Modelling Urban Public Transportation Networks to Support Robust Routing

Kateřina Böhmová, Matúš Mihalák, Tobias Pröger, Peter Widmayer

Stops

Stops

Stops

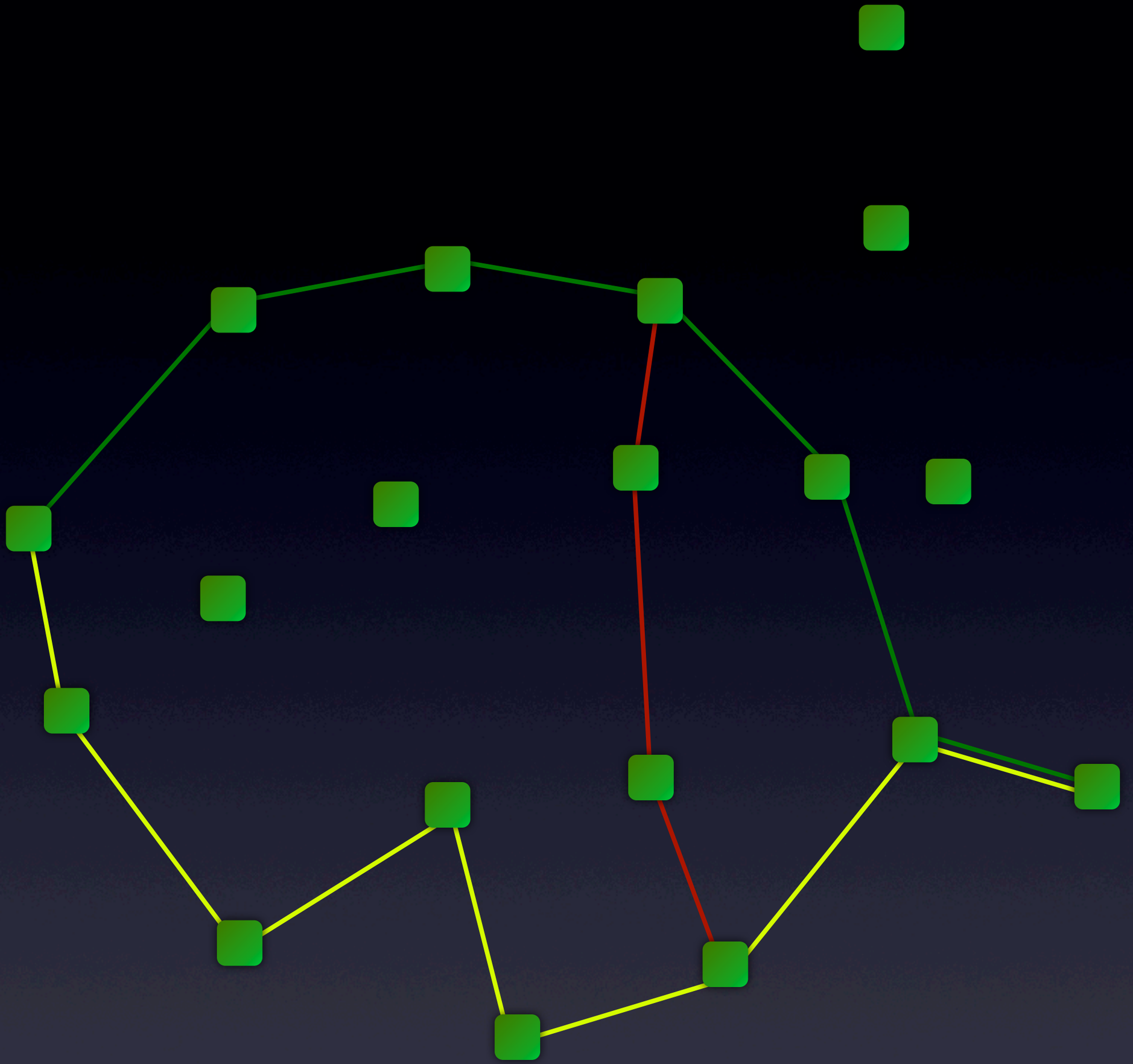
Lines

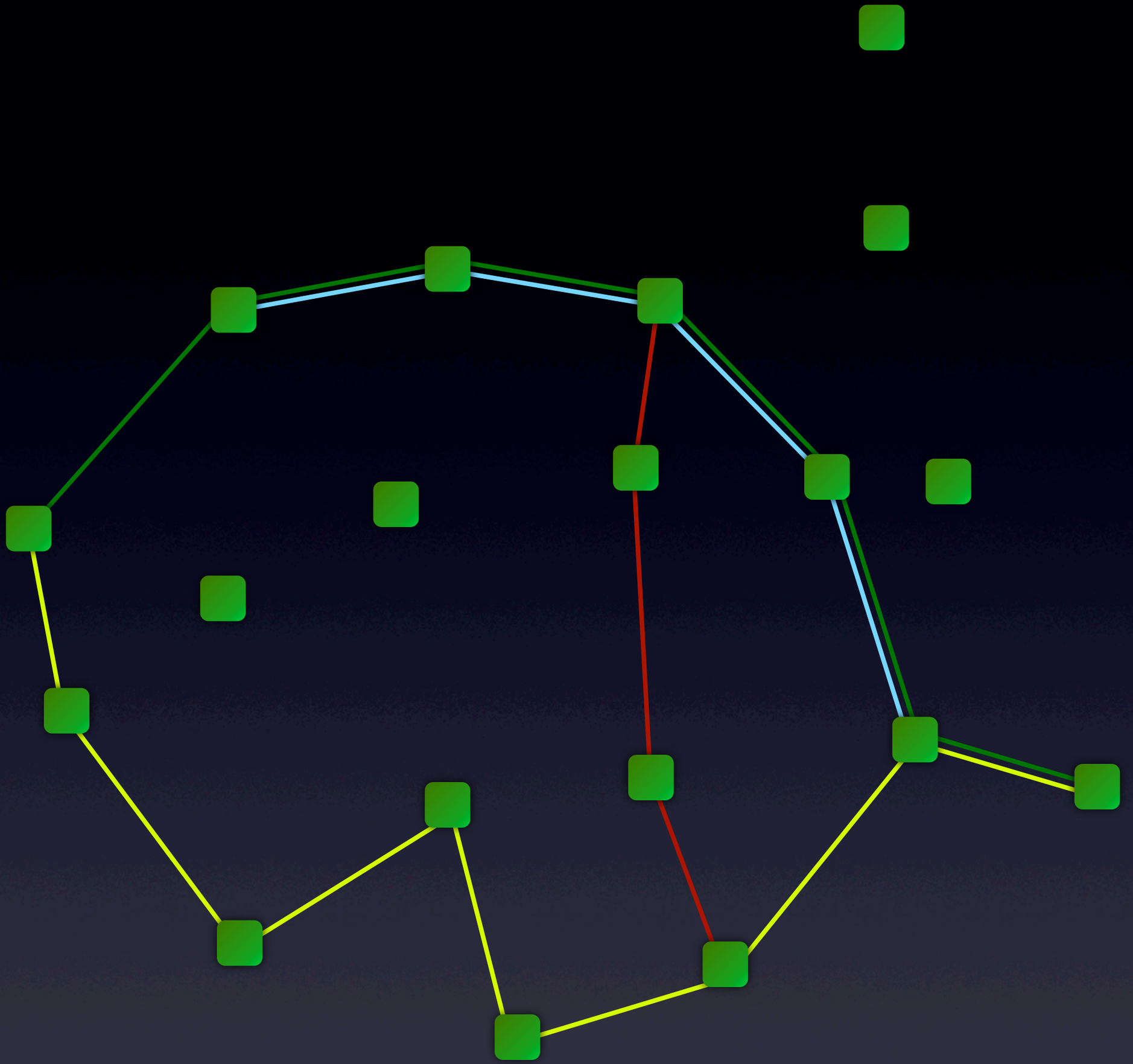
Stops

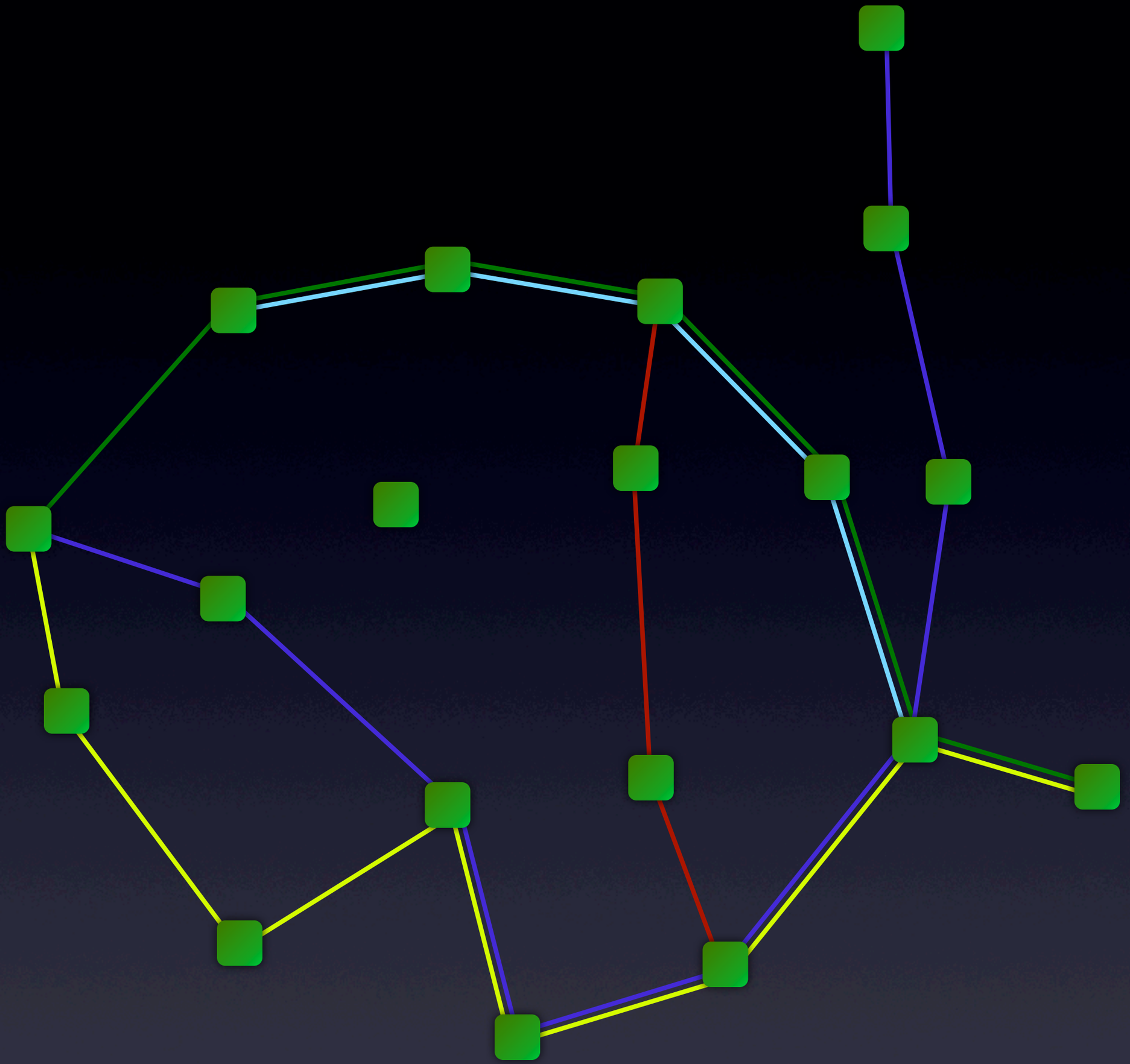
Lines

Stops

Lines

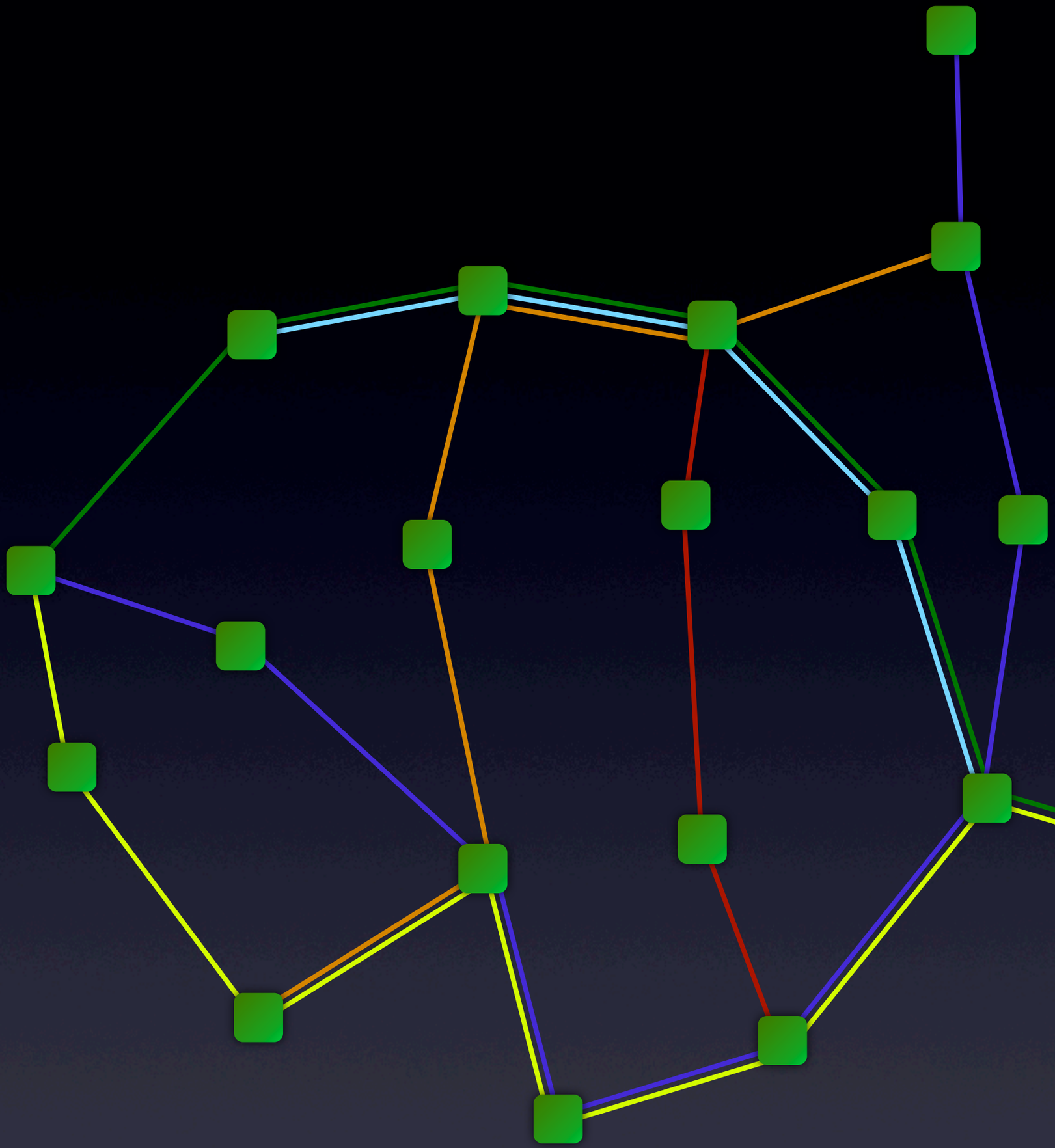

Stops
Lines


Stops
Lines



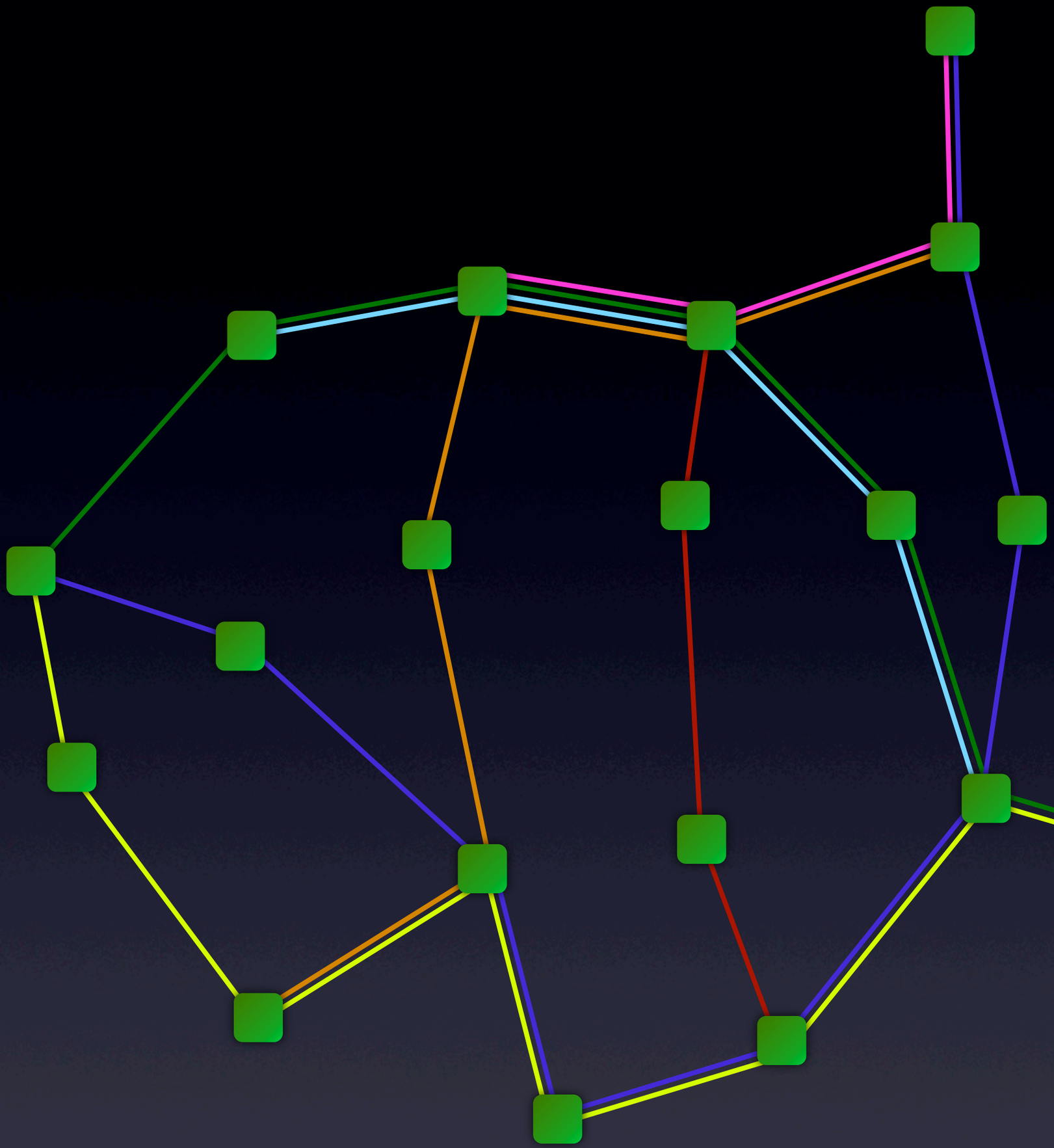
Stops

Lines



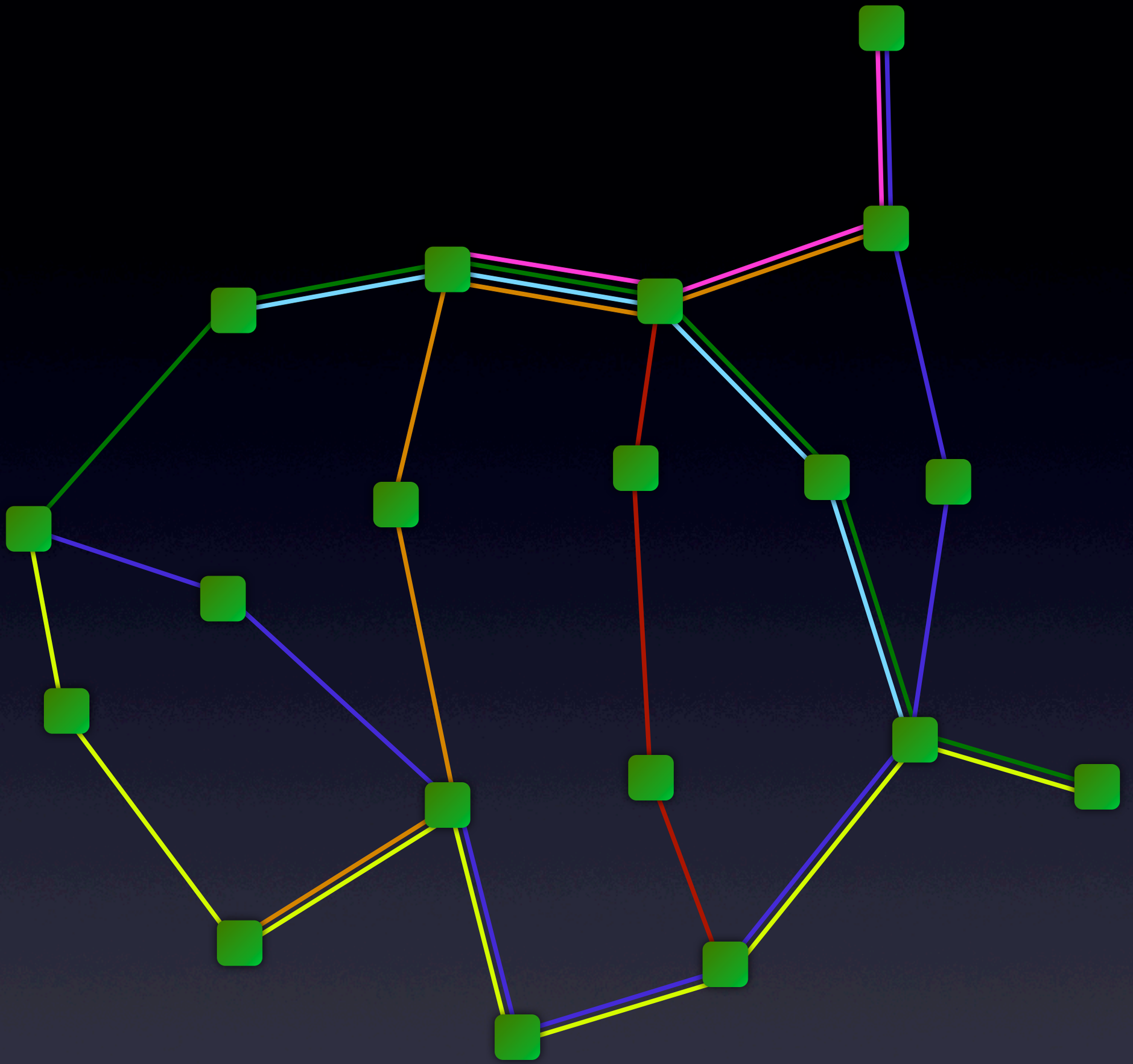
Stops

Lines



Stops

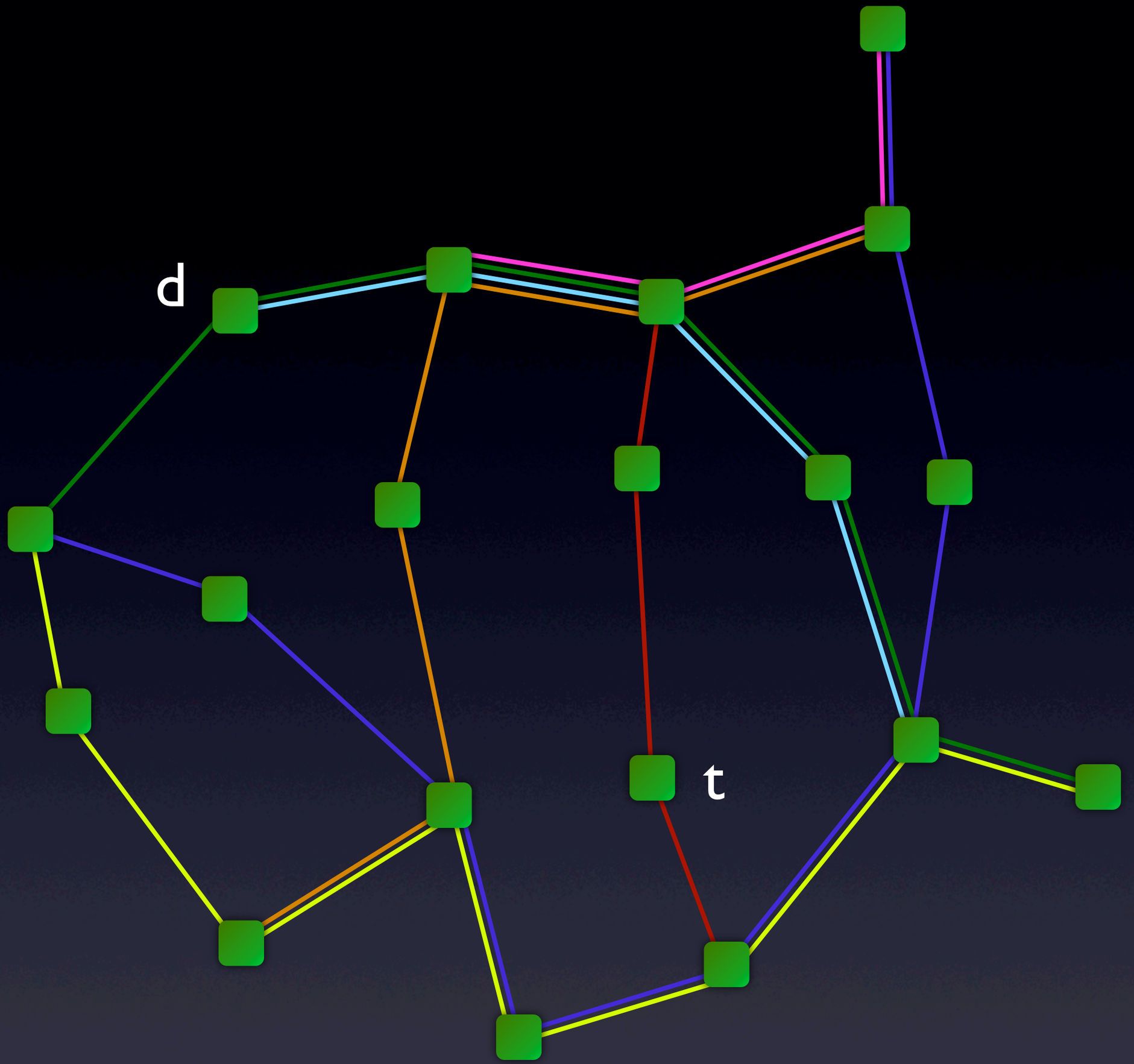
Lines



Stops

Lines

Timetable



Stops

Lines

Timetable

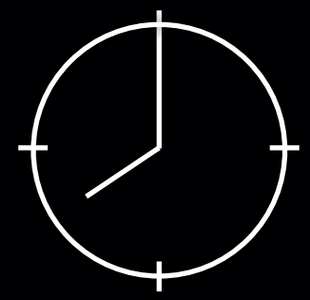
d

t

Stops

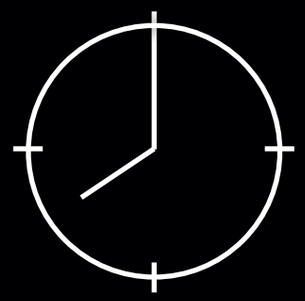
Lines

Timetable



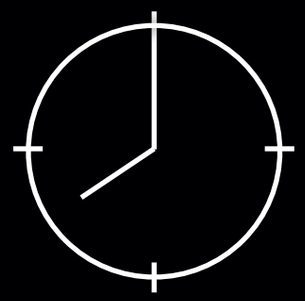
Home

ETH



Home → (4 Minutes) → Main Station → (7 Minutes) → ETH

07:34	31		07:40	10	
07:35	3		07:42	6	
07:39	14		07:47	10	
07:42	31		07:49	6	
07:43	3		07:55	10	
...			...		



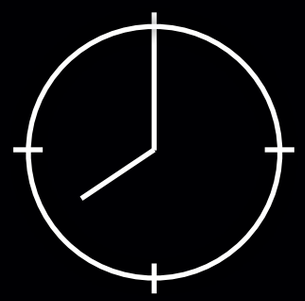
4 Minutes

7 Minutes

Home → Main Station → ETH

07:34	31
07:35	3
07:39	14
07:42	31
07:43	3
...	

07:40	10
07:42	6
07:47	10
07:49	6
07:55	10
...	



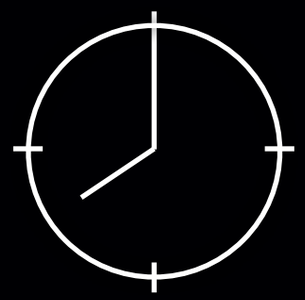
7 Minutes

10 Minutes

Home → Main Station → ETH

07:34	31
07:35	3
07:39	14
07:42	31
07:43	3
...	

07:42	10
07:44	6
07:48	10
07:54	6
07:59	10
...	



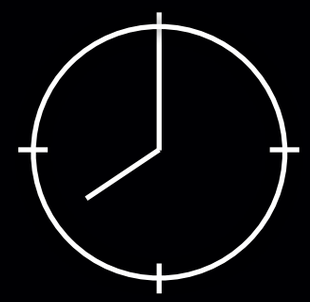
7 Minutes

10 Minutes

Home → Main Station → ETH

07:34	31
07:35	3
07:39	14
07:42	31
07:43	3
...	

07:42	10
07:44	6
07:48	10
07:54	6
07:59	10
...	



7 Minutes

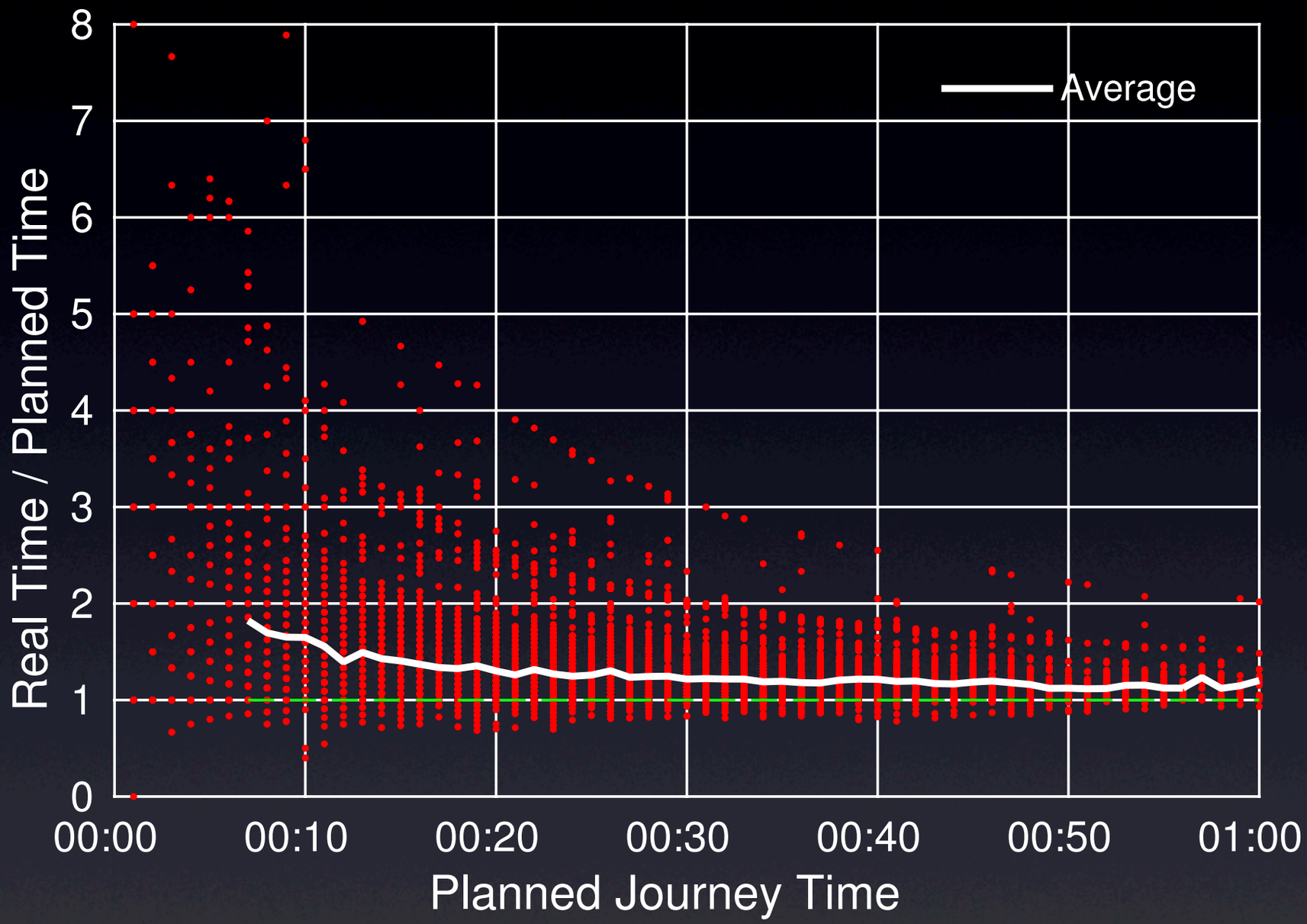
10 Minutes

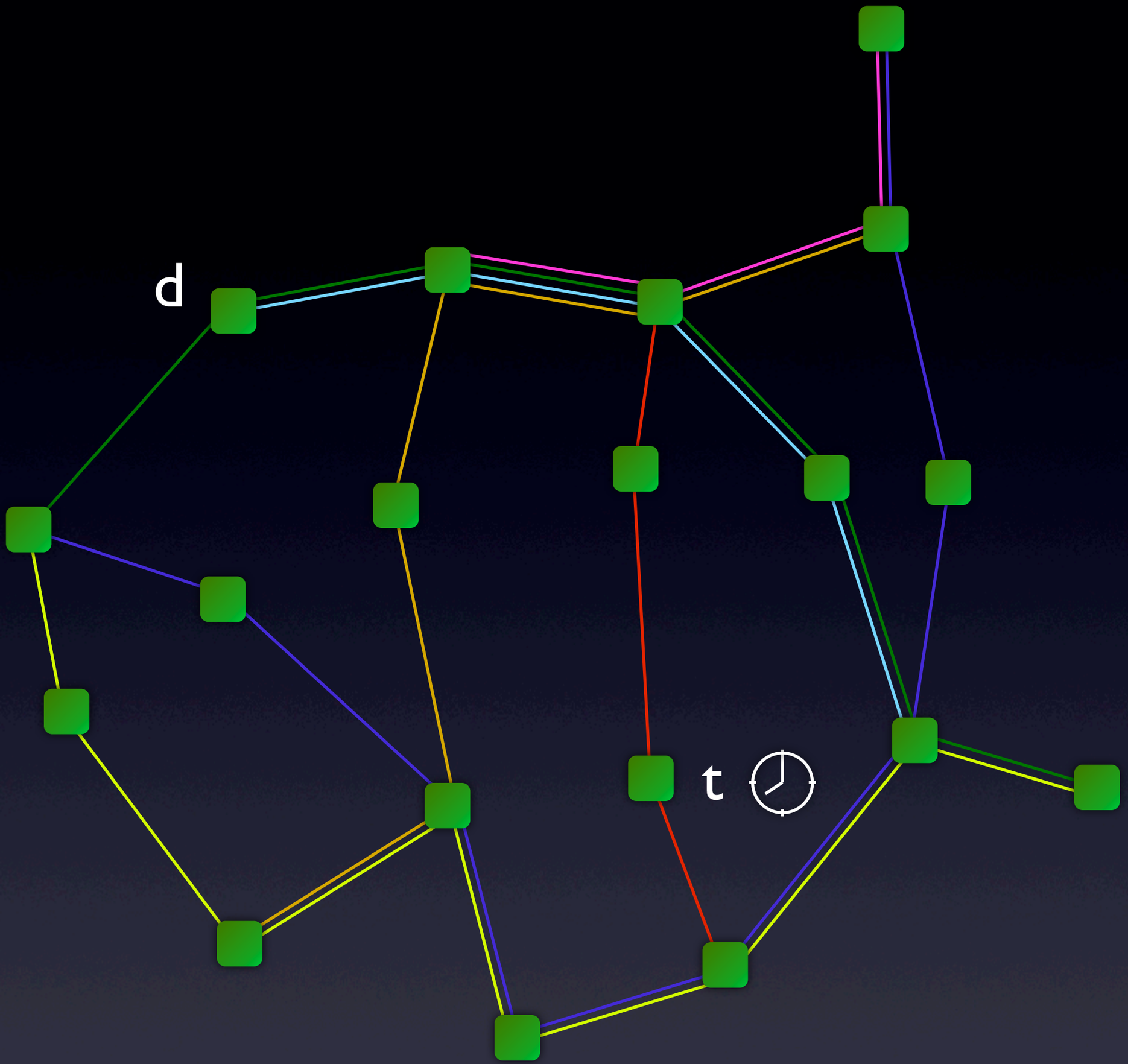
Home → Main Station → ETH

07:34	31
07:35	3
07:39	14
07:42	31
07:43	3
...	

07:42	10
07:44	6
07:48	10
07:54	6
07:59	10
...	

Planned vs. Real Travel Time




d
t

d

t

Stops

Lines

Timetable

d

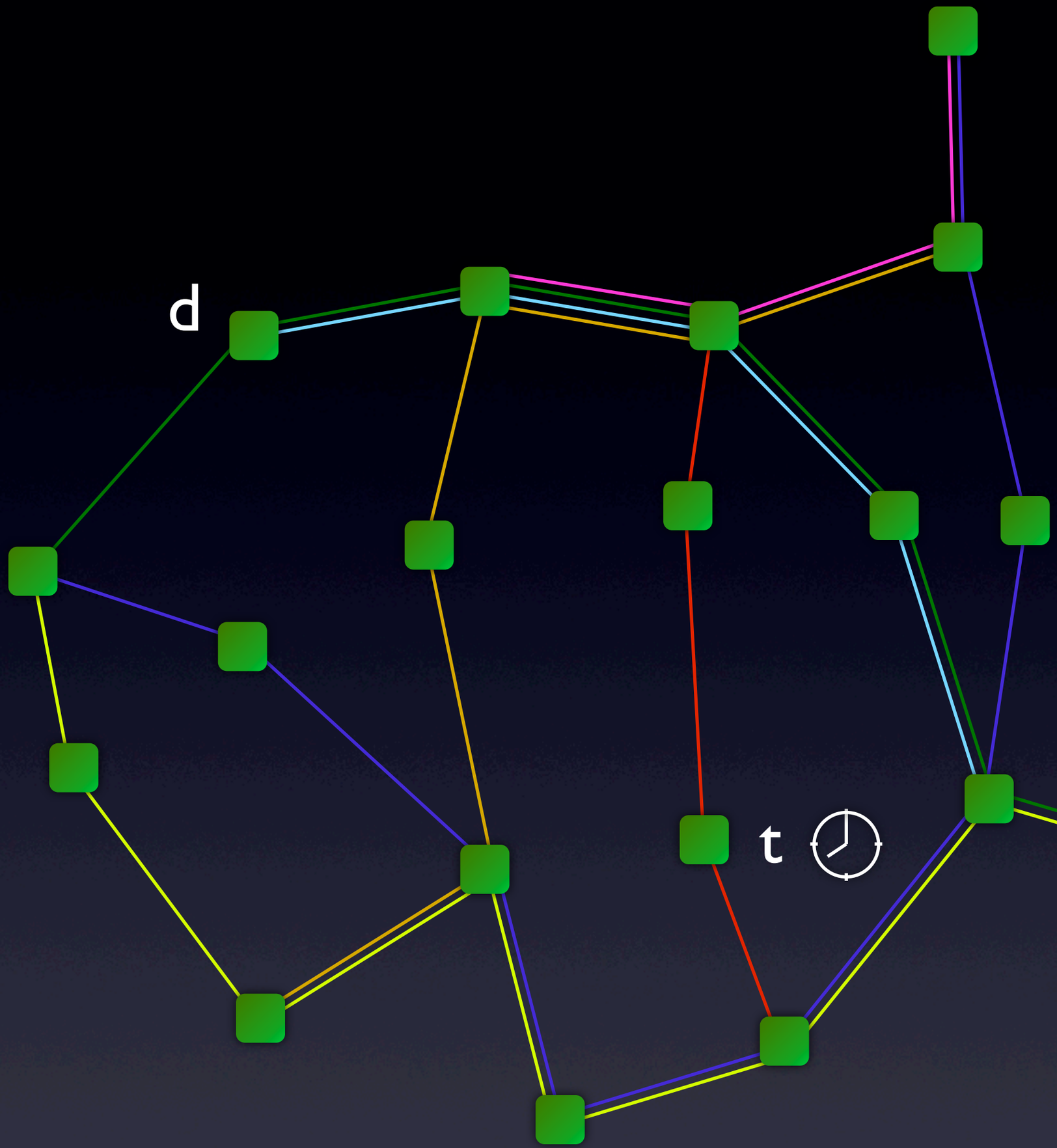
t

Stops

Lines

Timetable

Recorded timetables



Stops

Lines

Timetable

Recorded timetables

Solutions?

07:43	from	Zürich, Sihlpost/HB
	3	Direction: Zürich, Klusplatz
07:47 07:49	to from	Zürich HB
	6	Direction: Zürich, Zoo
07:56	to	Zürich, ETH/Universitätsspital

Zürich, Sihlpost/HB 3 Zürich HB 6 Zürich, ETH/Universitätsspital

3 Zürich HB 6

3 6

3
6

3
6

Tuesday

21 Minutes

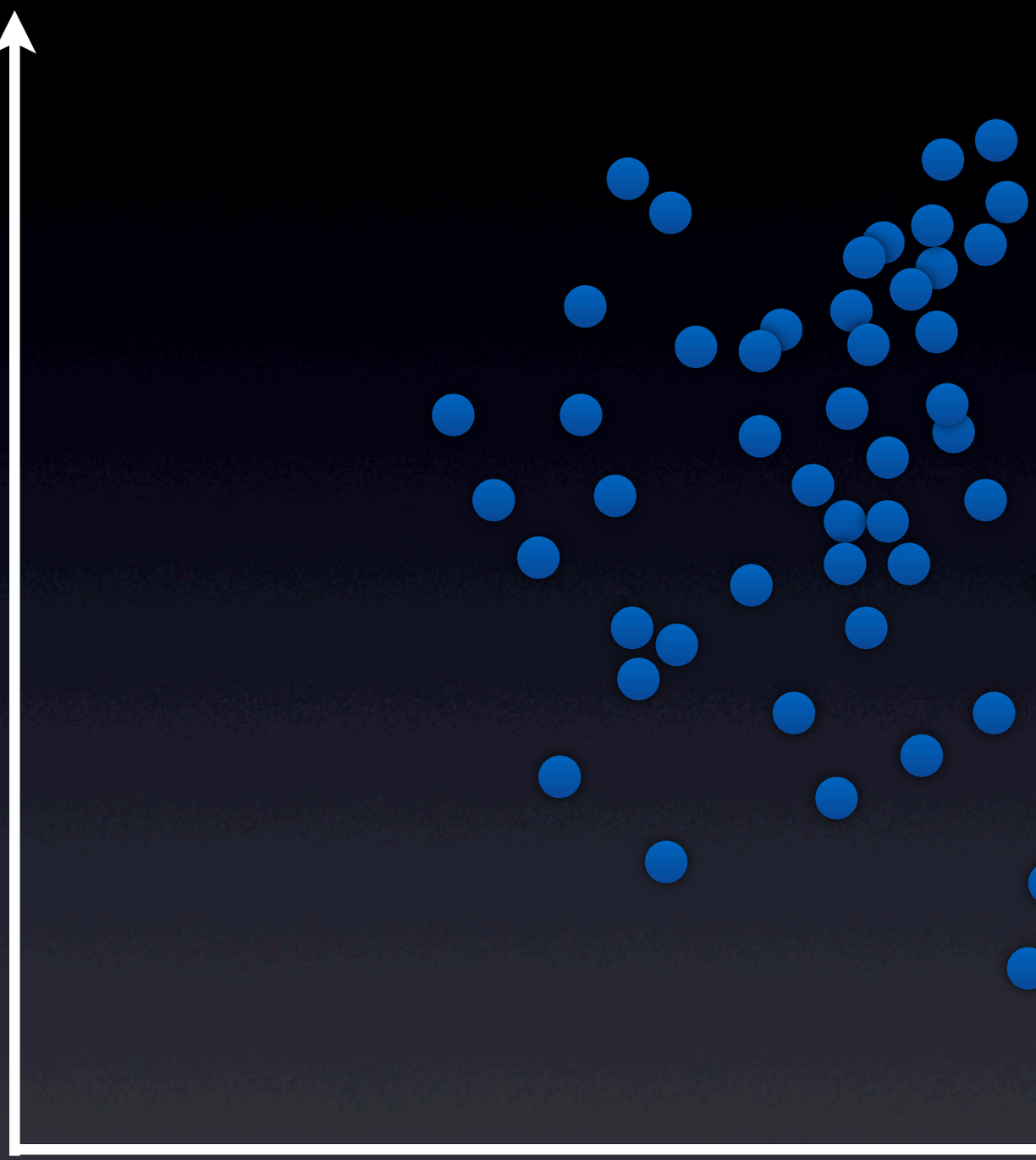
16 Minutes

Wednesday

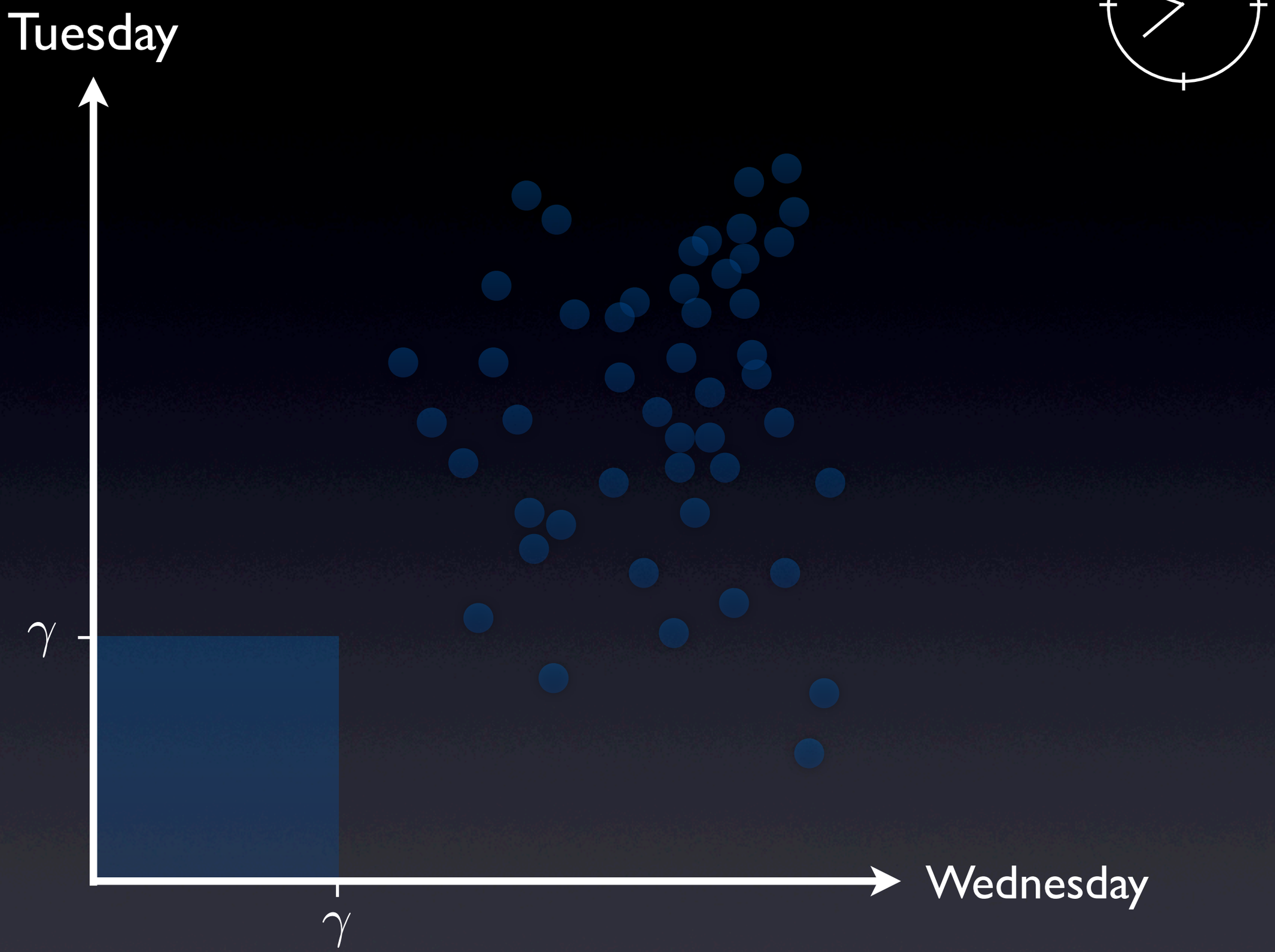
3

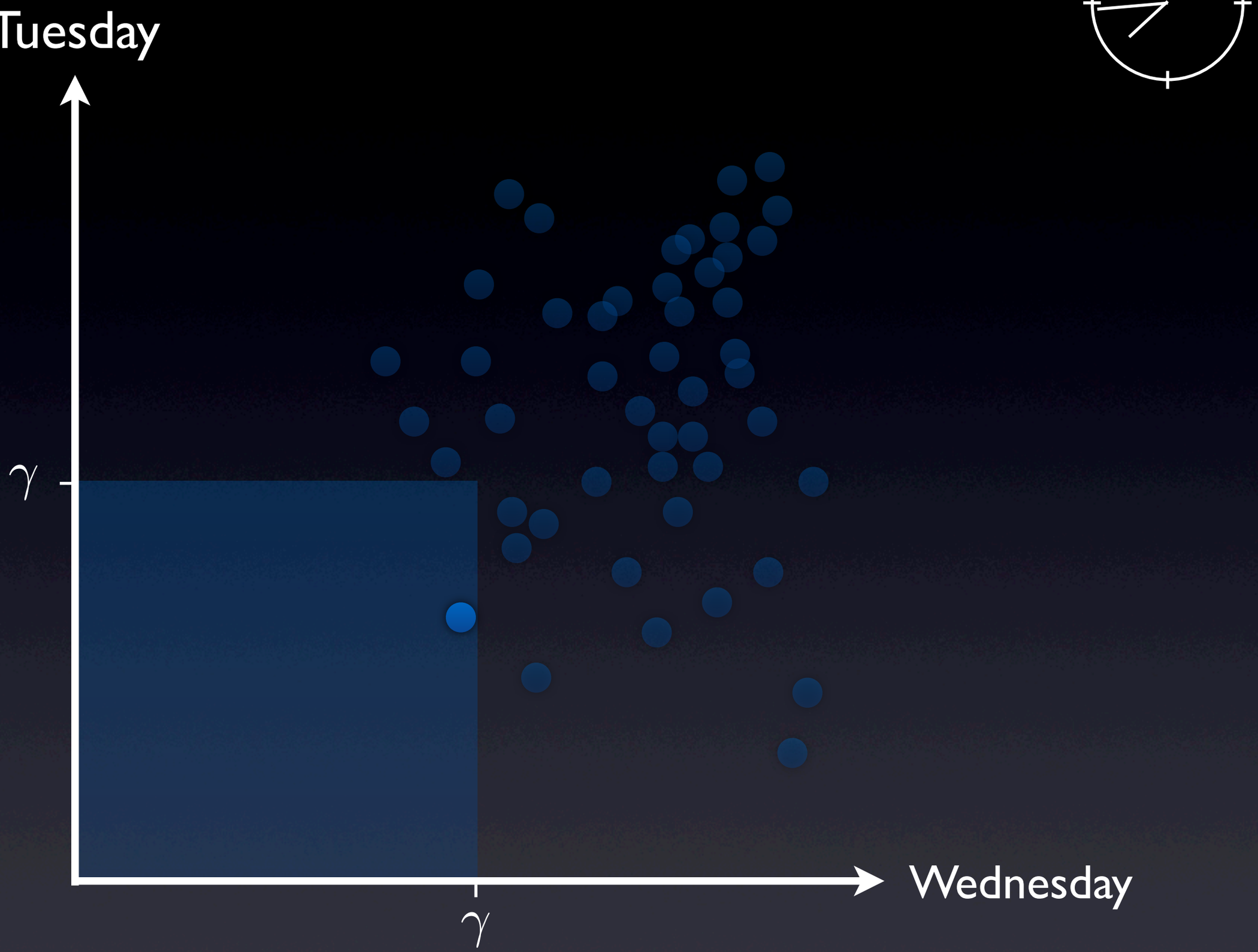
6

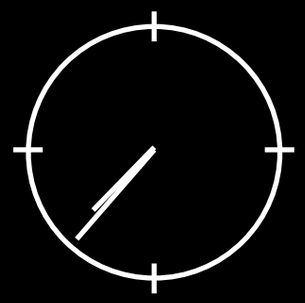
Tuesday

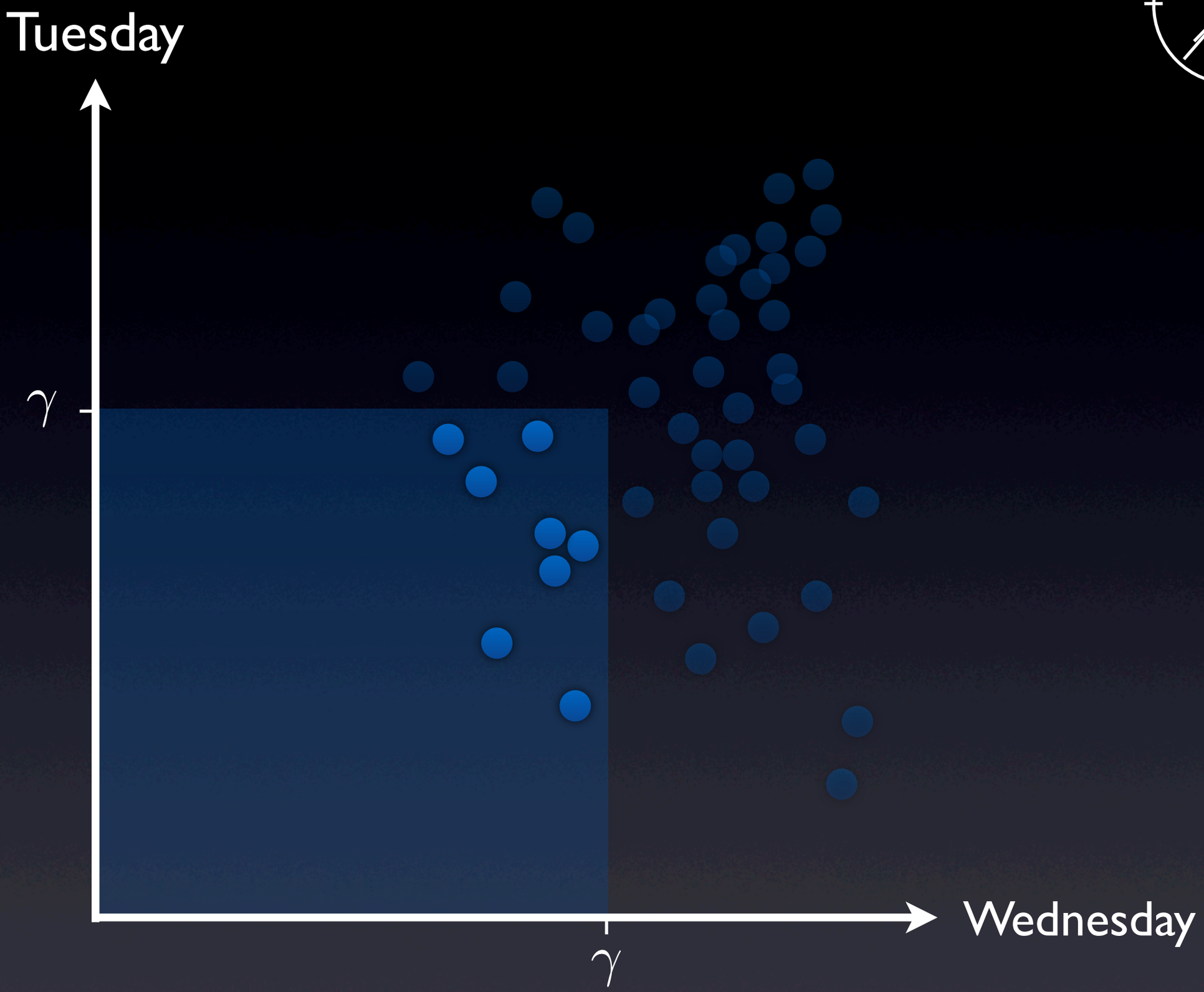


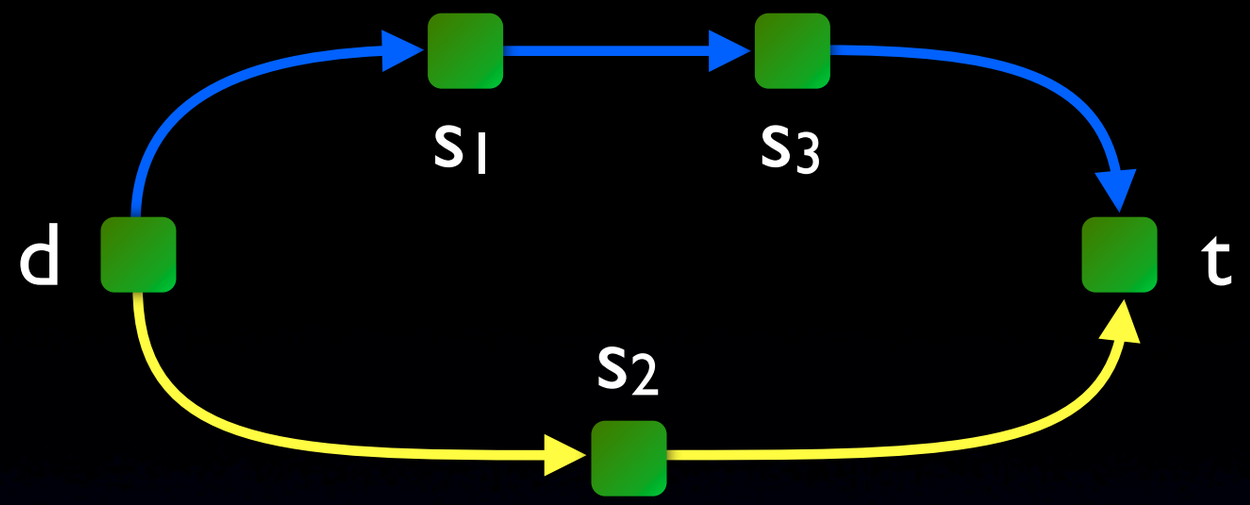
Wednesday

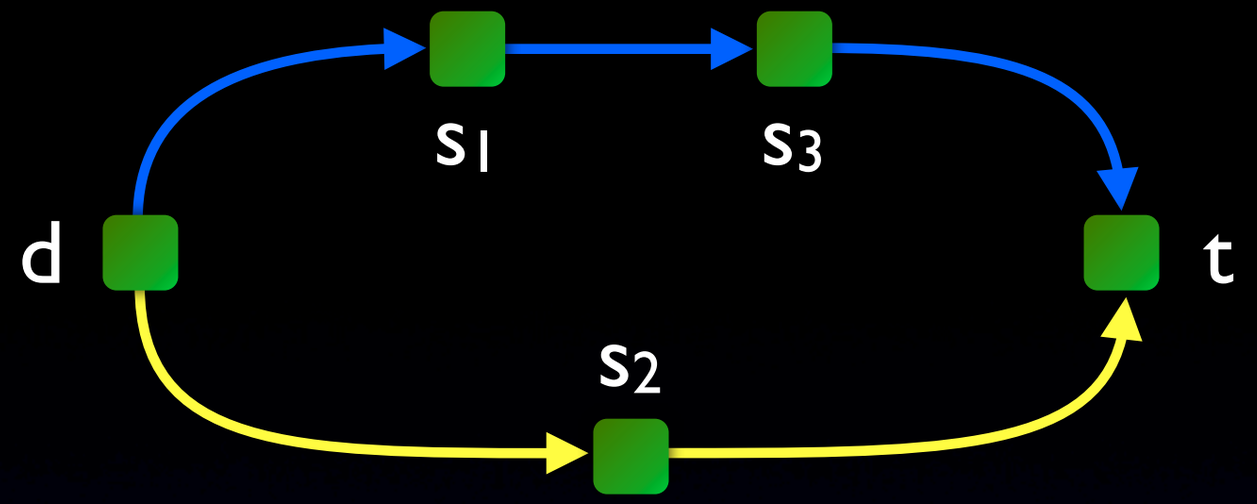

Tuesday
γ
γ
Wednesday


Tuesday
γ
γ
Wednesday

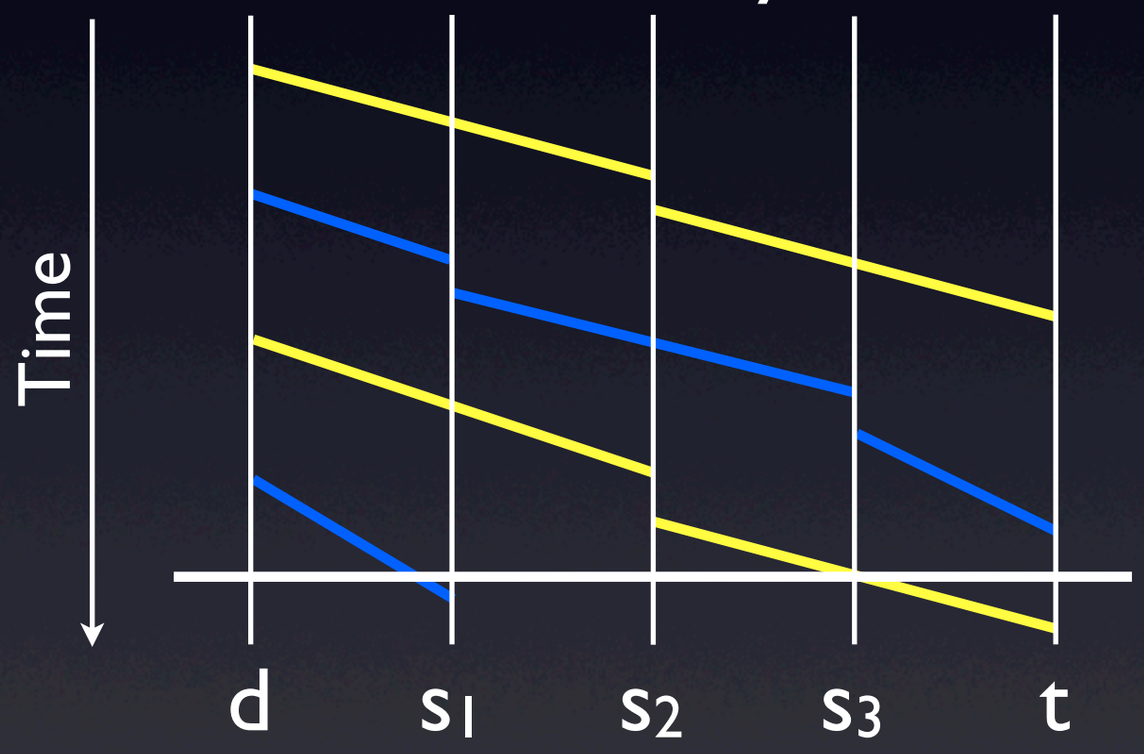



Tuesday
γ
γ
Wednesday

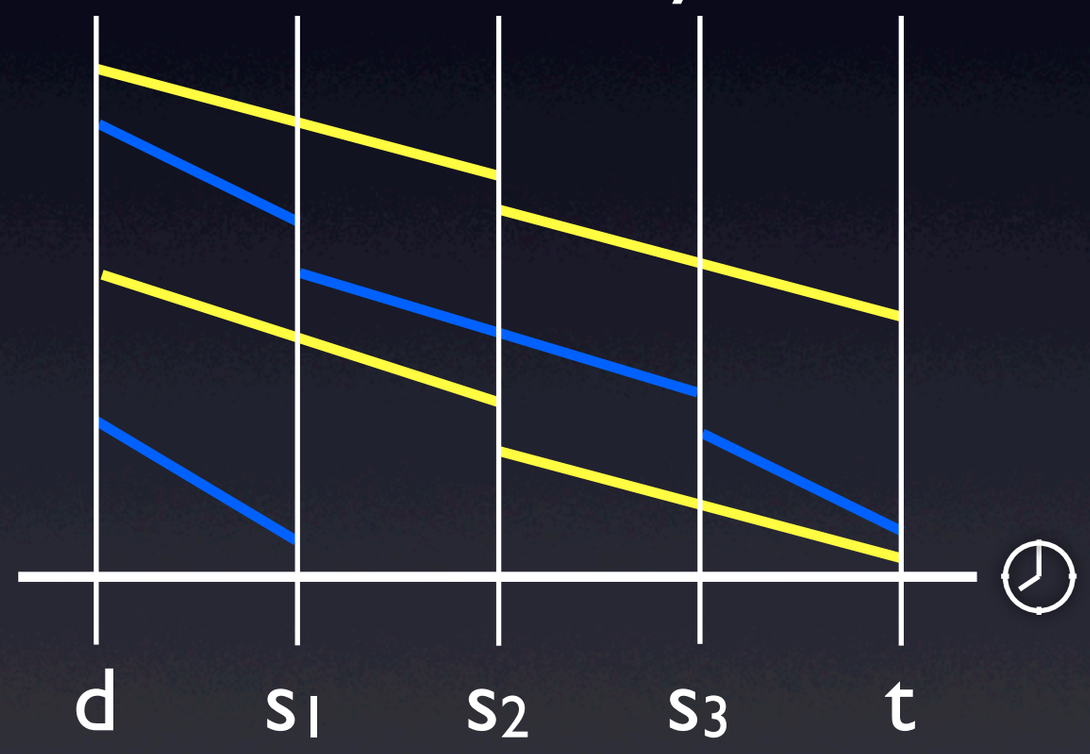

s1
s3
d
t
s2

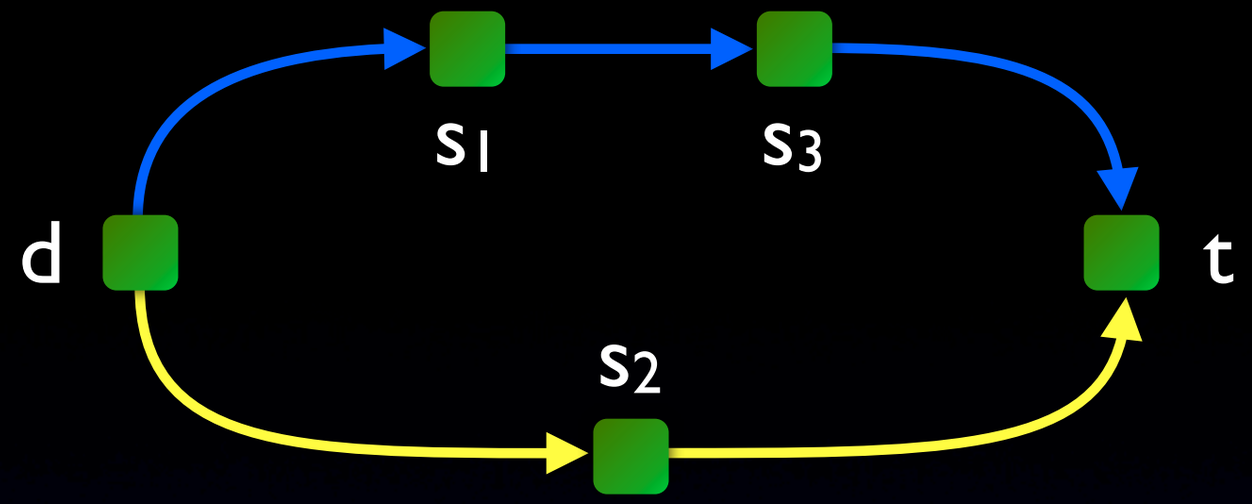


Tuesday



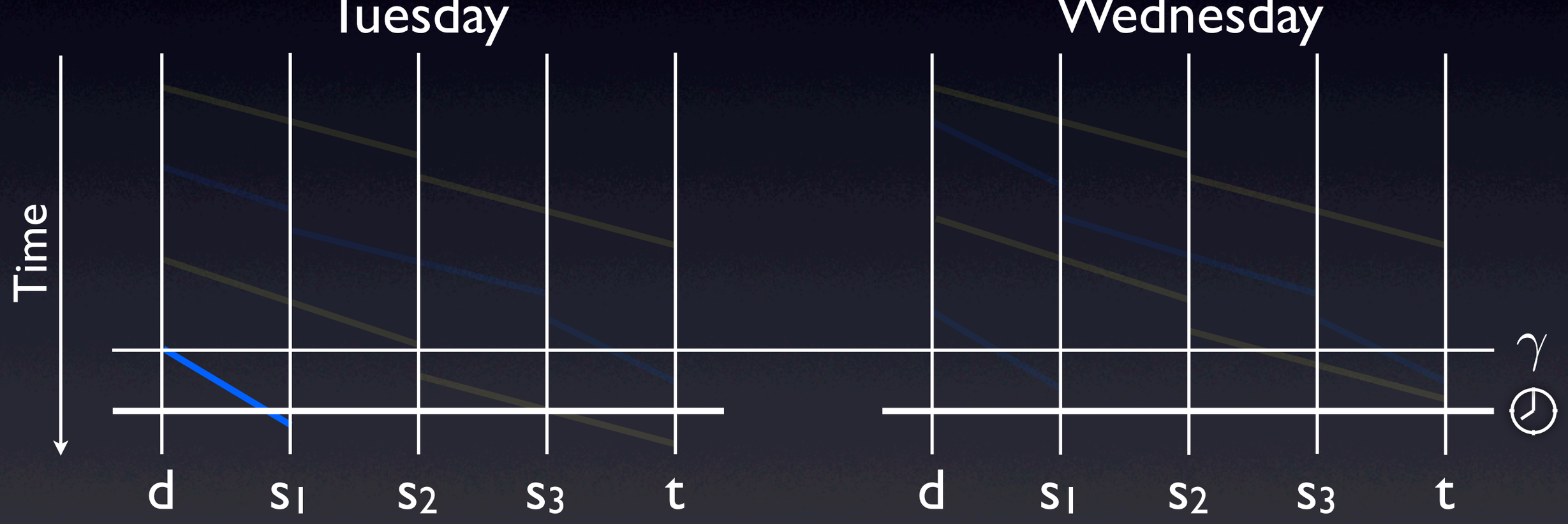
Wednesday

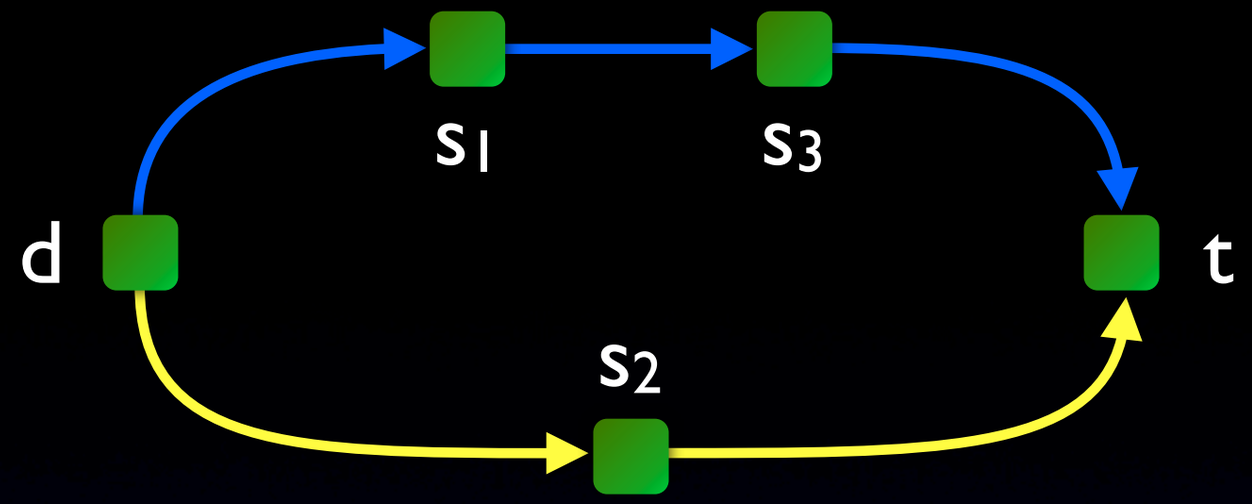




Tuesday

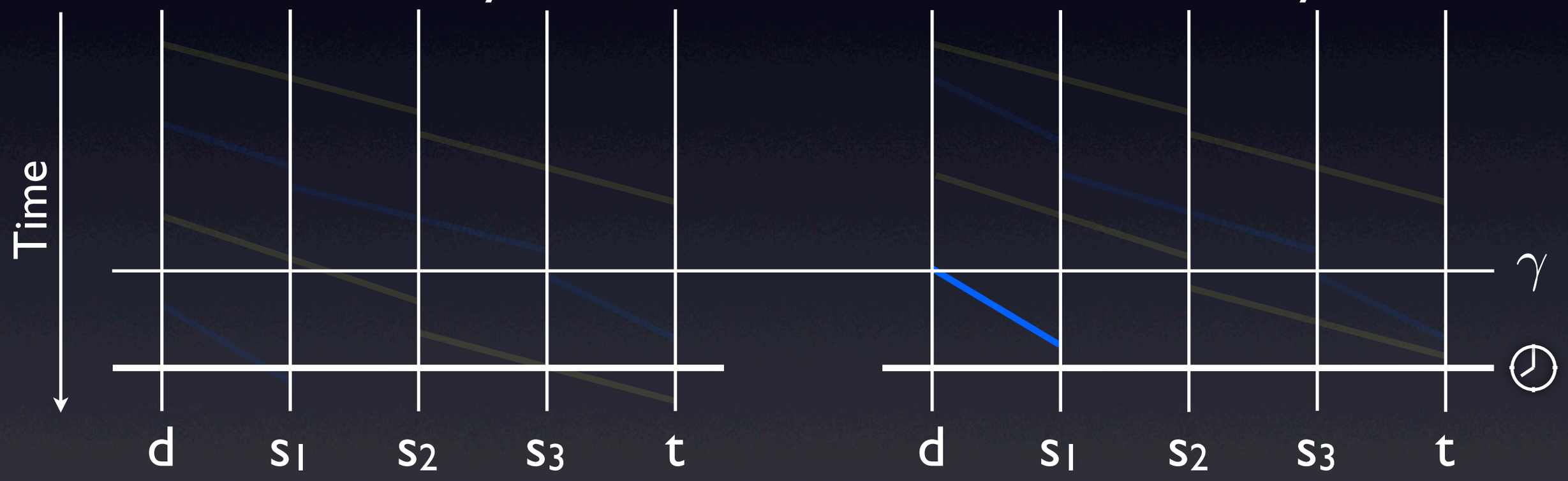
Wednesday

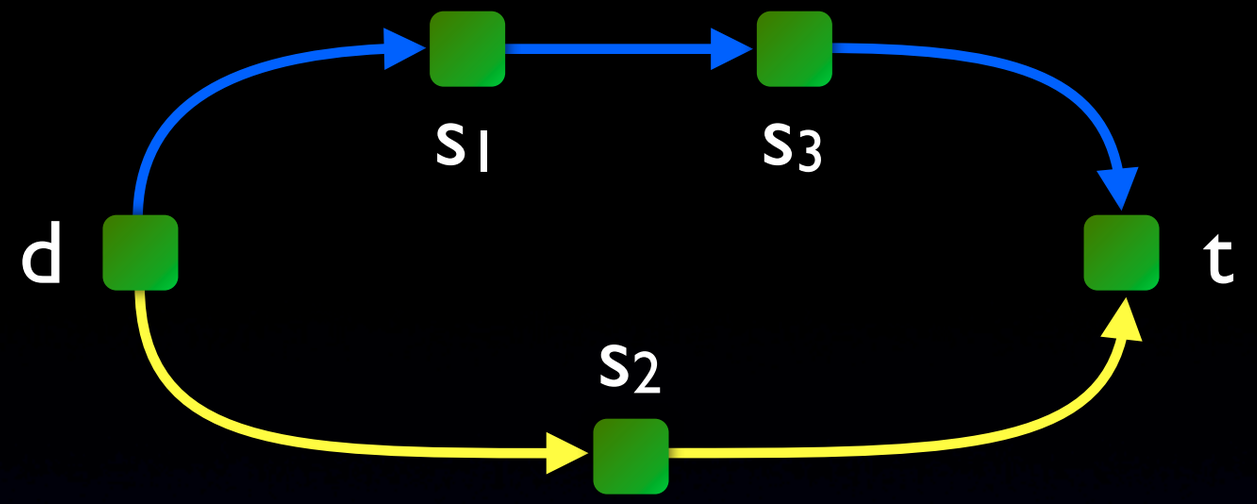




Tuesday

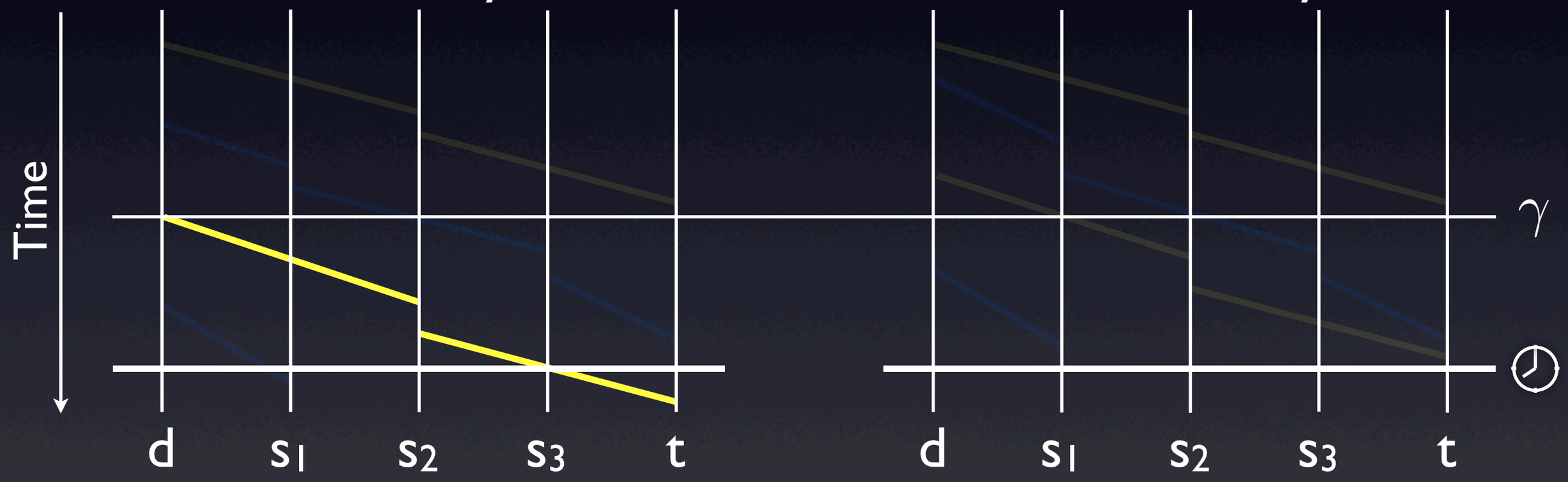
Wednesday

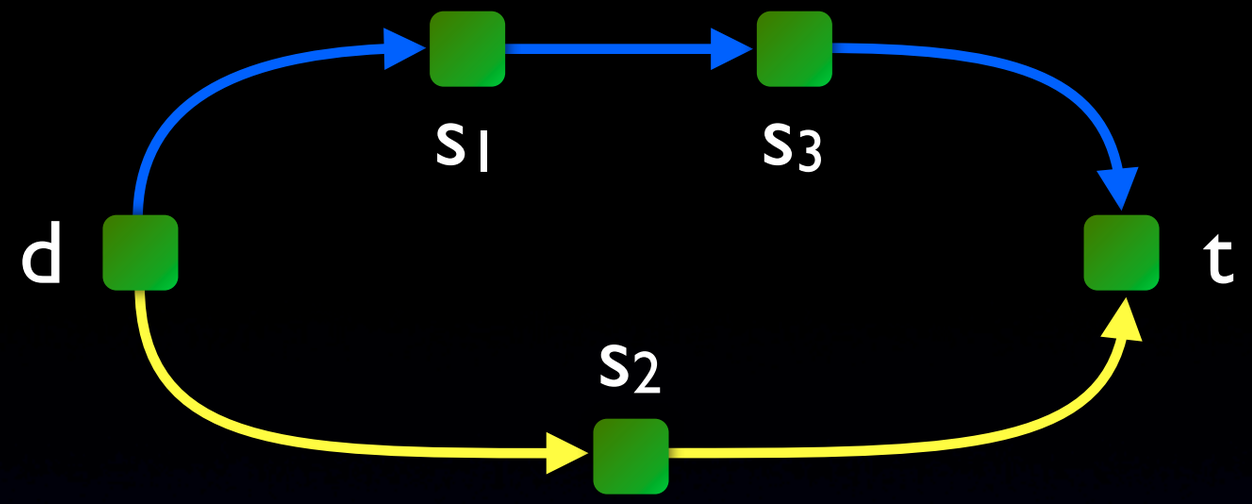




Tuesday

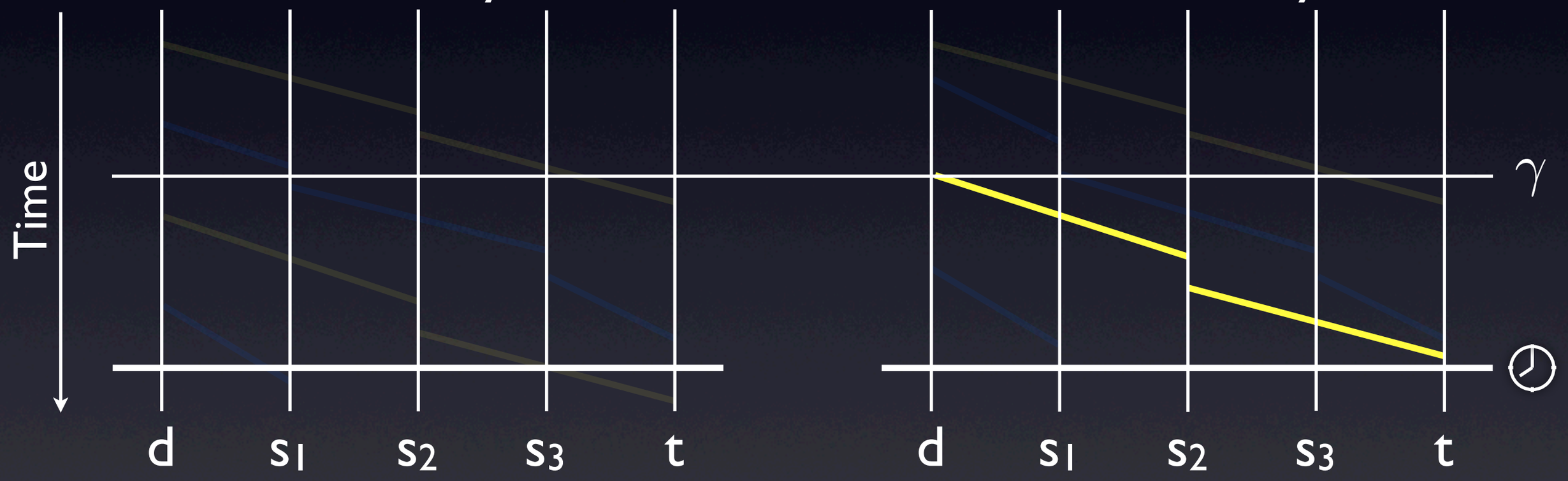
Wednesday

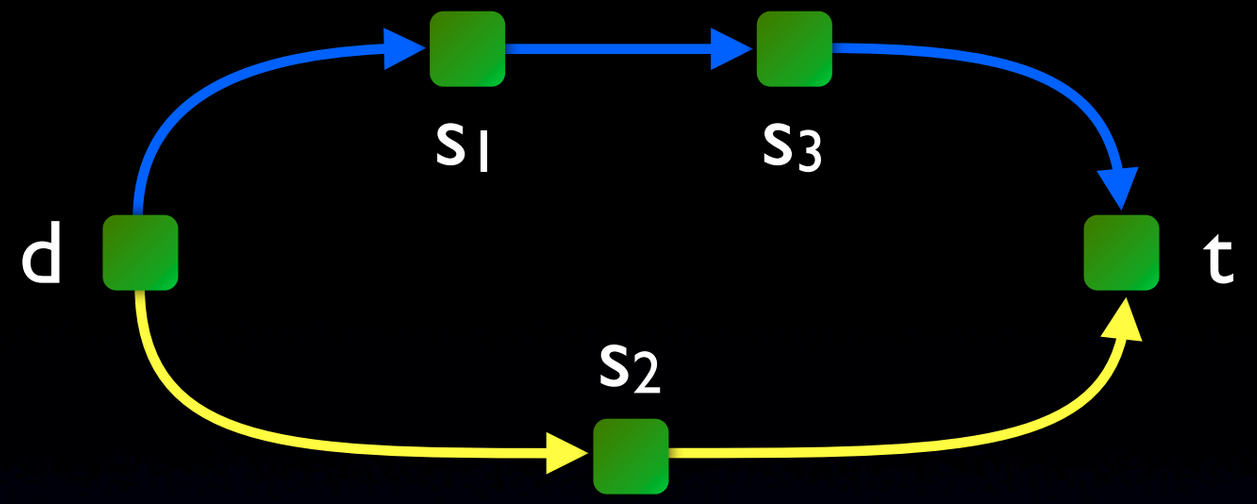




Tuesday

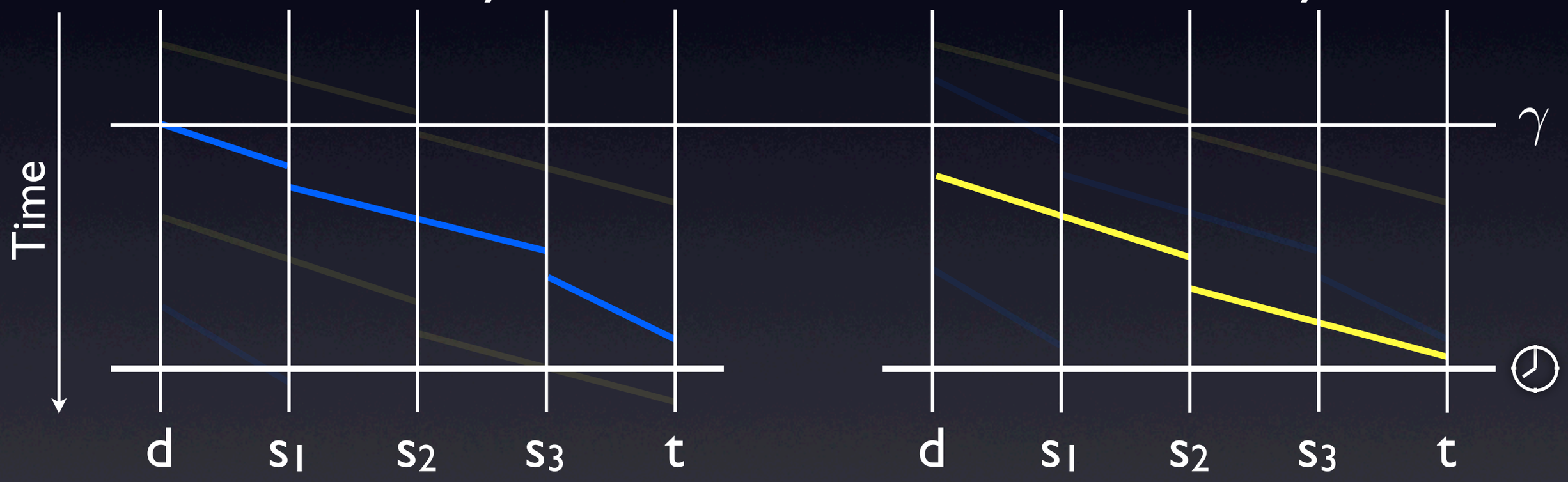
Wednesday

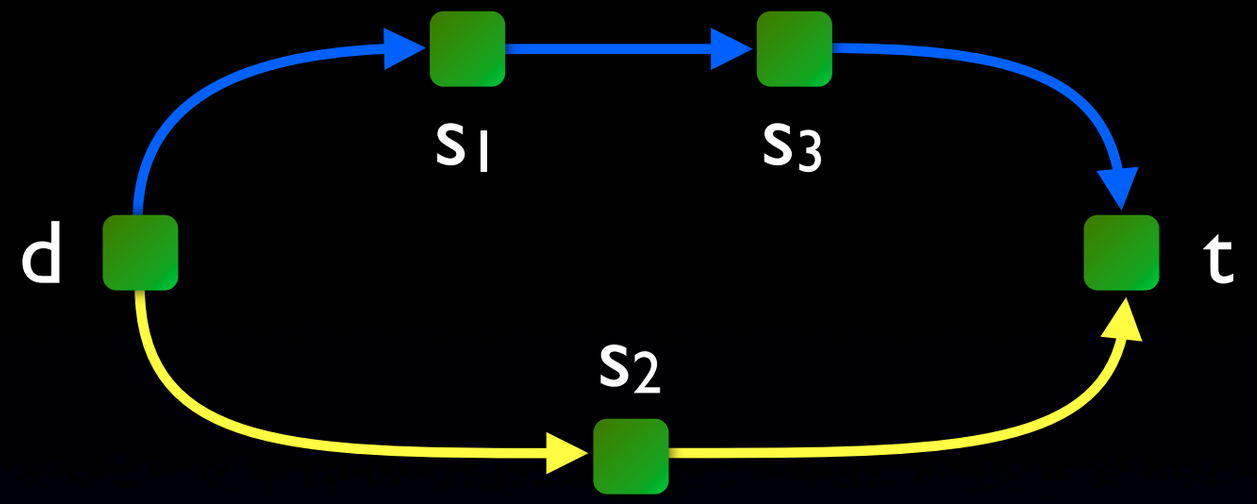




Tuesday

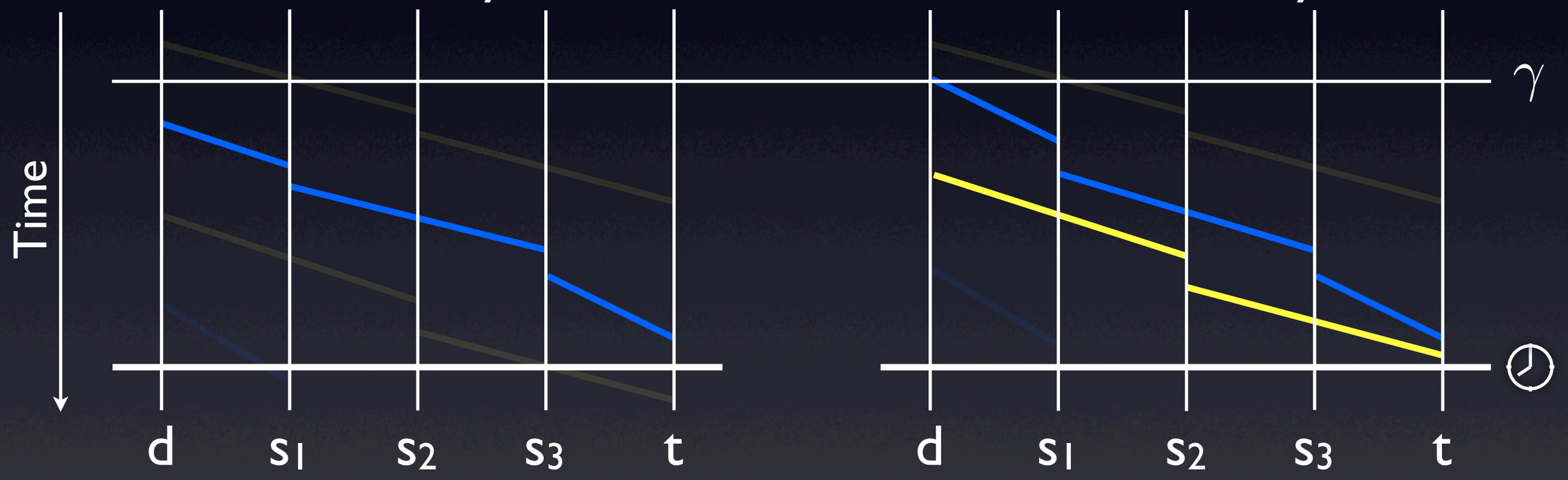
Wednesday



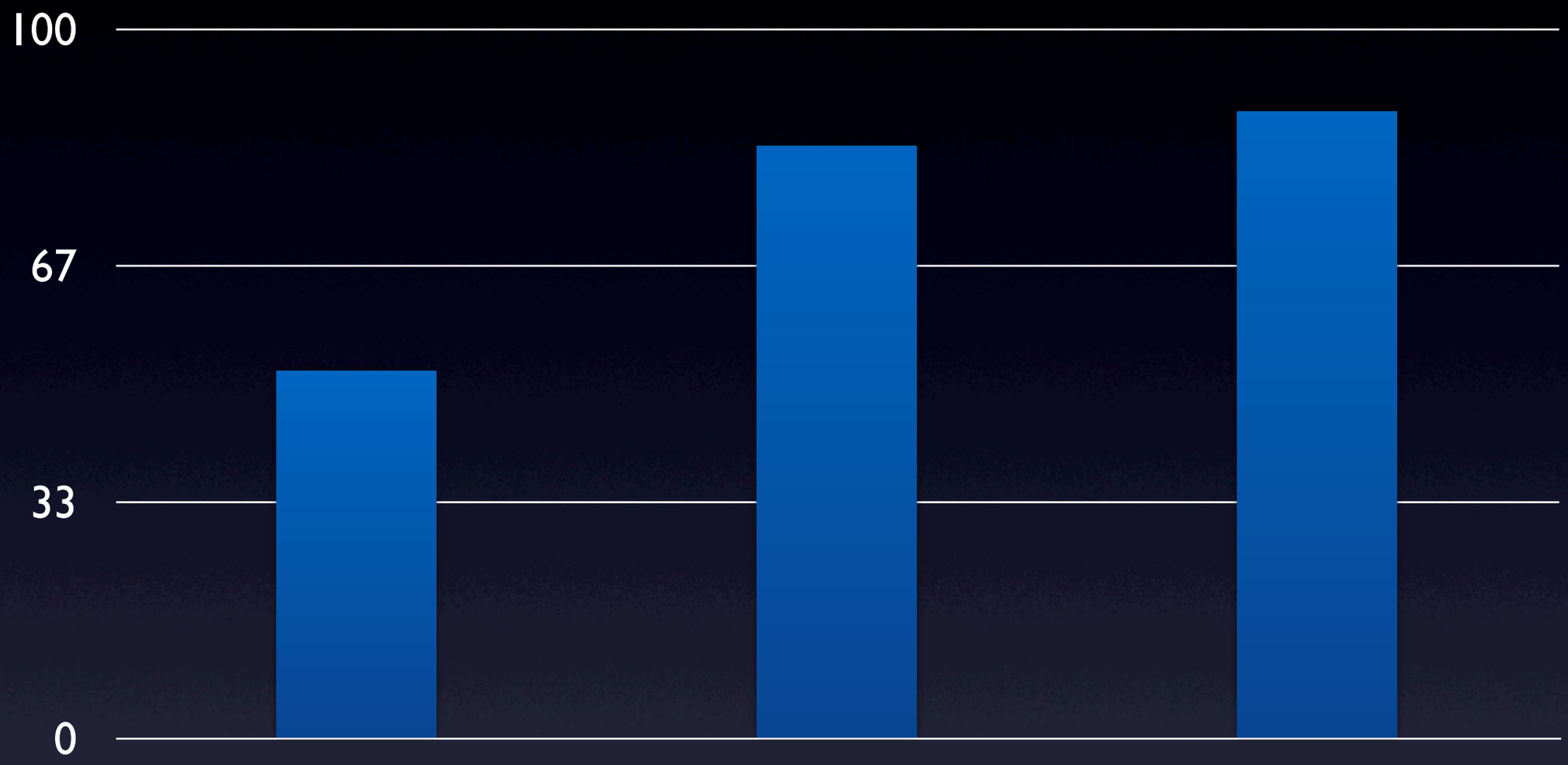


Tuesday

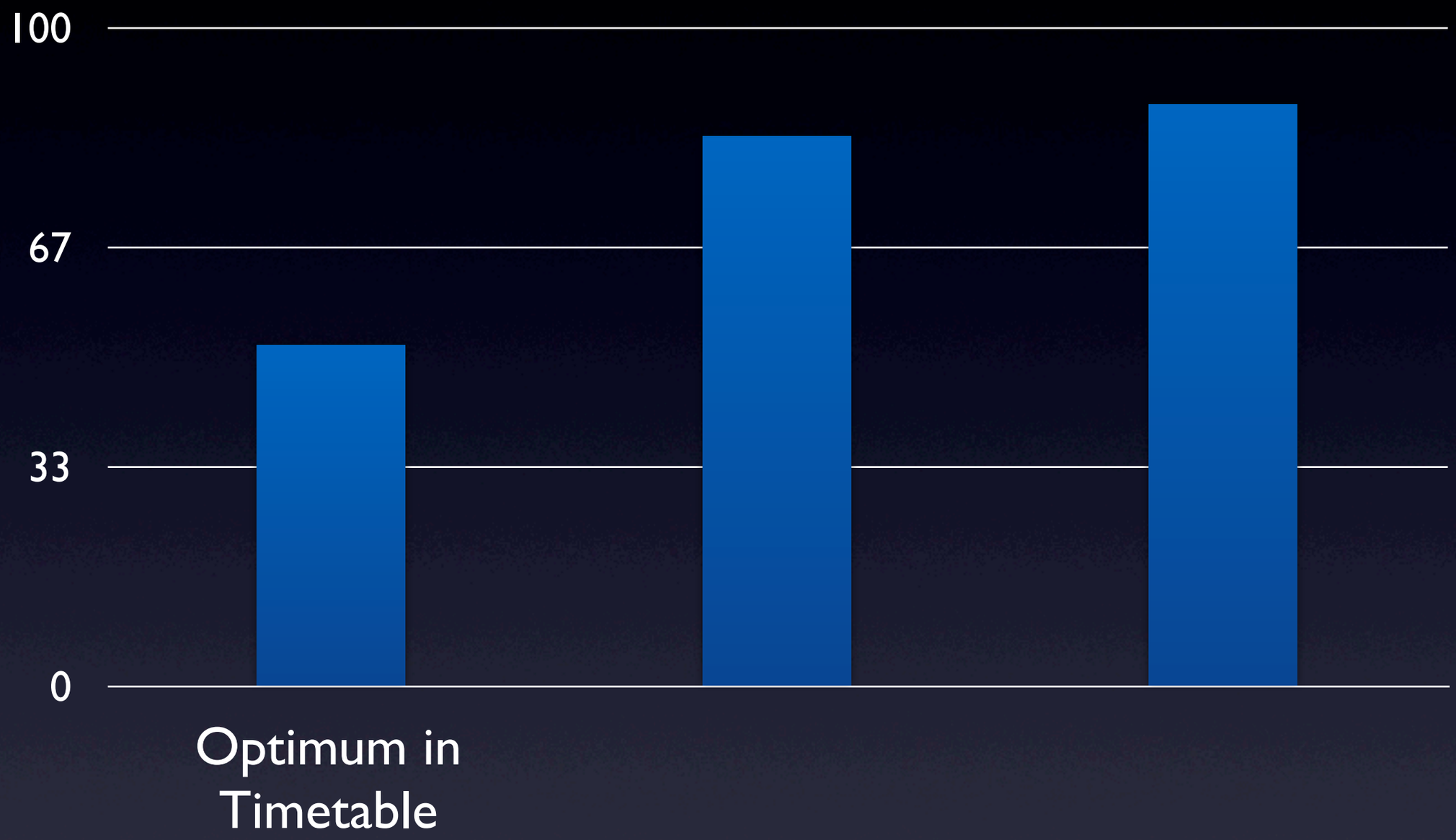
Wednesday



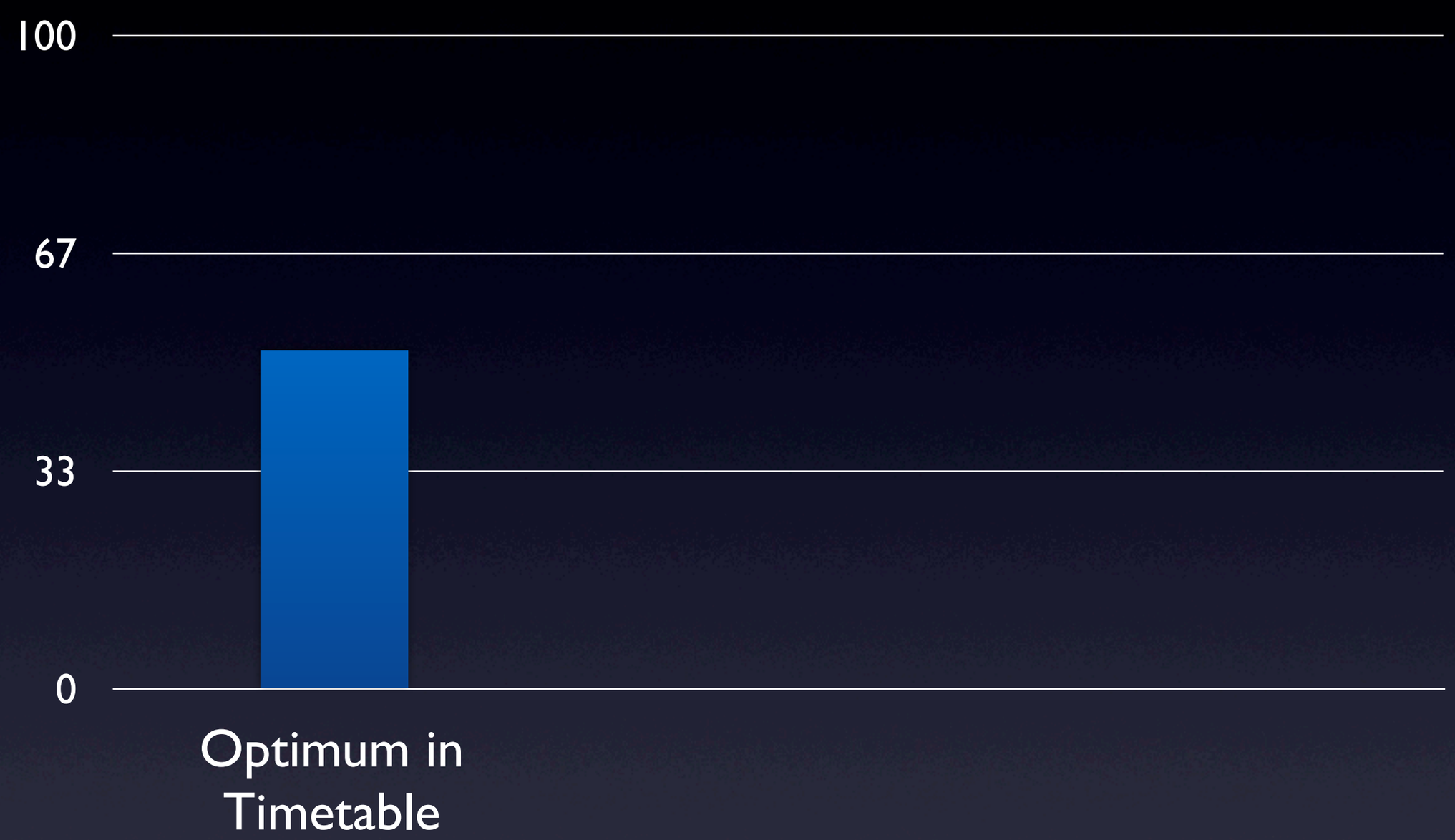
Arrival Rates



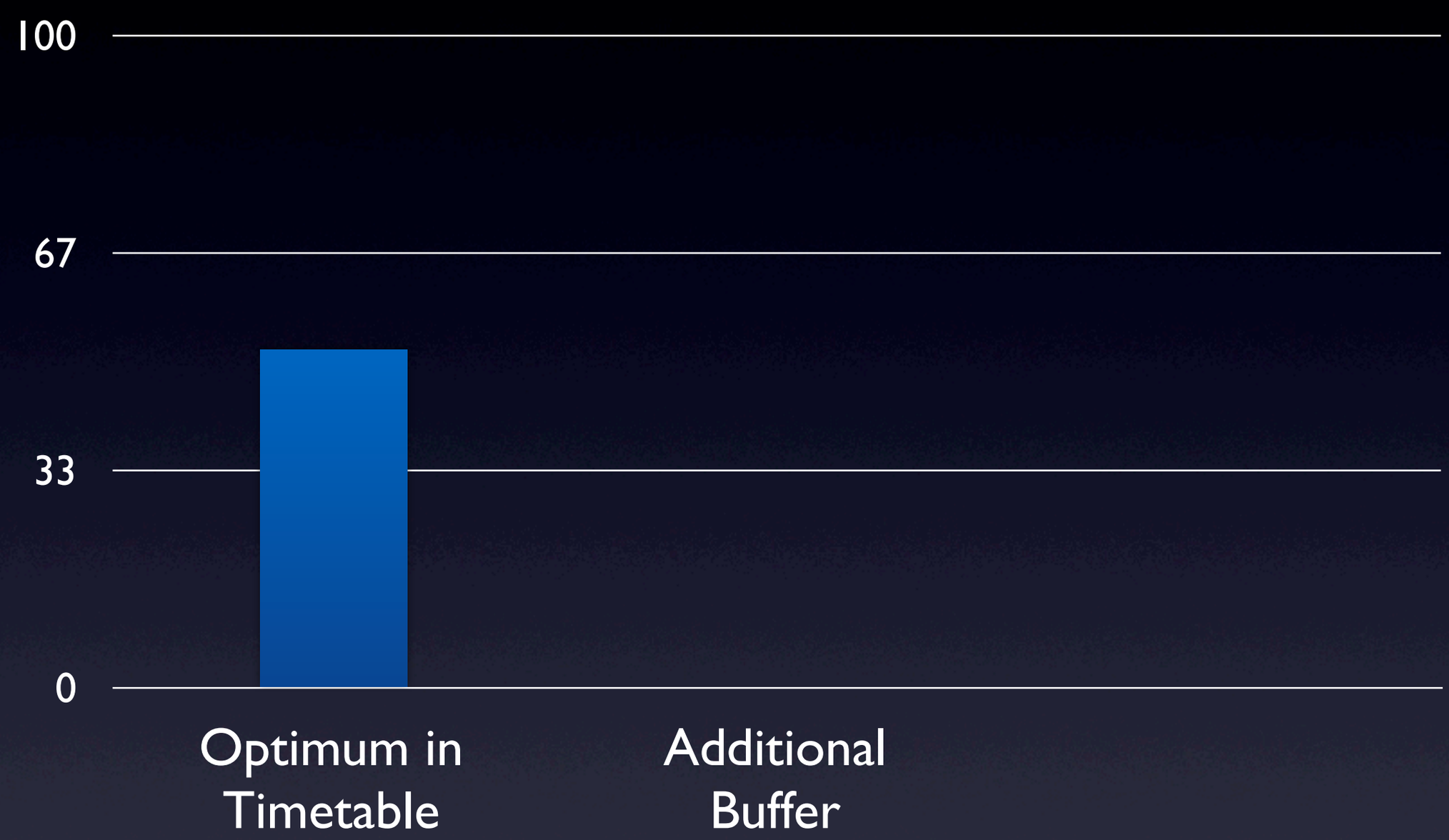
Arrival Rates



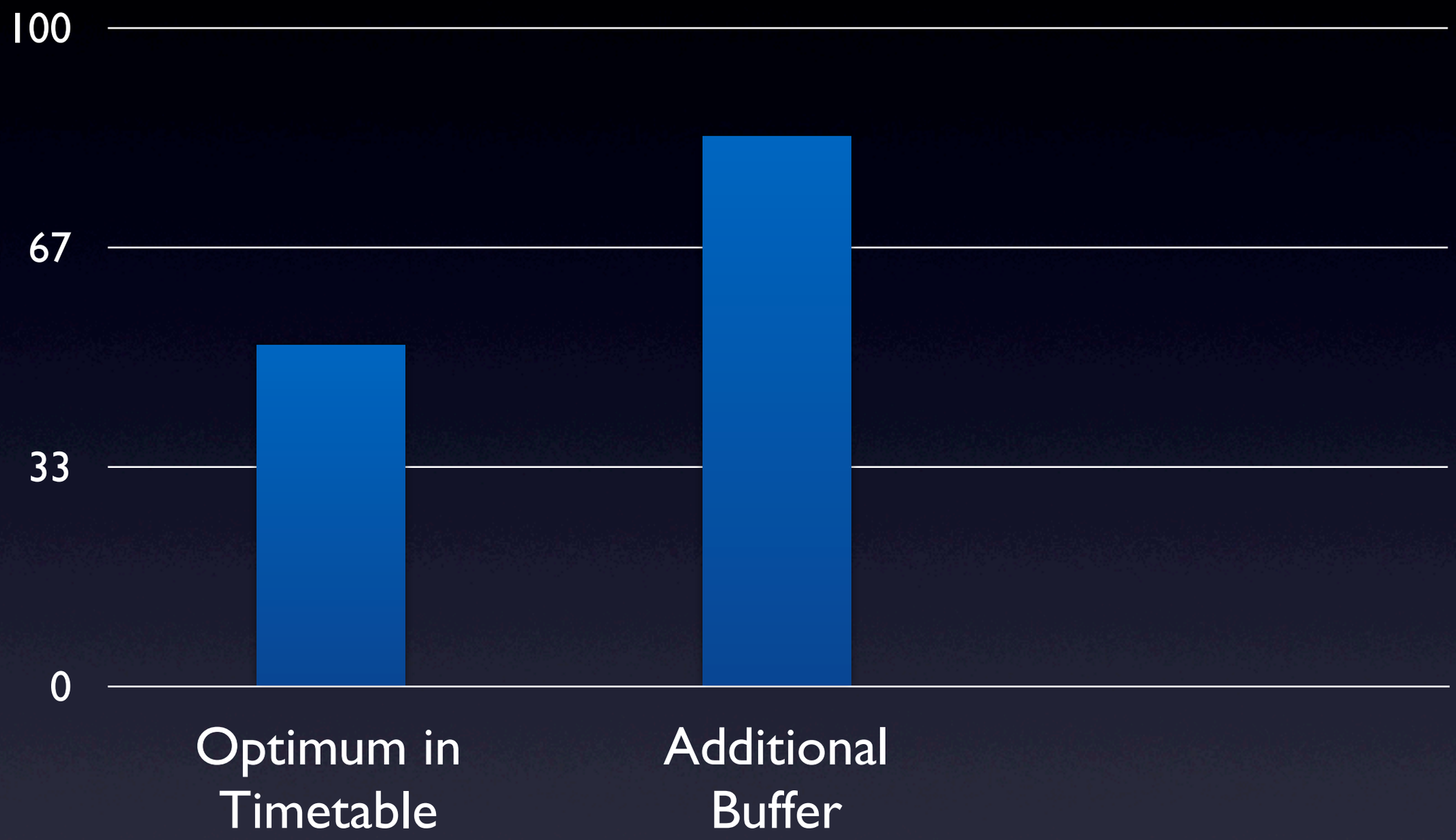
Arrival Rates



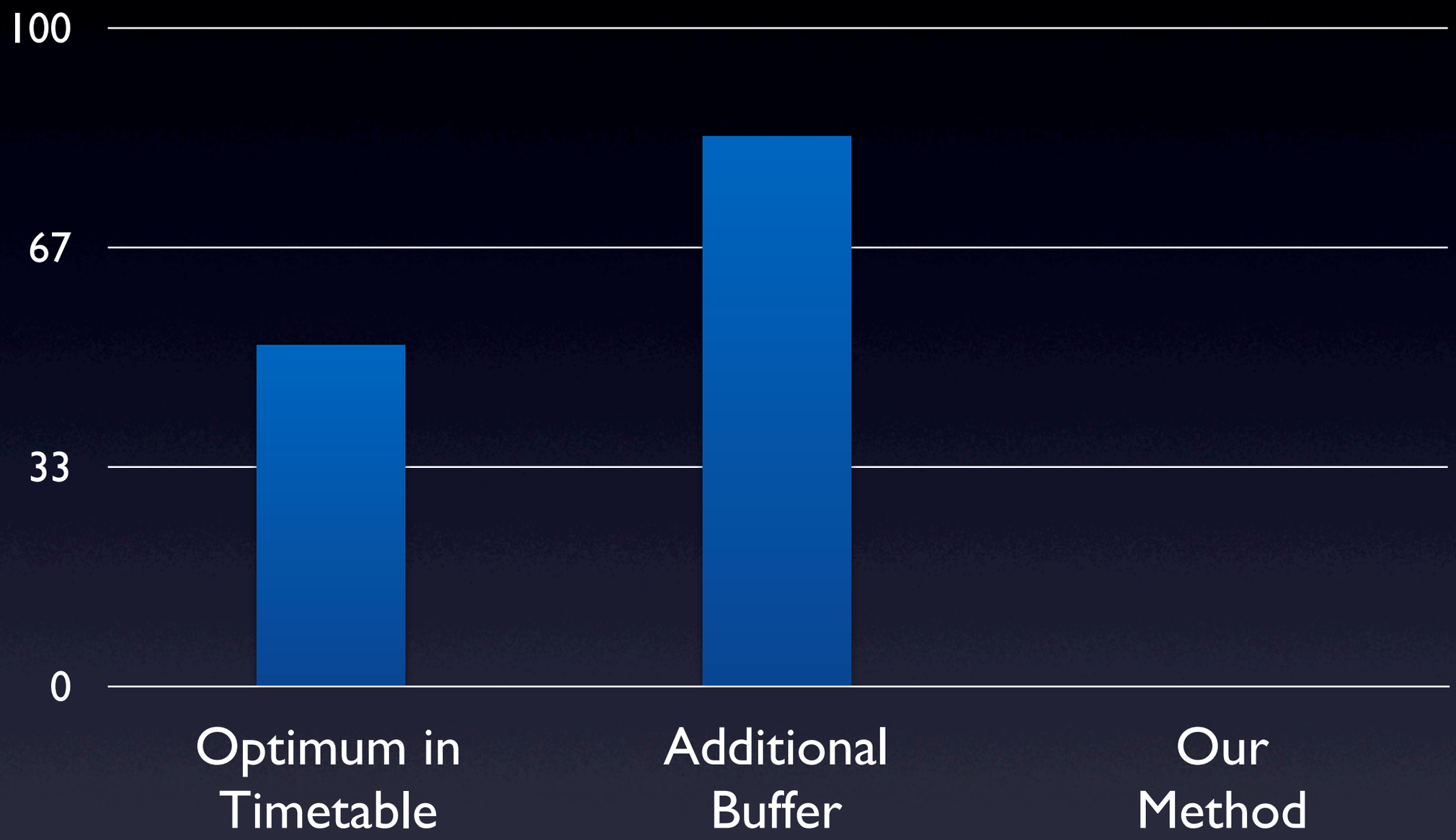
Arrival Rates



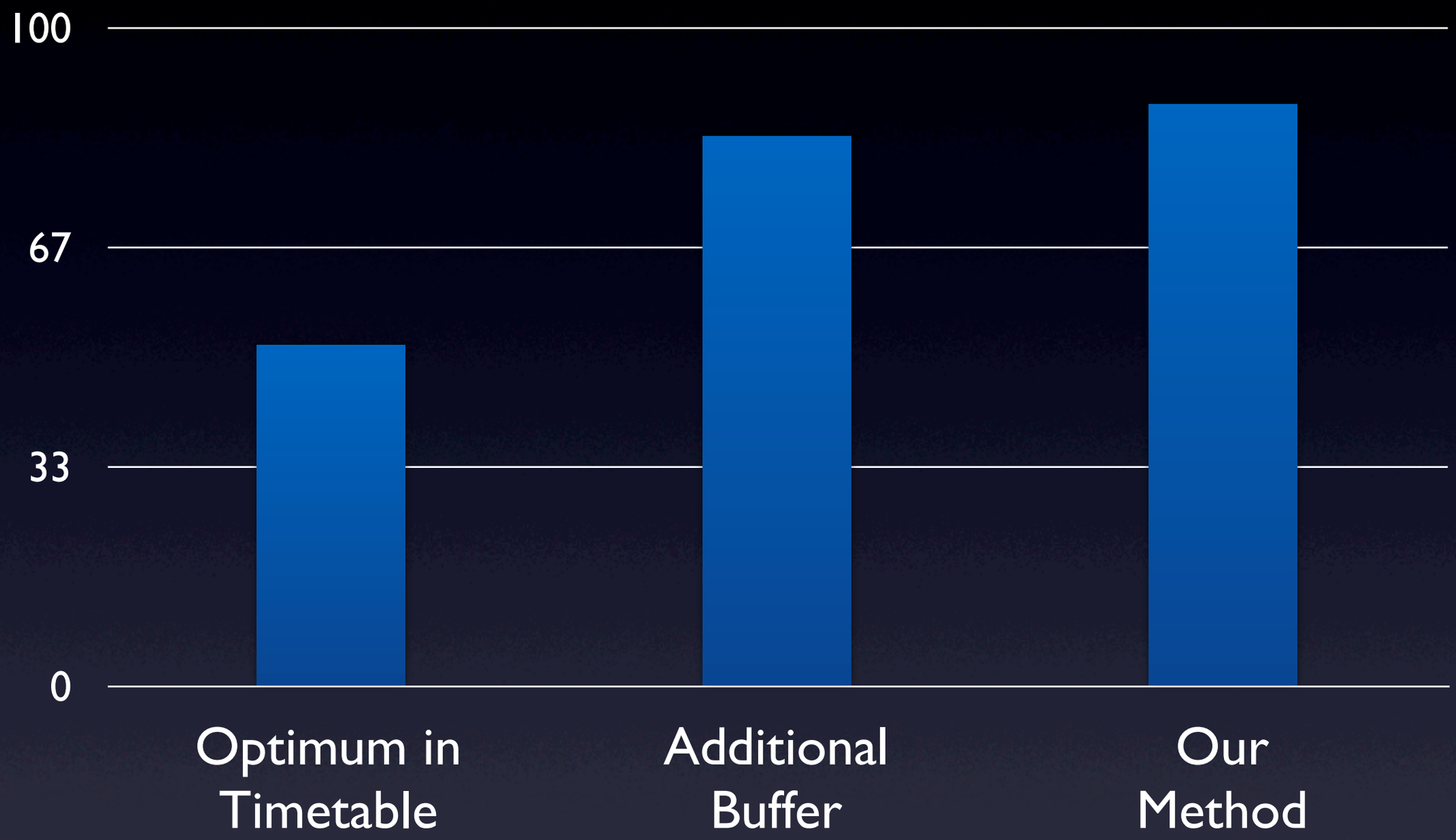
Arrival Rates



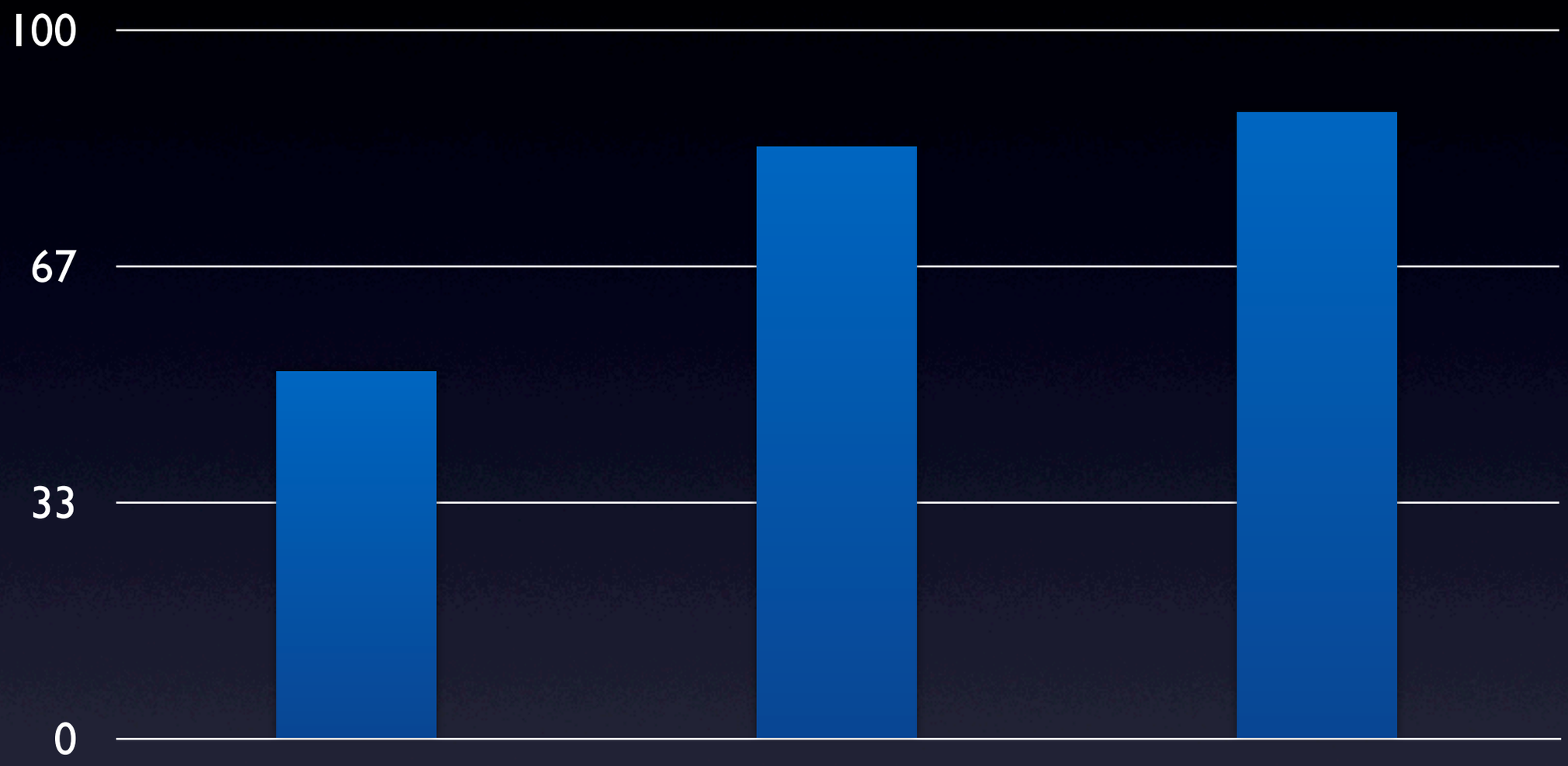
Arrival Rates



Arrival Rates



Arrival Rates



Line Types

Line Types

Standard line

Line Types

Standard line

Backward line

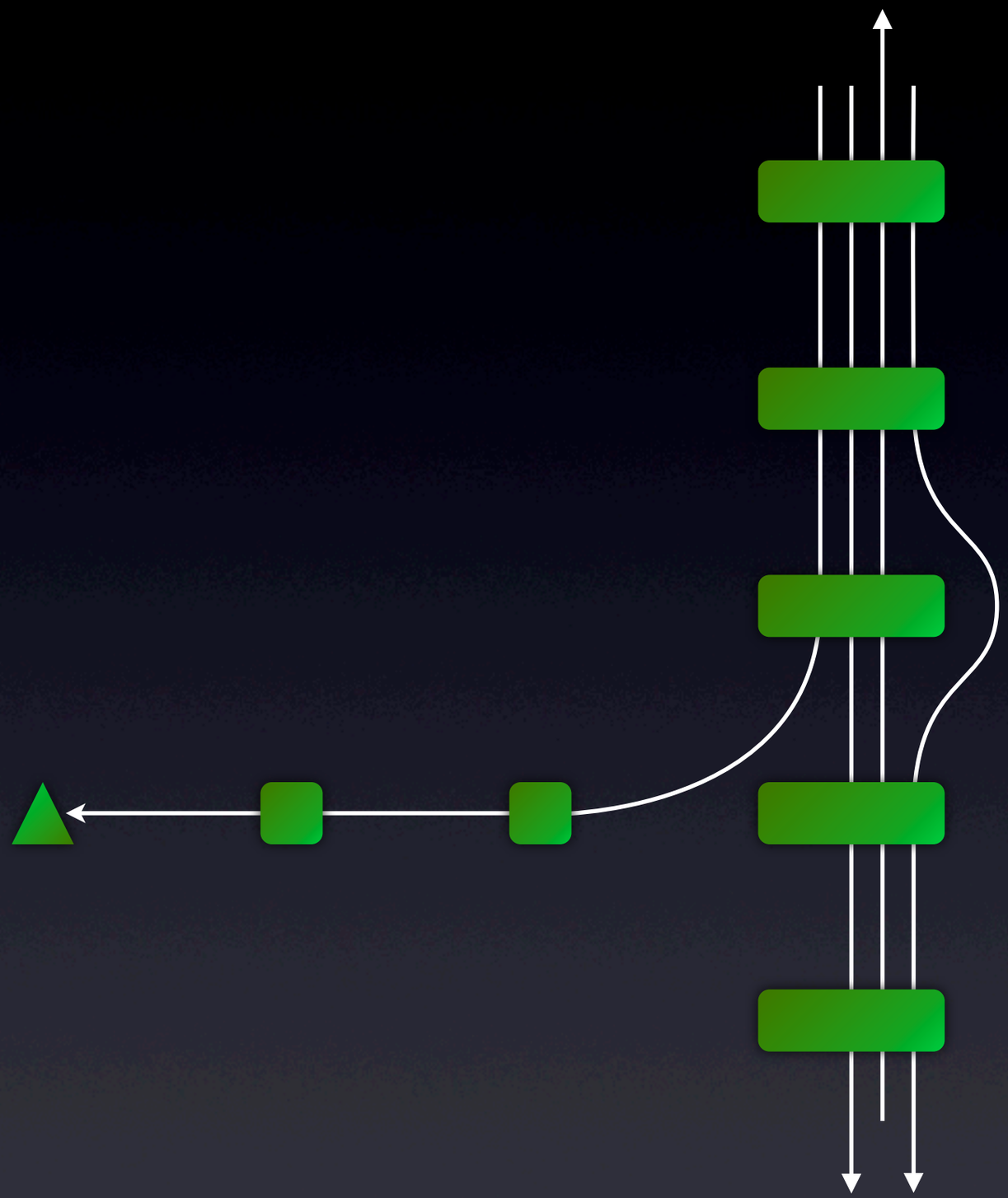
Line Types

Standard line

Backward line

Line skipping certain stops

Line Types



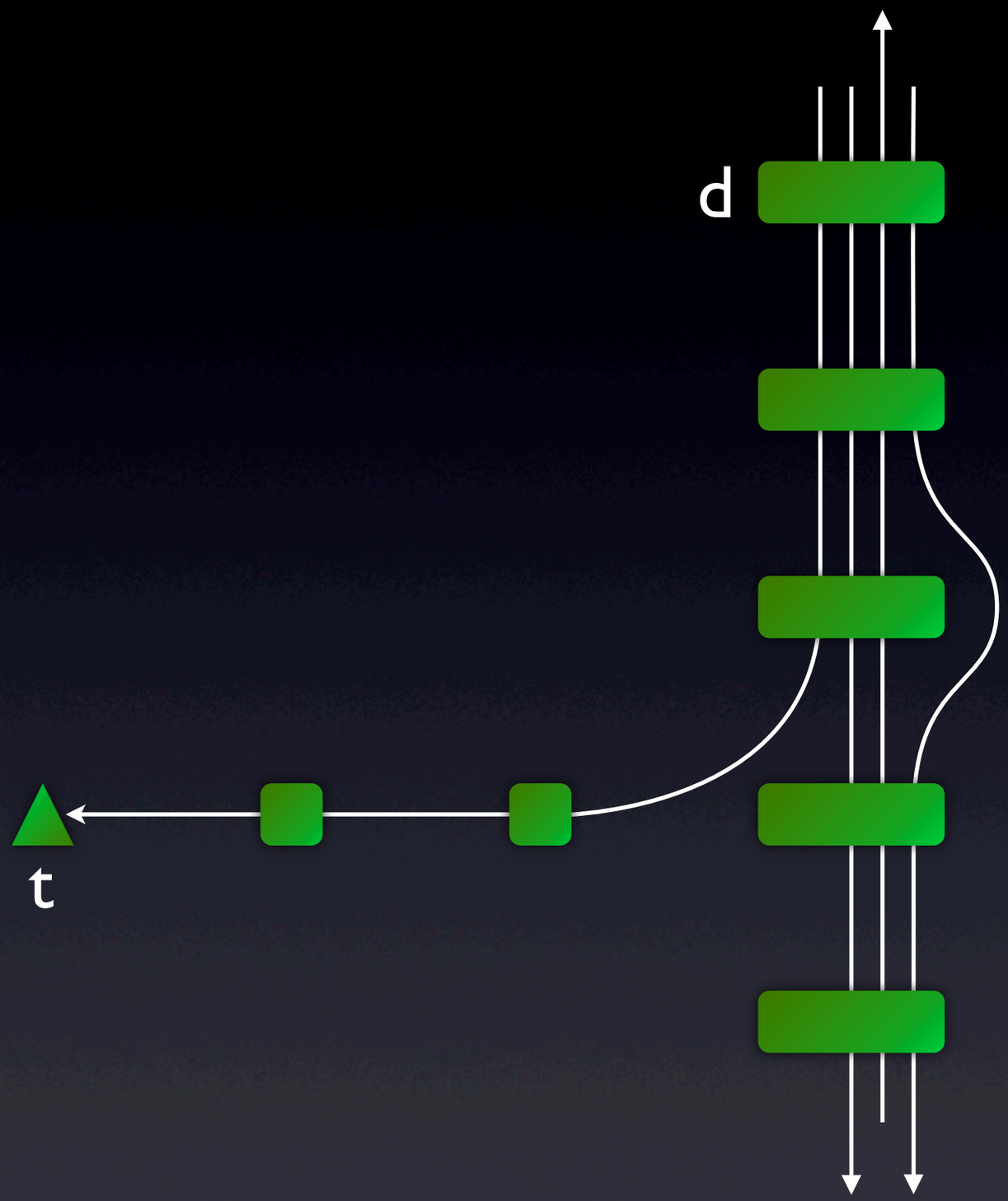
Standard line

Backward line

Line skipping certain stops

Depot lines

Line Types



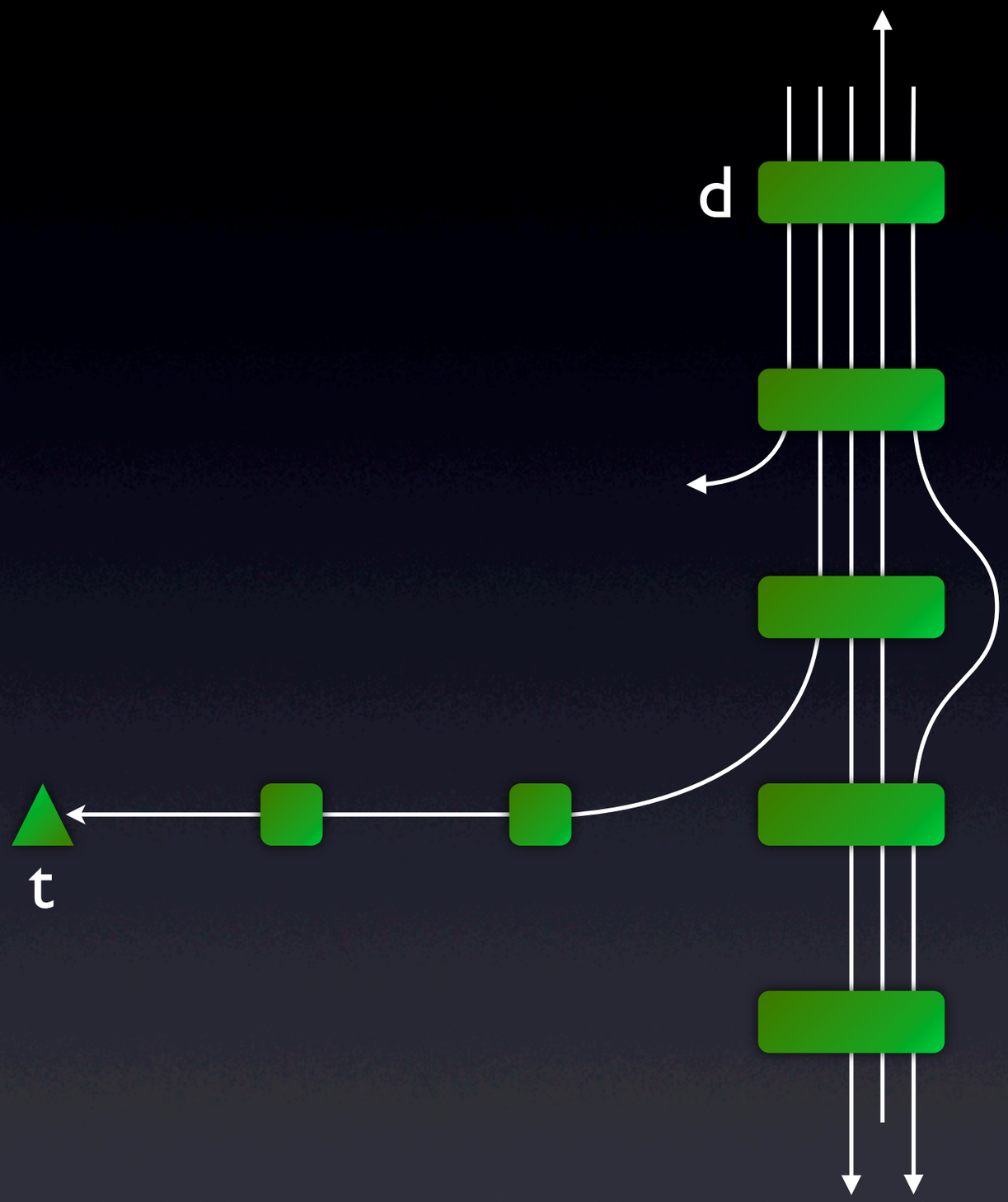
Standard line

Backward line

Line skipping certain stops

Depot lines

Line Types



Standard line

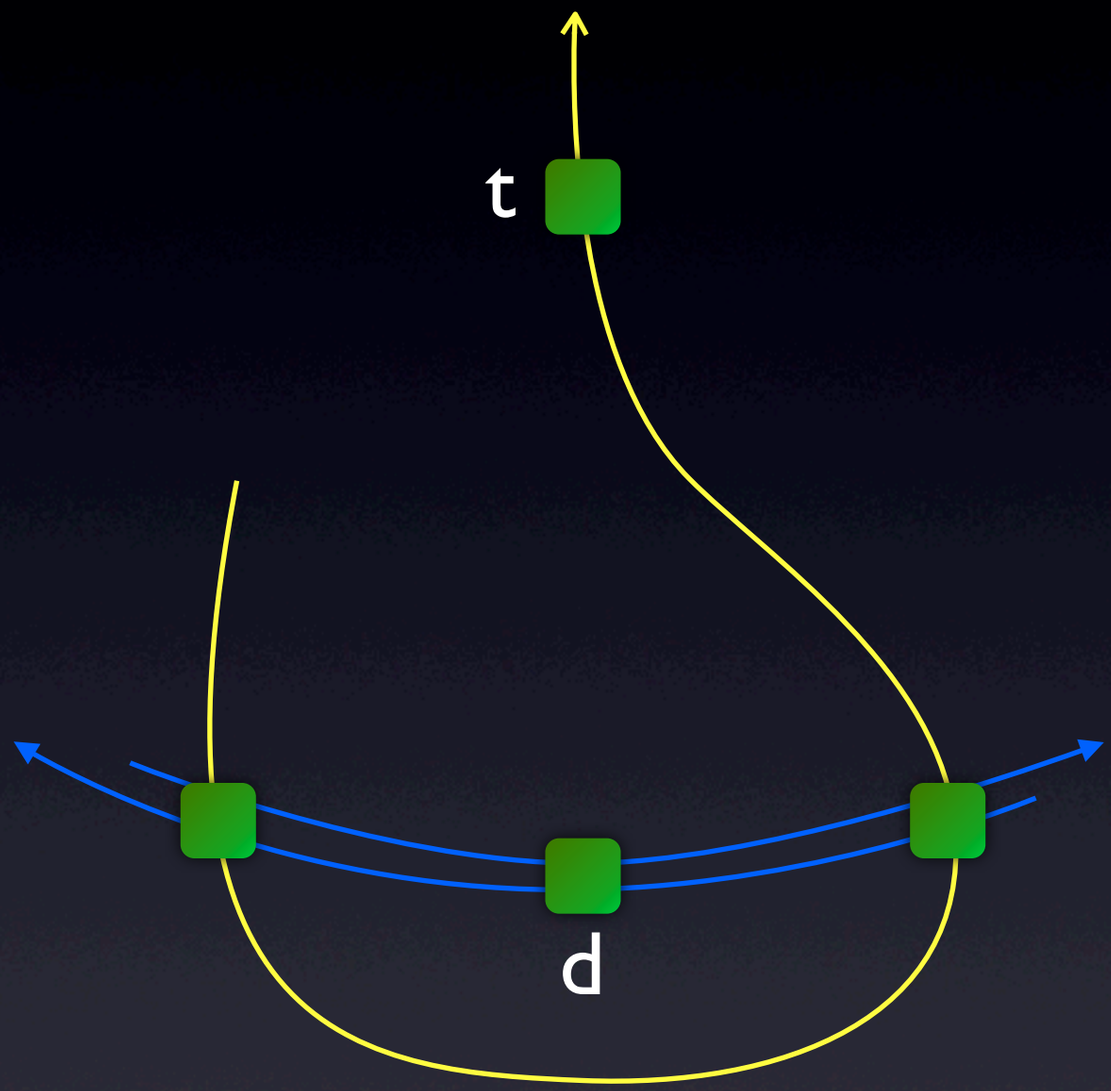
Backward line

Line skipping certain stops

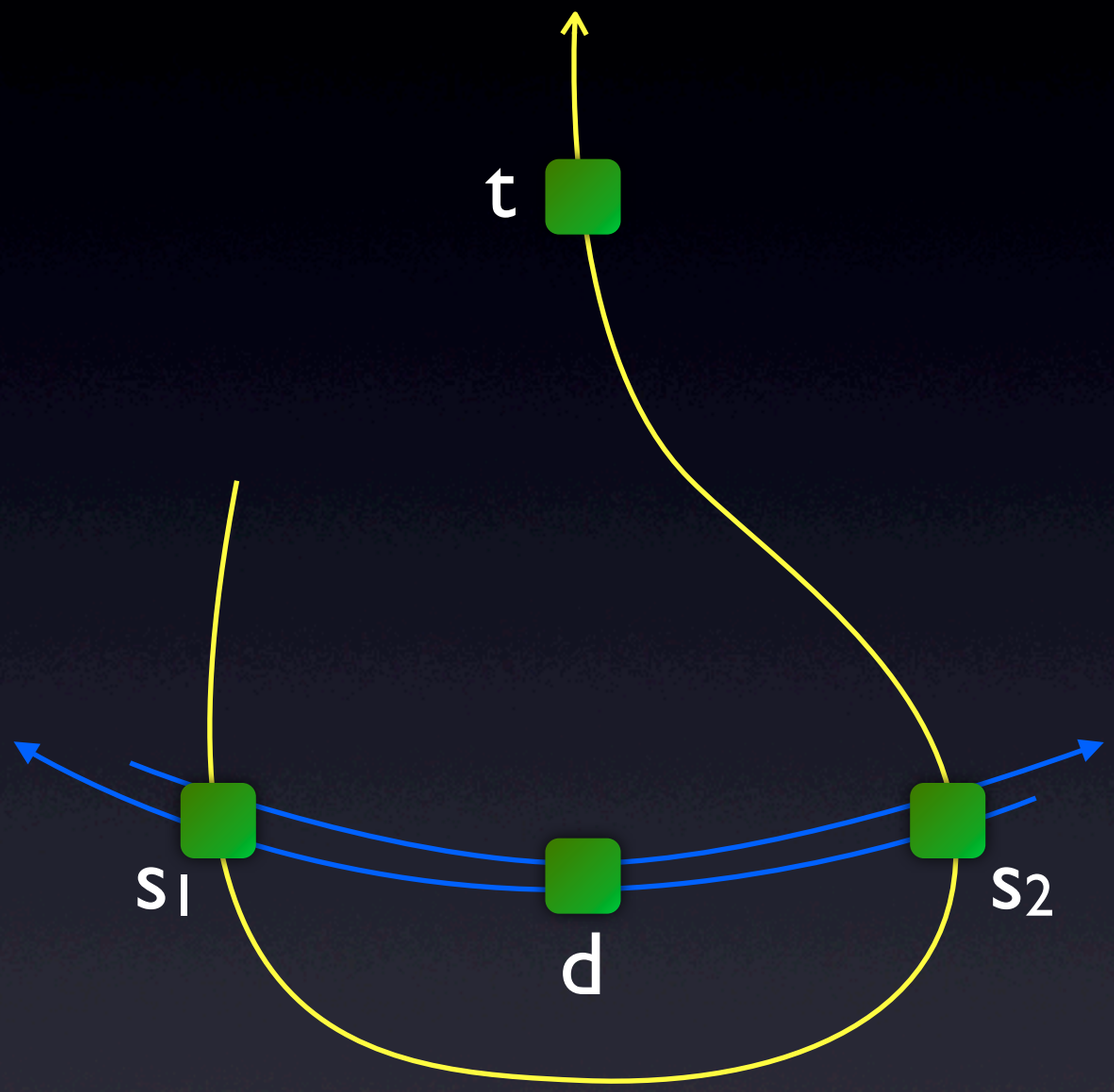
Depot lines

Early Turnaround

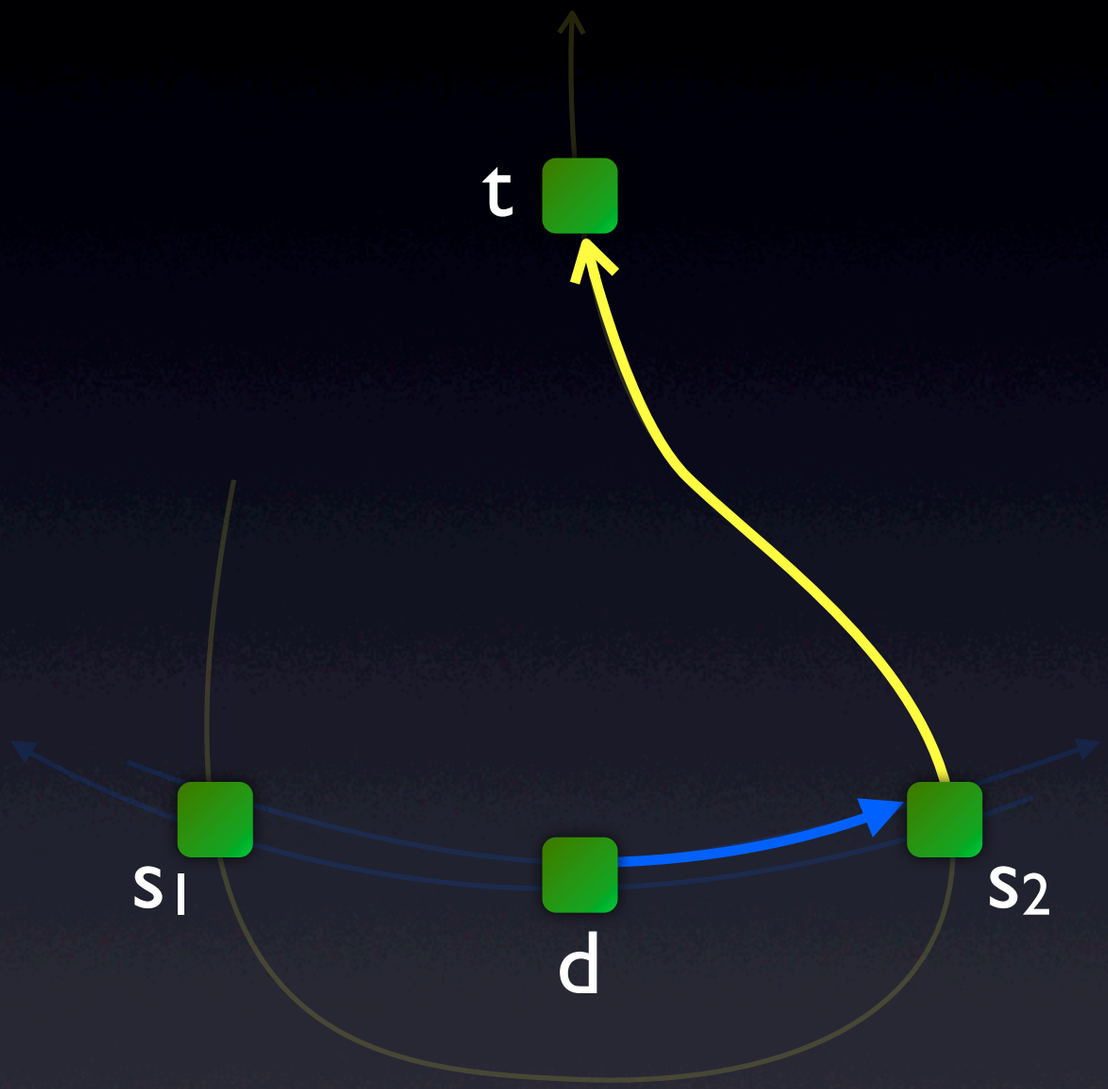
Example



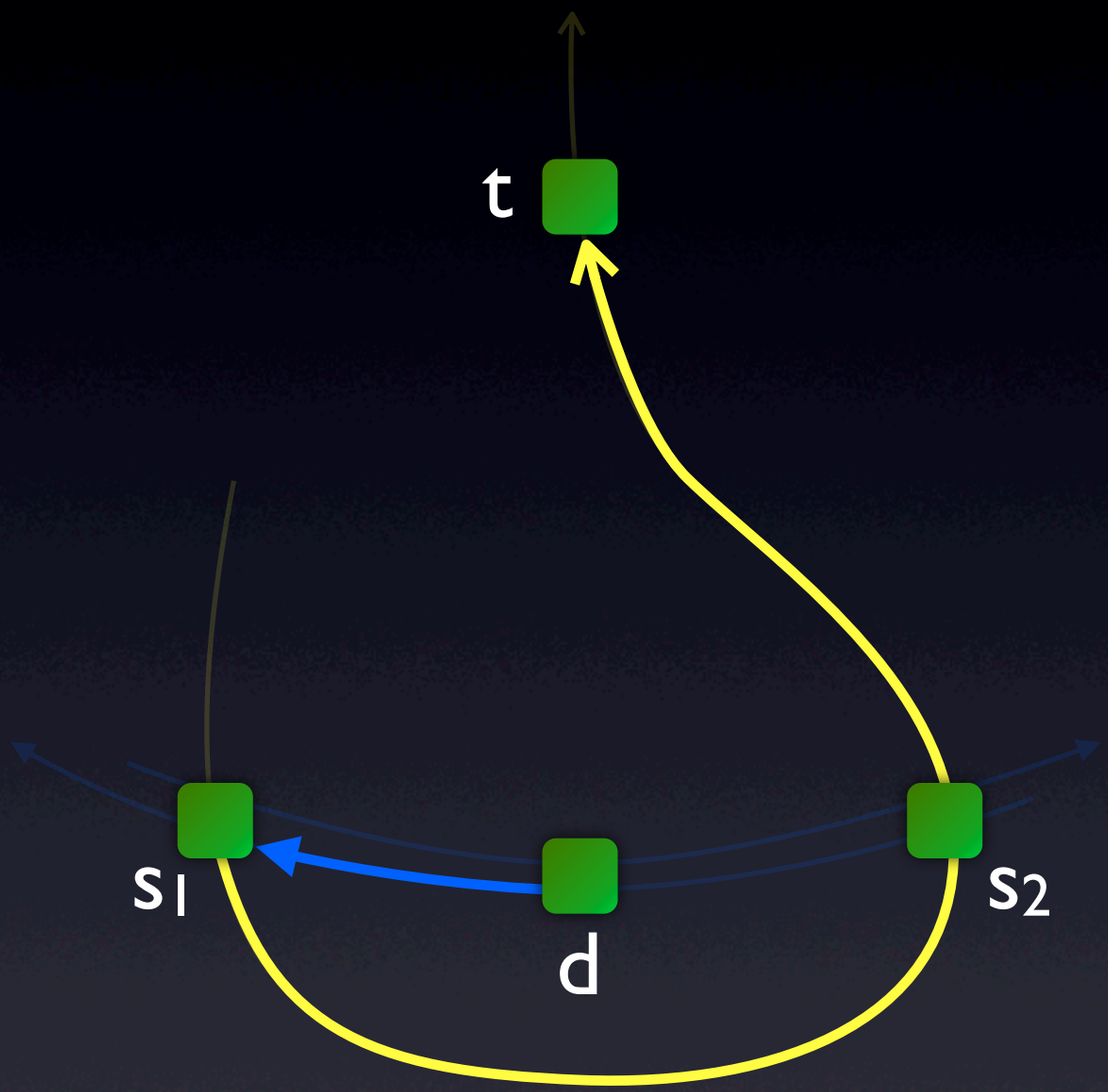
Example



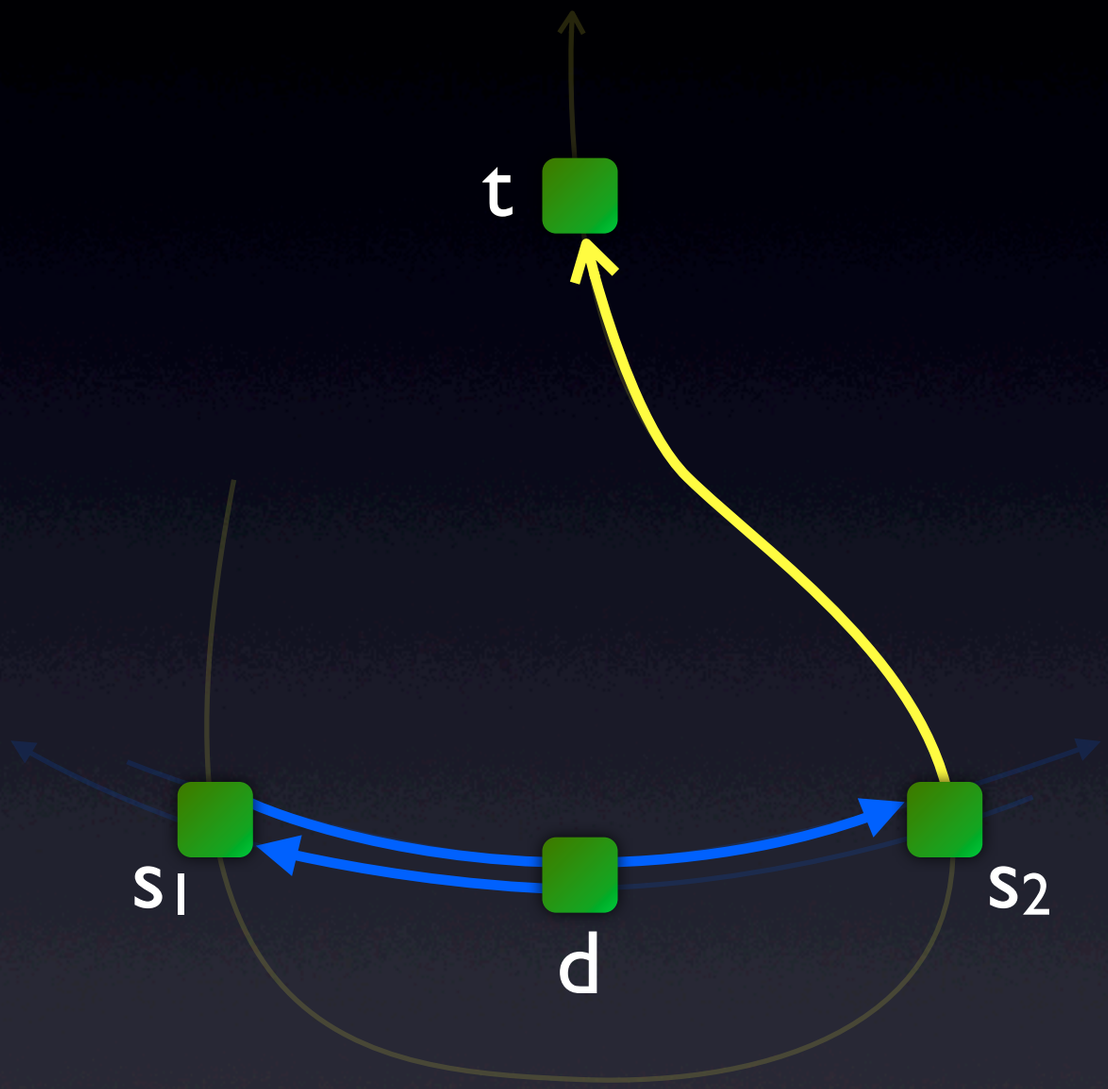
Example



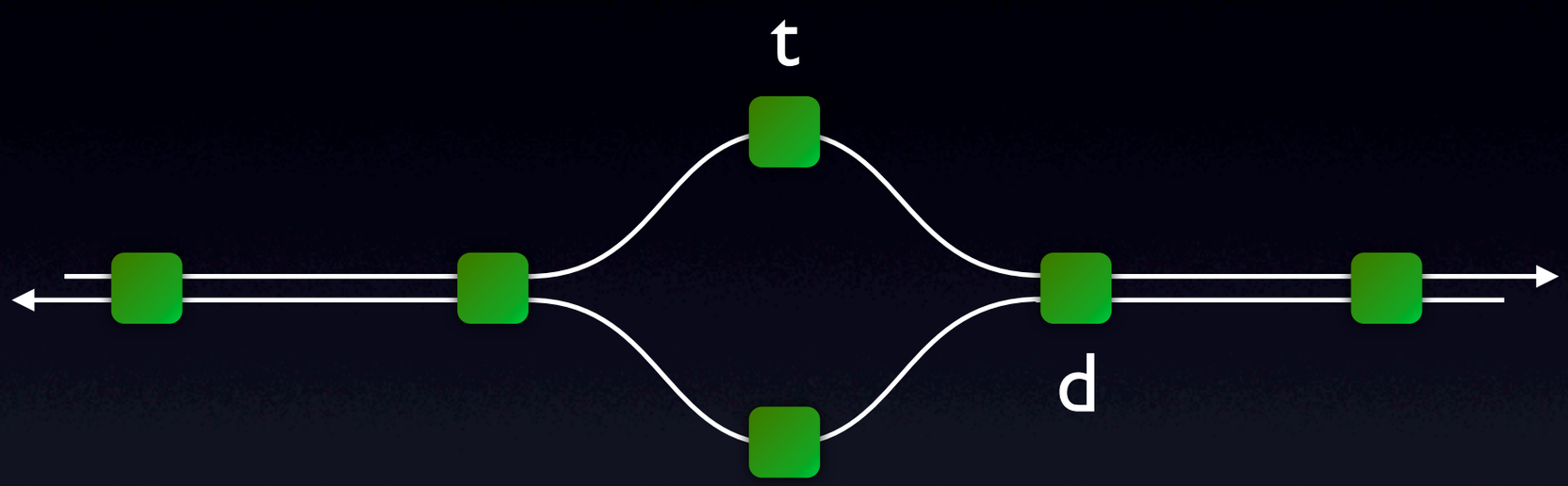
Example



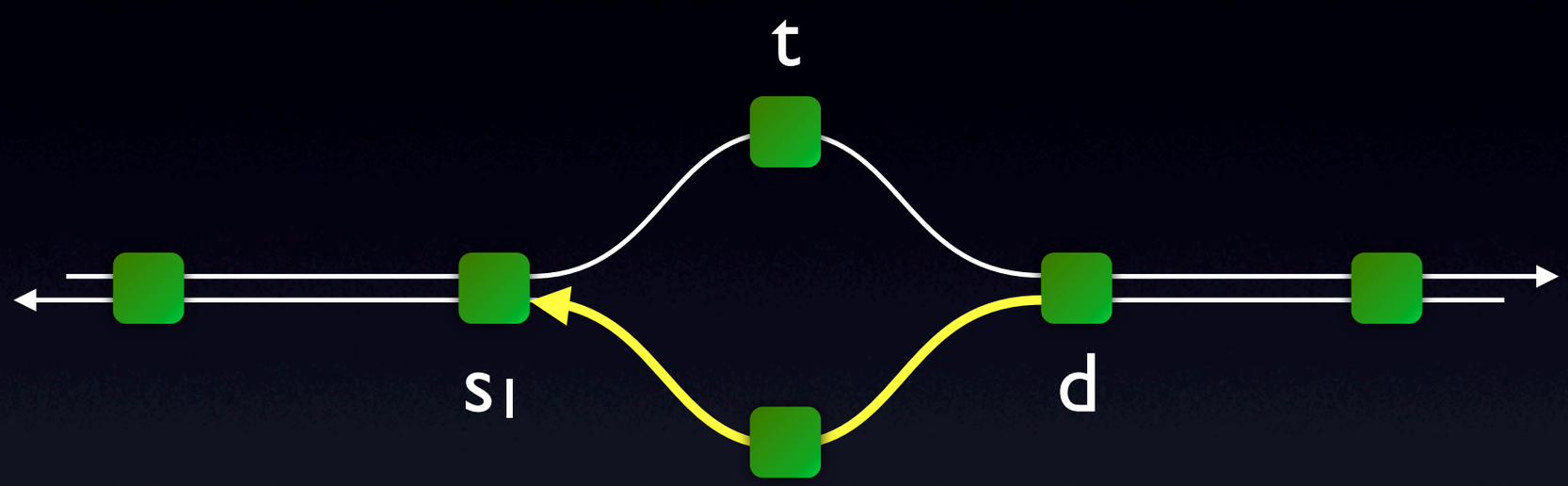
Example



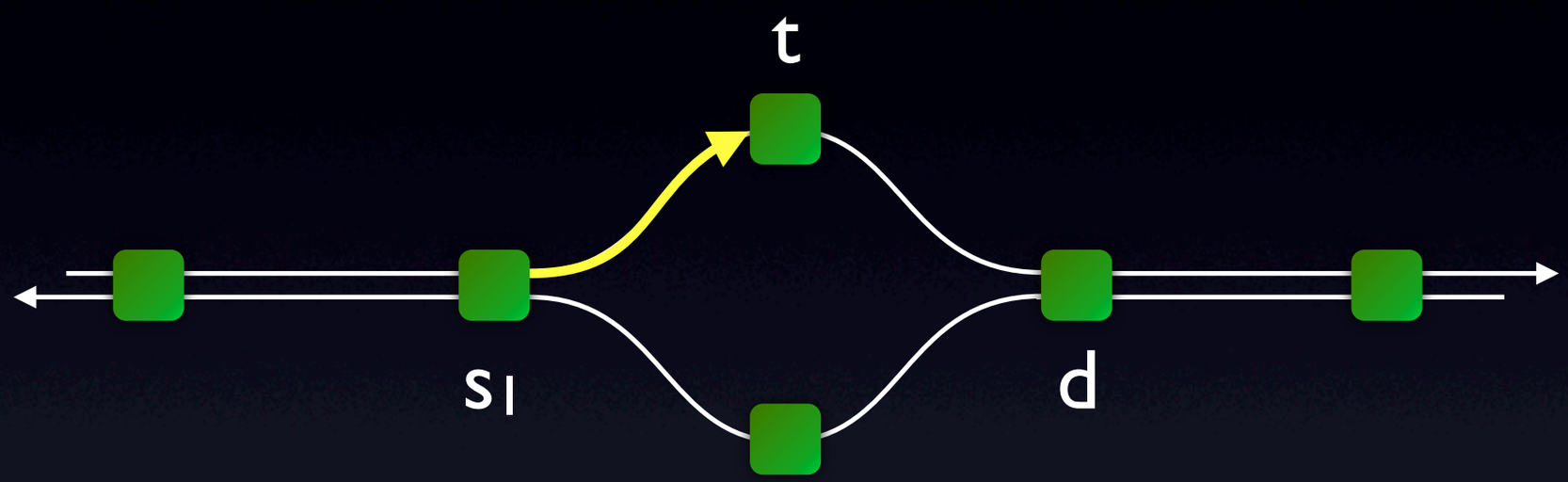
Forward and Backward Line Differ



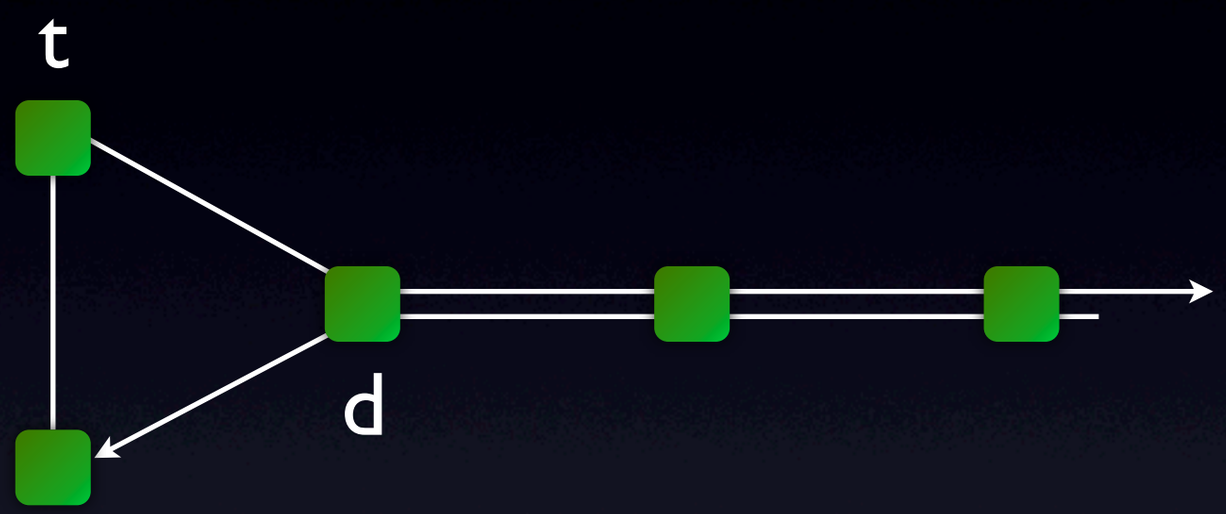
Forward and Backward Line Differ



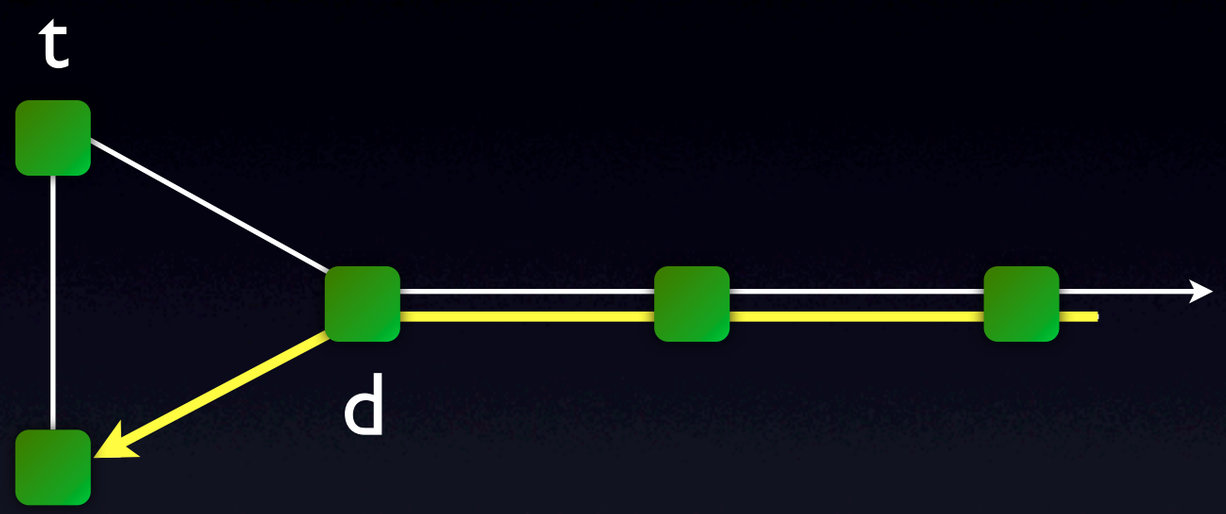
Forward and Backward Line Differ



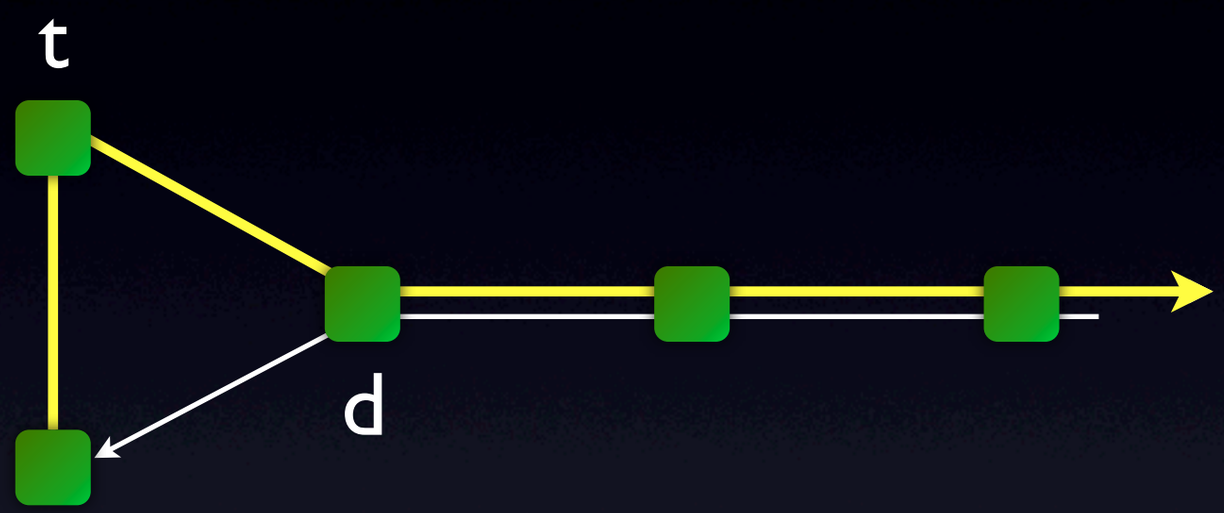
Cyclic Line Ends



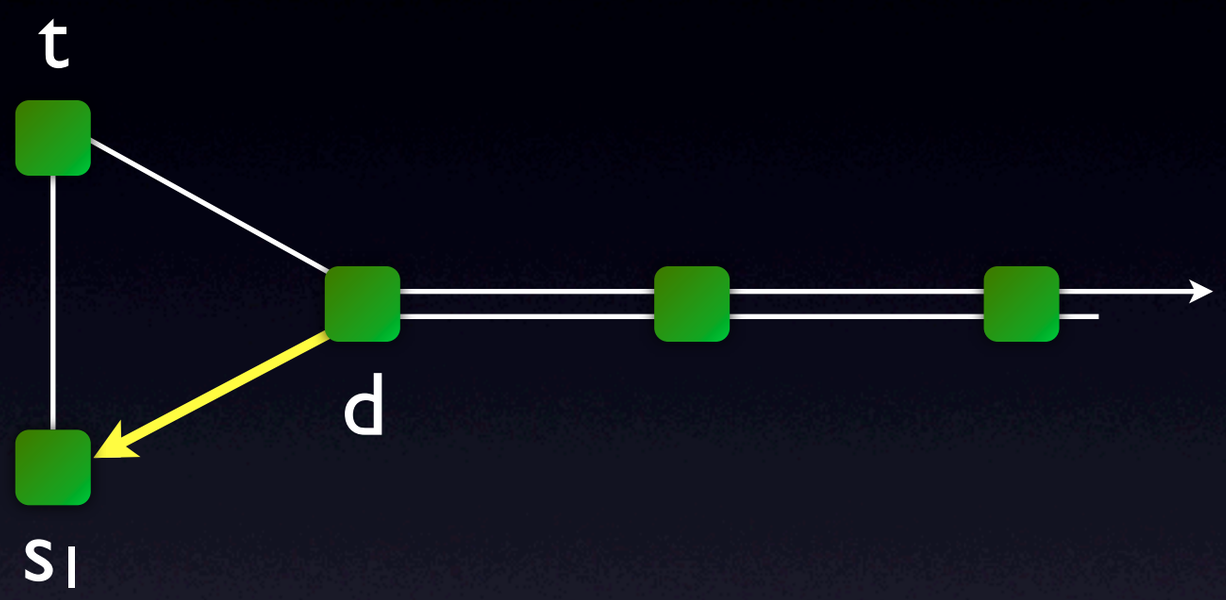
Cyclic Line Ends



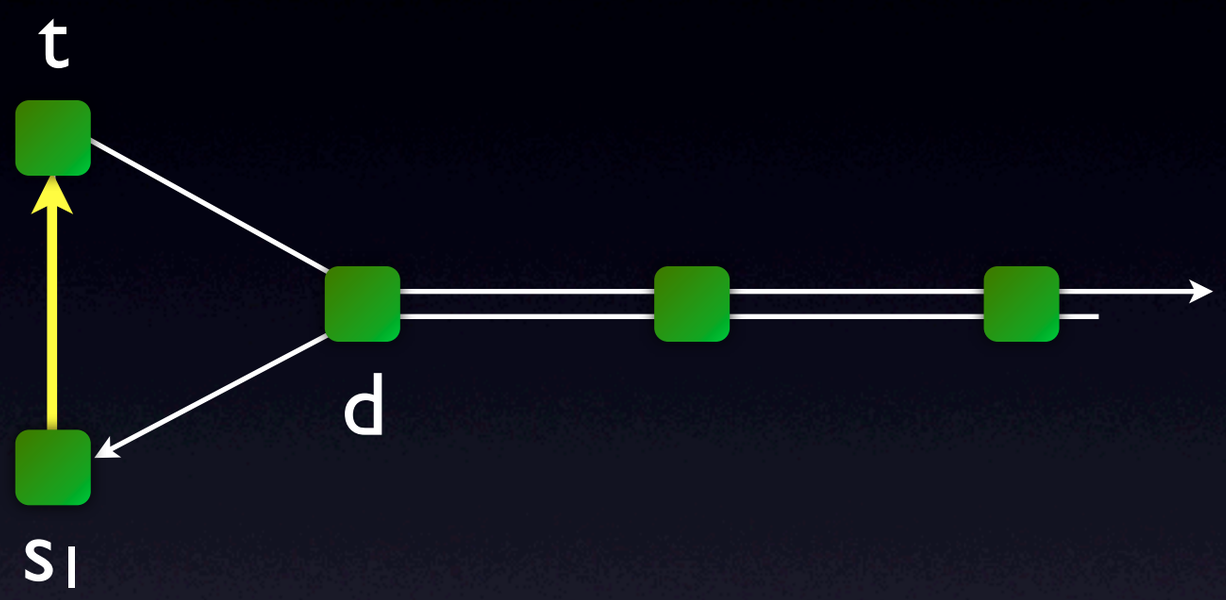
Cyclic Line Ends



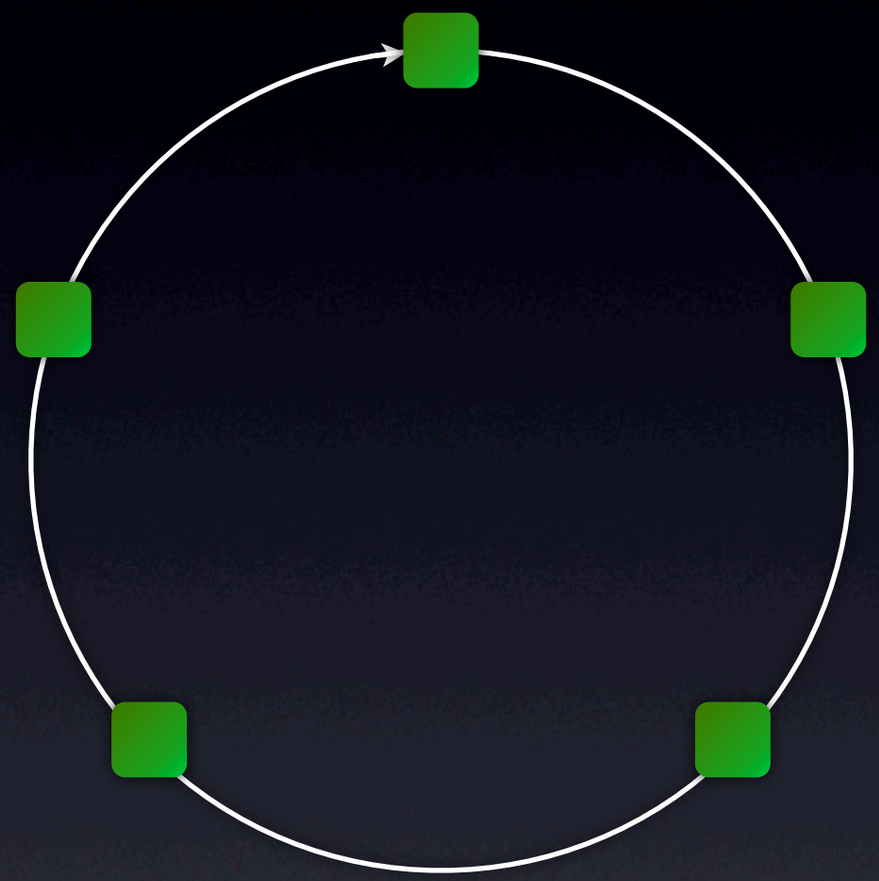
Cyclic Line Ends



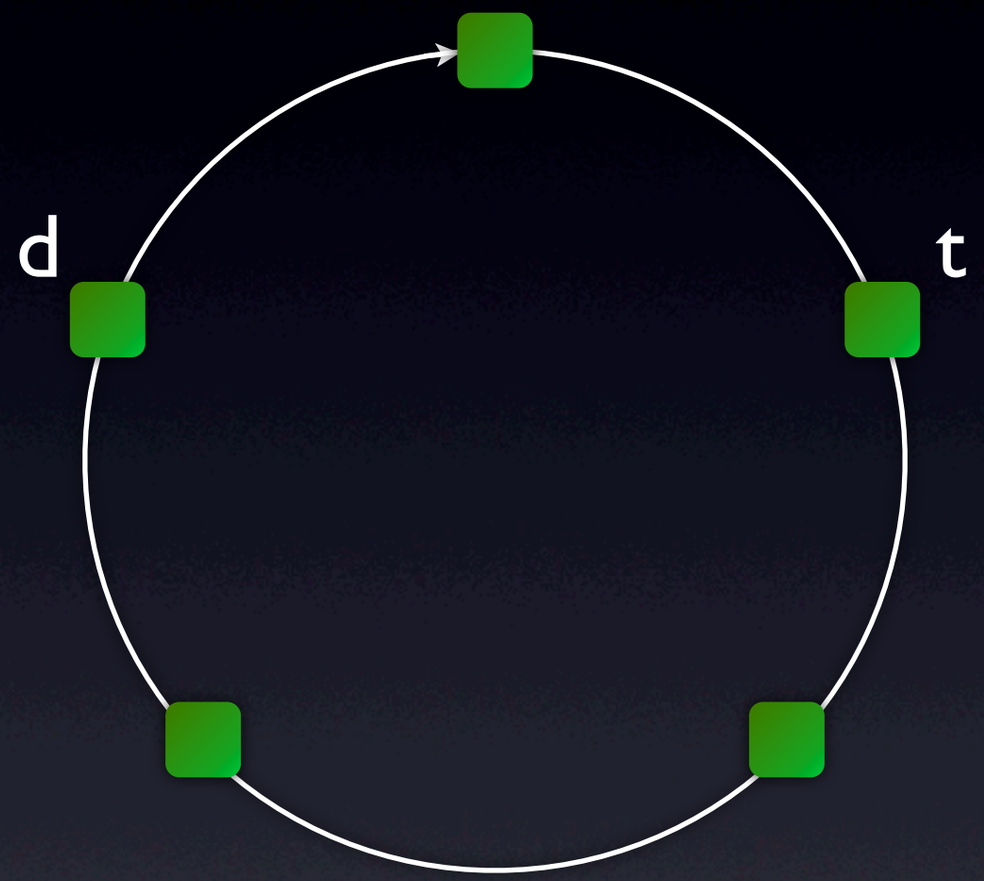
Cyclic Line Ends



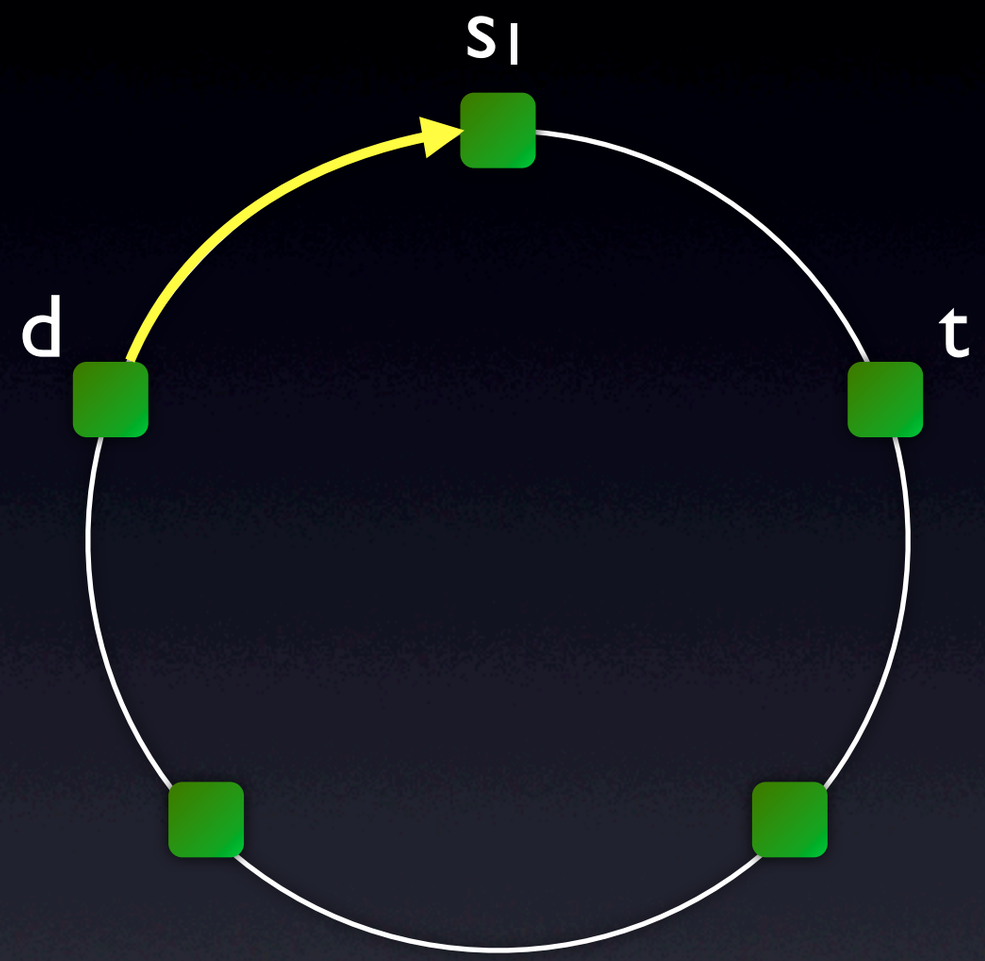
Cyclic Lines



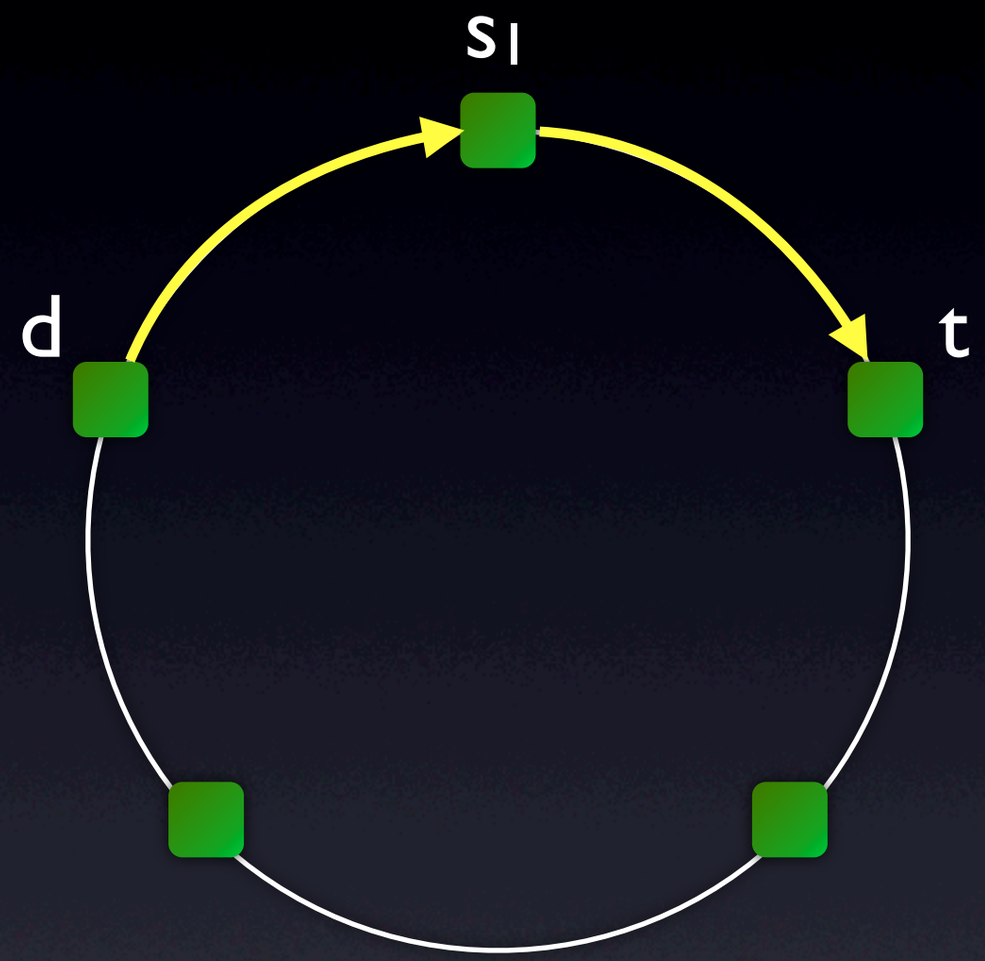
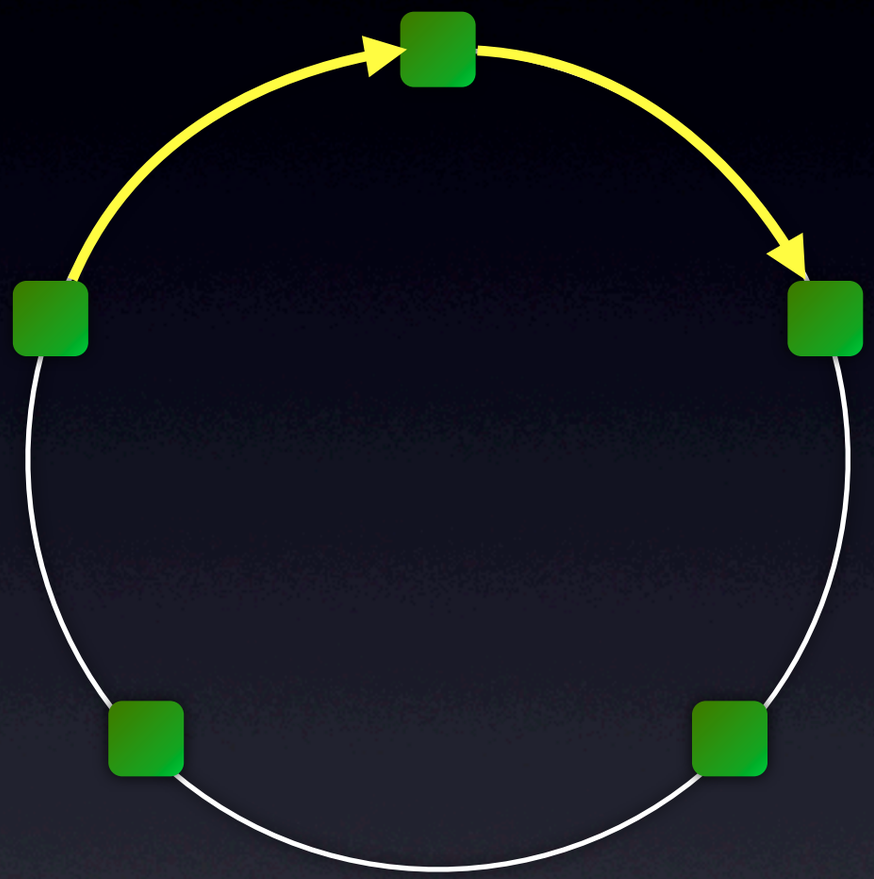
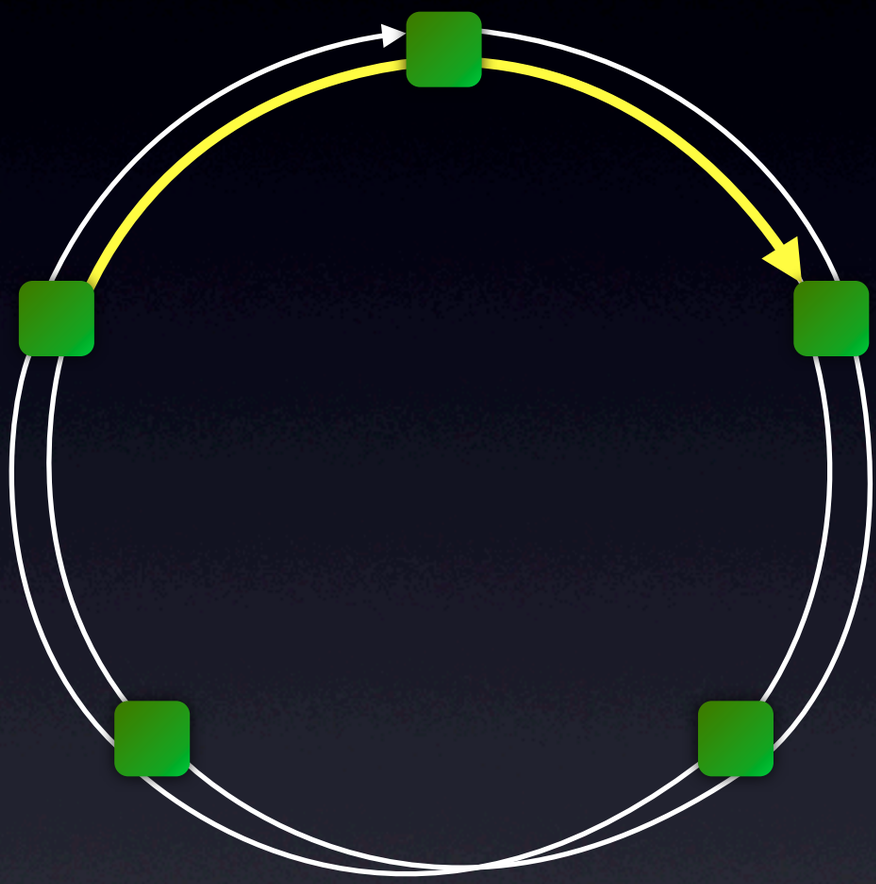
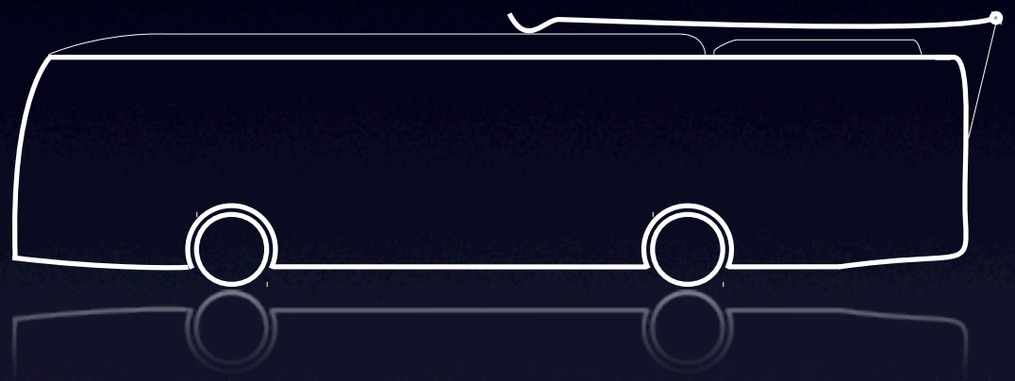
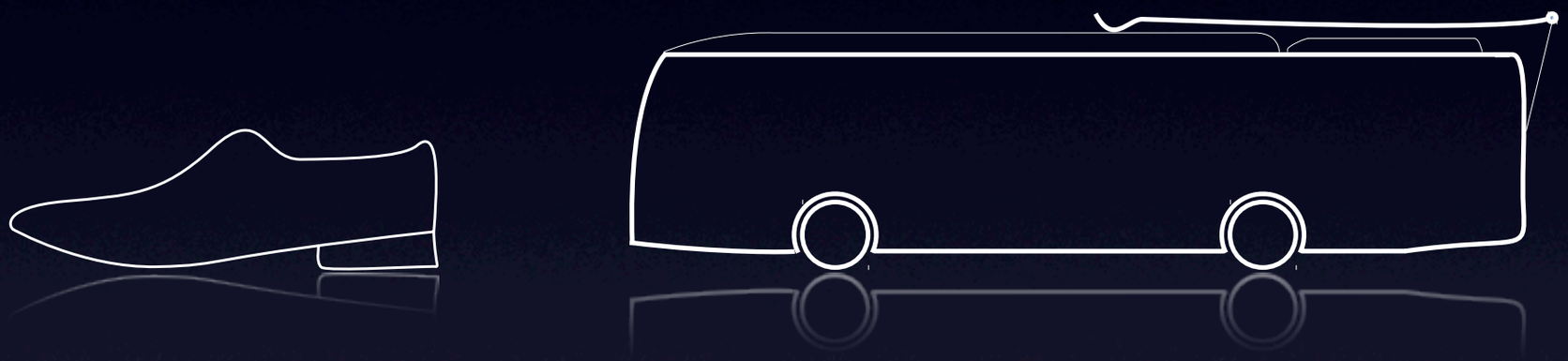
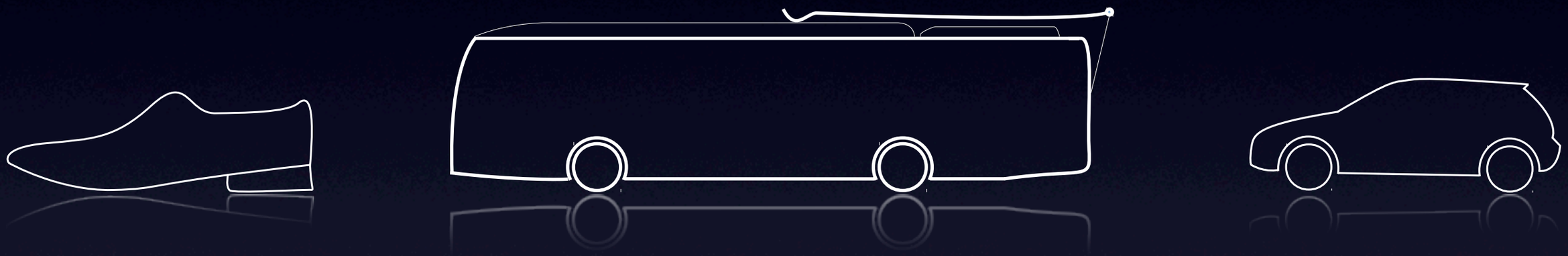
Cyclic Lines



Cyclic Lines



Cyclic Lines



Cyclic Lines