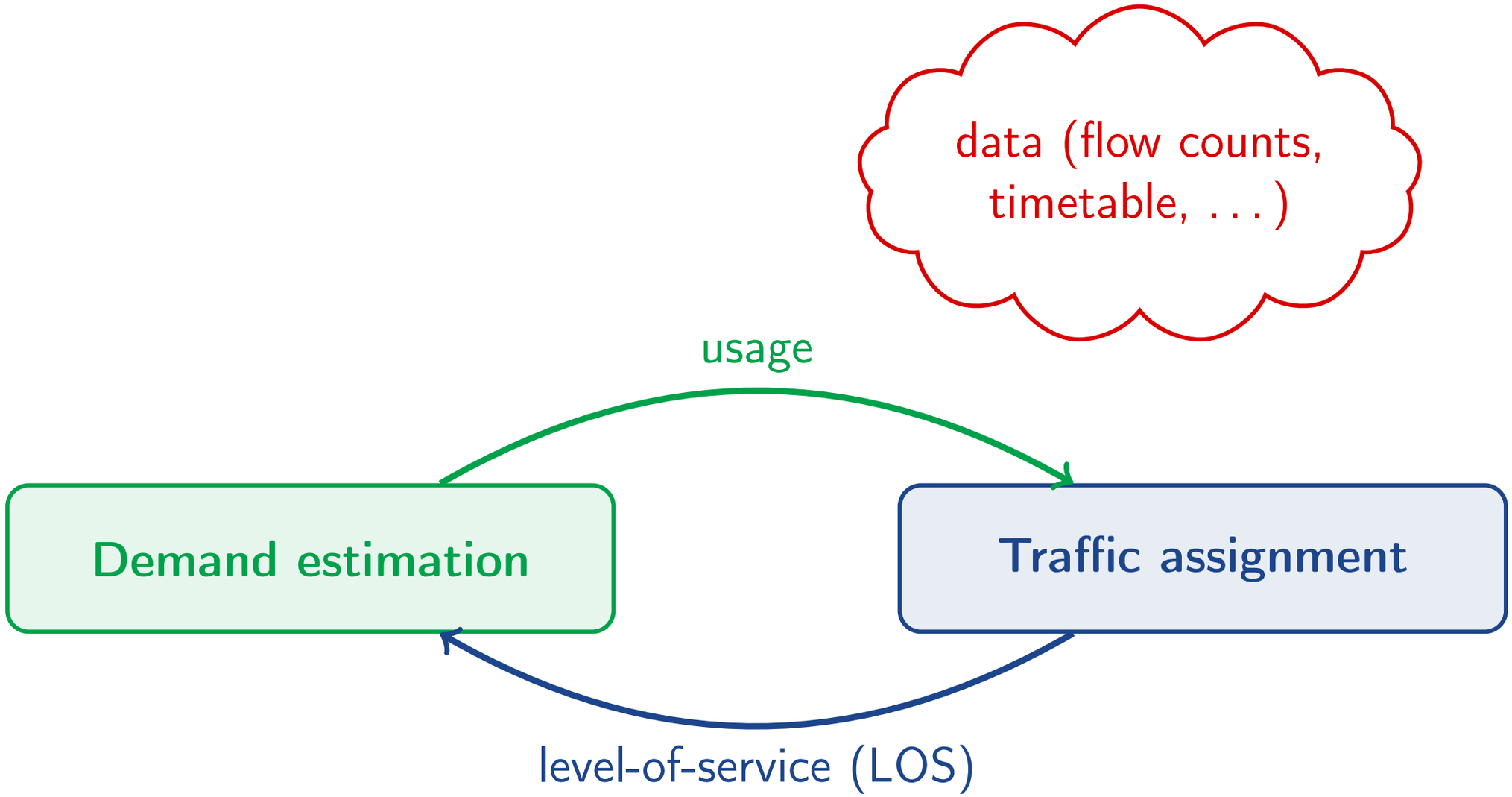
Modeling pedestrian flows in train stations



Modeling pedestrian flows in train stations

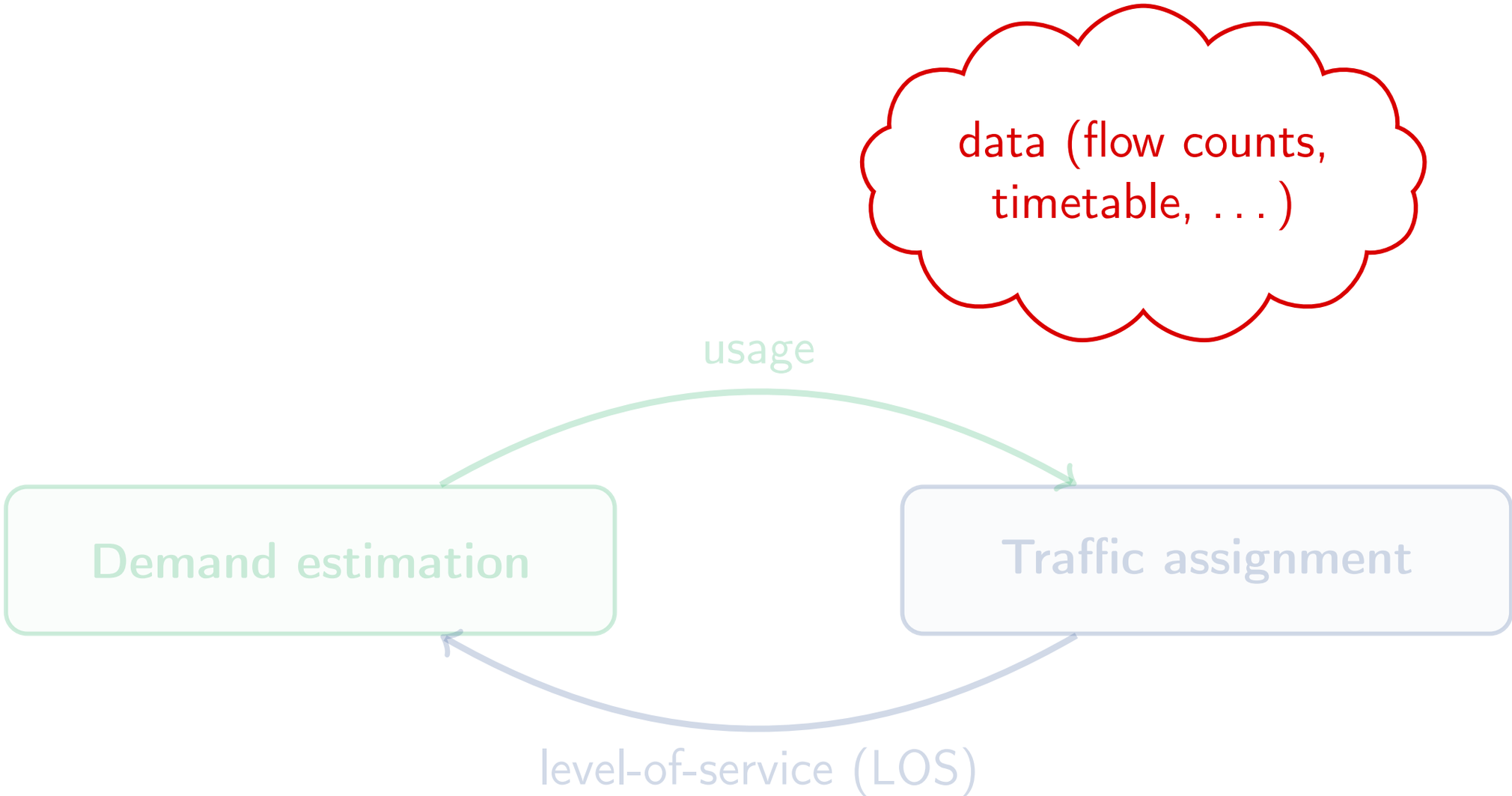


Modeling pedestrian flows in train stations



Lausanne railway station

Modeling pedestrian flows in train stations



Train passenger volume over a day

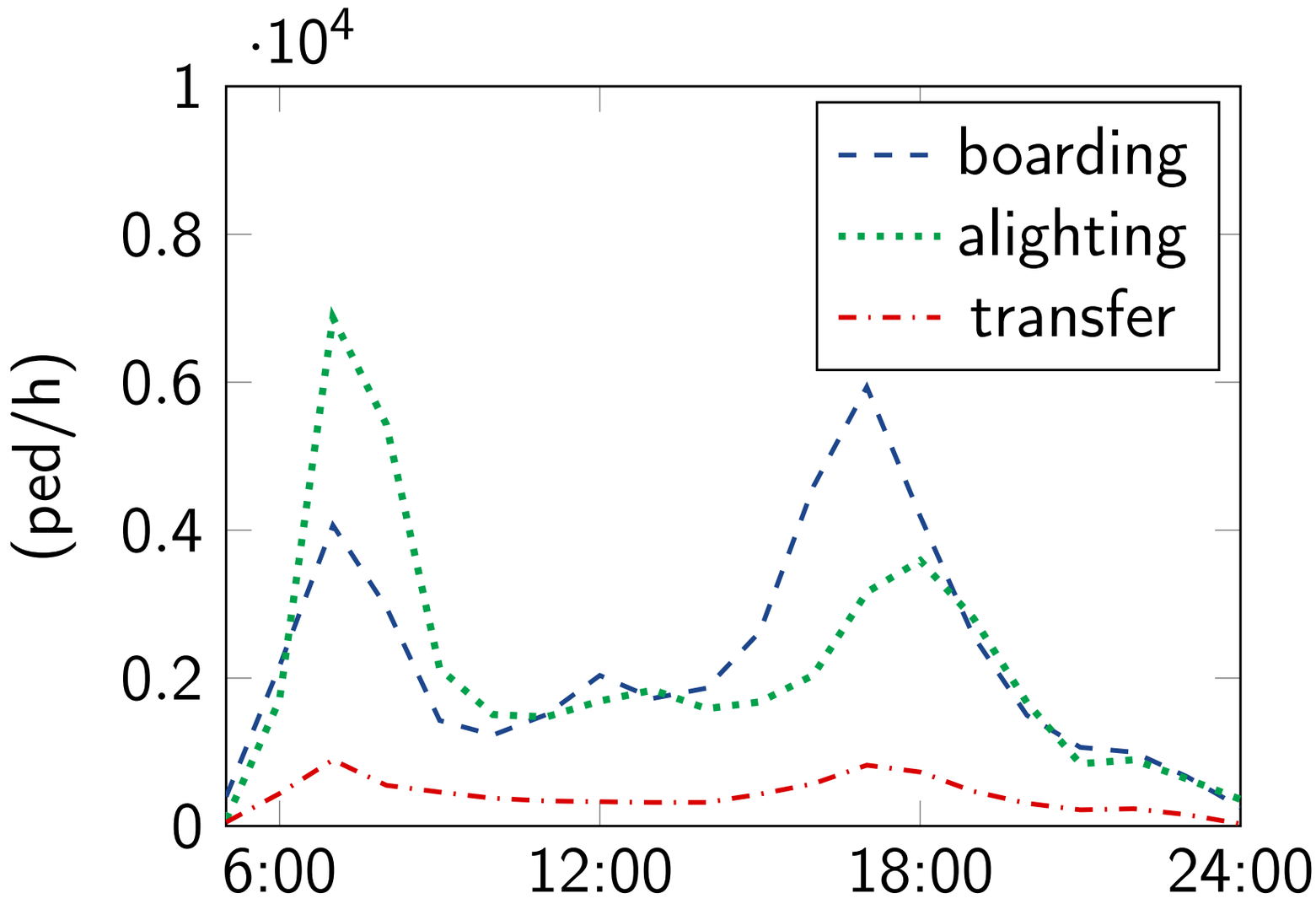
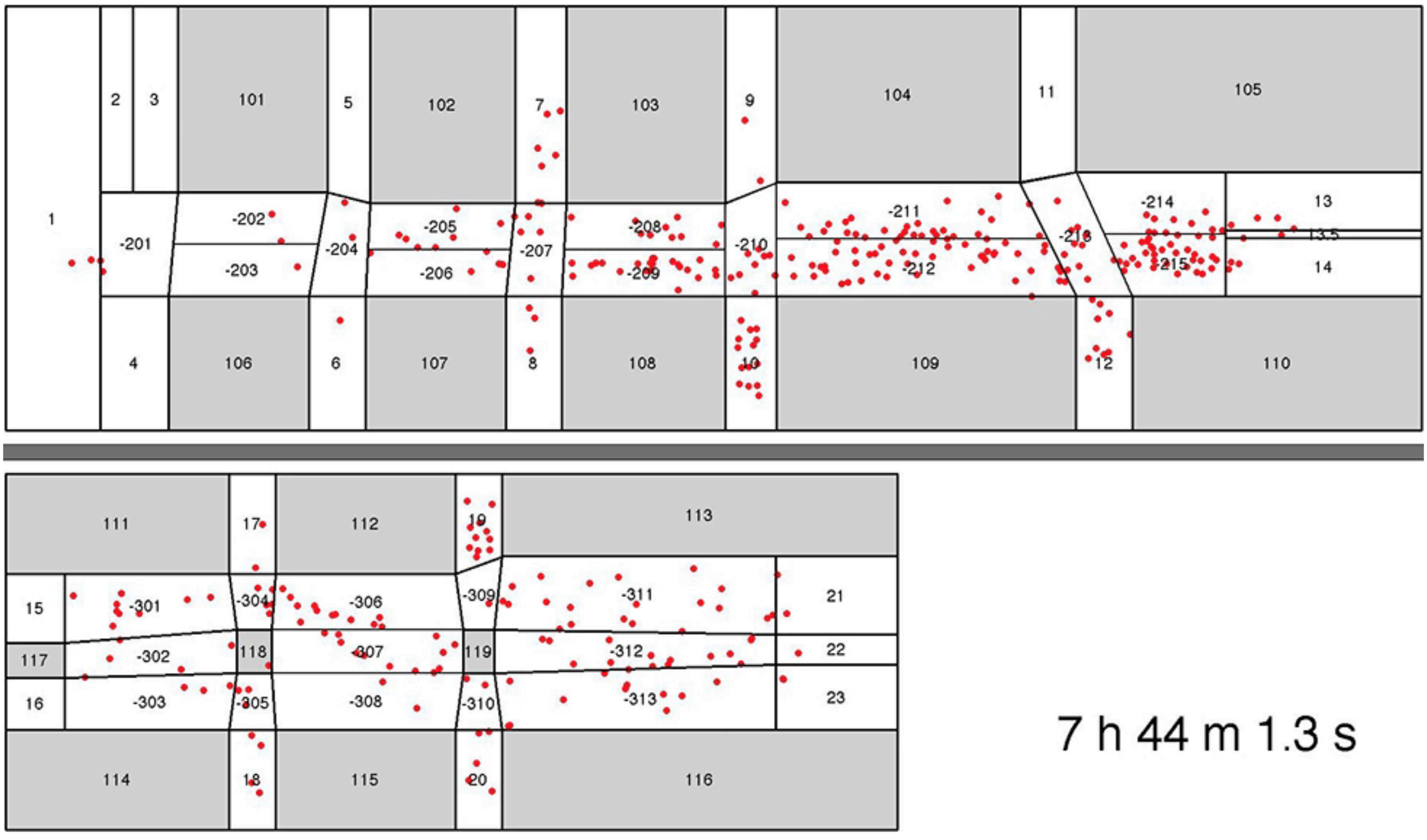


Figure: Travel survey data (2013)

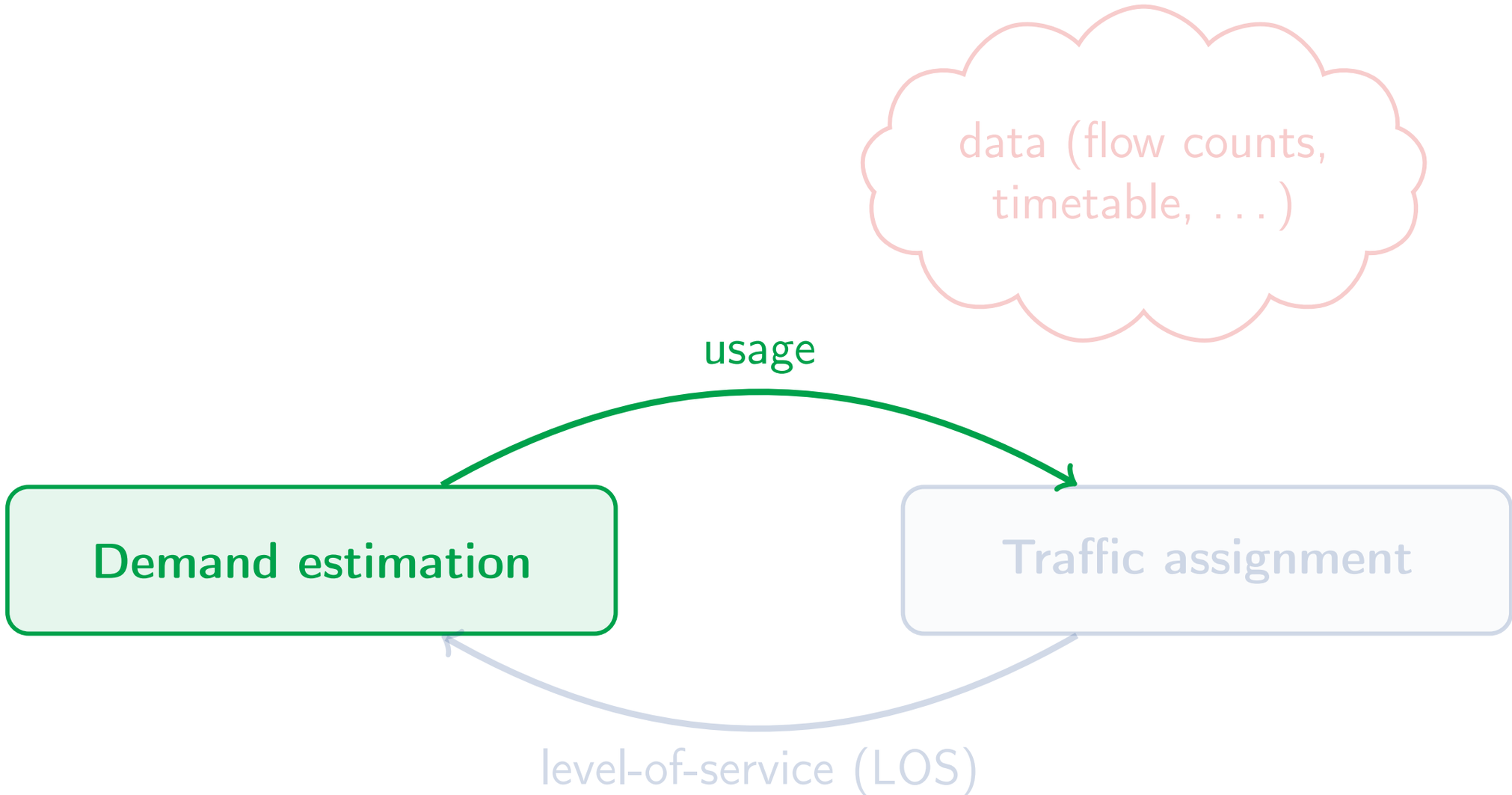
Pedestrian movements on January 16, 2013



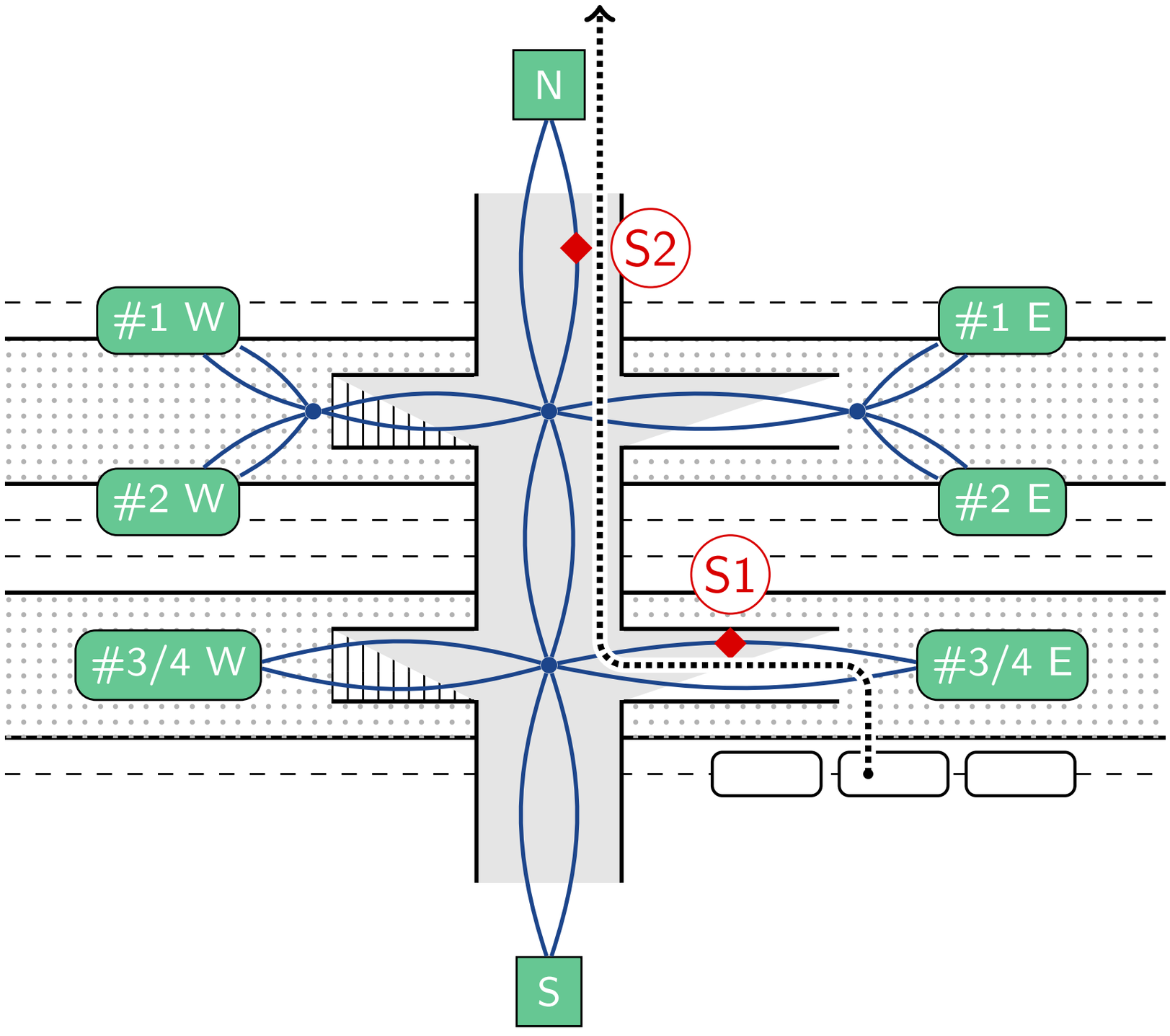
7 h 44 m 1.3 s

Animation: https://youtu.be/HHMXTJlQlkY

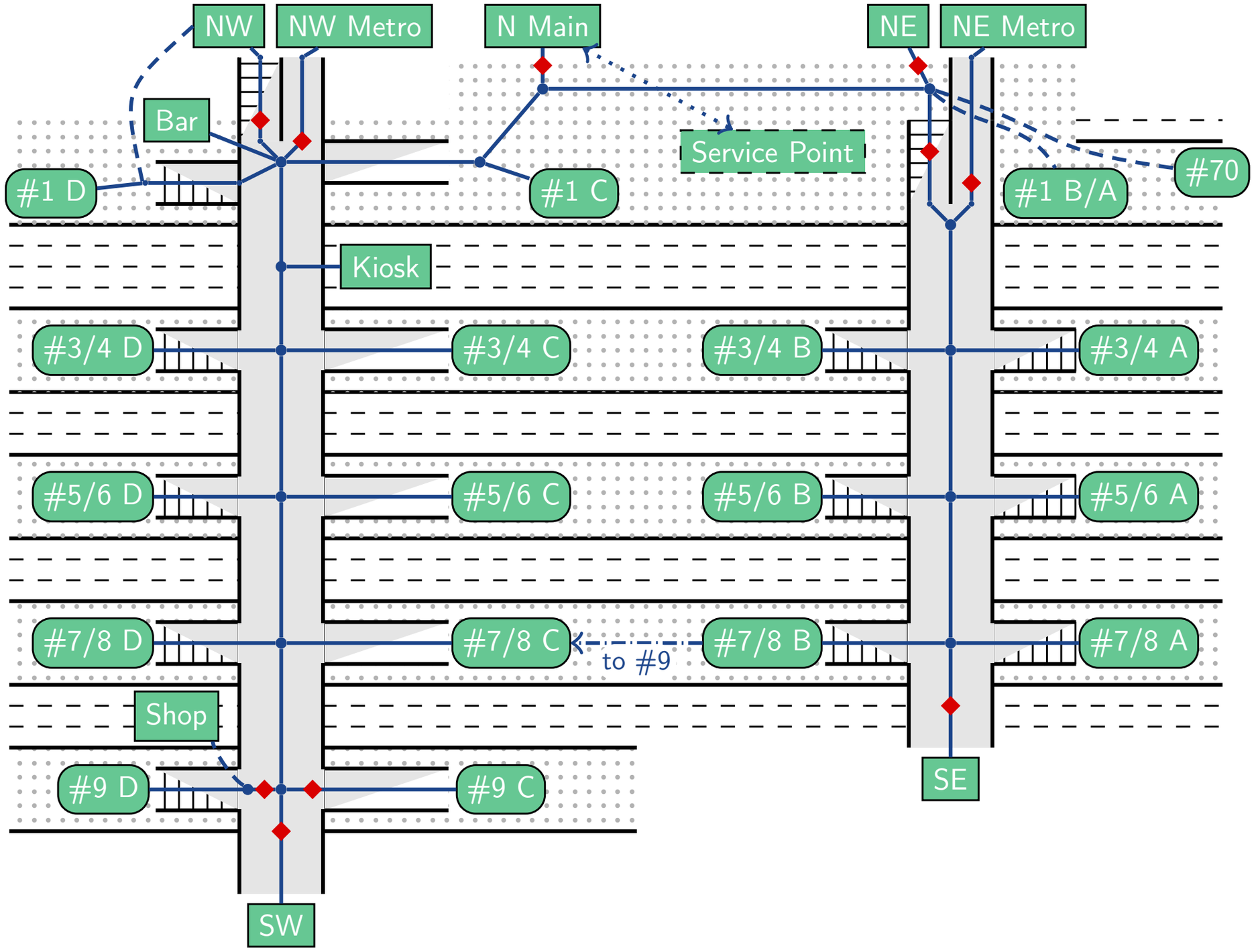
Modeling pedestrian flows in train stations



Pedestrian demand estimation: Illustration



Lausanne railway station: Pedestrian network



Flow map of Lausanne railway station (2013)

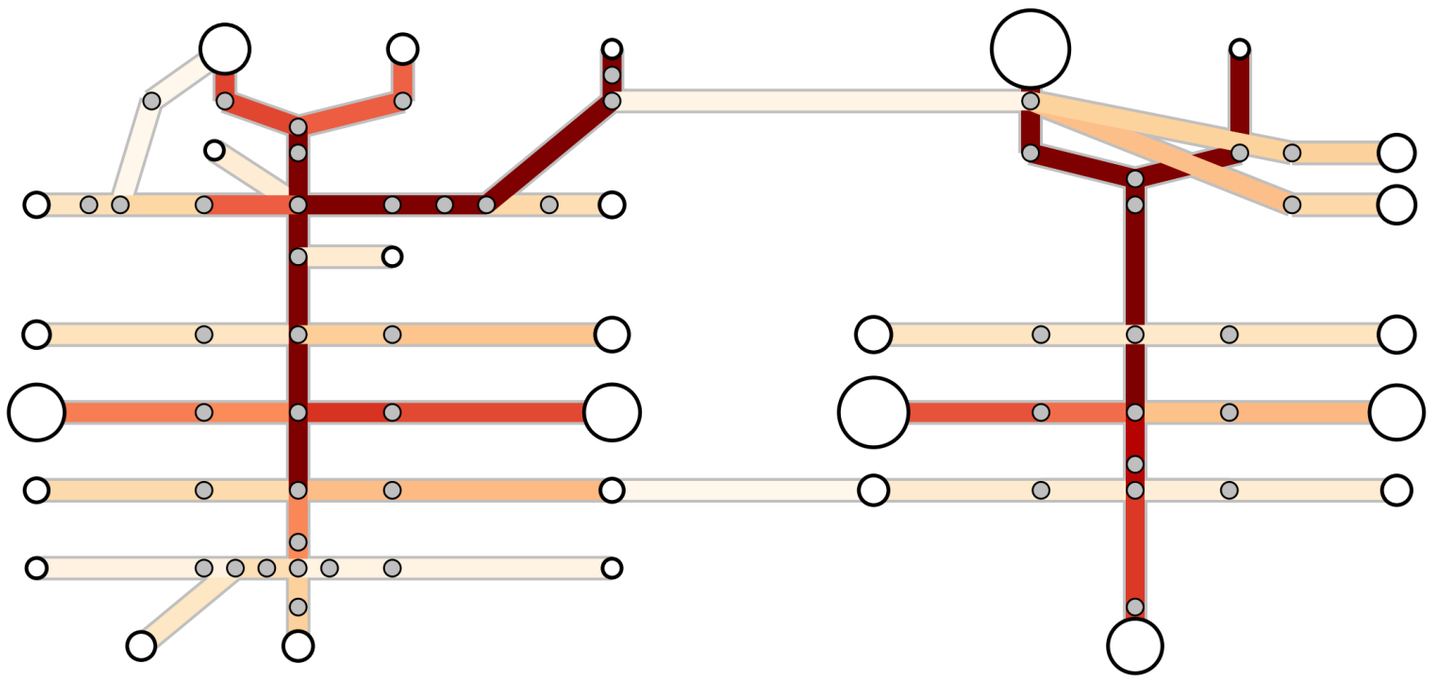
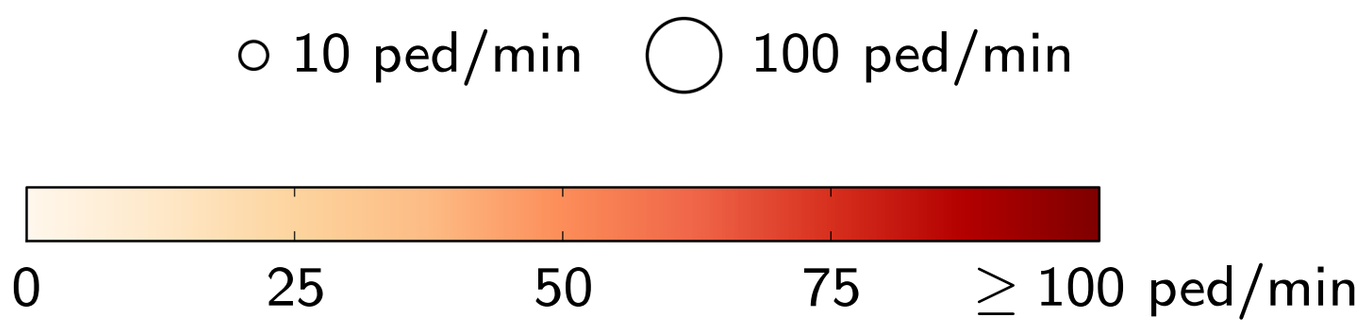


Figure: 7:40–7:41



Flow map of Lausanne railway station (2013)

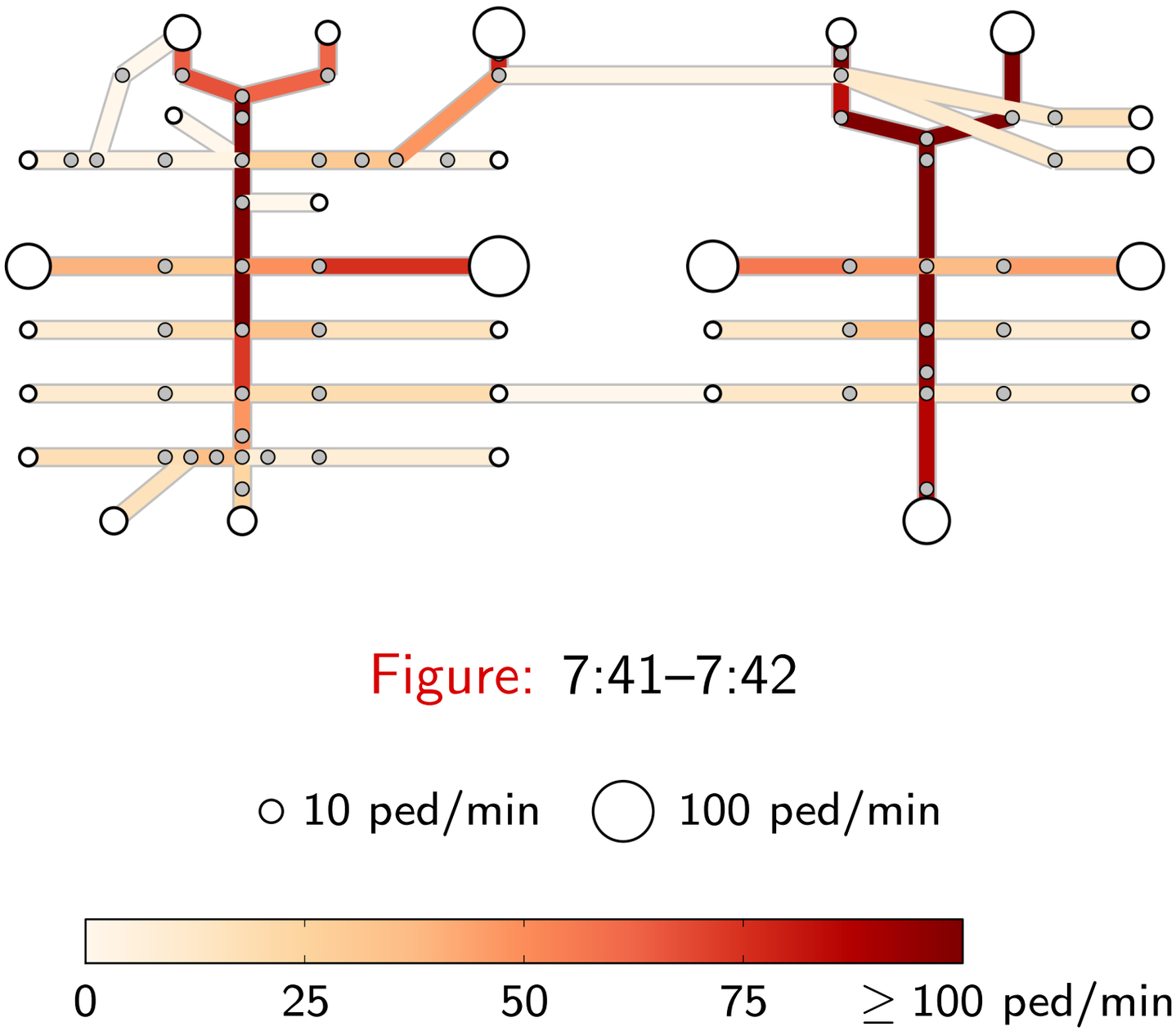


Figure: 7:41–7:42

Flow map of Lausanne railway station (2013)

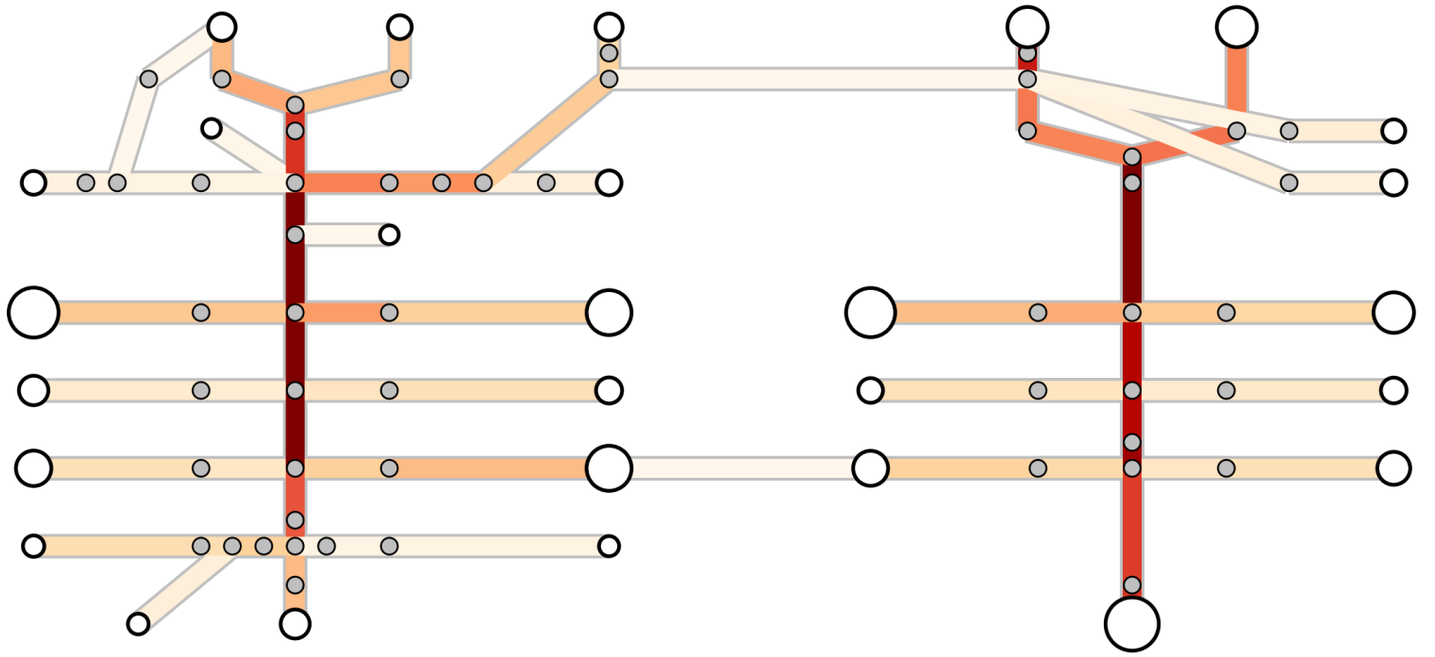
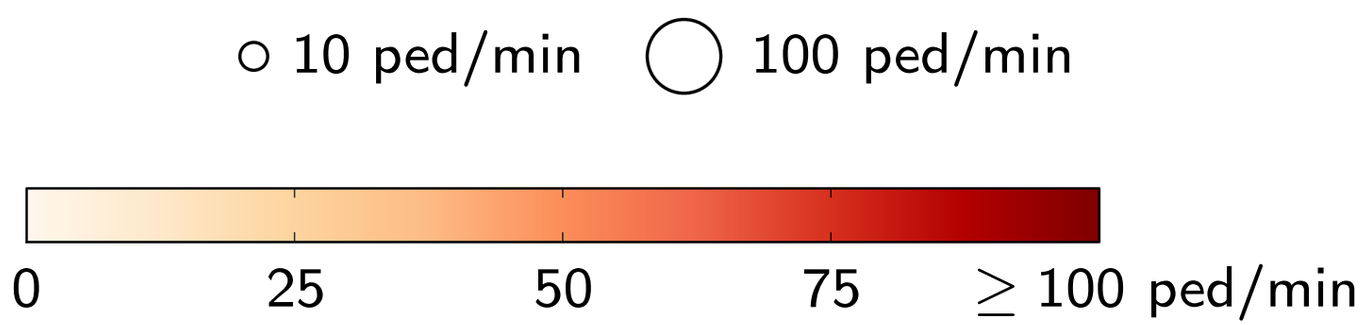
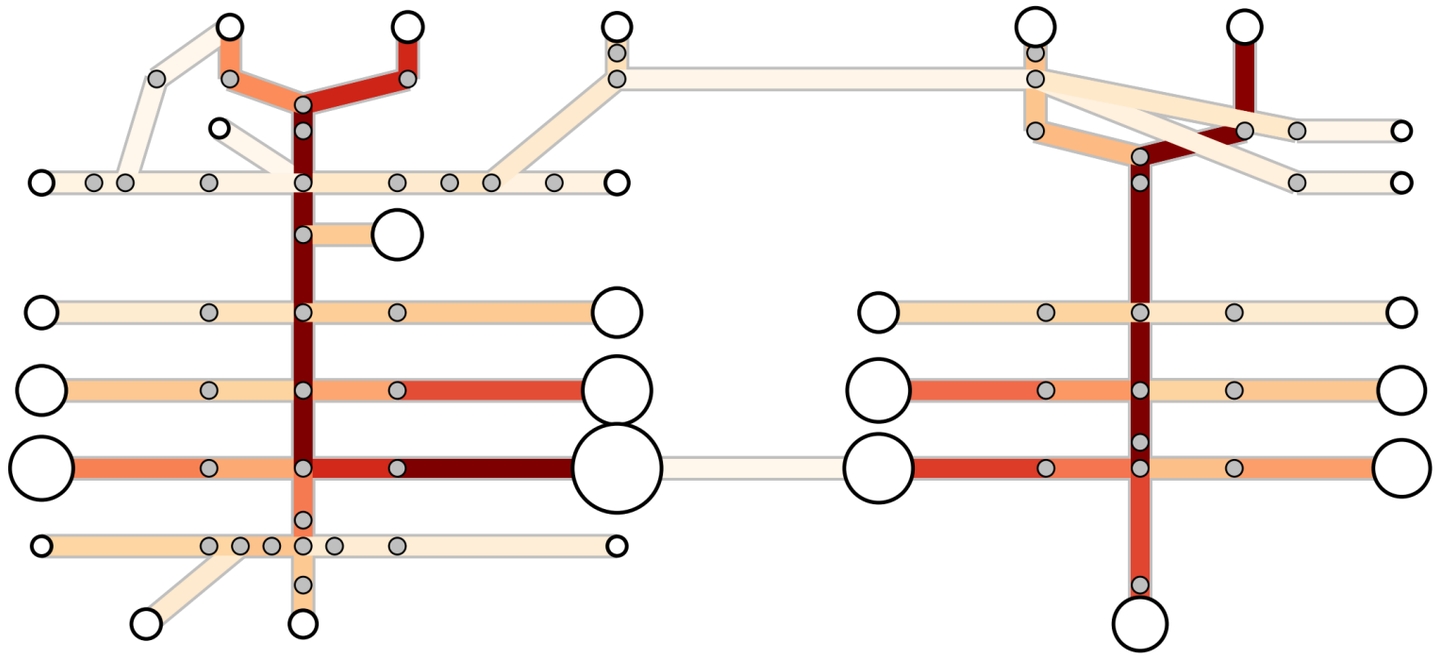


Figure: 7:42–7:43



Flow map of Lausanne railway station (2013)



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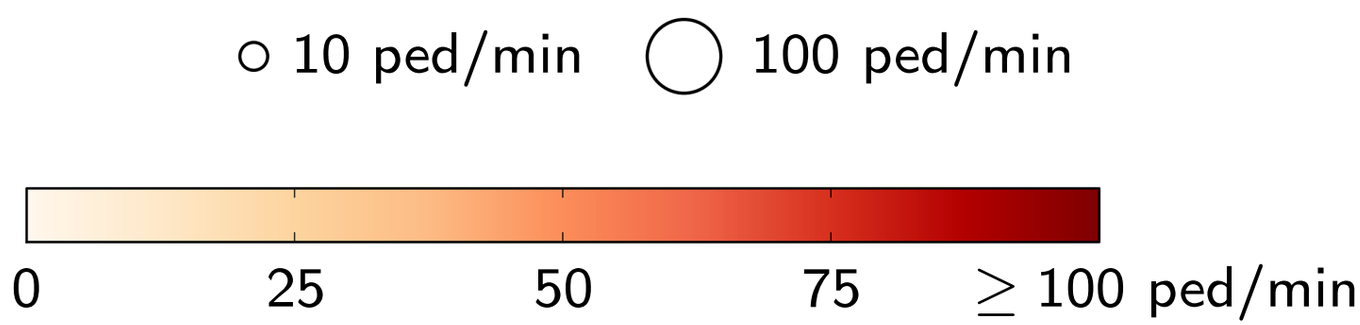


Flow map of Lausanne railway station (2013)

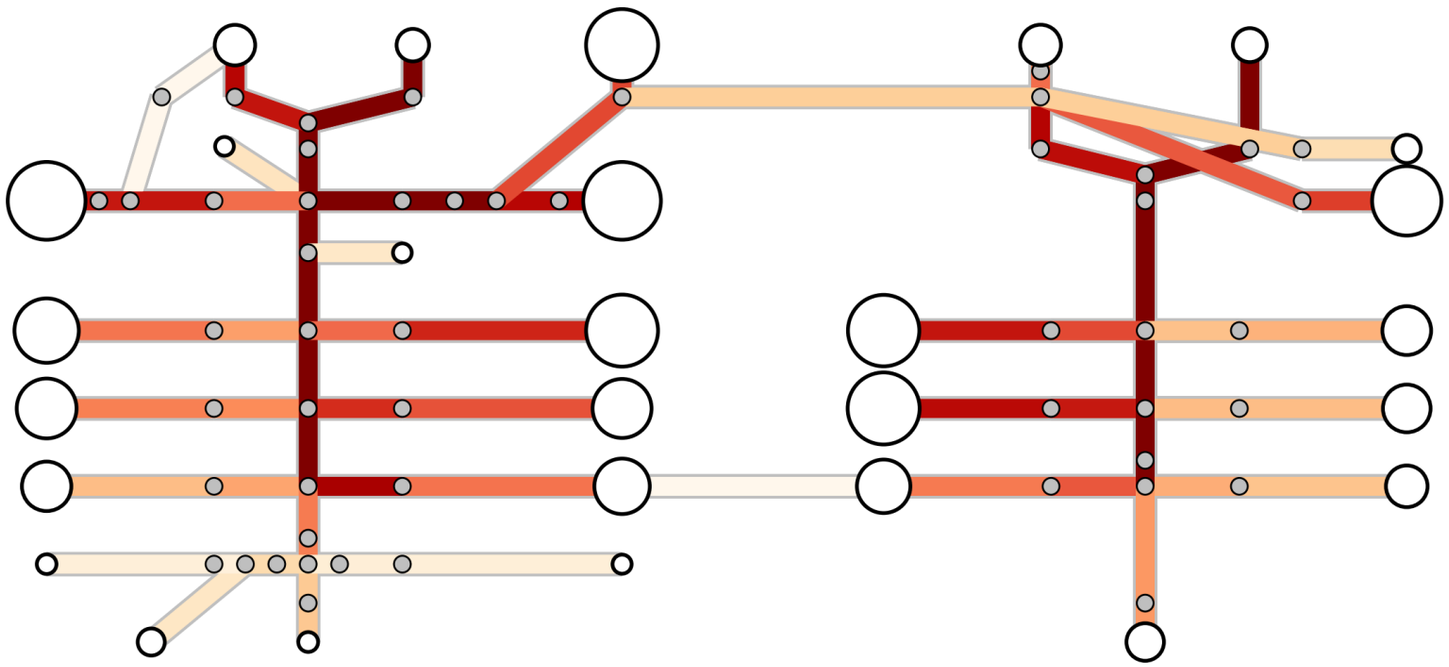
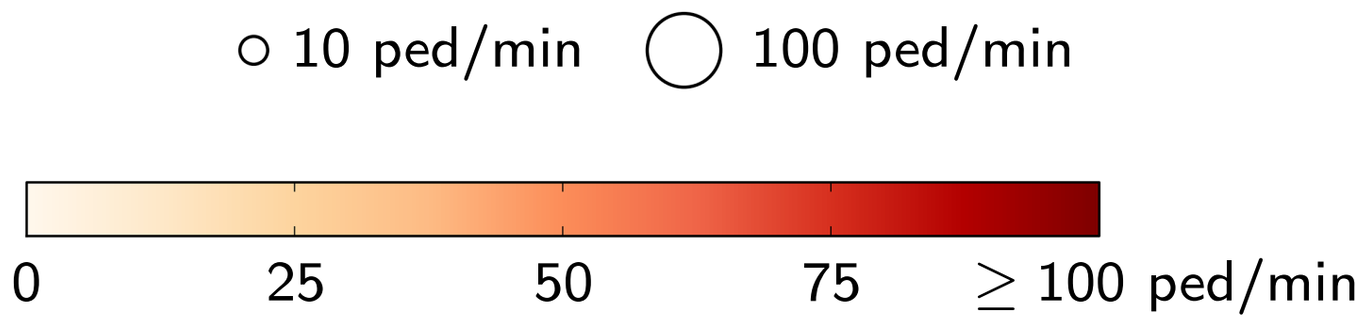


Figure: 7:44–7:45



Flow map of Lausanne railway station (2013)

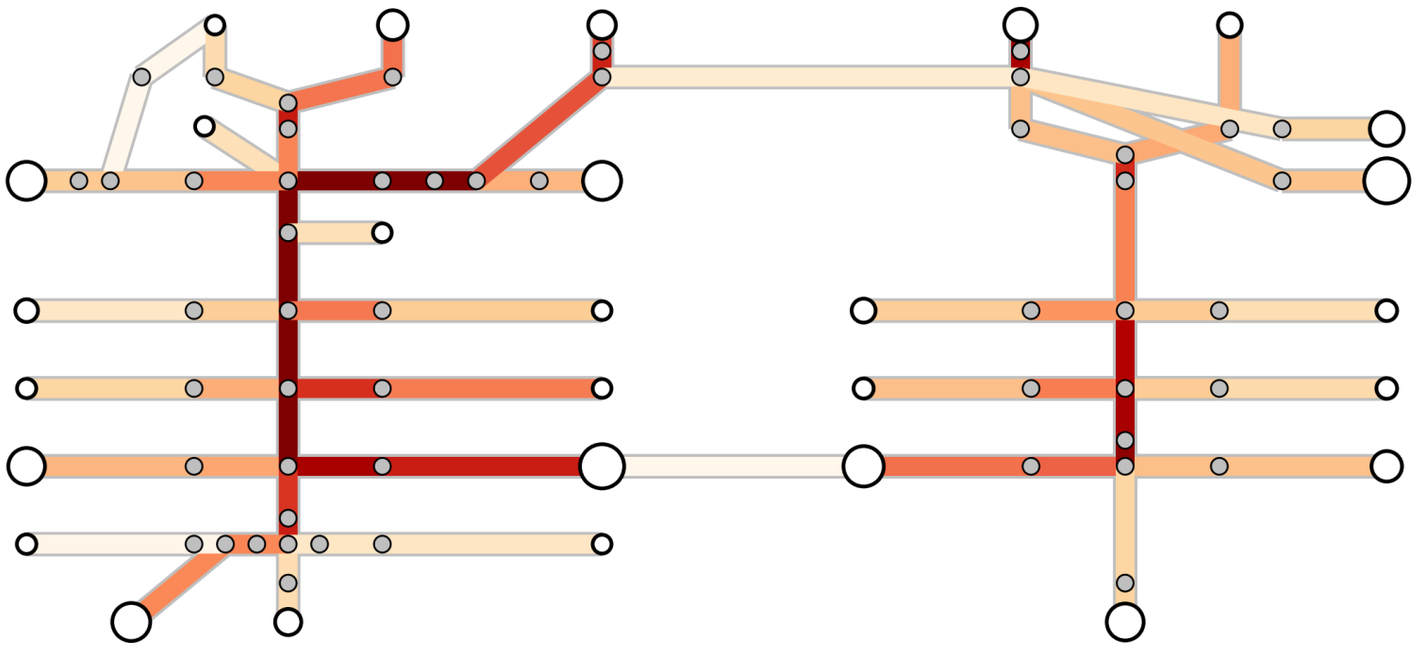
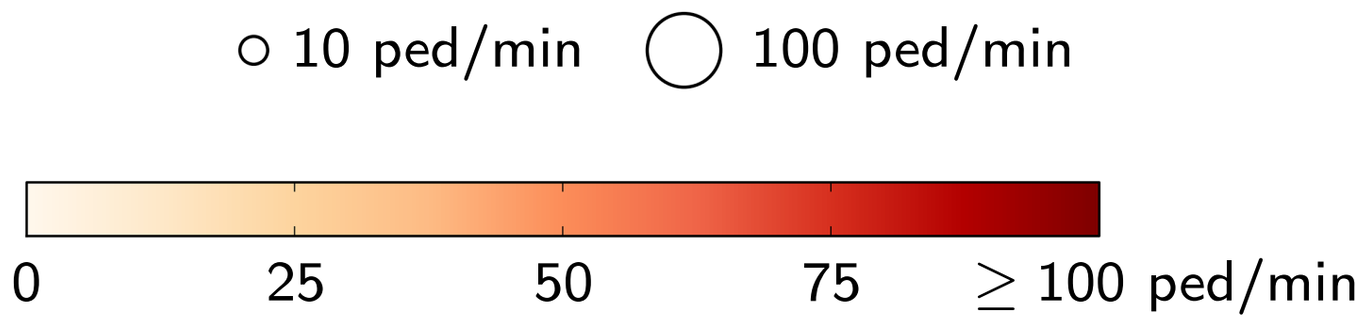


Figure: 7:45–7:46



Flow map of Lausanne railway station (2013)

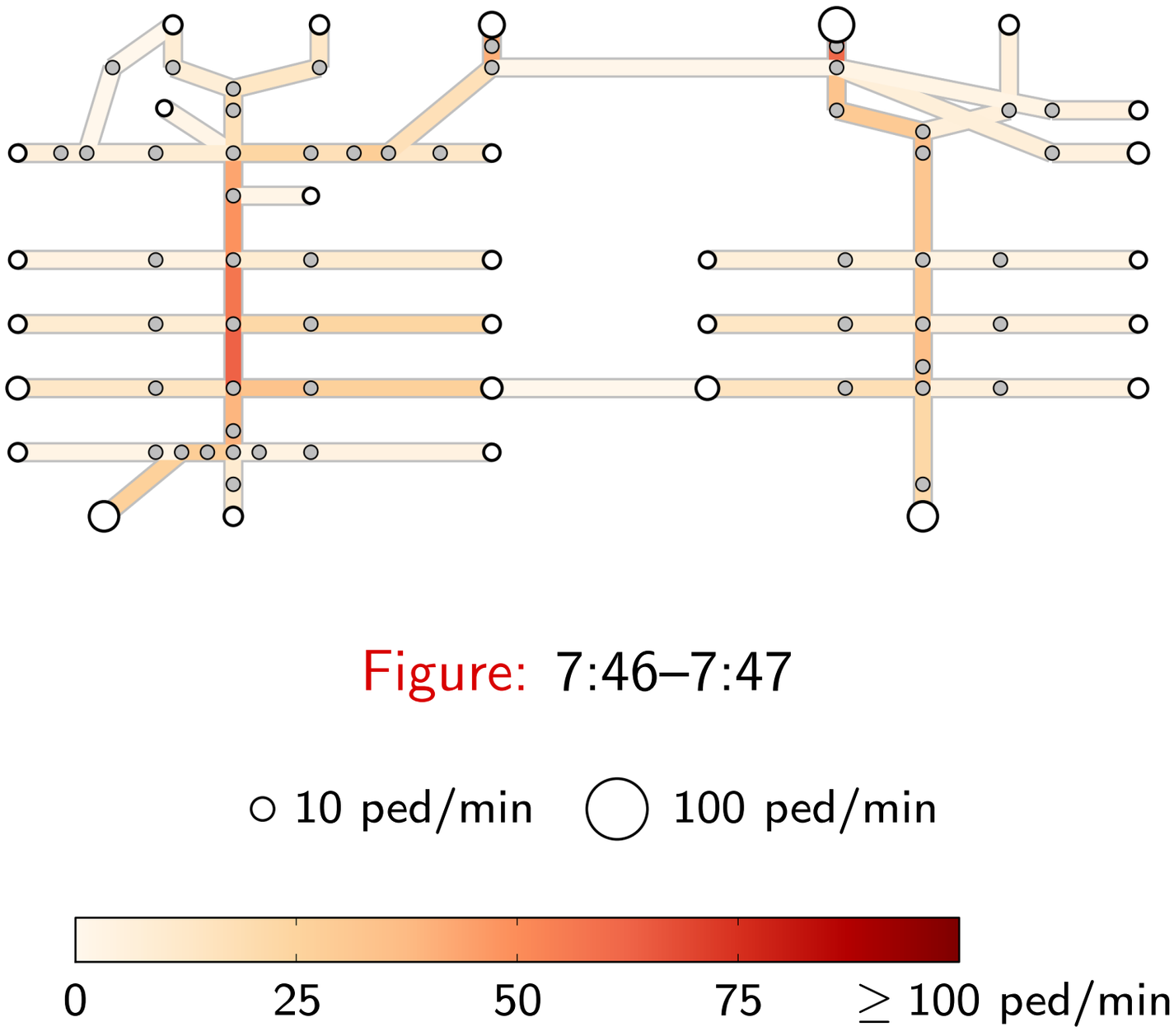


Figure: 7:46–7:47

Flow map of Lausanne railway station (2013)

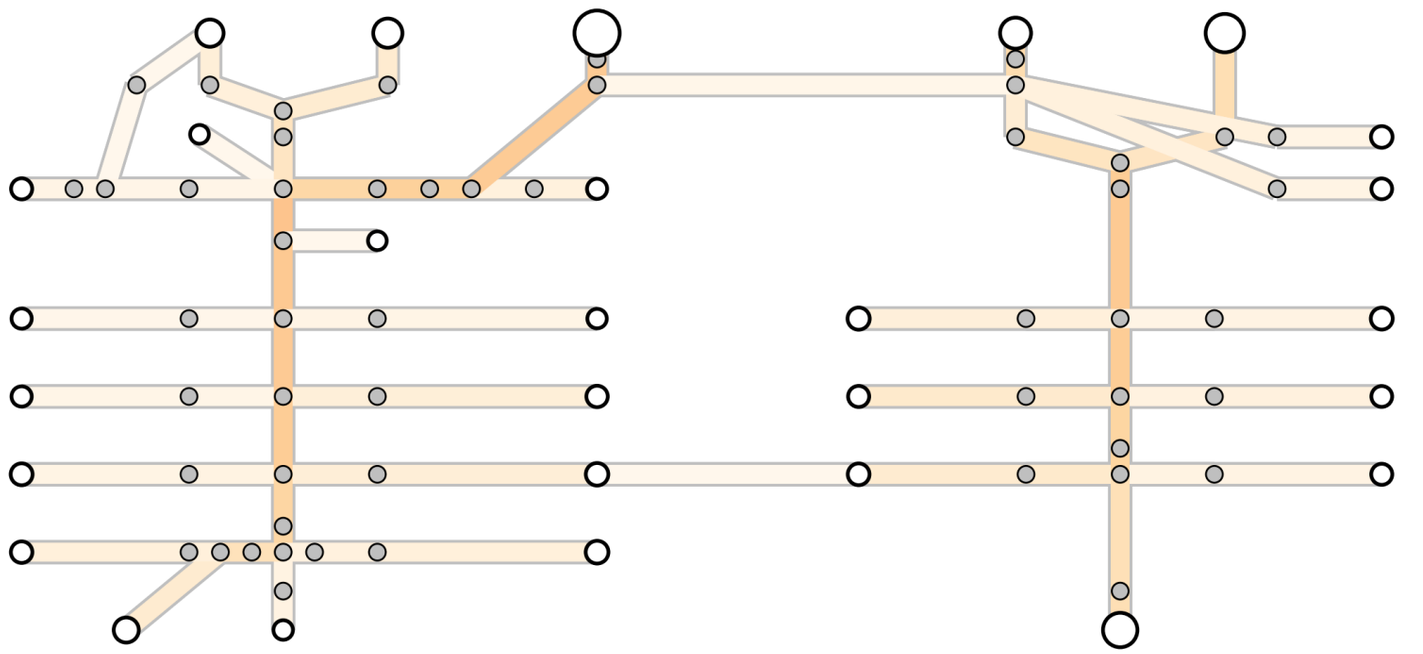
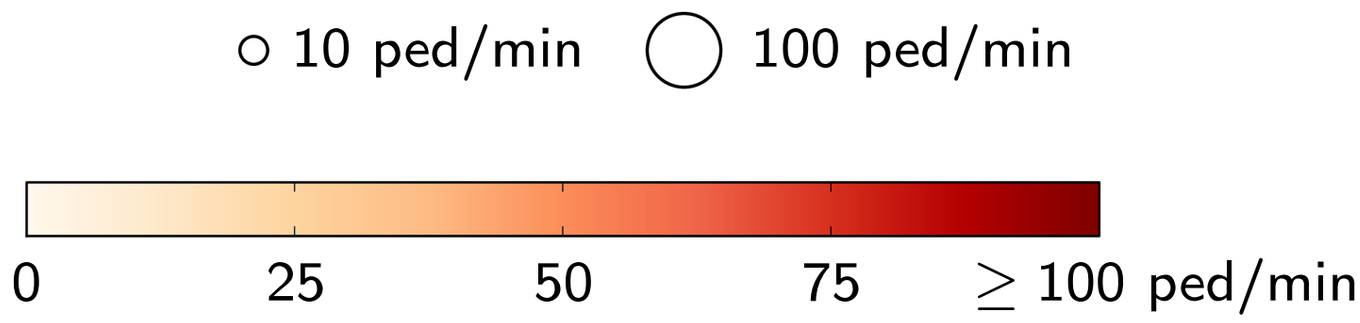
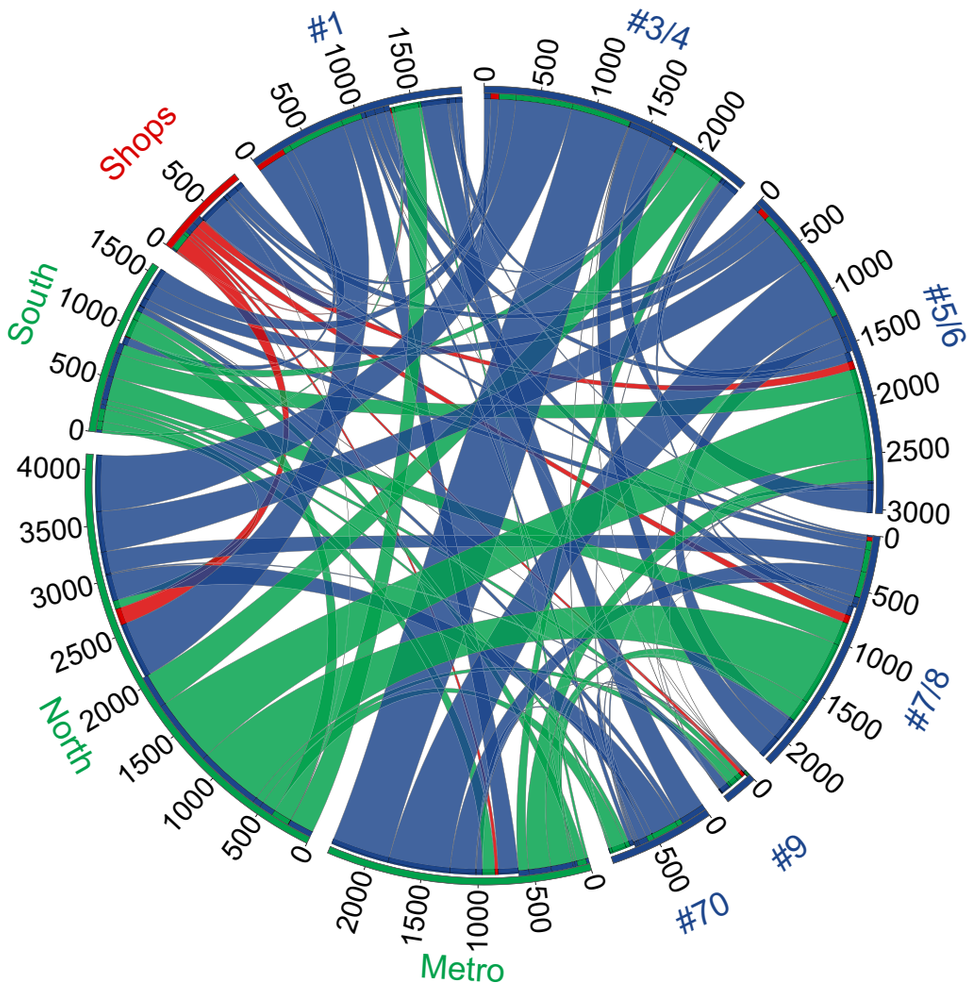


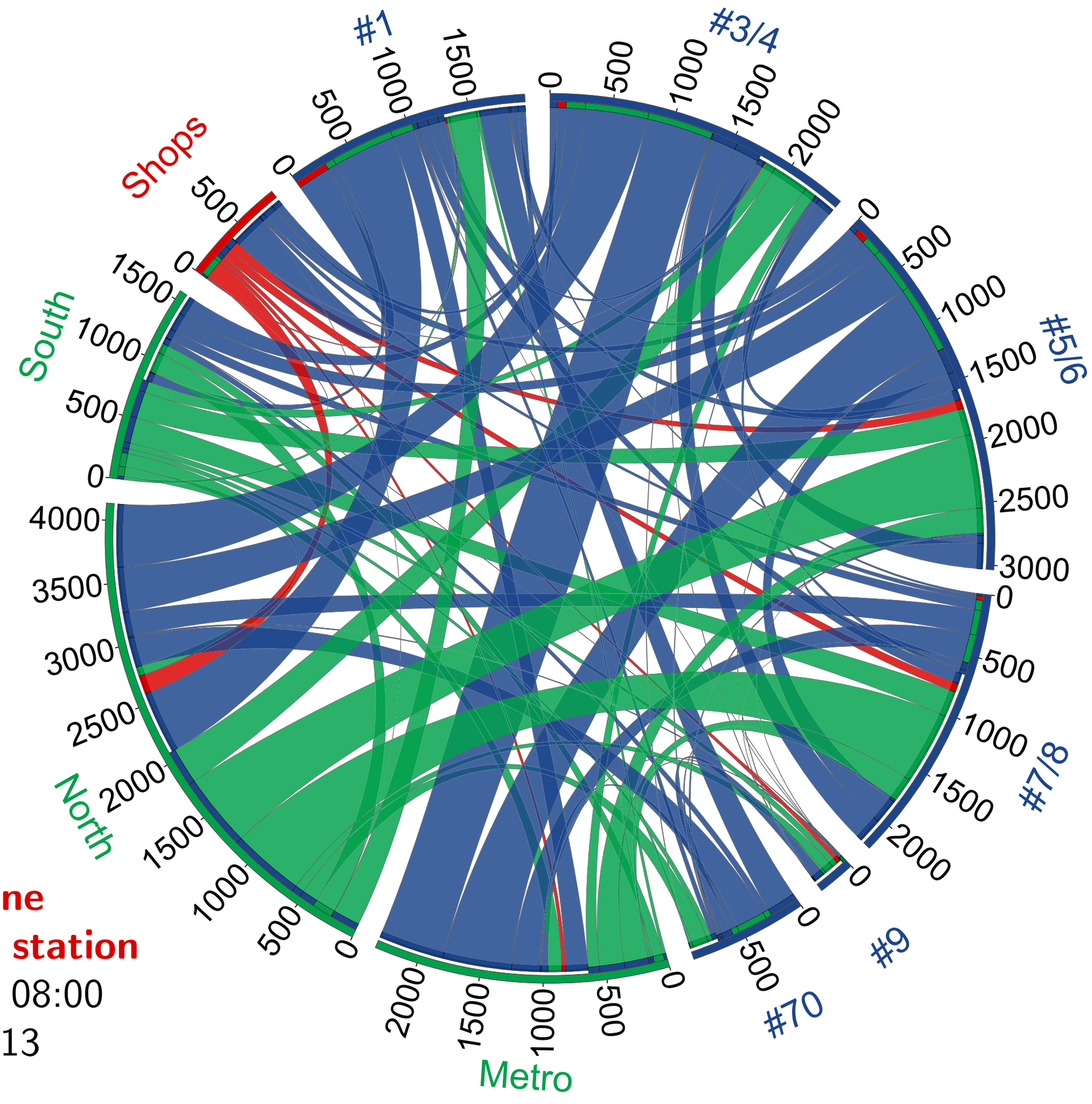
Figure: 7:47–7:48



Average OD demand in Lausanne railway station

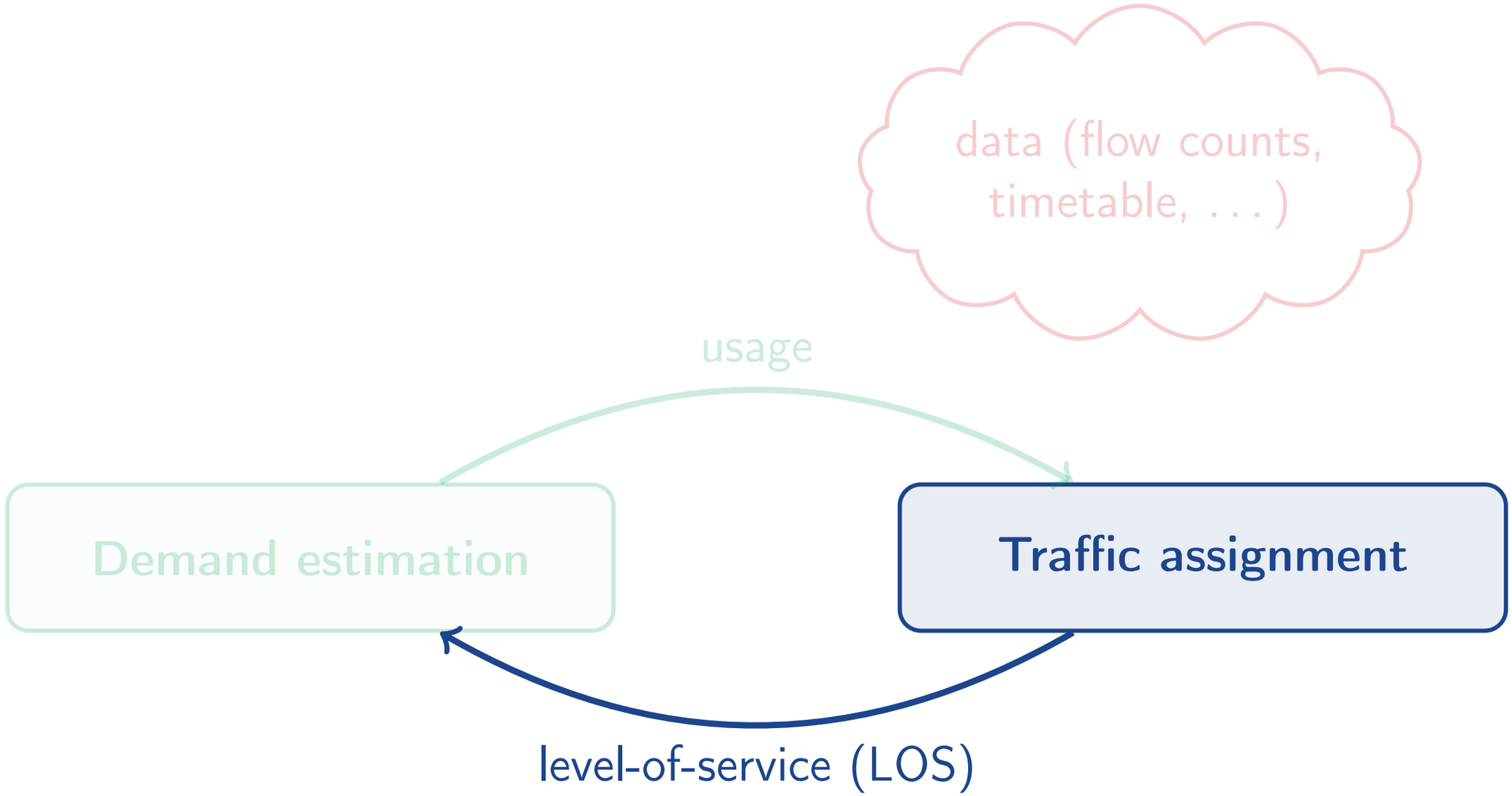


- peak period: 7:30 – 8:00
- origin of streams
  - train platforms
  - city/metro/bus
  - shops



Lausanne
railway station
07:30 – 08:00
Year 2013

Modeling pedestrian flows in train stations



Level-of-service

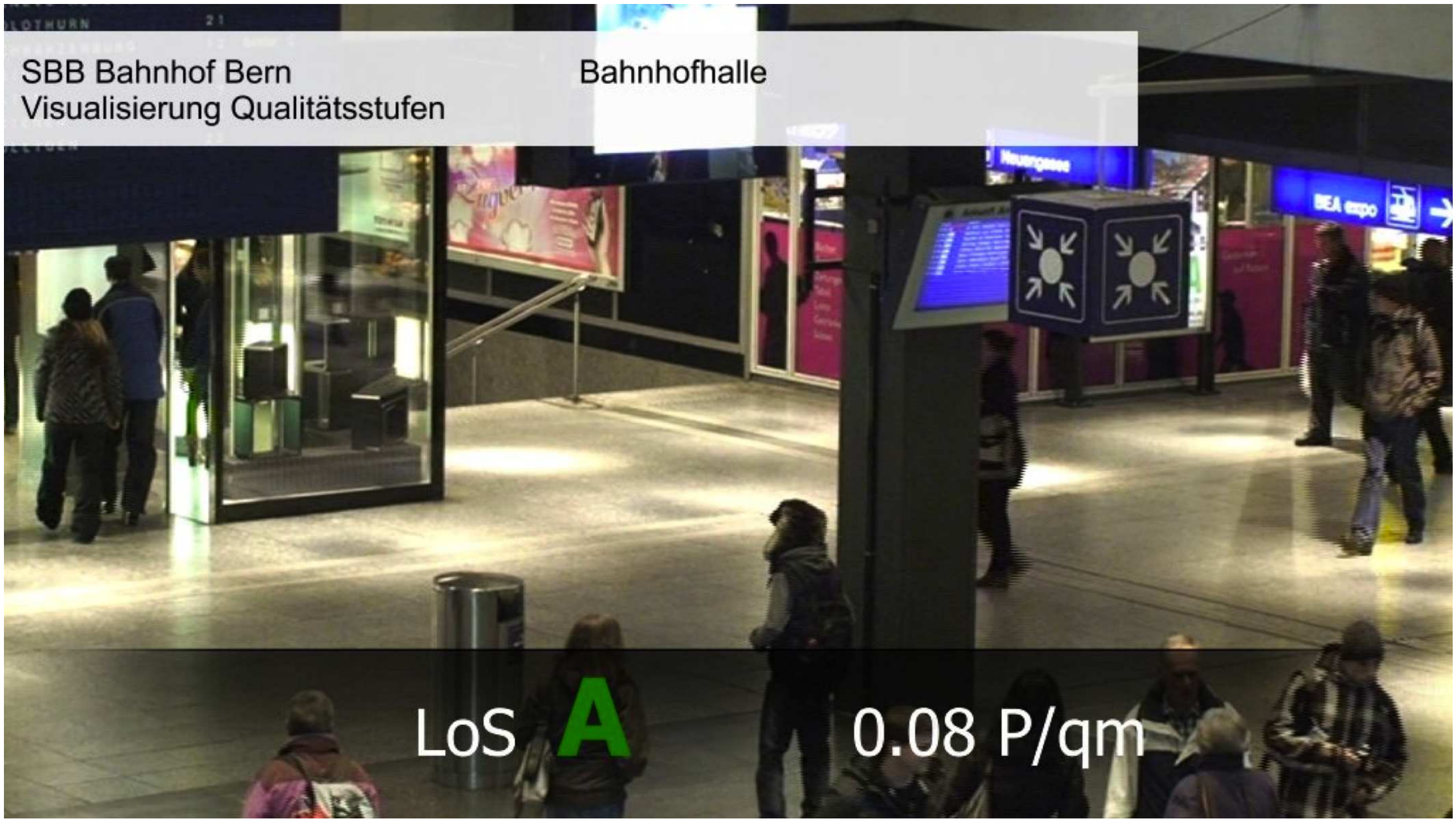


Figure: SBB-I-AT-BZU-PFL

Level-of-service

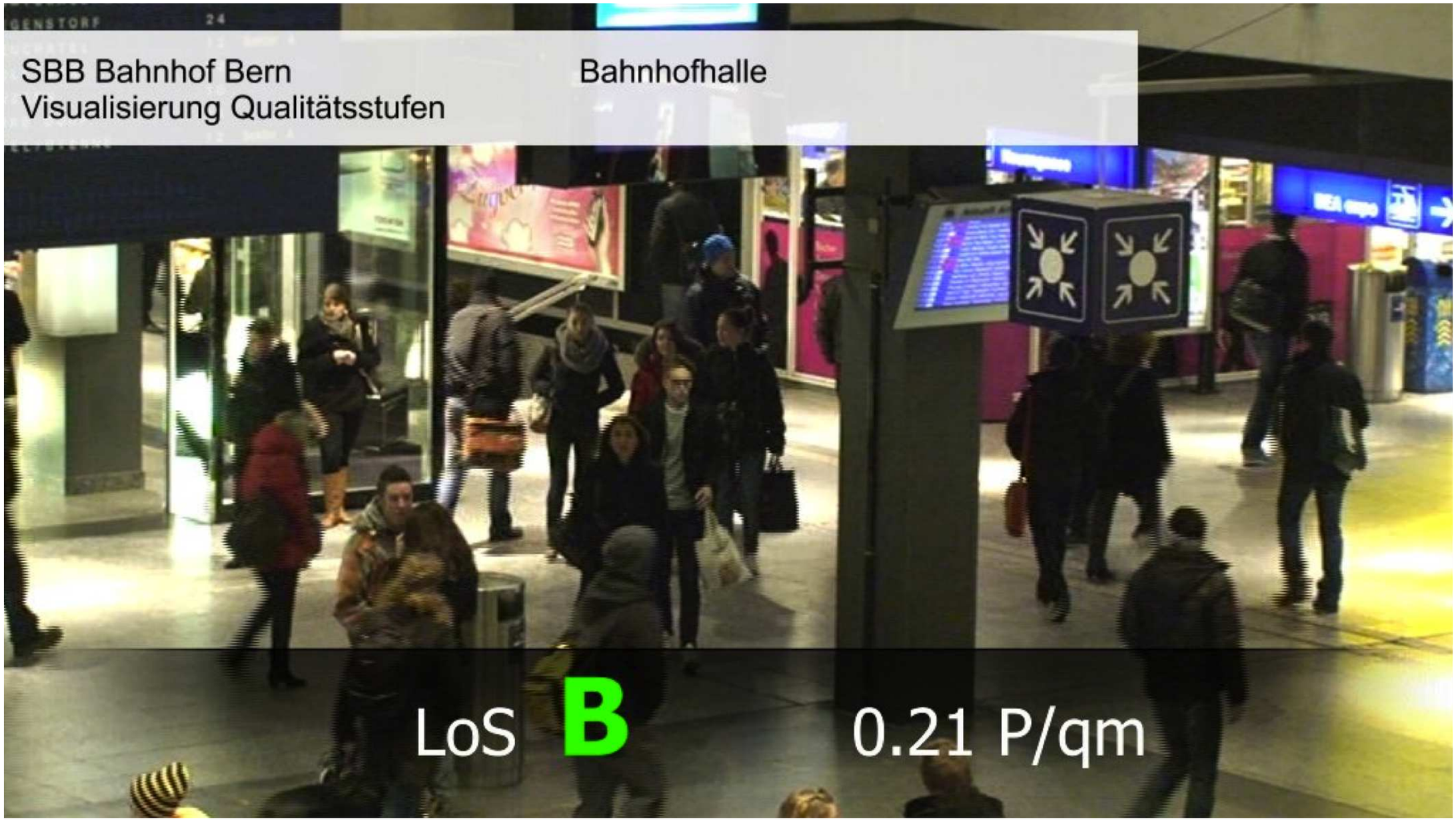


Figure: SBB-I-AT-BZU-PFL

Level-of-service

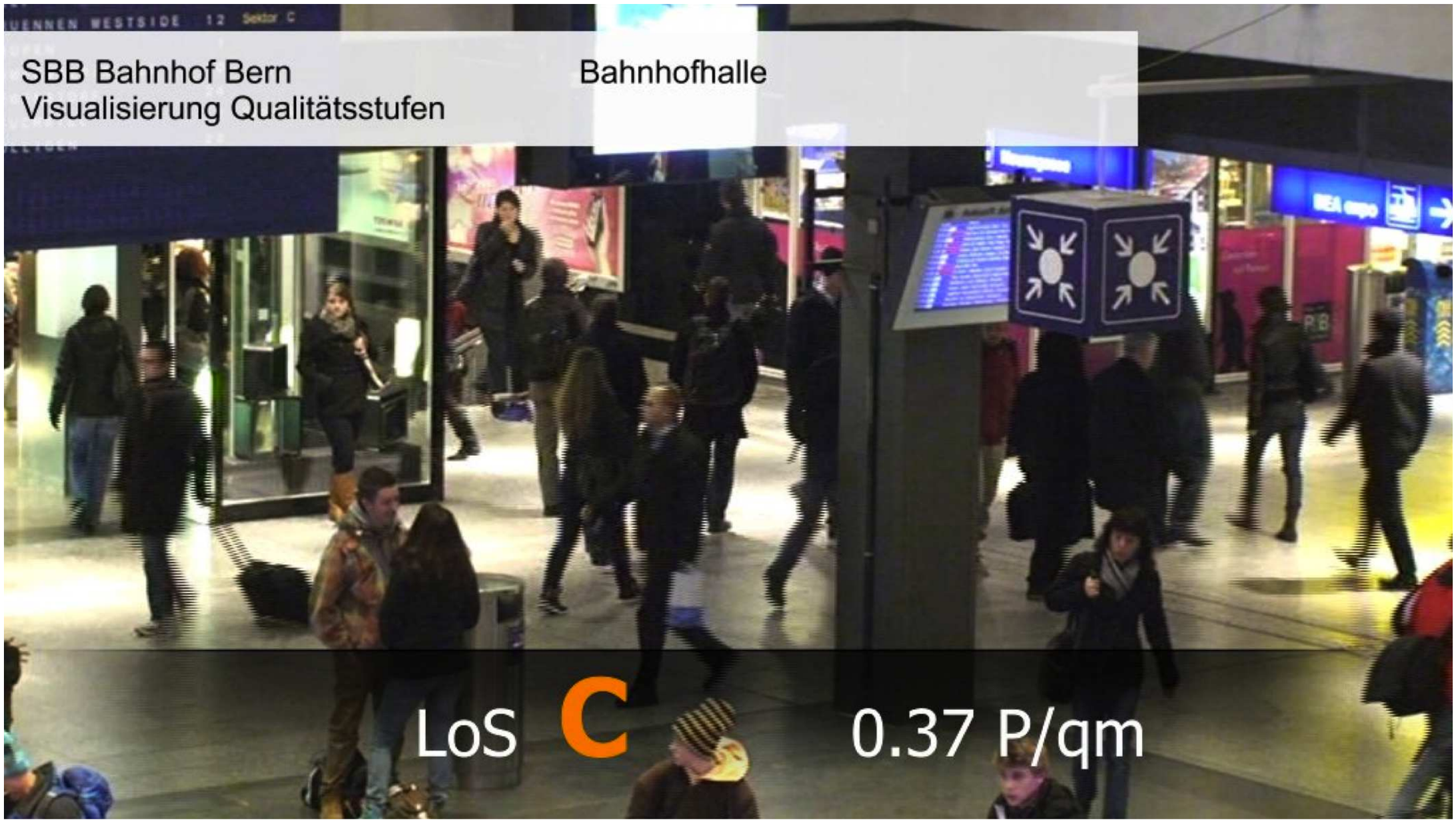


Figure: SBB-I-AT-BZU-PFL

Level-of-service

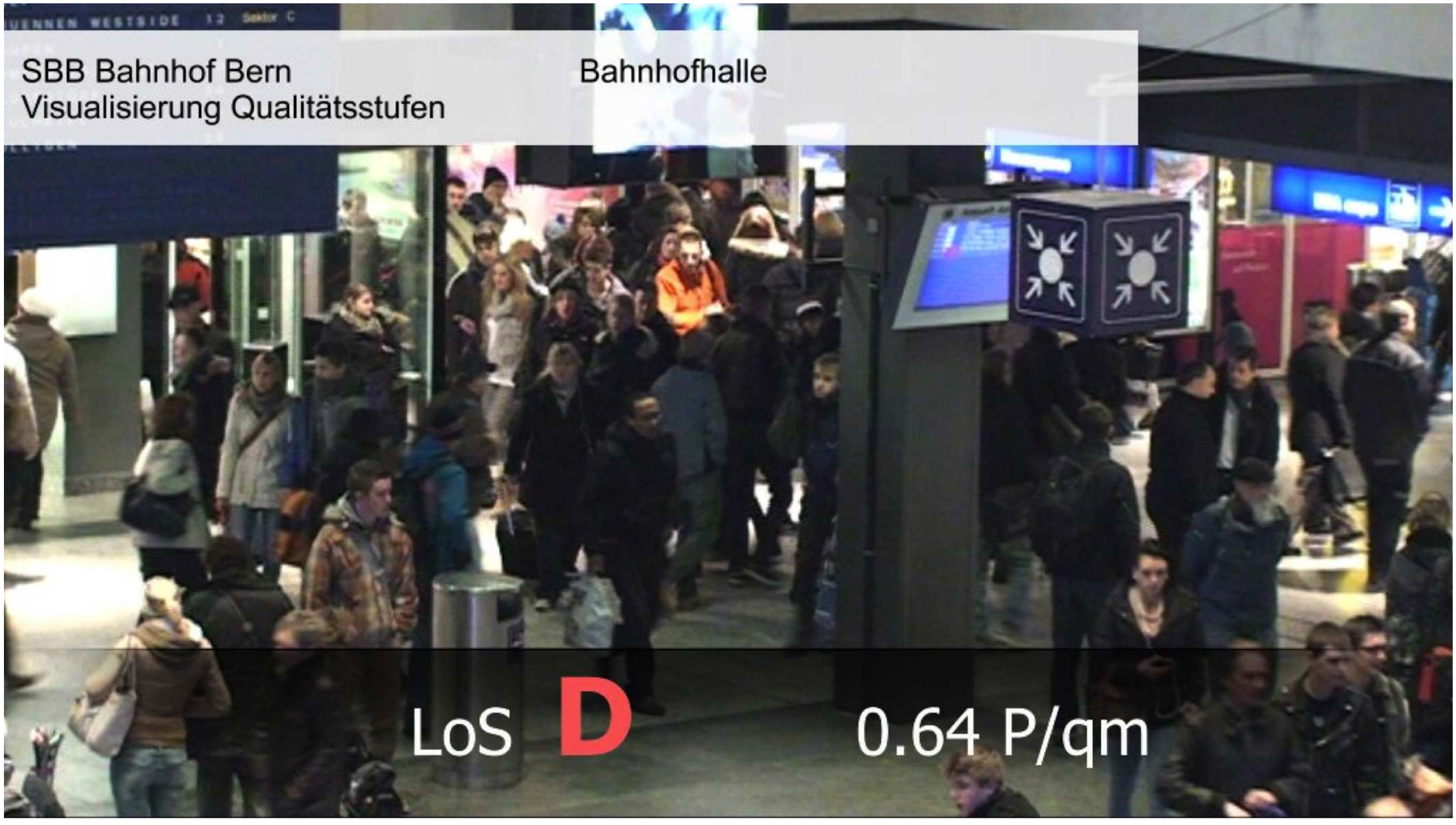


Figure: SBB-I-AT-BZU-PFL

Level-of-service

Figure: SBB-I-AT-BZU-PFL

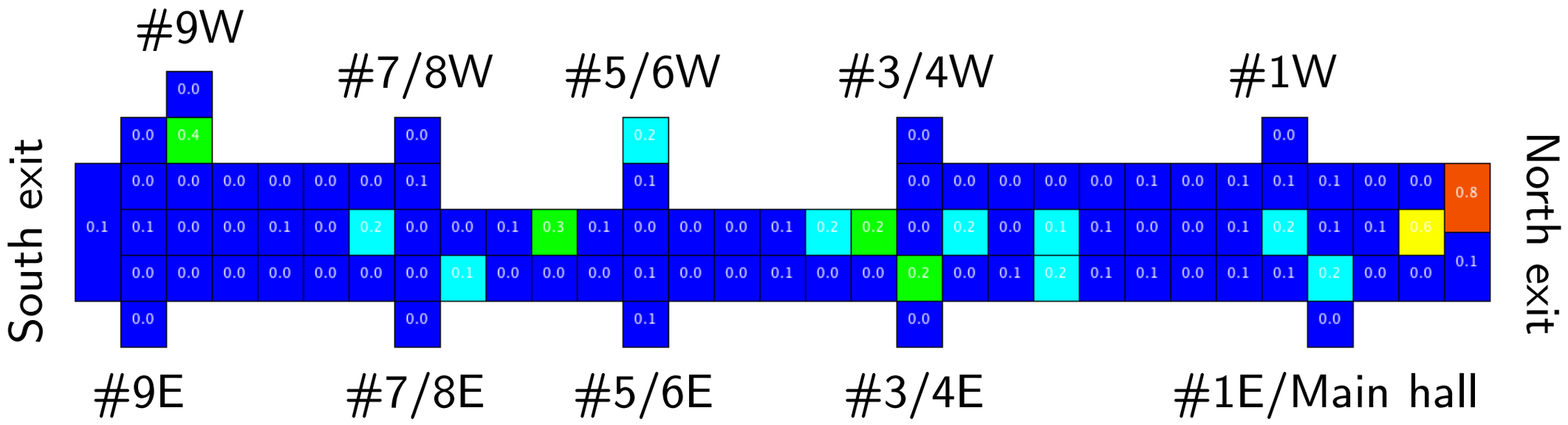
Level-of-service assessment: Example

Figure: Pedestrian Underpass West, Lausanne railway station

Level-of-service assessment: Example

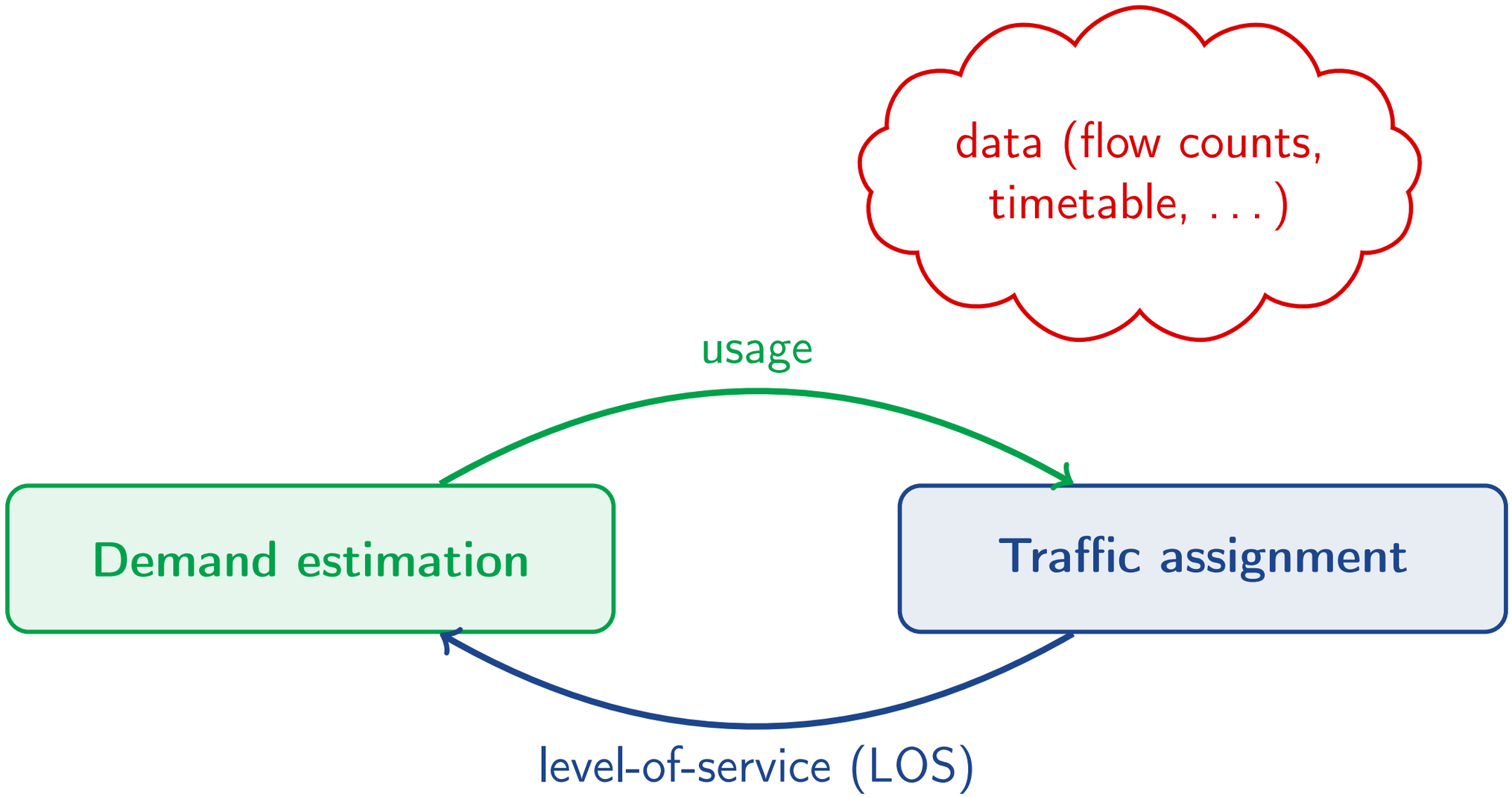
- PU West, Lausanne
- January 22, 2013, 07:40 – 07:46

	LOS	[#/m^2]
	A	< 0.179
	B	< 0.270
	C	< 0.455
	D	< 0.714
	E	< 1.333
	F	≥ 1.333



Animation: http://youtu.be/16_MkoF70Hc

Modeling pedestrian flows in train stations

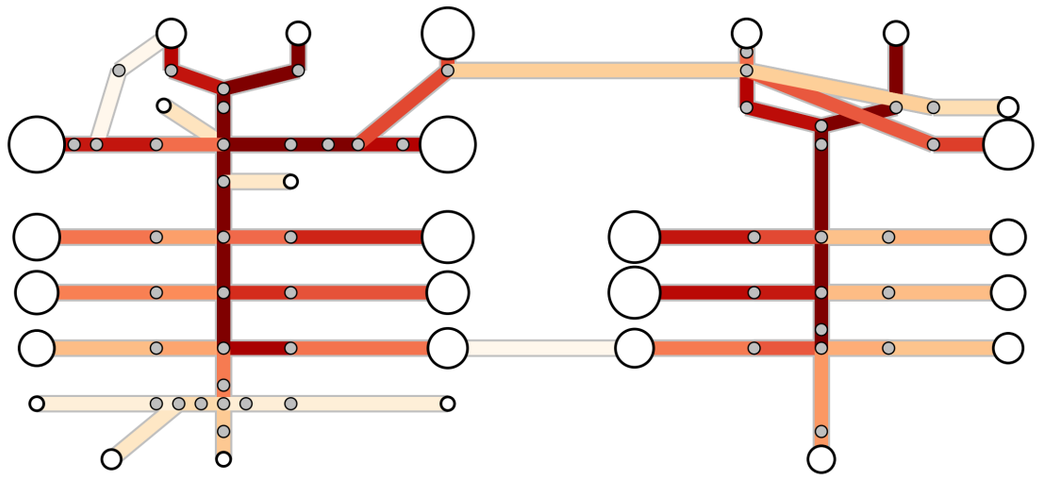


Crowd management: Gating I

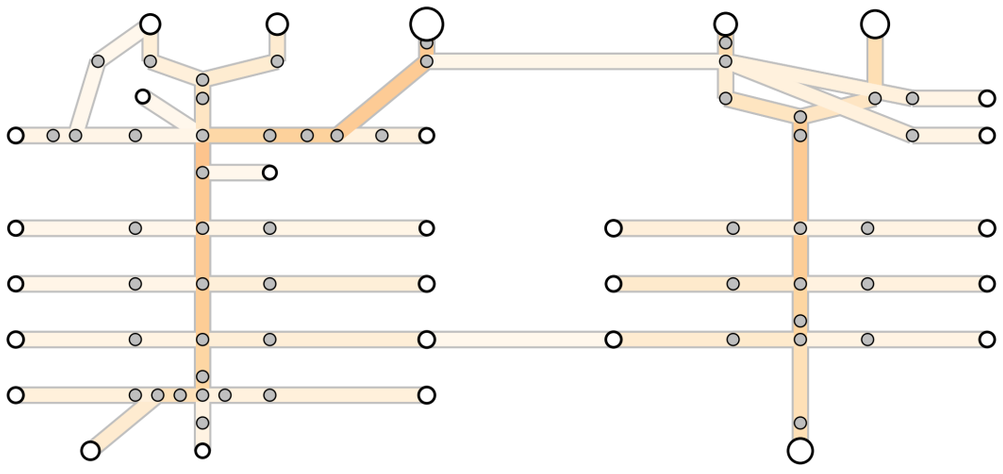
Crowd management: Gating II

Source: https://www.youtube.com/watch?v=RRm1W9g54xg

Crowd management: Load balancing I



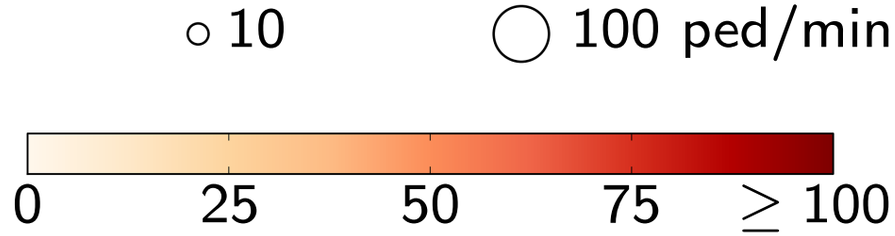
(a) 7:44–7:45



(b) 7:47–7:48

control variables:

- train timetable
- train-track assignment
- train stop position



Crowd management: Load balancing II

Source: https://www.youtube.com/watch?v=p2PcgDt4cFs

Thank you

Public defense:

Modeling and estimation of pedestrian flows in train stations

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Wankdorf


HOLLISTER
CO


FOREVER OCEAN

Pedestrian flows in train stations

Bibliography I

F. S. Hänseler.
Modeling and estimation of pedestrian flows in train stations.
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Washington, DC, 2000.