

GÖTEBORG STRATEGIC MODEL - TRAINING WEBINAR 1

GÖTEBORG STRATEGIC MODEL - TRAINING SESSIONS

Overview of the 4 Webinars

- 11.5.2020
 - Overview of the calculation procedures
 - Congestion Charging Implementation
 - PrT and PuT Assignment

- 18.5.2020
 - Scenario Manager - General Presentation
 - Updating future year person groups

- 25.5.2020
 - Scenario Manager - a practical example

- 1.6.2020
 - Model Management: how users should work with the model

CONTENT

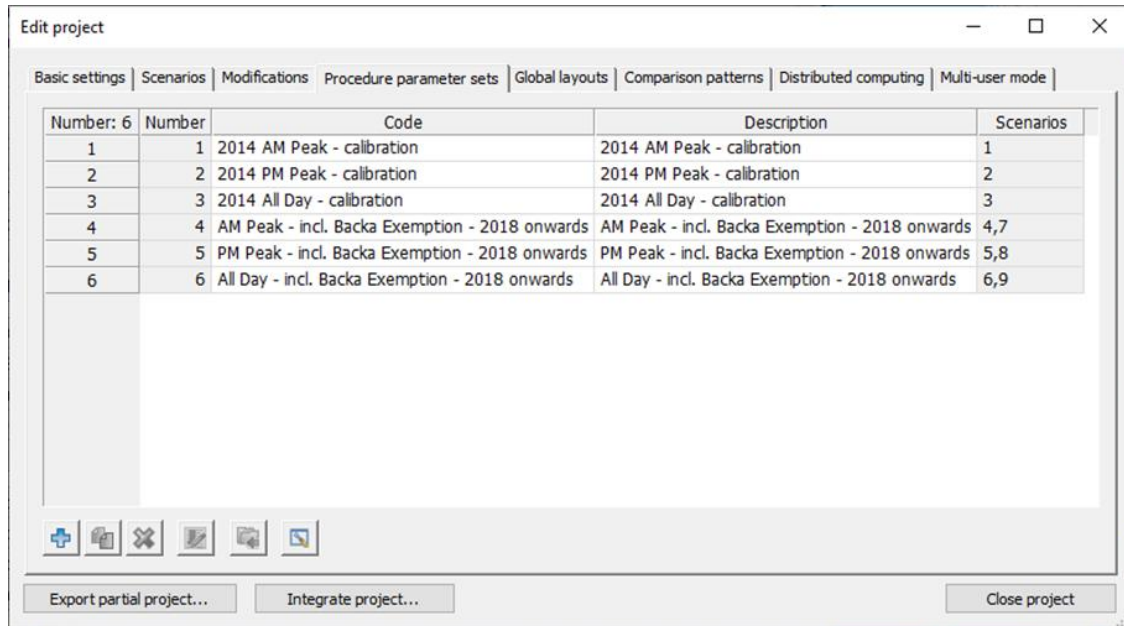
1. Overview of the procedures
2. Congestion Charging Implementation
3. PrT and PuT Assignment

1. OVERVIEW OF THE CALCULATION PROCEDURES

Procedures in the model

- 2 x 3 parameter sets
 - 2014 AM Peak
 - 2014 PM Peak
 - 2014 All Day

- AM Peak - 2018 onwards
- PM Peak - 2018 onwards
- All Day - 2018 onwards



The screenshot shows the 'Edit project' window with a table of calculation procedures. The table has five columns: 'Number: 6', 'Number', 'Code', 'Description', and 'Scenarios'. The data is as follows:

Number: 6	Number	Code	Description	Scenarios
1	1	2014 AM Peak - calibration	2014 AM Peak - calibration	1
2	2	2014 PM Peak - calibration	2014 PM Peak - calibration	2
3	3	2014 All Day - calibration	2014 All Day - calibration	3
4	4	AM Peak - incl. Backa Exemption - 2018 onwards	AM Peak - incl. Backa Exemption - 2018 onwards	4,7
5	5	PM Peak - incl. Backa Exemption - 2018 onwards	PM Peak - incl. Backa Exemption - 2018 onwards	5,8
6	6	All Day - incl. Backa Exemption - 2018 onwards	All Day - incl. Backa Exemption - 2018 onwards	6,9

- Difference between 2014 and 2018 onwards:
 - CC System
 - 2014: initial CC system
 - 2018: introduction of « Backa Exemption »
- Calculation Time
 - 2-3h per scenario, can be done in parallel with Scenario Manager

1. OVERVIEW OF THE CALCULATION PROCEDURES

Stages of Calculation Procedures

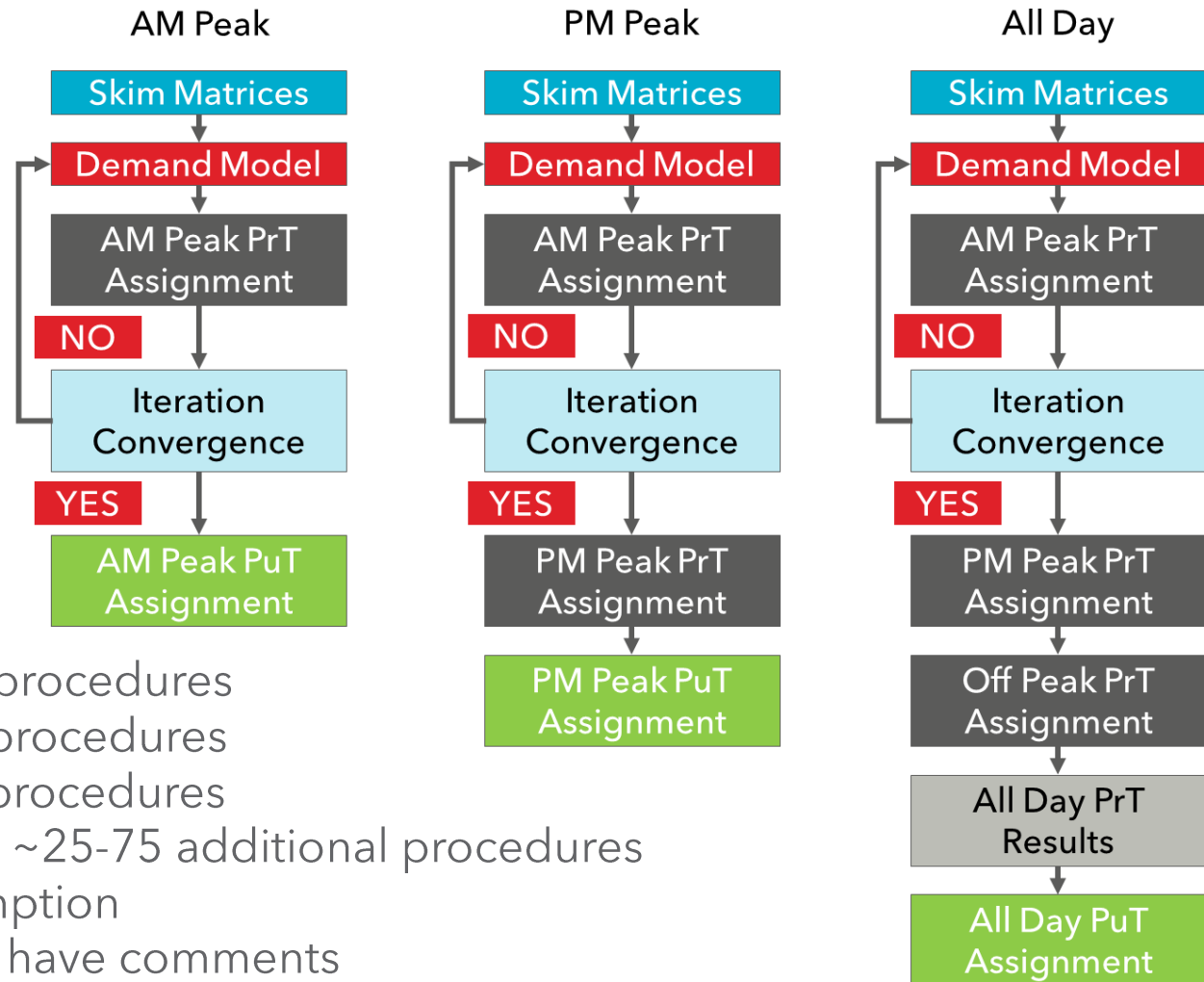
- Network Indicator Calculation (Skim)
- Demand Model
- Assignment Model

- AM Peak, PM Peak and All-Day use the same structure, only assignment periods change
- Allows for
 - Consistency of the procedures between time periods
 - Less error prone
 - Always same results of demand model

- All Time Periods use
 - same AM Peak skim matrices, symmetrised, values depending on scenarios PrT and PuT offer
 - same demand model parameters
 - same assignment parameters

1. OVERVIEW OF THE CALCULATION PROCEDURES

Stages of Calculation Procedures



- AM Peak: ~70 procedures
- PM Peak: ~85 procedures
- All Day: ~115 procedures
- 2018 onwards: ~25-75 additional procedures for Backa Exemption
- All procedures have comments

1. OVERVIEW OF THE CALCULATION PROCEDURES

Procedure Groups

► Procedures put in groups for better readability

Procedure sequence					
Number: 145	Execution	Active	Procedure	Reference object	Comment
1	▶	<input checked="" type="checkbox"/>	Group Network Preparation ...	2 - 12	Network Preparation
13		<input checked="" type="checkbox"/>	Group Precharge Car ...	14 - 21	Precharge Car
22		<input checked="" type="checkbox"/>	Group Convergence Assistance ...	23	Convergence Assistance
24		<input checked="" type="checkbox"/>	Group Indicator Calculation ...	25 - 30	Indicator Calculation
31		<input checked="" type="checkbox"/>	Group Indicator Correction ...	32 - 49	Indicator Correction
50		<input checked="" type="checkbox"/>	Group Municipality Correction per trip purp	51 - 52	Municipality Correction per trip purpose
53		<input type="checkbox"/>	Group Set Congestion Charge Price for va	54 - 57	Set Congestion Charge Price for valid ODs
58		<input checked="" type="checkbox"/>	Group Demand Model ...	59 - 61	Demand Model
62		<input checked="" type="checkbox"/>	Group AM Peak - from Peak Period - Dem	63 - 65	AM Peak - from Peak Period - Demand Split Congestion Charging
66		<input checked="" type="checkbox"/>	Group AM Peak - from Peak Period - Prep	67 - 72	AM Peak - from Peak Period - Preparation PrT Assignment matrices
73		<input checked="" type="checkbox"/>	Group AM Peak - from Peak Period - PrT	74 - 76	AM Peak - from Peak Period - PrT Assignment
77		<input checked="" type="checkbox"/>	Group AM Peak - from Peak Period - Itera	78 - 87	AM Peak - from Peak Period - Iteration Car
88		<input type="checkbox"/>	Group AM Peak PuT Assignment ...	89 - 91	AM Peak PuT Assignment
92		<input checked="" type="checkbox"/>	Group PM Peak Demand Split Congestion	93 - 95	PM Peak Demand Split Congestion Charging
96		<input checked="" type="checkbox"/>	Group PM Peak Preparation PrT Assignme	97 - 102	PM Peak Preparation PrT Assignment matrices
103		<input checked="" type="checkbox"/>	Group PM Peak PrT Assignment ...	104 - 111	PM Peak PrT Assignment
112		<input type="checkbox"/>	Group PM Peak PuT Assignment ...	113 - 115	PM Peak PuT Assignment
116		<input checked="" type="checkbox"/>	Group Daily PrT Charge - Off-Peak Deman	117 - 119	Daily PrT Charge - Off-Peak Demand Split Congestion Charging
120		<input checked="" type="checkbox"/>	Group Daily PrT Charge - Off-Peak Prepar	121 - 126	Daily PrT Charge - Off-Peak Preparation PrT Assignment matrices
127		<input checked="" type="checkbox"/>	Group Daily PrT Charge - Off-Peak PrT As	128 - 135	Daily PrT Charge - Off-Peak PrT Assignment
73		<input checked="" type="checkbox"/>	Group AM Peak - from Peak Period - PrT Assignment	74 - 76	AM Peak - from Peak Period - PrT Assignment
74		<input checked="" type="checkbox"/>	Init assignment		All
75		<input checked="" type="checkbox"/>	PrT assignment	T Truck, T no CC Truck no CC	Equilibrium assignment PrT Assignment Trucks
76		<input checked="" type="checkbox"/>	PrT assignment	C Car Driver, C no CC Car Driver no CC	Equilibrium assignment PrT Assignment Cars

1. OVERVIEW OF THE CALCULATION PROCEDURES

Procedure Groups

Procedure Group	Description of Procedure Steps
Network Preparation	Setting of connector travel times: Walk, PuT/Walk and Ferry-Car Demand: min 1 min or 4kph, Bike: 15 kph + 1min, Car 30 kph + 1min, limit t0 PuT to 15 (Bus/Tram) or 20 min(Rail)
Precharge Car	Loading Precharge Car and Truck Matrix and Equilibrium Assignment
Convergence Assistance	Copy last iterations AM Peak car demand matrix into temporary matrix 30
Indicator Calculation	Calculation of Indicators for modes Walk, Bike, PuT and Car/Car no CC
Indicator Correction	Correction of skim matrices: internal distances, internal T0/TTC for Walk, Bike, PuT, Car depending on zone attribute "Internal Travel Time MODE" , symmetrisation of skim matrices
Municipality Correction per trip purpose	Adjusting attractivity of Municipalities with Bonus/Malus for Work and non-Work trip purposes
Set Congestion Charge Price for valid ODs	Identification of OD trips necessitating Congestion Charge and setting CC price to an indicator matrix
Demand Model	Trip Distribution and Mode Choice, deleting of internal trips in outer model area
AM Peak - from Peak Period - Demand Split Congestion Charging	Splitting overall AM Peak car demand into CC paying and non-CC paying demand by calculating Alpha and using it in LogNormal distribution
AM Peak - from Peak Period - Preparation PrT Assignment matrices	Setting up AM Peak Assignment matrices (adding external demand), using 30/70 split from demand of iteration N-1
AM Peak - from Peak Period - PrT Assignment	AM Peak PrT Assignment of modes Truck, Truck no CC, Car, Car no CC, using equilibrium assignment
AM Peak - from Peak Period - Iteration Car	Convergence Control using AM Peak car demand matrix
AM Peak PuT Assignment	AM Peak Period PuT Assignment, time-table based

1. OVERVIEW OF THE CALCULATION PROCEDURES

Demand Model

- ▶ Visem Trip Generation
 - Mobility rate identical for all procedures
 - ~700 demand strata

Parameters: Tour-based model - Trip generation

For active zones only
 Sum up values

Home trips:

	Demand stratum	Mobility rate constant	Mobility rate	Study area factor home constant
1	HAH_ftw+c	<input checked="" type="checkbox"/>	0.07910953	<input checked="" type="checkbox"/>
2	HDH_ftw+c	<input checked="" type="checkbox"/>	0.07327711	<input checked="" type="checkbox"/>
3	HLH_ftw+c	<input checked="" type="checkbox"/>	0.18185554	<input checked="" type="checkbox"/>
4	HPH_ftw+c	<input checked="" type="checkbox"/>	0.03415439	<input checked="" type="checkbox"/>
5	HQH_ftw+c	<input checked="" type="checkbox"/>	0.02796308	<input checked="" type="checkbox"/>
6	HUH_ftw+c	<input checked="" type="checkbox"/>	0.00205184	<input checked="" type="checkbox"/>
7	HVH_ftw+c	<input checked="" type="checkbox"/>	0.0424888	<input checked="" type="checkbox"/>
8	HWH_ftw+c	<input checked="" type="checkbox"/>	0.32347988	<input checked="" type="checkbox"/>
9	HAAH_ftw+c	<input checked="" type="checkbox"/>	0.01600147	<input checked="" type="checkbox"/>
10	HADH_ftw+c	<input checked="" type="checkbox"/>	0.00712738	<input checked="" type="checkbox"/>
11	HALH_ftw+c	<input checked="" type="checkbox"/>	0.00399309	<input checked="" type="checkbox"/>
12	HAPH_ftw+c	<input checked="" type="checkbox"/>	0.00405257	<input checked="" type="checkbox"/>
13	HAQH_ftw+c	<input checked="" type="checkbox"/>	0.00643784	<input checked="" type="checkbox"/>
14	HAVH_ftw+c	<input checked="" type="checkbox"/>	0.00244827	<input checked="" type="checkbox"/>
15	HAWH_ftw+c	<input checked="" type="checkbox"/>	0.03158844	<input checked="" type="checkbox"/>
16	HDAH_ftw+c	<input checked="" type="checkbox"/>	0.0052999	<input checked="" type="checkbox"/>

OK Cancel

1. OVERVIEW OF THE CALCULATION PROCEDURES

Demand Model

► Visem Trip Distribution

- One utility function for each combination of person group and activity
- Logsum and Adjustment of Municipality attraction per trip purpose here

Parameters: Tour-based model - Combined trip distribution / mode choice

Mode choice: Define utility per destination activity

Use nested logit model for mode choice Decision tree...

Options for double binding

Maximum number of iterations:

Precision factor:

Distribution utility | Mode choice utility | Rubber banding | Output demand matrices | Output path sequences

Number: 86	Key	Person group	Activity	Utility function	ction t	a	b	c	^
1	ftw+c/A	ftw+c full-time workers with car	A accompany	0.350000*ModeLogSum + - 0.0875 *matrix(133) + 0 *matrix(180) + 1 *matrix(181) ...	Logit				1
2	ftw+c/D	ftw+c full-time workers with car	D daily shopping +	0.450000*ModeLogSum + - 0.225 *matrix(133) + 0 *matrix(180) + 1 *matrix(181) ...	Logit				1
3	ftw+c/L	ftw+c full-time workers with car	L leisure	0.350000*ModeLogSum + - 0.175 *matrix(133) + 0 *matrix(180) + 1 *matrix(181) ...	Logit				1
4	ftw+c/P	ftw+c full-time workers with car	P professional	0.100000*ModeLogSum + - 0.05 *matrix(133) + 0 *matrix(180) + 1 *matrix(181) ...	Logit				1
5	ftw+c/Q	ftw+c full-time workers with car	Q other shopping	0.250000*ModeLogSum + - 0.125 *matrix(133) + 0 *matrix(180) + 1 *matrix(181) ...	Logit				1
6	ftw+c/U	ftw+c full-time workers with car	U university	0.600000*ModeLogSum + - 0.15 *matrix(133) + 0 *matrix(180) + 1 *matrix(181) ...	Logit				1
7	ftw+c/V	ftw+c full-time workers with car	V visits	0.350000*ModeLogSum + - 0.0875 *matrix(133) + 0 *matrix(180) + 1 *matrix(181) ...	Logit				1
8	ftw+c/W	ftw+c full-time workers with car	W work	0.150000*ModeLogSum + - 0.0375 *matrix(133) + 1 *matrix(180) + 0 *matrix(181) ...	Logit				1
9	i+c/A	i+c non-workers with car	A accompanv	0.550000*Model ogSum + - 0.1375 *matrix(133) + 0 *matrix(180) + 1 *matrix(181) ...	Logit				1

OK Cancel

1. OVERVIEW OF THE CALCULATION PROCEDURES

Demand Model

► Visem Mode Choice

- One utility function for each combination of person group and mode
- Utility expressed as impedance: the lower the value, the less attractive it is

Parameters: Tour-based model - Combined trip distribution / mode choice

Mode choice: Define utility per destination activity

Use nested logit model for mode choice Decision tree...

Options for double binding

Maximum number of iterations

Precision factor

Distribution utility | Mode choice utility | Rubber banding | Output demand matrices | Output path sequences

Number: 55	Key	Person group	Mode	Utility function	ction t	a	b	c	^
1	ftw+c/B	ftw+c full-time workers with car	B Bike	$0.625+0.1495*\text{matrix}(109) - 0.015*\text{matrix}(136) + 0$	...	Logit			-1
2	ftw+c/C	ftw+c full-time workers with car	C Car Driver CC	$-0.375+0.11*\text{matrix}(161) + 0.44*\text{matrix}(137) + 0.085*\text{matrix}(141) + 0$	...	Logit			-1
3	ftw+c/CP	ftw+c full-time workers with car	CP Car Passenger	$2.25+0.12*\text{matrix}(161) + 0.22*\text{matrix}(137) + 0.085*\text{matrix}(141) + 0$	...	Logit			-1
4	ftw+c/PuT	ftw+c full-time workers with car	PuT PuT	$1.125+0.05*\text{matrix}(118) * (1.4*\text{matrix}(128) + 1.2*\text{matrix}(129) + 0.6*\text{matrix}(130) + 0$	...	Logit			-1
5	ftw+c/W	ftw+c full-time workers with car	W Walk	$-2.125+0.115*\text{matrix}(134) + -0.2*\text{matrix}(136) + 0$	...	Logit			-1
6	i+c/B	i+c non-workers with car	B Bike	$1.875+0.133*\text{matrix}(109) + -0.015*\text{matrix}(136) + 0$	...	Logit			-1
7	i+c/C	i+c non-workers with car	C Car Driver CC	$0+0.105*\text{matrix}(161) + 0.42*\text{matrix}(137) + 0.1*\text{matrix}(141) + 0$	...	Logit			-1
8	i+c/CP	i+c non-workers with car	CP Car Passenger	$1.875+0.14*\text{matrix}(161) + 0.21*\text{matrix}(137) + 0.06666666666666667*\text{matrix}(141) + 0$	...	Logit			-1
9	i+c/PuT	i+c non-workers with car	PuT PuT	$1.5+0.035*\text{matrix}(118) * (1.4*\text{matrix}(128) + 1.2*\text{matrix}(129) + 0.6*\text{matrix}(130) + 0$	...	Logit			-1
10	i+c/W	i+c non-workers with car	W Walk	$-1+0.095*\text{matrix}(134) + -0.15*\text{matrix}(136) + 0$	...	Logit			-1

OK Cancel

1. OVERVIEW OF THE CALCULATION PROCEDURES

Demand Model

► Visem Rubberbanding

- Dependent on main activity in chain (for example work)
- Higher weight → secondary purpose closer between home and main activity

Parameters: Tour-based model - Combined trip distribution / mode choice

Mode choice: Define utility per destination activity

Use nested logit model for mode choice Decision tree...

Options for double binding

Maximum number of iterations:

Precision factor:

Distribution utility | Mode choice utility | **Rubber banding** | Output demand matrices | Output path sequences

	Demand stratum	Person group	Activity chain	Activity chain with main activity	Use rubberbanding	Rubberbanding weight	
1	HAWH_ftw+c	ftw+c full-time workers with car	HAWH H-A-W-H	HA[W]H	<input checked="" type="checkbox"/>		2
2	HDWH_ftw+c	ftw+c full-time workers with car	HDWH H-D-W-H	HD[W]H	<input checked="" type="checkbox"/>		2
3	HLWH_ftw+c	ftw+c full-time workers with car	HLWH H-L-W-H	HL[W]H	<input checked="" type="checkbox"/>		2
4	HPWH_ftw+c	ftw+c full-time workers with car	HPWH H-P-W-H	HP[W]H	<input checked="" type="checkbox"/>		2
5	HQWH_ftw+c	ftw+c full-time workers with car	HQWH H-Q-W-H	HQ[W]H	<input checked="" type="checkbox"/>		2
6	HUWH_ftw+c	ftw+c full-time workers with car	HUWH H-U-W-H	H[U]WH	<input checked="" type="checkbox"/>		2
7	HVWH_ftw+c	ftw+c full-time workers with car	HVWH H-V-W-H	HV[W]H	<input checked="" type="checkbox"/>		2
8	HWAH_ftw+c	ftw+c full-time workers with car	HWAH H-W-A-H	H[W]AH	<input checked="" type="checkbox"/>		2
9	HWDH_ftw+c	ftw+c full-time workers with car	HWDH H-W-D-H	H[W]DH	<input checked="" type="checkbox"/>		2
10	HWH_ftw+c	ftw+c full-time workers with car	HWH H-W-H	H[W]H	<input checked="" type="checkbox"/>		?

1. OVERVIEW OF THE CALCULATION PROCEDURES

Demand Model

► Visem Output Matrice

- Possible for each combination of person group, mode, origin or destination activities, time periods

Parameters: Tour-based model - Combined trip distribution / mode choice

Mode choice: Define utility per destination activity

Use nested logit model for mode choice Decision tree...

Options for double binding

Maximum number of iterations:

Precision factor:

Distribution utility | Mode choice utility | Rubber banding | **Output demand matrices** | Output path sequences

	Calculate	Person groups	Modes	Origin activities	Destination activities	From time	To time	Type	Output matrix	Output matrix ^
162	<input checked="" type="checkbox"/>	All	All	All	All	07:00:00	09:00:00	Distribution matrix	Matrix(260)	260 Total Demand AM Peak Period
163	<input checked="" type="checkbox"/>	All	W	All	All	07:00:00	09:00:00	Mode choice matrix	Matrix(261)	261 Walk AM Peak Period
164	<input checked="" type="checkbox"/>	All	B	All	All	07:00:00	09:00:00	Mode choice matrix	Matrix(262)	262 Bike AM Peak Period
165	<input checked="" type="checkbox"/>	All	PuT	All	All	06:30:00	09:00:00	Mode choice matrix	Matrix(263)	263 PuT AM Peak Period
166	<input checked="" type="checkbox"/>	All	C	All	All	07:00:00	09:00:00	Mode choice matrix	Matrix(264)	264 Car Driver AM Peak Period
167	<input checked="" type="checkbox"/>	All	CP	All	All	07:00:00	09:00:00	Mode choice matrix	Matrix(265)	265 Car Passenger AM Peak Period
168	<input checked="" type="checkbox"/>	All	All	All	All	16:00:00	18:00:00	Distribution matrix	Matrix(270)	270 Total Demand PM Peak Period
169	<input checked="" type="checkbox"/>	All	W	All	All	16:00:00	18:00:00	Mode choice matrix	Matrix(271)	271 Walk PM Peak Period
170	<input checked="" type="checkbox"/>	All	B	All	All	16:00:00	18:00:00	Mode choice matrix	Matrix(272)	272 Bike PM Peak Period

2. CONGESTION CHARGING IMPLEMENTATION

Implementation - Approach

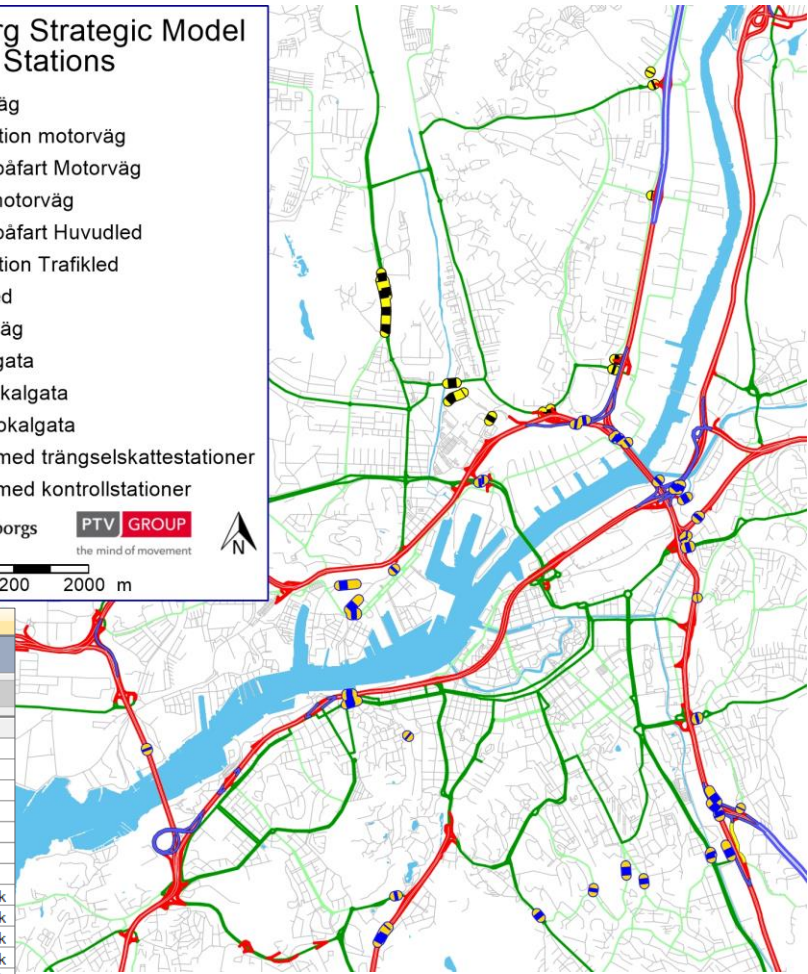
- ▶ CC taken into account in Demand Model and in Assignment Model
- ▶ 3 Steps to calculate CC cost for demand model:
 - ▶ Identify ODs passing CC stations → PrT Skims using link type UDAs
 - ▶ Verification of ODs passing/in/out Backa → Skim Matrix 0 (no CC) /1 (CC)
 - ▶ Application of CC Toll Value to 0/1 skim → OD Skim Matrix with CC Value for demand model
- ▶ Demand Model uses CC skim as one of the factors influencing mode choice and distribution
- ▶ Assignment Model
 - ▶ Calculation of threshold value between routes passing CC Toll stations and routes not passing CC Toll stations
 - ▶ Using Value of time and the threshold value in a lognormal function, the share between paying and not-paying demand for each OD is calculated
 - ▶ → Split of car demand according to share paying/not paying
 - ▶ Assignment of paying and not-paying demand segments

2. CONGESTION CHARGING IMPLEMENTATION

Implementation - Network

Network

- 13x3 specific link types closed to non-paying demand with "marker" UDA (Toll Station, Backa Exemption, Backa Control Point)
- CC UDAs used in PrT skims, influencing demand model and assignment route choice



List (Link types)						
Number	No	GType	Name	Strict	Rank	TSysSet
76	75	7	Avfart/påfart, Motorväg - 2 kf - 70 - no CC	<input checked="" type="checkbox"/>	8	Bus,Car,Citybus,Linbana,Metrobus,Truck
77	76	7	Avfart/påfart, Motorväg - 1 kf - 70 - no CC	<input checked="" type="checkbox"/>	9	Bus,Car,Citybus,Linbana,Metrobus,Truck
78	77	7	Stadsmotorväg - 3 kf - 70 - no CC	<input checked="" type="checkbox"/>	12	Bus,Car,Citybus,Linbana,Metrobus,Truck
79	78	7	Stadsmotorväg - 2 kf - 80 - no CC	<input checked="" type="checkbox"/>	14	Bus,Car,Citybus,Linbana,Metrobus,Truck
80	79	7	Stadsmotorväg - 2 kf - 70 - no CC	<input checked="" type="checkbox"/>	15	Bus,Car,Citybus,Linbana,Metrobus,Truck
81	80	8	Stadsmotorväg - 1 kf - 70 - no CC	<input checked="" type="checkbox"/>	16	Bus,Car,Citybus,Linbana,Metrobus,Truck
82	81	8	Avfart/påfart, Huvudled - 1 kf - 50 - no CC	<input checked="" type="checkbox"/>	18	Bus,Car,Citybus,Linbana,Metrobus,Truck,Walk
83	82	8	Huvudgata - 3 kf - 50 - no CC	<input checked="" type="checkbox"/>	41	Bike,Bus,Car,Citybus,Linbana,Metrobus,Stadsbana,Tram,Truck,Walk
84	83	8	Huvudgata - 2 kf - 50 - no CC	<input checked="" type="checkbox"/>	42	Bike,Bus,Car,Citybus,Linbana,Metrobus,Stadsbana,Tram,Truck,Walk
85	84	8	Huvudgata - 1 kf - 50 - no CC	<input checked="" type="checkbox"/>	43	Bike,Bus,Car,Citybus,Linbana,Metrobus,Stadsbana,Tram,Truck,Walk
86	85	8	Stor Lokalgata - 2 kf - 50 - no CC	<input checked="" type="checkbox"/>	52	Bike,Bus,Car,Citybus,Linbana,Metrobus,Stadsbana,Tram,Truck,Walk
87	86	8	Stor Lokalgata - 1 kf - 50 - no CC	<input checked="" type="checkbox"/>	53	Bike,Bus,Car,Citybus,Linbana,Metrobus,Stadsbana,Tram,Truck,Walk
88	87	8	Liten Lokalgata - 1 kf - 50 - no CC	<input checked="" type="checkbox"/>	61	Bike,Bus,Car,Citybus,Linbana,Metrobus,Stadsbana,Tram,Truck,Walk

2. CONGESTION CHARGING IMPLEMENTATION

Implementation - Network

- Demand segments/Modes/Transport Systems
 - Car/Truck paying
 - Car/Truck not paying (2014)
 - Car/Truck not paying + access Backa East (2018 onwards)
 - Car/Truck not paying access Backa West (2018 onwards)

Transport systems / Modes / Demand segments

Transport systems | Modes | Demand segments

Number: 12	Code	Name	TSys	Interchangeable	DSeg
1	B	Bike	Bike	<input type="checkbox"/>	B
2	C	Car Driver CC	Car	<input type="checkbox"/>	C
3	C no CC	Car Driver no CC	Car no CC	<input type="checkbox"/>	C no CC
4	C no CC + Backa East	Car no CC and Backa Exemption East	Car no CC + Backa East	<input type="checkbox"/>	C no CC + Backa East
5	C no CC Backa West	Car no CC Backa Exemption West	Car no CC Backa West	<input type="checkbox"/>	C no CC Backa West
6	CP	Car Passenger	Car	<input checked="" type="checkbox"/>	CP
7	PuT	PuT	Bus, Citybus, Ferry, Linbana, Metrobus, PuT Walk, Rail, Stadsbana, Tram	<input checked="" type="checkbox"/>	PuT AM Peak, PuT Day, PuT PM Peak
8	T	Truck	Truck	<input type="checkbox"/>	T
9	T no CC	Truck no CC	Truck no CC	<input type="checkbox"/>	T no CC
10	Truck no CC + Backa East	Truck no CC and Backa Exemption East	Truck no CC + Backa East	<input checked="" type="checkbox"/>	Truck no CC + Backa East
11	Truck no CC Backa West	Truck no CC Backa Exemption West	Truck no CC Backa West	<input checked="" type="checkbox"/>	Truck no CC Backa West
12	W	Walk	Walk	<input checked="" type="checkbox"/>	W

Operations

- Create
- Edit
- Delete

OK Cancel

- CC Toll Value stored as network UDA in SEK

Network settings

Basis | Co-ordinate system | Attributes | Network objects | User-defined attributes

Attribute	Value
CC_AM_Peak	22.00
CC_PM_Peak	22.00

2. CONGESTION CHARGING IMPLEMENTATION

Implementation - Demand Model

- ▶ PrT Skim matrix for CC OD's using Link Type UDAs
 - ▶ CC Tolling Station (value 1)
 - ▶ CC Backa Exemption (value 1)
 - ▶ CC Backa Control Point (value 1)

Parameters 'Edit attribute'

Network object type Link

Target attribute User-defined skim
:=

Number: 3	Coefficient	Attribute	Op.	Coefficient	Attribute
	1.0000	CC Tolling Station	▼		
+	100.0000	CC Backa Exemption	▼		
+	1000.0000	CC Backa Control Point	▼		

- ▶ Skim matrix formula:

- ▶ 1x CC Tolling Station + 100x CC Backa Exemption + 1000x Backa Control Point
- ▶ Possible Results
 - ▶ Paths passing no CC Tolling Station: value 0 → no CC
 - ▶ Paths passing Backa Exemption Tolling Station or Backa Control Point: values like 100, 200... 1000, 200 → no CC
 - ▶ Paths passing one or more regular CC Tolling Station: values 0.5 - 99 → CC
 - ▶ Passing one or more regular and one or more Backa Exemption or Backa Control Point station: values like 101, 1101, 2203 → CC

- ▶ Value written into Skim matrix

- ▶ Multiplied with CC value to be used in Demand Model

- ▶ Value of Time depending on Person Group
- ▶ Less important for employed persons (0.085)
- ▶ More important for non-working persons (0.100)
- ▶ Different for car passengers

```
Matrix([NO]=140):=
IF(Matrix([NO] = 139)=0 |Matrix([NO] = 139)= 100|
Matrix([NO] = 139)= 200|Matrix([NO] = 139)= 300|
Matrix([NO] = 139)= 400|Matrix([NO] = 139)= 500|
Matrix([NO] = 139)= 600|Matrix([NO] = 139)= 700|
Matrix([NO] = 139)= 800|Matrix([NO] = 139)= 900|
Matrix([NO] = 139)= 1000|Matrix([NO] = 139)= 2000|
Matrix([NO] = 139)= 3000|Matrix([NO] = 139)= 4000|
Matrix([NO] = 139)= 5000|Matrix([NO] = 139)= 6000|
Matrix([NO] = 139)= 7000|Matrix([NO] = 139)= 8000|
Matrix([NO] = 139)= 9000,0,1)
```

2. CONGESTION CHARGING IMPLEMENTATION

Implementation - Assignment Model

- ▶ Choice of Road User
 - ▶ Using toll road to reach destination or to shorten travel time, incurring costs
 - ▶ Avoiding toll road on a usually longer route

- ▶ Model needs to distinguish 3 (2014-2017) or 4 (2018 onwards) situations
 - ▶ 1. ODs that need to pass Congestion Charge Stations: Backa to Göteborg Centrum
 - ▶ 2. ODs that do not need to pass Congestion Charge Stations: Borås to Partille
 - ▶ 3. ODs that can, but do not need to pass Congestion Charge Stations: Kungälv to Torslanda via E6 (paying) or via Norrleden/Hisingsleden (not paying)
 - ▶ 4. ODs from Backa to the north or vice versa (Backa Exemption from 2018 onwards)

2. CONGESTION CHARGING IMPLEMENTATION

Implementation - Assignment Model

- ▶ Standard VISUM road toll assignment procedure (link, area or matrix toll) currently not feasible for Vignette style CC system
 - ➔ Implementation of Sampers approach
 - ▶ Demand model calculates car demand for trip purposes “work”, “professional”, remaining trip purposes grouped into “other”
 - ▶ splitting car demand using lognormal function into CC-paying and non-CC-paying demand
 - ▶ Assign car demand separately onto network, where links with CC-Toll stations are closed to non-CC-paying demand
- ▶ Threshold value calculated in VISUM for each OD, value used in lognormal function

$$\hat{\alpha} = \frac{C + \beta D_P - \beta D_N}{T_N - T_P}$$

- ▶ C: Congestion Charge,
- ▶ D: Distance paying (p) or non-paying(n)
- ▶ T: Travel Time paying (p) or non-paying(n)
- ▶ β : coefficient

2. CONGESTION CHARGING IMPLEMENTATION

Implementation - Assignment Model

- ▶ Lognormal function not available standalone in VISUM (only as part of Tribut) → values precalculated in Excel

- ▶ Needs VoT, StDev, beta (from Sampers), Toll cost (peak hour),

Trip Purpose	VoT (SEK/h)	StDev	Toll cost (SEK)	beta
Work	102	1.22	22.00	1.04
Professional Trips	617	0.36	22.00	1.04
Other	49	1.17	22.00	1.04

- ▶ High Alpha = Low share of CC

- ▶ Example "other trips":

- ▶ D_p : 10 km

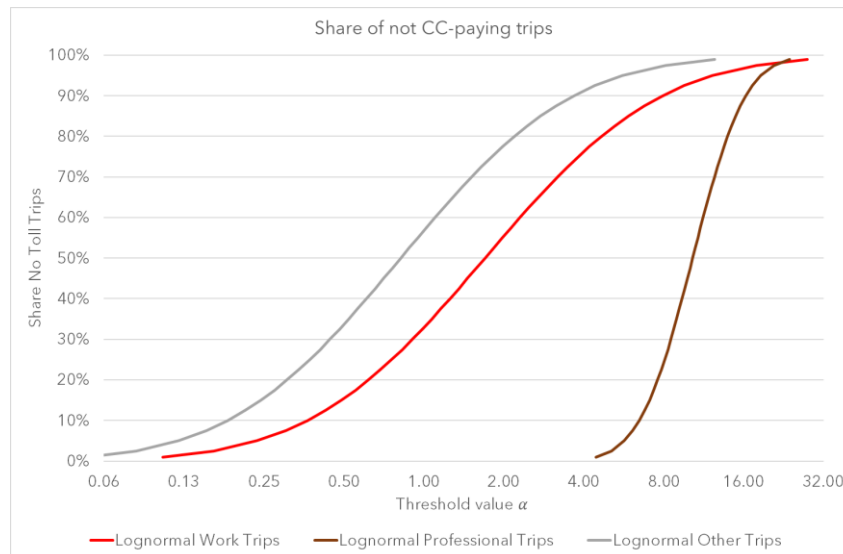
- ▶ D_n : 15 km

- ▶ T_p : 10 min

- ▶ T_n : 30 min

- ▶ $\hat{\alpha}$: 0.85

- ▶ 50% paying CC



- ▶ Demand Split into CC paying and no-CC-paying → standard EQ assignment

3. PRT AND PUT ASSIGNMENT

PrT Assignment

► Standard equilibrium assignment

- Truck
 - Demand: CC-paying and non-CC-paying demand from Sampers
 - 100% split (= no demand split per iteration)
 - Max 20 iterations
 - Standard maximum gap 0.0001
 - Procedure duration: 40s, 2 iterations

- Cars
 - Demand: CC-paying and non-CC-paying demand (from demand model), external matrices for exchange traffic and internal commercial traffic
 - 33/33/34 split per iteration step to help balancing routes
 - Max 50 iterations
 - Standard maximum gap 0.0001
 - Procedure duration: 10 min, 35 iterations

Parameters: Equilibrium assignment

Use current assignment result as initial solution

Initial solution with incremental assignment

OD demand share per iteration step

1	2	3	4	5	6	7	8	9	10	11	12
100	0	0	0	0	0	0	0	0	0	0	0

Termination condition

Permitted deviation of impedances of alternative routes:

Absolute deviation

Relative deviation

Maximum number of iterations

Maximum gap

Network balancing

Maximum number of iterations

Parameters: Equilibrium assignment

Use current assignment result as initial solution

Initial solution with incremental assignment

OD demand share per iteration step

1	2	3	4	5	6	7	8	9	10	11	12
33	33	34	0	0	0	0	0	0	0	0	0

Termination condition

Permitted deviation of impedances of alternative routes:

Absolute deviation

Relative deviation

Maximum number of iterations

Maximum gap

Network balancing

Maximum number of iterations

3. PRT AND PUT ASSIGNMENT

PrT Assignment

- Feedback loop for demand model
 - AM Peak used for all time periods, as the mode choice is usually done at the beginning of the trip chain
 - feedback loop using 30% of current AM Peak demand (cars) + 70% of last iterations AM Peak demand (cars)
→ Quicker stabilization of demand model
- 4 iterations in 2014 AM Peak

Parameters: Go to procedure

Go to procedure: 27 (Calculate PrT skim matrix - C Car Driver)

If

Number of iterations < 1 (Minimum number)

or

For at least one network object

$ABS(X(n) - X(n-1)) > MIN(0.02 * MAX(X(n), X(n-1)) + 20, 50)$

With X

Link attribute: Volume PrT [veh] (AP)

Matrix: i3 AM Car Total demand iterator

The value of the network attribute

and number of iterations < 7 (Maximum number)

Current iteration: 0

OK Cancel

3. PRT AND PUT ASSIGNMENT

PuT Assignment

► PuT Offer

- 2014:
 - 3 operators
 - Västtrafik
 - Öresundståg
 - SJ
 - 290 lines
 - 1400 line routes
 - 2300 time profiles
 - 16000 vehicle journeys
- 2035:
 - 3 operators
 - 315 lines
 - 1400 line routes
 - 2200 time profiles
 - 33000 vehicle journeys

Timetable (tabular)

108 vehicle journeys					
No	498403	498404	498405	498406	498407
Name					
LineName	279_5001_SLT_2	279_5001_SLT_2	279_5001_SLT_2	279_5001_SLT_2	279_5001_SLT_2
DirectionCode	>	>	>	>	>
Concatenate:VehJourneySections\ValidDays\Code	tägl.	tägl.	tägl.	tägl.	tägl.
FromTProfileIdentifier	1: 7425668 74256	1: 7425668 74256	1: 7425668 74256	1: 7425668 74256	1: 7425668 74256
Dep	06:54:00	07:04:00	07:14:00	07:22:00	07:31:00
Arr	07:38:00	07:48:00	07:58:00	08:06:00	08:15:00
ToTProfileIdentifier	29: 7416368 7416	29: 7416368 7416	29: 7416368 7416	29: 7416368 7416	29: 7416368 7416
OperatorIdentifier	24 Västtrafik	24 Västtrafik	24 Västtrafik	24 Västtrafik	24 Västtrafik
Count:VehJourneySections	1	1	1	1	1
IsCoupled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

108 vehicle journey sections					
VehCombIdentifier	2 M31	2 M31	2 M31	2 M31	2 M31
ValidDaysIdentifier	1 tägl.	1 tägl.	1 tägl.	1 tägl.	1 tägl.
FromTProfileIdentifier	1: 7425668 74256	1: 7425668 74256	1: 7425668 74256	1: 7425668 74256	1: 7425668 74256
Dep	06:54:00	07:04:00	07:14:00	07:22:00	07:31:00
Arr	07:38:00	07:48:00	07:58:00	08:06:00	08:15:00
ToTProfileIdentifier	29: 7416368 7416	29: 7416368 7416	29: 7416368 7416	29: 7416368 7416	29: 7416368 7416
PrePrep Time	Omin	Omin	Omin	Omin	Omin
PostPrep Time	Omin	Omin	Omin	Omin	Omin

ObjNo	ObjCode	ObjName	Arr / Dep	Arr / Dep	Arr / Dep	Arr / Dep	Arr / Dep
7425668	7425668	Tynnered Opalorget	06:54:00	07:04:00	07:14:00	07:22:00	07:31:00
7425684	7425684	Tynnered Smaragdgate	06:55:00	07:05:00	07:15:00	07:23:00	07:32:00
7425613	7425613	Tynnered Briljantgatan	06:56:00	07:06:00	07:16:00	07:24:00	07:33:00
7415565	7415565	Frölunda Torg	06:58:00	07:08:00	07:18:00	07:26:00	07:35:00
7420480	7420480	Frölunda Positivgatan	06:59:00	07:09:00	07:19:00	07:27:00	07:36:00
7425662	7425662	Frölunda Musikvägen	07:00:00	07:10:00	07:20:00	07:28:00	07:37:00

3. PRT AND PUT ASSIGNMENT

PuT Assignment

► PuT Demand

- Demand straight from Demand Model, no external data available
- Added 30 min to demand period to take into account long distance trips
 - AM Peak: demand from 06:30 - 09:00
 - PM Peak: demand from 15:30 - 18:00
 - All-Day: demand from 00:00 - 24:00
- Assignment period
 - AM Peak: 07:00 - 09:00 with 24h arrival extension
 - PM Peak: 16:00 - 18:00 with 24h arrival extension
 - All-Day: 00:00 - 24:00 with 24h arrival extension

3. PRT AND PUT ASSIGNMENT

PuT Assignment

▶ Timetable

- Sets the departure time and stop of each vehicle journey
- Uses Travel Time Profiles for runtimes between stop points

→ Departure times for each vehicle journey and each stop point

Timetable (tabular)

108 vehicle journeys				
No	498403	498404	498405	498406
Name				
LineName	279_5001_SLT_2	279_5001_SLT_2	279_5001_SLT_2	279_5001_SLT_2
DirectionCode	>	>	>	>
Concatenate:VehJourneySections\ValidDays\Code	tägl.	tägl.	tägl.	tägl.
From TProfileIdentifier	1: 7425668 74256	1: 7425668 74256	1: 7425668 74256	1: 7425668 74256
Dep	06:54:00	07:04:00	07:14:00	07:22:00
Arr	07:38:00	07:48:00	07:58:00	08:06:00
To TProfileIdentifier	29: 7416368 7416	29: 7416368 7416	29: 7416368 7416	29: 7416368 7416
OperatorIdentifier	24 Västtrafik	24 Västtrafik	24 Västtrafik	24 Västtrafik
Count:VehJourneySections	1	1	1	1
IsCoupled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

108 vehicle journey sections				
VehCombidentifier	2 M31	2 M31	2 M31	2 M31
ValidDaysIdentifier	1 tägl.	1 tägl.	1 tägl.	1 tägl.
From TProfileIdentifier	1: 7425668 74256	1: 7425668 74256	1: 7425668 74256	1: 7425668 74256
Dep	06:54:00	07:04:00	07:14:00	07:22:00
Arr	07:38:00	07:48:00	07:58:00	08:06:00
To TProfileIdentifier	29: 7416368 7416	29: 7416368 7416	29: 7416368 7416	29: 7416368 7416
PrePrep Time	0min	0min	0min	0min
PostPrep Time	0min	0min	0min	0min

ObjNo	ObjCode	ObjName	Arr / Dep	Arr / Dep	Arr / Dep	Arr / Dep
7425668	7425668	Tynnered Opalatorget	06:54:00	07:04:00	07:14:00	07:22:00
7425684	7425684	Tynnered Smaragdgate	06:55:00	07:05:00	07:15:00	07:23:00
7425613	7425613	Tynnered Brilljantgatan	06:56:00	07:06:00	07:16:00	07:24:00
7415565	7415565	Frölunda Torg	06:58:00	07:08:00	07:18:00	07:26:00
7420480	7420480	Frölunda Positivgatan	06:59:00	07:09:00	07:19:00	07:27:00
7425662	7425662	Frölunda Musikvägen	07:00:00	07:10:00	07:20:00	07:28:00

3. PRT AND PUT ASSIGNMENT

PuT Assignment

- Assignment parameters
 - Type "Timetable based assignment"
 - Stages:
 1. Connection Search for each OD
 2. Preselection filters out lower quality connections from step 1
 3. Impedance calculates utility of remaining connections from step 2
 4. Choice shares the demand over the remaining connections, using the utility from step 3

Parameters: Assignment procedure: Timetable-based

Basis

- Calculate assignment
- Calculate skim matrices
- Analyze risk of delay
- Use connector shares
- Save detailed log files

Restrict demand data

OD pairs considered for assignment: All

Restrict origin zones: ⓘ

From origin zone number:

To origin zone number:

Assignment time interval

From: 07:00:00

To: 09:00:00

Departure extension: 0min

Arrival extension: 24h

Calculate paths from

- Connection search
- Stored connections for DSeg: PuT AM Peak PuT AM Peak
- File:
- Import fares

OK Cancel

3. PRT AND PUT ASSIGNMENT

PuT Assignment

- Assignment parameters
 - Connection Search
 - Max 3 transfers
 - Walk times count double
 - Transfer wait times count triple
 - Each transfer adds 8 min
 - No specific transport system or vehicle journey impedance

Parameters: Assignment procedure: Timetable-based

Branch and Bound search

Search impedance =

Number	Coefficient	Attribute		
	1.00	In-vehicle time	*	...PerceivedJT_TrSys
+	1.00	PuT-Aux ride time	*	1.0
+	2.00	Access time		
+	2.00	Egress time		
+	2.00	Walk time		
+	3.00	Transfer wait time		
+	8min	Number of transfers		
+	1.00	Transport system impedance		Parameters
+	0.00	Vehicle journey impedance		Parameters

[Transfer coefficients to PJT definition on the 'Impedance' page](#)

Cut off rules

A connection is deleted if one of the following conditions is met:

Search impedance > * minimum search impedance +

Journey time > * minimum journey time +

Number of transfers > minimum number of transfers +

OK Cancel

3. PRT AND PUT ASSIGNMENT

PuT Assignment

- Assignment parameters
 - Preselection
 - Connections only available in the departure or arrival extension are deleted
 - Connection is deleted if route is 20% + 5min longer than min search impedance or min journey time
 - Connection is deleted if number of transfers is 2 + min number of transfers

Parameters: Assignment procedure: Timetable-based

Preselection

Connections with PuT and without PuT on an OD pair: ⓘ

Delete all connections without PuT ▾

Delete connections that are entirely within the departure/arrival extension

Delete connections that depart before the start of the assignment period
Applies to departure time-related demand segments

Delete connections that arrive after the end of the assignment period
Applies to arrival time-related demand segments

1. Search impedance _____

A connection is deleted if the following condition applies:

Search impedance > 1.20 * minimum search impedance + 5.00

The search impedance is calculated according to the search parameters.

2. Journey time and number of transfers _____

A connection is deleted if one of the following conditions applies: ⓘ

Journey time > 1.20 * minimum journey time + 5min and number of transfers > minimum number of transfers + 2 and journey time > minimum journey time

Number of transfers > minimum number of transfers + 2 and journey time > minimum journey time

3. Perceived journey time (PJT) _____

Perceived journey time (PJT) > 1.50 * mean PJT + 0min ⓘ

OK Cancel

3. PRT AND PUT ASSIGNMENT

PuT Assignment

- Assignment parameters
 - Impedance
 - Utility = perceived journey time + Fare + time difference between desired and actual departure time
 - Same values as for connection search
 - + origin wait time counts double
 - + Operator change adds 10 min

Parameters: Assignment procedure: Timetable-based

- ... Basis
- [-] Search
 - [-] Branch and Bound search
 - ... Dominance
 - ... Shortest path search
- ... Preselection
- Impedance**
- ... Choice
- ... Skim matrices
- [-] Capacity restriction
- ... Connection export
- ... Risk of delay

Impedance

Perceived journey time (PJT) =

Number	Coefficient	Attribute		BoxCox	Lambda
	1.00	In-vehicle time	* ..PerceivedJT_TrSys	<input type="checkbox"/>	1.00
+	1.00	PuT-Aux ride time	* 1.0	<input type="checkbox"/>	1.00
+	2.00	Access time		<input type="checkbox"/>	1.00
+	2.00	Egress time		<input type="checkbox"/>	1.00
+	2.00	Walk time		<input type="checkbox"/>	1.00
+	2.00	Origin wait time	Parameters	<input type="checkbox"/>	1.00
+	3.00	Transfer wait time	Parameters	<input type="checkbox"/>	1.00
+	8min	Number of transfers	* Formula	<input type="checkbox"/>	1.00
+	10min	Number of operator change	Parameters	<input type="checkbox"/>	1.00
+	0.00	Extended impedance	Parameters	<input type="checkbox"/>	1.00

Consider connections with DeltaT > 0 if connections with DeltaT = 0 exist
 DeltaT = Time difference between desired and actual departure or arrival time

Impedance =

Number	Coefficient	Attribute		BoxCox	Lambda
	1.00	PJT [min]		<input type="checkbox"/>	1.00
+	6.00	Fare		<input type="checkbox"/>	1.00
+	10.00	DeltaT(early) [min]		<input type="checkbox"/>	1.00
+	10.00	DeltaT(late) [min]		<input type="checkbox"/>	1.00

Time-varying impedance calculation

Segment time series intervals
 Maximum interval length: 24h

3. PRT AND PUT ASSIGNMENT

PuT Assignment

- Assignment parameters
 - Choice
 - Impedance converted to utility
 - From Utility, demand shares are calculated
 - Choice Model: Kirchhoff
 - Uses ratio of impedances of different routes to distribute demand over connections
 - Standard parameters

Parameters: Assignment procedure: Timetable-based

Choice

Choice model: Kirchhoff

Utility $U = R^{-\beta}$

R = Impedance of a connection

$\beta = 4.0000$

Use independence

Maximum time slot: 1h

Impact of perc. journey time and fare: 1.0000 (0 = none, 1 = max. impact)

Impact on connections of high quality: 0.3000

Impact on connections of low quality: 0.6000

[What does independence of a connection mean?](#)

OK Cancel

3. PRT AND PUT ASSIGNMENT

PuT Assignment

Results

- Passengers per
 - line
 - line route
 - vehicle journey
 - Stop
 - Boarding
 - Alighting
 - Transfers
- Number of transfers
- Passenger.km
- Vehicle.km

Number: 16,236	Dep	Arr	LineRoute\Lin	DirectionCode	ServiceKm(AP)	PassKm Trav(AP)	PTripsUnlinked(A)
916	15:05:00	16:18:00	6	<	25km	1466km	299
917	15:14:00	16:27:00	6	<	25km	1966km	369
918	15:23:00	16:36:00	6	<	25km	1466km	301
919	15:32:00	16:45:00	6	<	25km	1745km	373
920	15:41:00	16:54:00	6	<	25km	1761km	371
921	15:50:00	17:03:00	6	<	25km	1614km	328
922	15:59:00	17:12:00	6	<	25km	2014km	414
923	16:08:00	17:21:00	6	<	25km	2017km	457
924	16:17:00	17:30:00	6	<	25km	1654km	339
925	16:26:00	17:39:00	6	<	25km	1643km	325
926	16:35:00	17:48:00	6	<	25km	1594km	313
927	16:44:00	17:57:00	6	<	25km	2366km	408
928	16:53:00	18:06:00	6	<	25km	1428km	287
929	17:02:00	18:15:00	6	<	25km	1562km	324
930	17:11:00	18:24:00	6	<	25km	1481km	297
931	17:20:00	18:33:00	6	<	25km	1469km	311
932	17:29:00	18:42:00	6	<	25km	1289km	249
933	17:38:00	18:51:00	6	<	25km	1211km	262
934	17:47:00	19:00:00	6	<	25km	1180km	237
935	17:56:00	19:09:00	6	<	25km	1296km	264
936	18:05:00	19:18:00	6	<	25km	1285km	254

Number: 4,696	Name	NumLines	PassBoard_TS	PassBoard_TS	PassBoard_TS	PassAlight_TS	PassAlight_TS	PassAlight_TS	PassTransTotal(AP)
1	Centralen med omnejd	141	28864	32758	12588	28929	32018	13720	53476
2	Göteborg Hjalmar Brantingspl	74	15436	6774	0	15771	6398	0	19578
3	Frolunda Torg	46	9048	7371	0	8855	7467	0	11503
4	Göteborg Marklandsgatan	37	7887	7032	0	6791	7979	0	12596
5	Angered centrum	30	6452	5695	0	5904	6119	0	9501
6	Göteborg Brunnsparken	40	6451	18832	0	4436	20172	0	11255
7	Göteborg Svingeln	44	5544	6003	0	6677	5165	0	8445
8	Göteborg Korsvägen	48	5438	12889	0	5835	12514	0	9742
9	Lindholmen	18	5061	0	0	5512	0	0	205
10	Göteborg Vägmästareplatsen	38	4922	4986	0	4896	5069	0	6543
11	Partille centrum	23	3234	0	0	2912	0	0	2063
12	Kungsbacka station	42	3188	0	1987	3405	0	1834	4237
13	Göteborg Eketrägatan	25	2778	3214	0	2756	3212	0	4425
14	Radiomotet	21	2670	0	0	2634	0	0	2483
15	Göteborg Kungsten	32	2358	1866	0	2253	1949	0	3312
16	Göteborg Sahlgrenska Huvudentr	18	2351	8994	0	2774	8851	0	1709
17	Mölndal station	27	2152	0	1680	2178	0	1405	1965
18	Torslandakryssset	20	2136	0	0	2086	0	0	1222
19	Göteborg LinnÅ-platsen	19	2071	1713	0	2210	1774	0	1891
20	Söredsvägen	34	1721	0	0	1713	0	0	1522

THANKS !

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