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Operational Programme Research,
Development and Education
MINISTRY OF EDUCATION, YOUTH AND SPORTS

System train paths as the key to efficient infrastructure usage for on-track competition in ITF-regimes

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Graz University of Technology

Introducing On-track Competition in Passenger Rail Services 2019
14.03.2019, Masaryk University Brno

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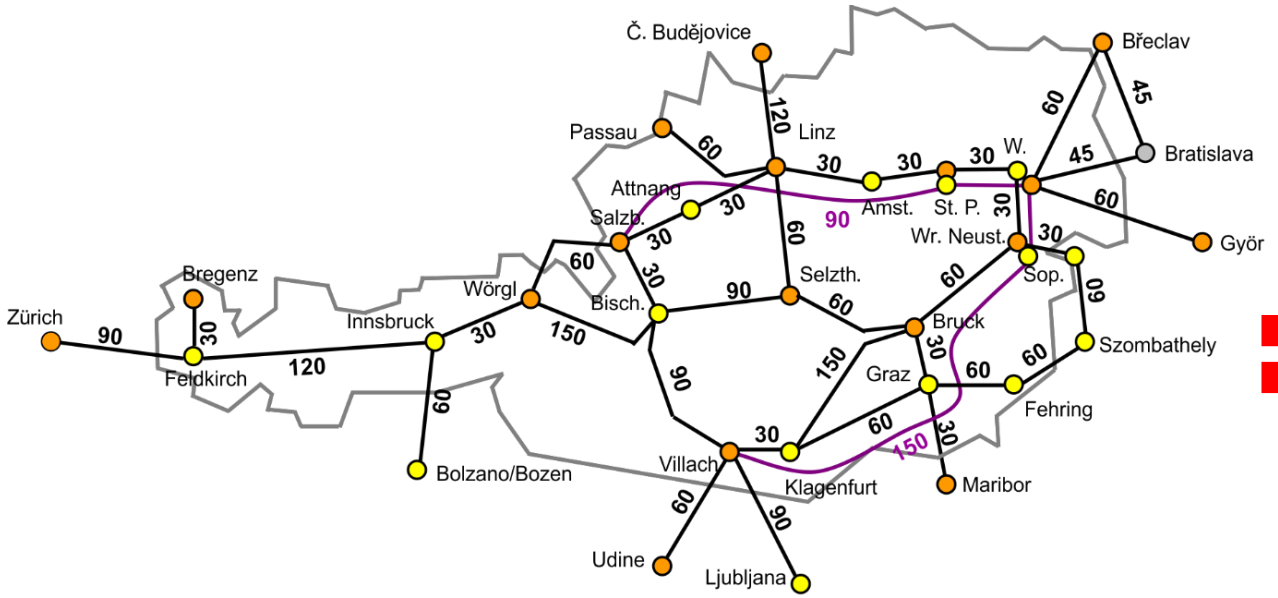

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On-Track Competition

Integrated Periodic Timetable (ITF) / Long Term Infrastructure Development

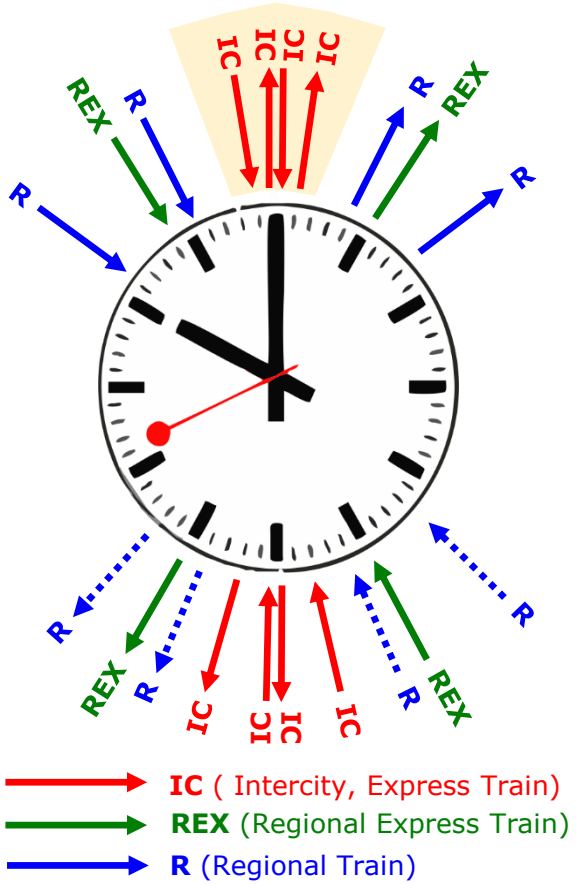
Challenge for Infrastructure Managers

➢ ***systematic approach required***

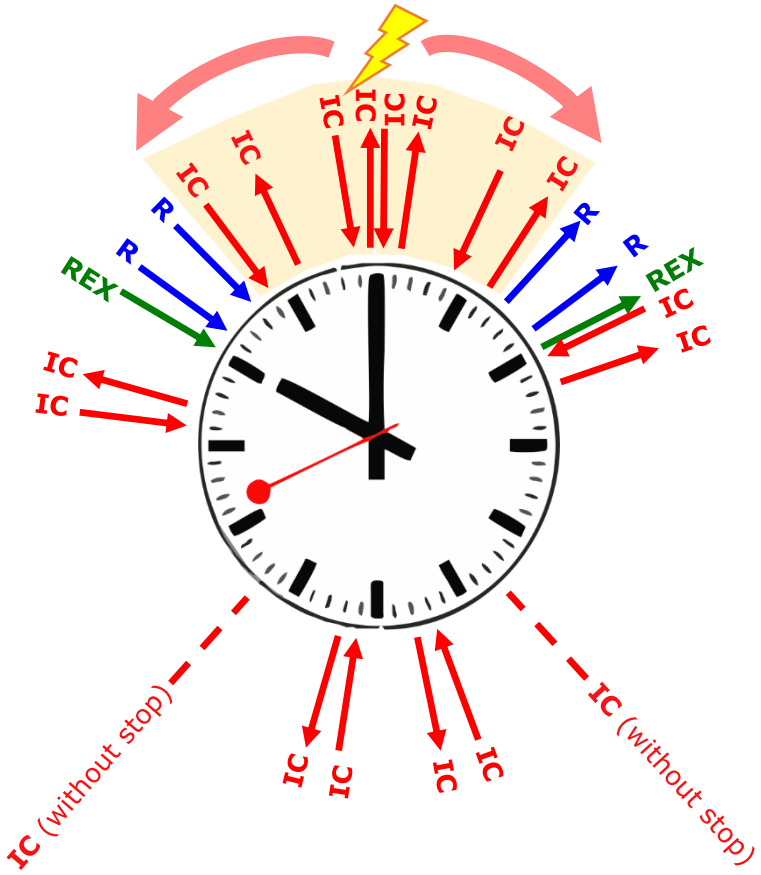
hub Amstetten

theory

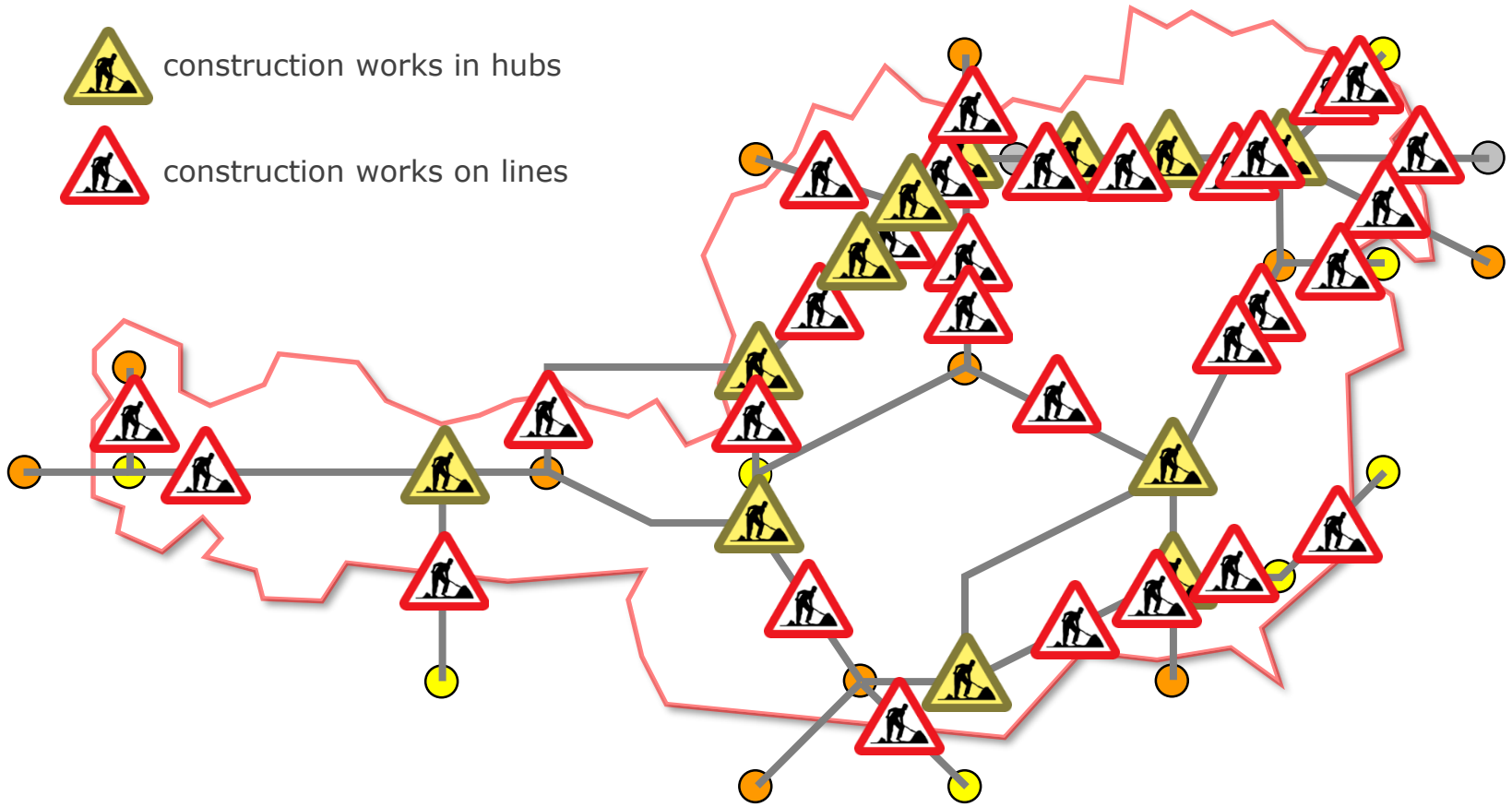
concept 2009



situation 2018



➢ ***hub spreading critical***


construction works in hubs
construction works on lines

overall infrastructure investments in the Austrian railway network 1990-2040 **100%**

Relevant investments for ITF:

Approach 1 **51%** according to target timetable 2025+ (rough first estimate)

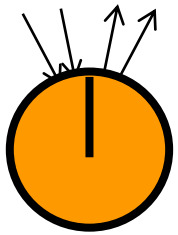
Approach 3 **31%** considering only ITF-effective measures and relevant proportion of hub-invesmtents - investments due to capacity reasons

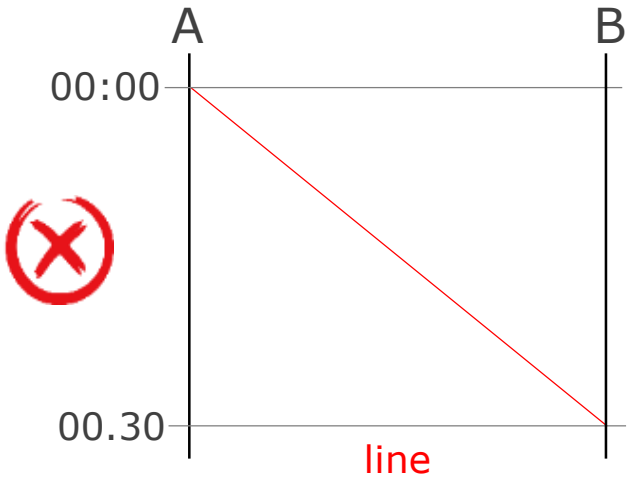
Today... …the entire network is offered, customers ask for train paths designed due to their specific demand.

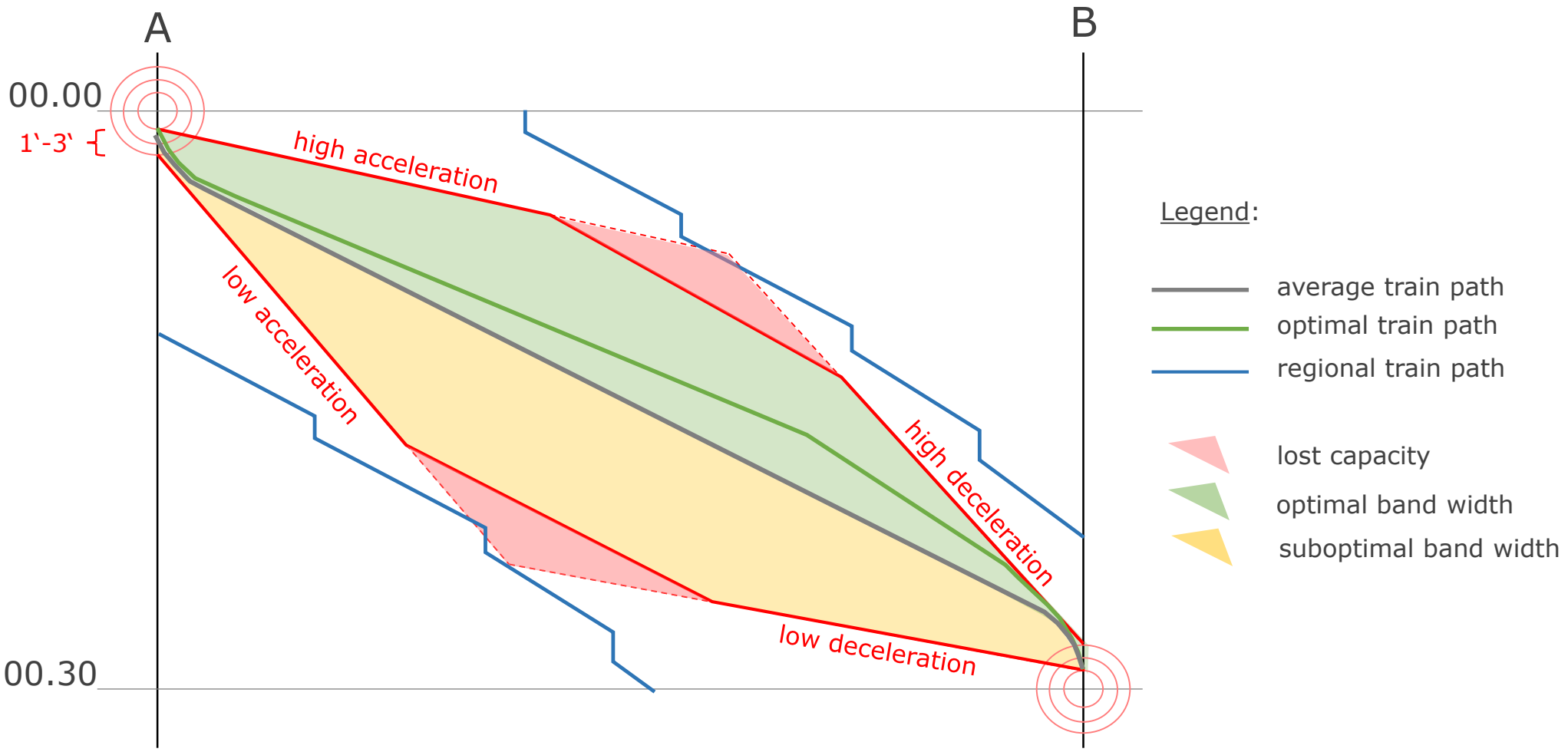
Problem... …in case of train paths conflicts the Integrated Timetable (ITF) cannot be ensured.

Solution... …system train paths are offered. Part of the network is offered as today, however, a conflict with system train paths is not acceptable.

➢ ***appropriate scheme → system train path (STP)***




A
B
00:00
00.30
line



➢ ***STP: deltoid shape → enables flexibility***

Amstetten – St. Pölten

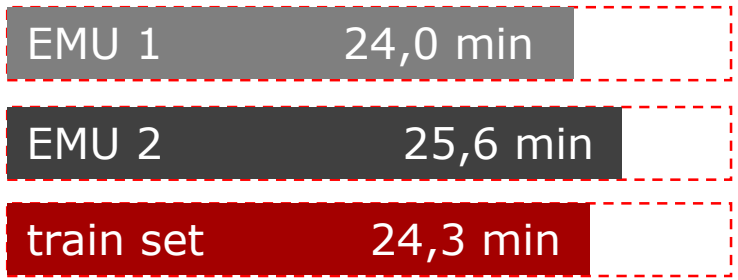
Infrastructure
- distance: 63,5 km
- edge target time: 30 min
- hub in-between: none
- maximum line speed: 200-230 km/h

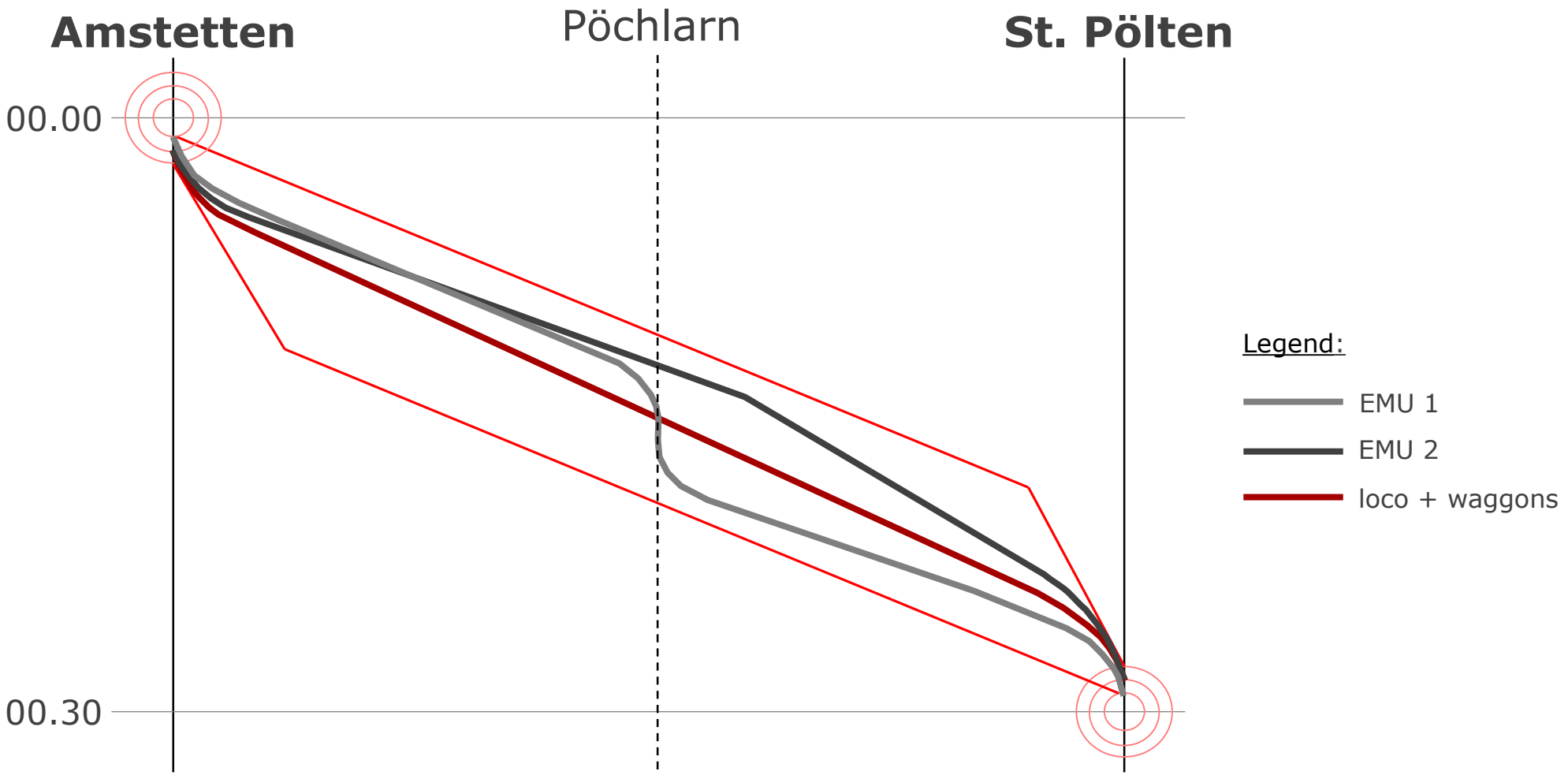
Riding times

St. Pölten – Vienna

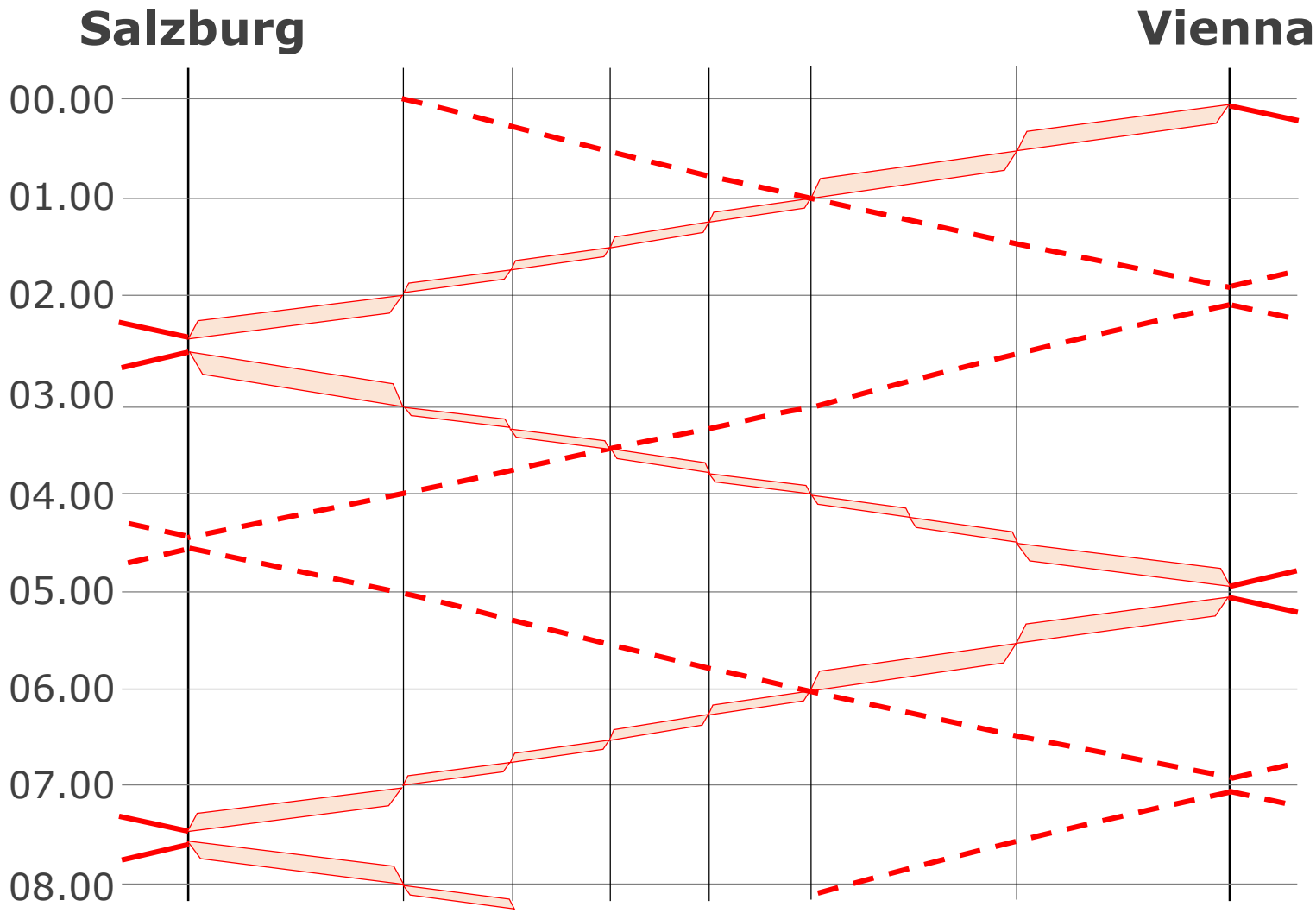
Infrastructure
- distance: 60,6 km
- edge target time: 30 min
- hub in-between: Meidling Bf.
- maximum line speed: 80-250 km/h

Riding times





➢ ***STP: parameters influence shape of deltoid***


Salzburg
Vienna
00.00
01.00
02.00
03.00
04.00
05.00
06.00
07.00
08.00

Conclusion

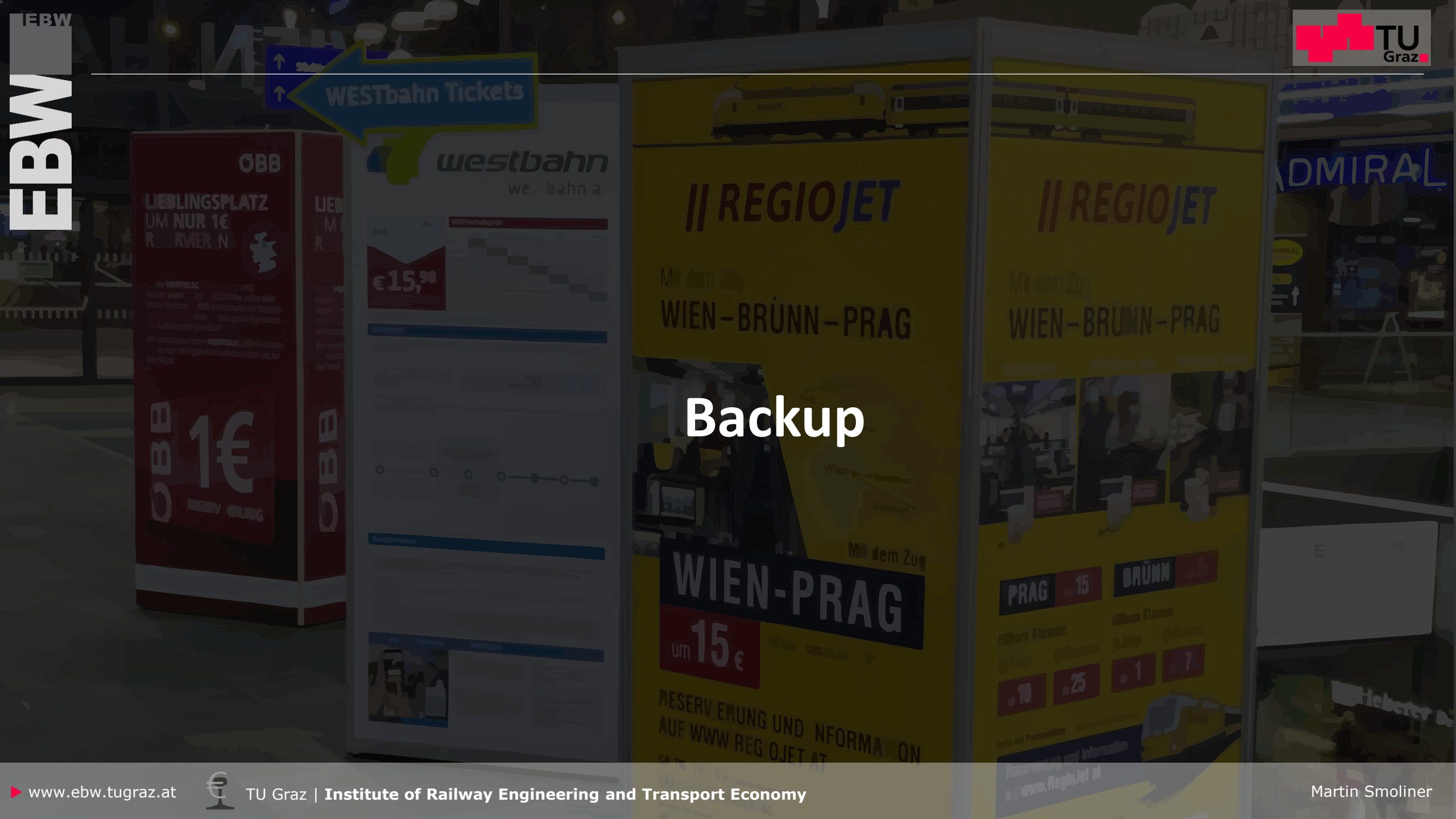
System train paths…

…are a scheme to offer the railway undertakings attractive train paths according to the rules of the ITF.

This scheme guarantees…

…an optimal network-wide implementation of the ITF.
…compliance with the framework of the EU-legislation.
…the highest possible customer benefit.

Looking forward to a lively discussion!


WESTbahn Tickets
westbahn
ÖBB
LIEBLINGSPLATZ
UM NUR 1€
1€
€ 15,90
// REGIOJET
WIEN–BRÜNN–PRAG
WIEN-PRAG
um 15 €
// REGIOJET
WIEN–BRÜNN–PRAG
PRAG
BRÜNN
ADMIRAL

Backup

parameters	timetable	infrastructure	vehicle
hub	• minimal stopping time • transfer time	• track layout • speed limit of tracks and turnouts	• time of passenger boarding • door size • opening speed of doors • low floor vehicle
edge	• stops in-between • time reserves / timetable stability • capacity	• distance • maximum line speed • unplanned track changes	• maximum speed • acceleration • mass • vehicle length • energy saving

Conclusion

1.) systematic approach required

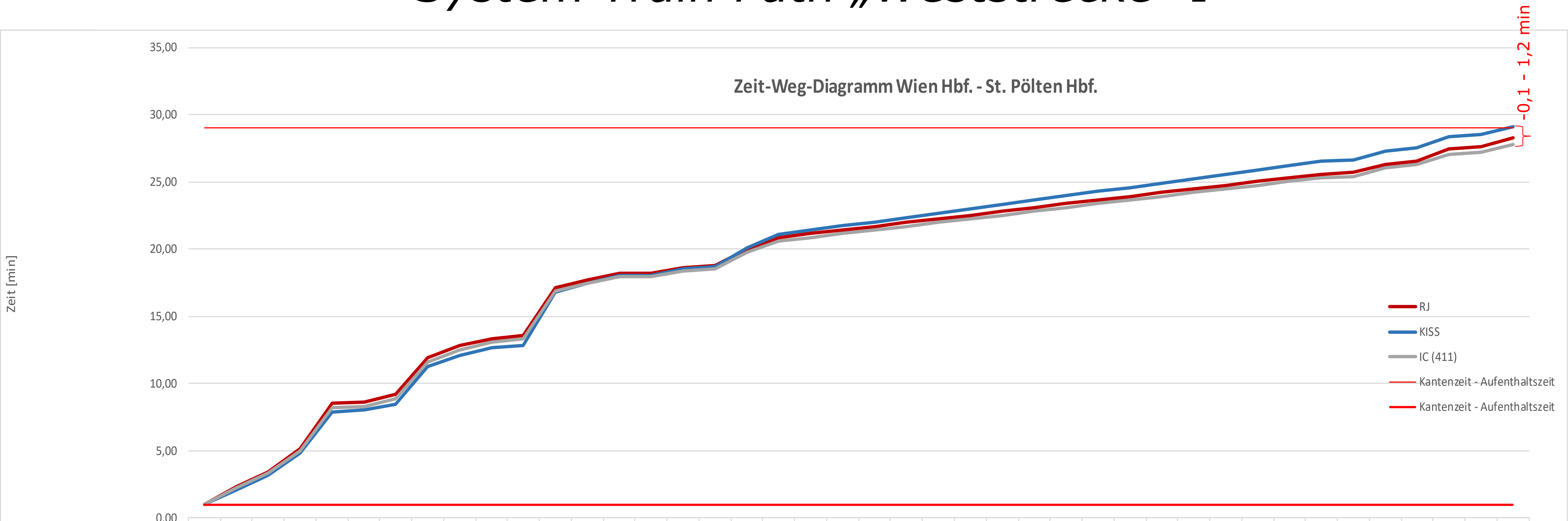
2.) hub spreading critical

3.) appropriate scheme → system train path (STP)

4.) STP: deltoid shape → enables flexibility

5.) STP: parameters influence shape of deltoid

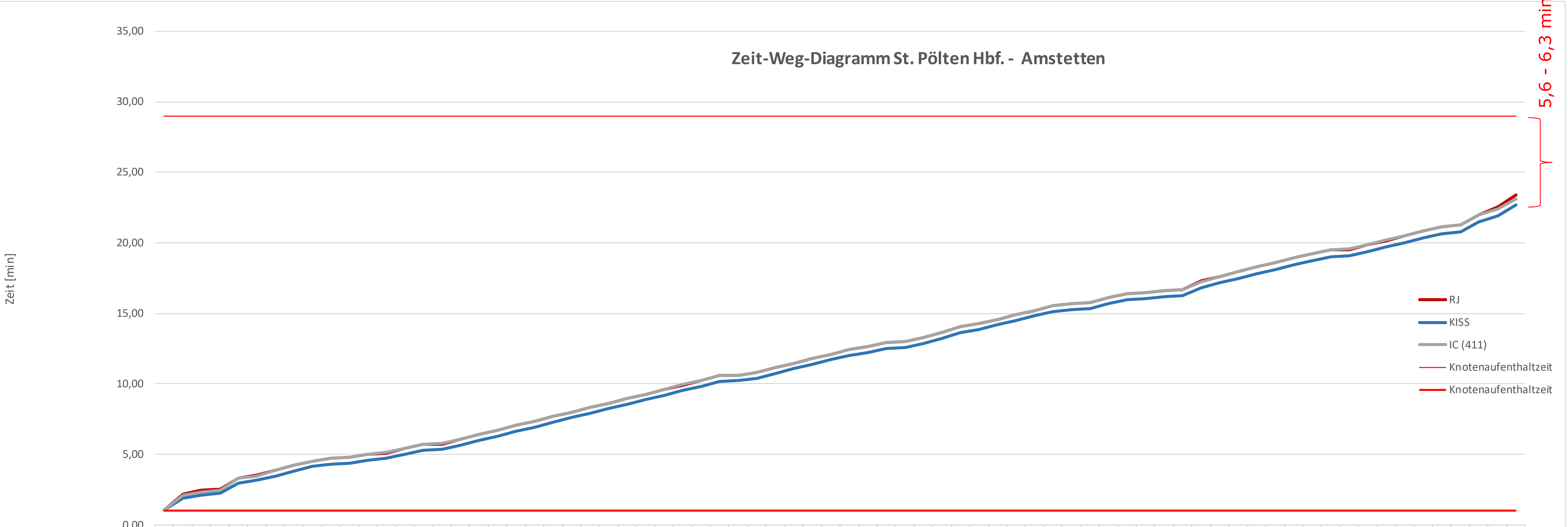
System Train Path „Weststrecke" I



	0,00	0,57	1,46	2,33	2,81	2,82	3,04	8,28	10,40	10,42	10,46	17,59	19,69	21,39	21,49	22,87	23,37	27,87	30,87	31,87	32,87
RJ	1,00	2,35	3,43	5,16	8,55	8,60	9,16	11,92	12,83	13,35	13,58	17,15	17,74	18,21	18,24	18,63	18,77	20,03	20,86	21,14	21,42
KISS	1,00	2,11	3,18	4,84	7,91	8,00	8,49	11,24	12,13	12,65	12,80	16,81	17,49	18,03	18,06	18,51	18,67	20,12	21,08	21,40	21,72
IC (411)	1,00	2,25	3,33	4,97	8,23	8,30	8,86	11,63	12,53	13,07	13,30	16,88	17,47	17,94	17,97	18,36	18,50	19,75	20,59	20,87	21,15
Kantenzeit - Aufenthaltszeit	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Kantenzeit - Aufenthaltszeit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

	33,87	34,87	35,87	36,87	37,87	38,87	39,87	40,87	41,87	42,87	43,87	44,86	45,86	46,78	47,71	48,11	48,79	48,80	49,19	49,19	49,19
RJ	21,70	21,98	22,26	22,54	22,82	23,10	23,38	23,65	23,93	24,21	24,49	24,77	25,05	25,33	25,59	25,70	26,35	26,59	27,49	27,67	28,33
KISS	22,05	22,37	22,69	23,01	23,33	23,65	23,97	24,29	24,61	24,93	25,26	25,58	25,90	26,22	26,52	26,65	27,34	27,57	28,37	28,53	29,09
IC (411)	21,43	21,71	21,99	22,27	22,55	22,83	23,10	23,38	23,66	23,94	24,22	24,50	24,78	25,06	25,32	25,43	26,06	26,29	27,09	27,25	27,80
Kantenzeit - Aufenthaltszeit	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Kantenzeit - Aufenthaltszeit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

System Train Path „Weststrecke“ II



	61	61	62	62	63	64	65	66	67	68	68	69	69	70	71	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	86	87
RJ	1,0	2,1	2,4	2,5	3,3	3,4	3,8	4,1	4,5	4,7	4,7	4,9	5,0	5,4	5,6	5,7	6,0	6,3	6,7	7,0	7,3	7,6	7,9	8,3	8,6	8,9	9,2	9,5	9,9	10,	10,	10,	10,
KISS	1,0	1,8	2,0	2,2	2,9	3,1	3,4	3,7	4,1	4,3	4,3	4,5	4,6	5,0	5,2	5,3	5,6	5,9	6,2	6,6	6,9	7,2	7,5	7,9	8,2	8,5	8,8	9,1	9,5	9,8	10,	10,	10,
IC (411)	1,0	2,0	2,3	2,4	3,2	3,4	3,8	4,1	4,5	4,7	4,7	4,9	5,1	5,4	5,6	5,7	6,0	6,3	6,7	7,0	7,3	7,6	7,9	8,3	8,6	8,9	9,2	9,5	9,9	10,	10,	10,	10,
Knotenaufenthaltzeit	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Knotenaufenthaltzeit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

	88	89	90	91	92	93	94	94	95	96	97	98	99	100	101	102	102	105	106	107	107	108	108
RJ	11,	11,	11,	12,	12,	12,	12,	12,	13,	13,	14,	14,	14,	14,	15,	15,	15,	15,	16,	16,	16,	16,	16,
KISS	10,	11,	11,	11,	11,	12,	12,	12,	12,	13,	13,	13,	14,	14,	14,	15,	15,	15,	15,	15,	16,	16,	16,
IC (411)	11,	11,	11,	12,	12,	12,	12,	12,	13,	13,	14,	14,	14,	14,	15,	15,	15,	15,	16,	16,	16,	16,	16,
Knotenaufenthaltzeit	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Knotenaufenthaltzeit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

	109	110	111	112	113	114	115	116	116	117	118	119	120	121	121	123	124	125
RJ	17,	17,	17,	18,	18,	18,	19,	19,	19,	19,	20,	20,	20,	21,	21,	21,	22,	23,
KISS	16,	17,	17,	17,	18,	18,	18,	19,	19,	19,	19,	20,	20,	20,	20,	21,	21,	22,
IC (411)	17,	17,	17,	18,	18,	18,	19,	19,	19,	19,	20,	20,	20,	21,	21,	21,	22,	23,
Knotenaufenthaltzeit	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Knotenaufenthaltzeit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1