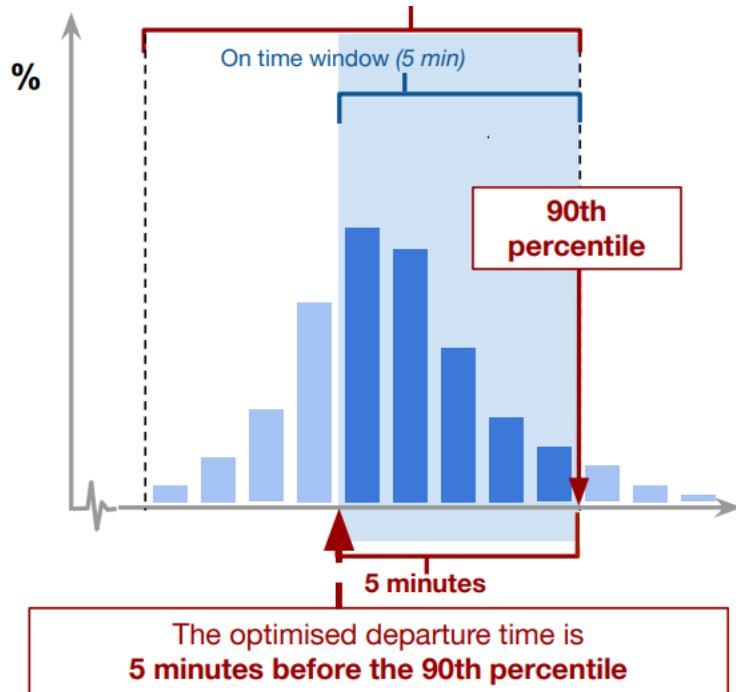


- The FlowOS approach to running time generation is fundamentally robust as it relies on **percentiles** and **probability**.
- Though averages can give a good and quick indication of likely running times, they are fundamentally flawed as they satisfy neither the probable worst case or optimal times.

Robustness whilst removing slack



- Allocating the 90th percentile goal would certainly deliver good OTP but would result in excess slack and slowing of customer journeys.

We need another step to get the best balance between cost/slack and punctuality

- To do this, the system allocates the fastest possible time that would still deliver 90% OTP in the event of 5 (or 4/3/2) minutes late running.
- Gives the best running times whilst ensuring 90% OTP is still achieved in worst case.
- In this example, the most common running time is allocated but with the insurance that it will still be 90% OTP in the event of late running.
- We control of both the percentile 'benchmark' as well as on-time window or 'buffer'.

Relationship to our inputs

DEFAULT TARGETS

Default OTP level

Default OTP thresholds

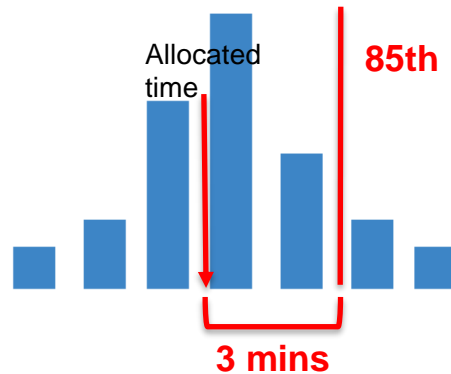
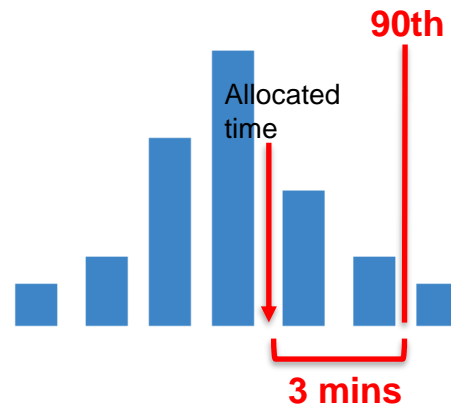
Default recovery level

DEFAULT TARGETS

Default OTP level

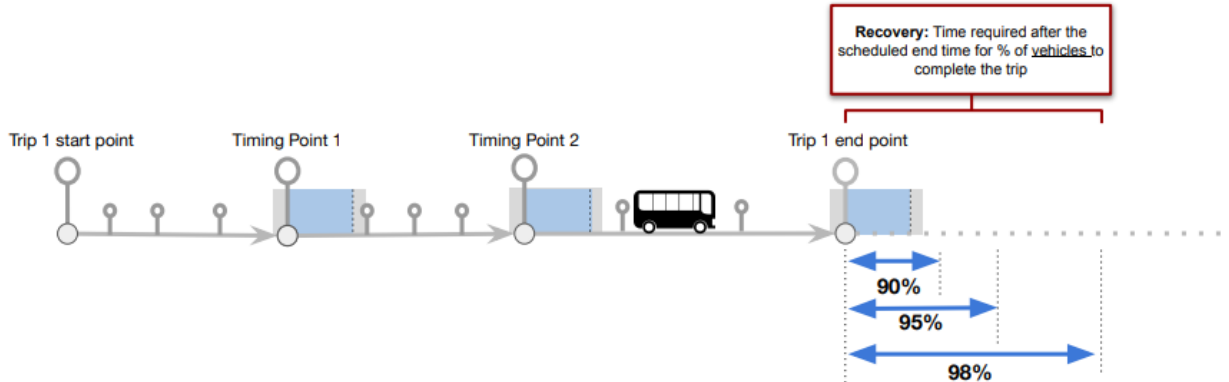
Default OTP thresholds

Default recovery level



Recovery time

Recovery times are calculated in a similar way, and specify how long it will take for 90%-98% of vehicles to complete the trip.



- As times generated are balanced between the optimal time and the TC window, it is crucially important that a high percentage of trips STA on-time.
- To solve this, there is a final piece of analysis done by the system that dictates the minimum recovery time for x% of trips observed to start their next trip on time.
- As the running times given allow for potential lateness of 5 (or whatever window given), the recovery time is generally at least greater than that 5 minutes (or whatever window given).

The trade-off: What levers can we pull?

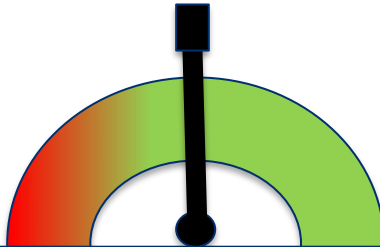
Resource/PVR



Impact on customer: Nil

- Simply make the case for adding the resource
- Might be a consideration for 'flagship' services

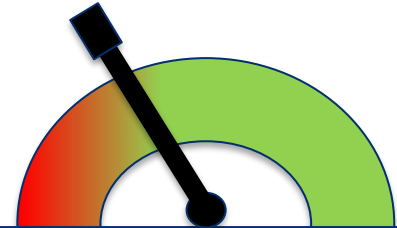
Frequency



Impact on customer: Med

- Allow frequency to flex +/- 2 minutes of desired
- Allow buses to step-back, missing trips in the hour

OTP



Impact on customer: High

- Increase OTP 'window'
- Reduce timing point OTP
- Or both
- Definitely not pinching time out of timeband to make it work on paper!

Doncaster 15: Clay Lane to Edlington



Last week's OTP: 85%

05:55: 43 mins

06:15: 43 mins

06:35: 44 mins

06:50: 48 mins

07:05: 53 mins

07:20: 53 mins

07:35: 58 mins

07:55: 63 mins

08:15: 63 mins

08:35: 58 mins

08:55: 53 mins

09:10: 53 mins

09:25: 53 mins

09:40: 53 mins

09:55: 53 mins

Service No.:	15	15	15	15	15	15	15	15	15	15
Notes:										
Clay Lane Estate, Jefferson Ave - 370045343	----	----	0555	0615	0635	0650	0705	0720	0735	0755
Wheatley, Beckett Rd - 370045136	----	----	0601	0621	0641	0656	0713	0728	0745	0805
Doncaster Intc [A8] arr - 370010245	----	----	0613	0633	0653	0706	0728	0743	0803	0823
Doncaster Intc [A8] dep - 370010245	0506	0536	0616	0636	0656	0711	0731	0746	0806	0826
Warmsworth, Cecil Hotel - 370045161	0517	0547	0627	0646	0707	0726	0746	0801	0821	0844
Edlington, Hatter Dr - 370045207	0527	0557	0638	0658	0719	0738	0758	0813	0833	0858

Service No.:	15	15	15	15	15	15	15	15	15	15
Notes:										
Clay Lane Estate, Jefferson Ave - 370045343	0815	0835	0855	0910	0925	0940	0955	1010	1025	1040
Wheatley, Beckett Rd - 370045136	0825	0845	0903	0918	0933	0948	1003	1018	1033	1048
Doncaster Intc [A8] arr - 370010245	0843	0903	0918	0933	0948	1003	1018	1033	1048	1103
Doncaster Intc [A8] dep - 370010245	0846	0906	0921	0936	0951	1006	1021	1036	1051	1106
Warmsworth, Cecil Hotel - 370045161	0904	0921	0936	0951	1006	1021	1036	1051	1106	1121
Edlington, Hatter Dr - 370045207	0918	0933	0948	1003	1018	1033	1048	1103	1118	1133

Sheffield 24: Woodhouse to Lowedges



Service No.:	24	24	24	24	24	24	24	24	24	24
Notes:										
Woodhouse, Cross St - 370020349	0530	0600	0620	0640	0700	0720	0740	0800	0820	0840
Castlebeck Ave, Lidl - 370023229	0545	0615	0635	0700	0720	0740	0800	0823	0843	0858
Manor Park Centre Shops - 370023232	0548	0618	0638	0703	0725	0745	0805	0828	0848	0903
O2 Academy [AG9] arr - 370022801	0600	0630	0650	0715	0737	0757	0822	0840	0900	0915
O2 Academy [AG9] dep - 370022801	0602	0632	0652	0717	0739	0759	0824	0842	0902	0917
Queens Road, Asda - 370023291	0612	0642	0702	0727	0749	0809	0834	0852	0912	0927
Woodseats, Abbey Lane - 370021440	0626	0656	0716	0741	0803	0823	0848	0906	0926	0941
Lowedges, The Grennel Mower - 370020434	0636	0706	0726	0751	0816	0836	0901	0916	0936	0951

Service No.:	24	24	24	24	24	24	24	24	24	24
Notes:										
Woodhouse, Cross St - 370020349	0900	0915	0930	0945	1000	1015	1030	1045	1100	1115
Castlebeck Ave, Lidl - 370023229	0915	0930	0945	1000	1015	1030	1045	1100	1115	1130
Manor Park Centre Shops - 370023232	0918	0933	0948	1003	1018	1033	1048	1103	1118	1133
O2 Academy [AG9] arr - 370022801	0930	0945	1000	1015	1030	1045	1100	1115	1130	1145
O2 Academy [AG9] dep - 370022801	0932	0947	1002	1017	1032	1047	1102	1117	1132	1147
Queens Road, Asda - 370023291	0942	0957	1012	1027	1042	1057	1112	1127	1142	1157
Woodseats, Abbey Lane - 370021440	0956	1011	1026	1041	1056	1111	1126	1141	1156	1211
Lowedges, The Grennel Mower - 370020434	1006	1021	1036	1051	1106	1121	1136	1151	1206	1221

Last week's OTP: 85.7%

05:30: 66 mins

06:00: 66 mins

06:20: 66 mins

06:40: 71 mins

07:00: 76 mins

07:20: 76 mins

07:40: 81 mins

08:00: 76 mins

08:20: 76 mins

08:40: 71 mins

09:00: 66 mins

09:15: 66 mins

09:30: 66 mins

09:45: 66 mins