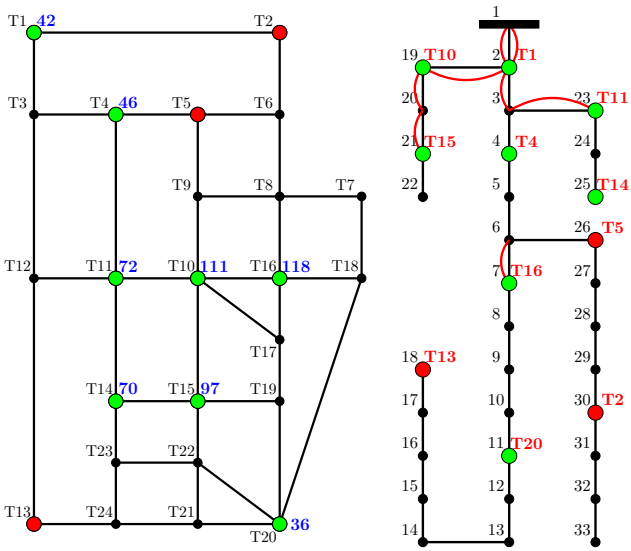
Results

May 6, 2021

Default Case



(a) Default TN (b) Default PDN

Figure 1: Default Decision Results: The green nodes in TN indicate we decide to build a charging station, and we also marked the corresponding PDN nodes as green; The red nodes are the candidate nodes we decide not to build stations; The blue numbers in the TN indicate the capacity of the charging stations.

FreeTN/PDN

Table 1: TN Decision of Extreme Cases

TN	1	2	4	5	10	11	13	14	15	16	20
Default	42	0	46	0	110	72	0	70	97	118	37
FreeTN	50	45	90	74	194	113	0	92	150	0	80
FreePDN	35	0	0	84	134	76	106	0	162	148	76

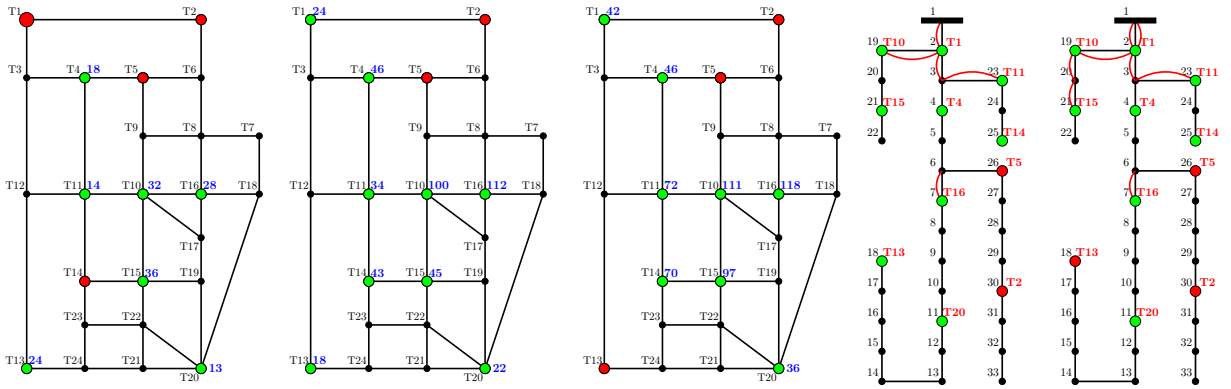
Table 2: PDN Decision of Extreme Cases

PDN Line	1-2	2-3	3-4	6-7	10-11	2-19	19-20	20-21	3-23
Default	2	1	0	1	0	1	1	1	1
Free TN	2	1	0	0	0	2	2	2	0
Free PDN	-	-	-	-	-	-	-	-	-

Table 3: Factors of Extreme Cases

Factors	SAT#	UNSAT#	SATScore	TN$	PDN$
Default	384	84	5016	4977	4564
Free TN	419	49	8028	-	5015
Free PDN	459	9	9813	5821	-

Changing K



(a) TN K = 0 (b) TN K = 1 (c) TN K = 2 (d) PDN K = 1 (e) PDN K = 2

Figure 2: Decision Result of Changing K: The yellow node in (c) means the closed station compared with default case

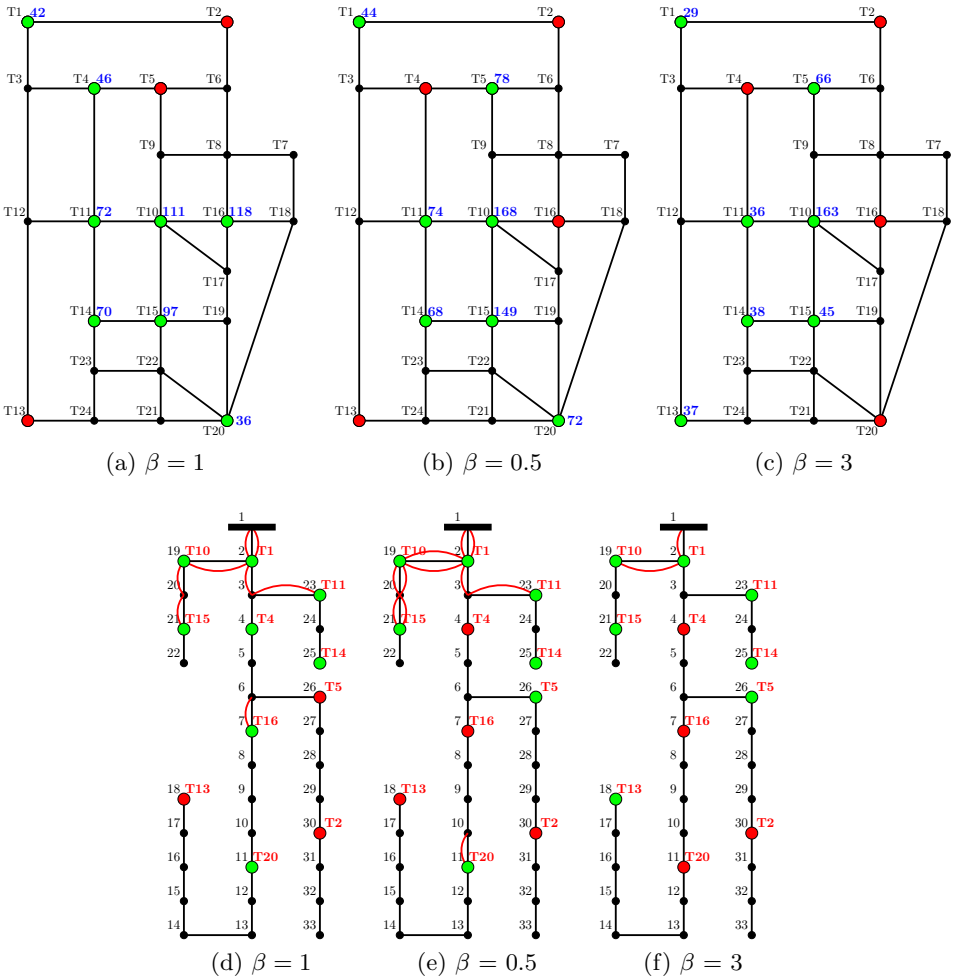
Table 4: TN Decision of Changing K

TN	T1	T2	T4	T5	T10	T11	T13	T14	T15	T16	T20
K = 0	0	0	18	0	32	14	24	0	36	28	12
K = 1	24	0	46	0	100	34	18	43	45	112	22
K=2 (Default)	42	0	46	0	110	72	0	70	97	118	37
K = 3	42	0	46	0	110	72	0	70	97	118	37

Table 5: Factors of Changeing K

Factors	SAT#	UNSAT#	SATScore	TN$	PDN$
K=0	119	349	-10950	2547	0
K = 1	306	162	741	4419	2787
K = 2 (Default)	384	84	5016	4977	4564
K = 3	384	84	7147	4977	4564

Changing PDN Cost



(a) $\beta = 1$ (b) $\beta = 0.5$ (c) $\beta = 3$

(d) $\beta = 1$ (e) $\beta = 0.5$ (f) $\beta = 3$

Figure 3: PDN Decision Result of Changing β

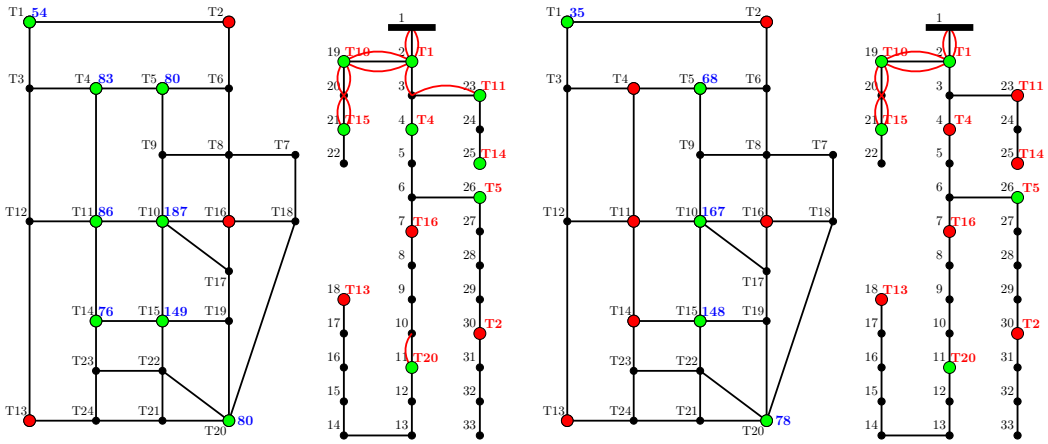
Table 6: TN Decision of Changing β

TN	T1	T2	T4	T5	T10	T11	T13	T14	T15	T16	T20
Default	42	0	46	0	110	72	0	70	97	118	37
$\beta = 0.5$	44	0	0	78	168	74	0	68	149	0	72
$\beta = 3$	29	0	0	66	163	36	37	38	45	0	0

Table 7: Factors of Changeing β

Factors	SAT#	UNSAT#	SATScore	TN$	PDN$
$\beta = 1$ (Default)	384	84	5016	4977	4564
$\beta = 0.5$	407	60	5924	5504	3824
$\beta = 3$	287	180	-1269	4420	3315

Change TN Cost



(a) TN $\alpha = 0.5$ (b) $PDN\alpha = 0.5$ (c) TN $\alpha = 3$ (d) PDN $\alpha = 3$

Figure 4: Decision Result of Changing K: The yellow node in (c) means the closed station compared with default case

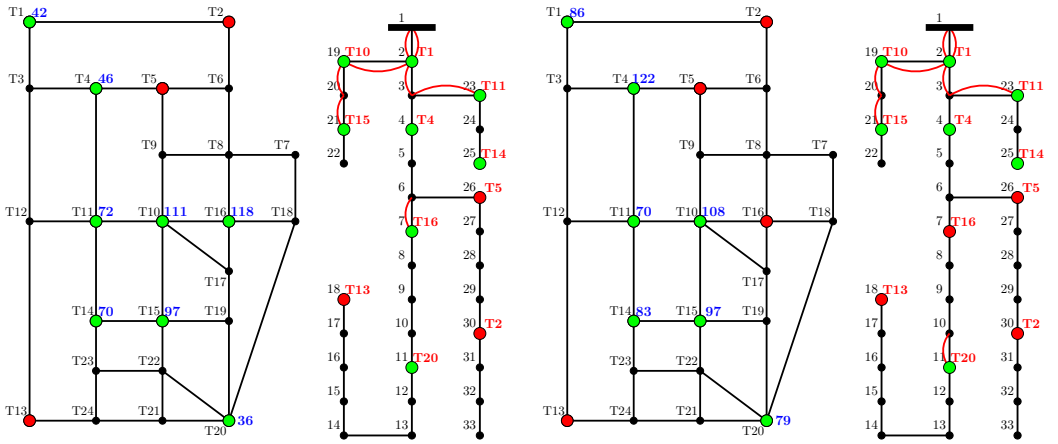
Table 8: Building Capacity for TN

TN	T1	T2	T4	T5	T10	T11	T13	T14	T15	T16	T20
Default	42	0	46	0	110	72	0	70	97	118	37
$\alpha = 0.5$	54	0	83	80	187	86	0	76	149	0	80
$\alpha = 3$	35	0	0	68	167	0	0	0	148	0	78

Table 9: Expansion Strategy for PDN

Factors	SAT#	UNSAT#	SATScore	TN$	PDN$
$\alpha = 1$(Default)	384	84	5016	4977	4564
$\alpha = 0.5$	419	49	6624	3241	4985
$\alpha = 3$	349	119	1729	12826	3558

Change Demand Pattern



(a) TN Default (b) PDN Default (c) TN Uniform (d) PDN Uniform

Figure 5: Decision Result of Changing K: The yellow node in (c) means the closed station compared with default case

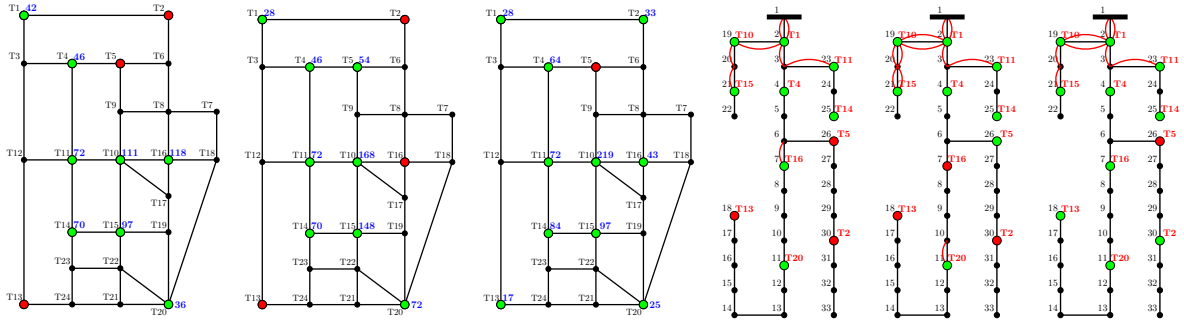
Table 10: Building Capacity for TN

TN	T1	T2	T4	T5	T10	T11	T13	T14	T15	T16	T20
Default	42	0	46	0	110	72	0	70	97	118	37
Uniform	86	0	122	0	108	70	0	83	97	0	79

Table 11: Expansion Strategy for PDN

Factors	SAT#	UNSAT#	SATScore	TN$	PDN$
Default	384	84	5016	4977	4564
Uniform	385	83	3883	5103	4689

Impact of Autonomous Vehicle - Allocation



(a) TN $\Delta U = 0$ (b) $\Delta U = 0.1$ (c) $\Delta U = 1$ (d) $\Delta U = 0$ (e) $\Delta U = 0.1$ (f) $\Delta U = 1$

Figure 6: PDN Expansion Comparasion

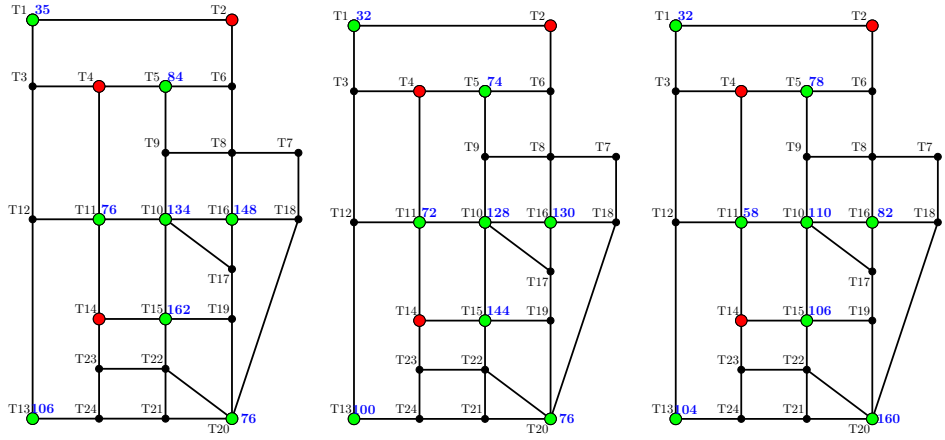
Table 12: Building Capacity for TN

TN	T1	T2	T4	T5	T10	T11	T13	T14	T15	T16	T20
Default	42	0	46	0	110	72	0	70	97	118	36
$\Delta U = 0.1$	28	0	46	54	168	72	0	70	148	0	72
$\Delta U = 1$	28	33	64	0	219	72	17	84	97	43	25

Table 13: Expansion Strategy for PDN

Factors	SAT#	UNSAT#	SATScore	TN$	PDN$
Default	384	84	5016	4977	4564
$\Delta U = 0.1$	427	41	7239	5798	5055
$\Delta U = 1$	447	21	8365	6317	4932

Impact of Autonomous Vehicle - Cost



(a) TN $\Delta U = 0$ (b) $\Delta U = 0.1$ (c) $\Delta U = 1$

Table 14: Building Capacity for TN

TN	T1	T2	T4	T5	T10	T11	T13	T14	T15	T16	T20
FreePDN	35	0	0	84	134	76	106	0	162	148	76
$\Delta U = 0.1$	32	0	0	74	128	72	100	0	144	130	76
$\Delta U = 1$	32	0	0	78	110	58	104	0	106	82	160

Table 15: Expansion Strategy for PDN

Factors	SAT#	UNSAT#	SATScore	TN$	PDN$
FreePDN	459	9	9813	5821	-
$\Delta U = 0.1$	453	5	9888	5530	-
$\Delta U = 1$	464	4	9726	5258	-