

ITDP webinars | MOBILIZE

Technology to Improve BRT Reliability: Lessons & Challenges



transit



Ricardo Giesen, Director of BRT+ CoE
Department of Transport Engineering & Logistics
Pontificia Universidad Católica de Chile
Giesen@ing.puc.cl
www.BRT.cl

Contents

- + BRT+ CoE
- + Reliability is key component to satisfy transit users
- + Technology to increase reliability: *Priority & Bus Assist*
- + Experiences in Chile and Sweden
- + Conclusions y Recommendations

BRT+ CoE was recently renewed until 2021

Members BRT+ Centre



THE UNIVERSITY OF
SYDNEY



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA



Contents

- + BRT+ CoE
- + **Reliability is key component to satisfy transit users**
- + Technology to increase reliability: *Priority & Bus Assist*
- + Experiences in Chile and Sweden
- + Conclusions y Recommendations

What do we want on BRT or transit services?



Fast

**REDUCE TRAVEL
TIME**



Low Waiting Time

**INCREASE
FREQUENCY**



Comfort

**INCREASE
CAPACITY**



Reliable

**REDUCE VARIABILITY OF
TRAVEL TIME**

What do we need to get what we want on BRT or transit services?



Fast

REDUCE TRAVEL TIME

INCREASE SPEED



Low Waiting Time

INCREASE FREQUENCY

INCREASE FLEET SIZE OR INCREASE SPEED



Comfort

INCREASE CAPACITY

INCREASE FLEET SIZE, SIZE OF VEHICLES, OR INCREASE SPEED



Reliable

REDUCE VARIABILITY OF TRAVEL TIME

REGULAR HEADWAYS

TODAY MESSAGE



Fast



Low Waiting Time



Comfort



Reliable

**i INCREASE SPEED
&
REGULAR HEADWAYS!**



Let's answer **three** questions

- 1 Why bunching occurs?
- 2 What are the impacts?
- 3 Is there a solution?

Variability of travel time



Poor
dispatching

Congestion

Traffic lights



Drivers
Heterogeneity



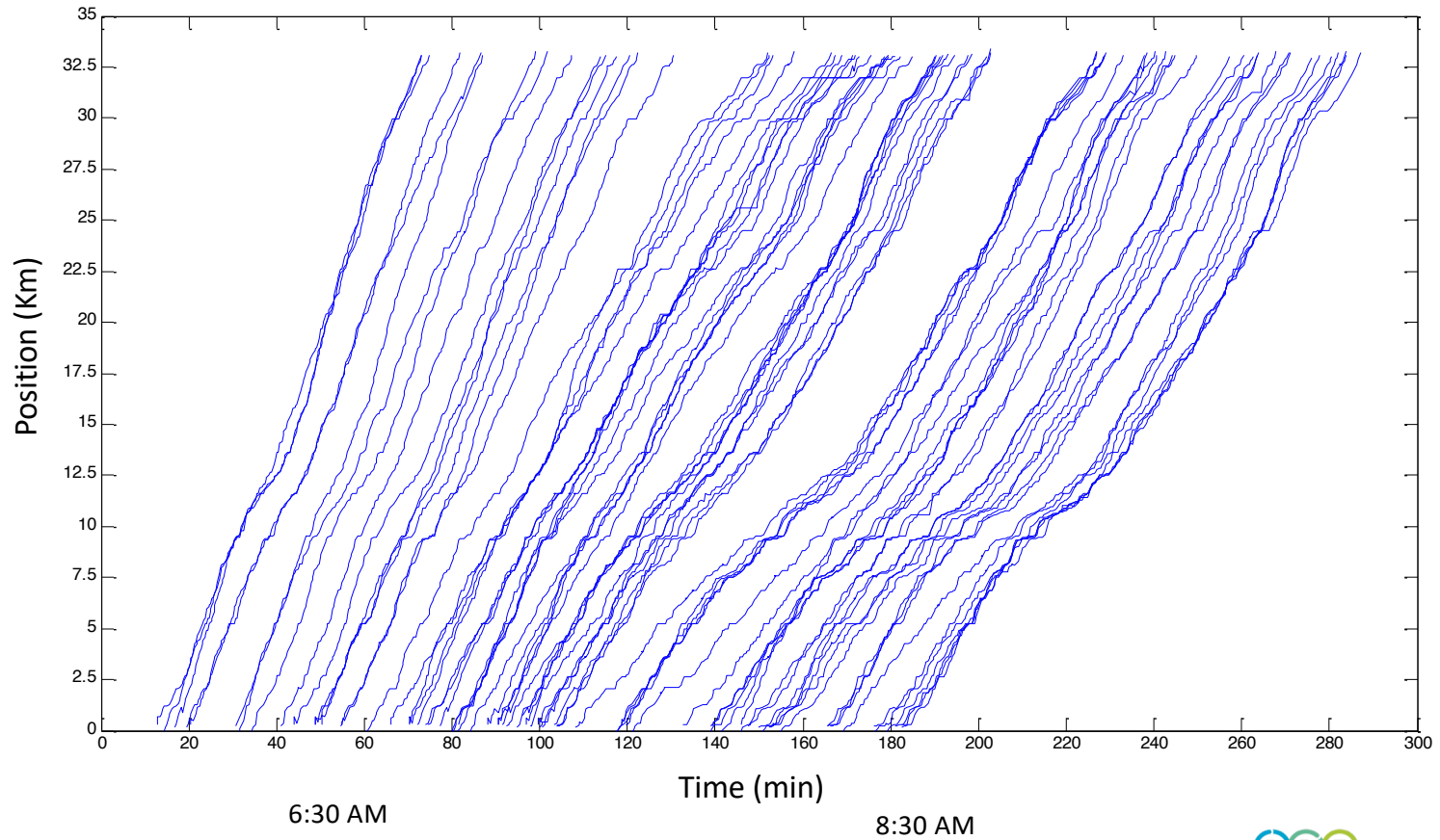
Variability in stopping times



Random arrival of users
at each stop

Trajectories time-space

A Service in Santiago, March 25th, 2009



Let's answer **three** questions

1

Why bunching occurs?

2

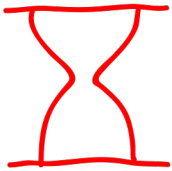
What are the impacts?

3

Is there a solution?

BUS BUNCHING

Many Negative Impacts



INCREASE OF
WAITING TIMES



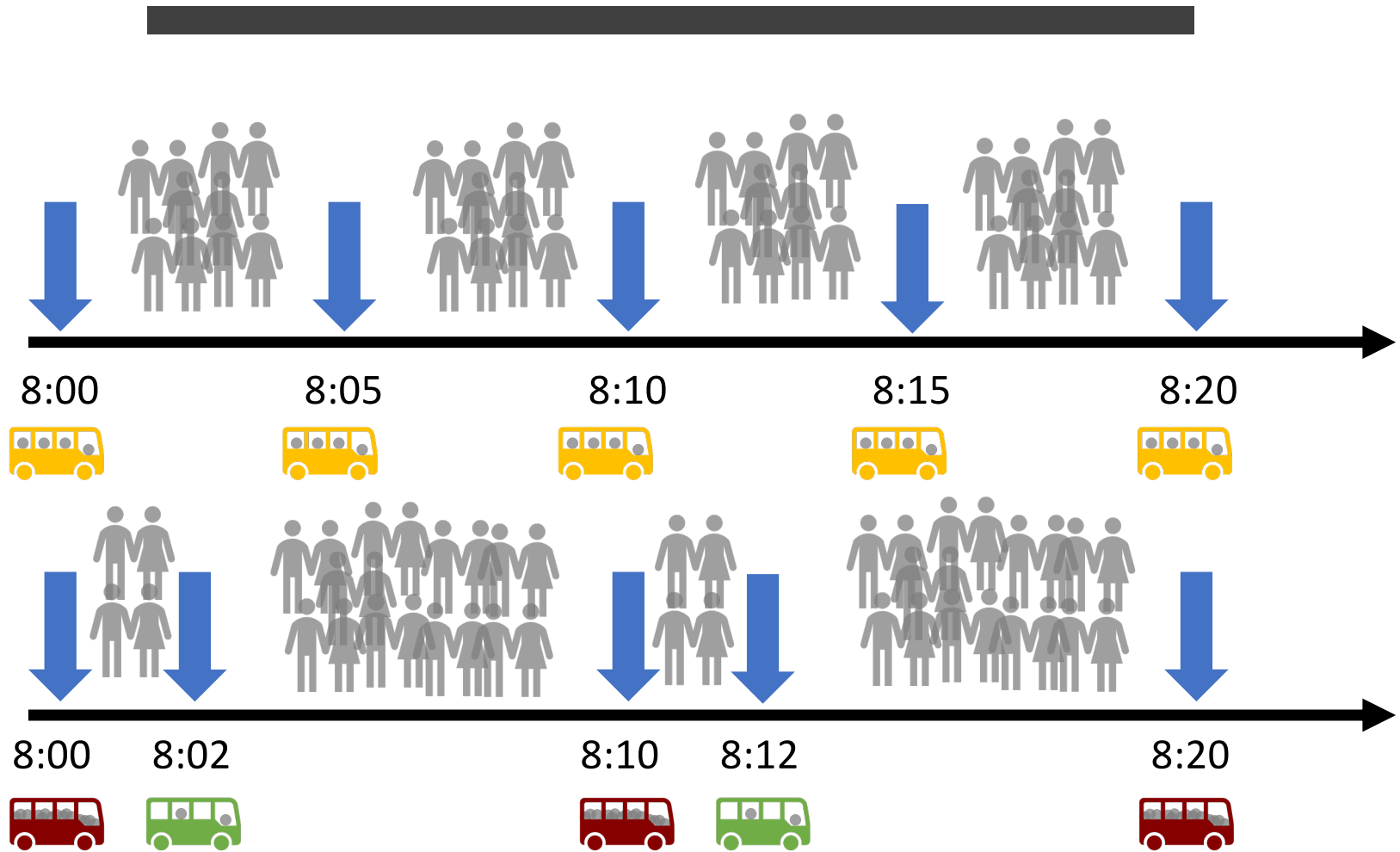
DECREASE COMFORT
& RELIABILITY



INCREASES VARIABILITY
OF CYCLE TIMES



REDUCES TRANSIT
DEMAND





Fast



Low Waiting Time



Comfort



Reliable

INCREASE THE SPEED

&

REGULAR HEADWAYS!



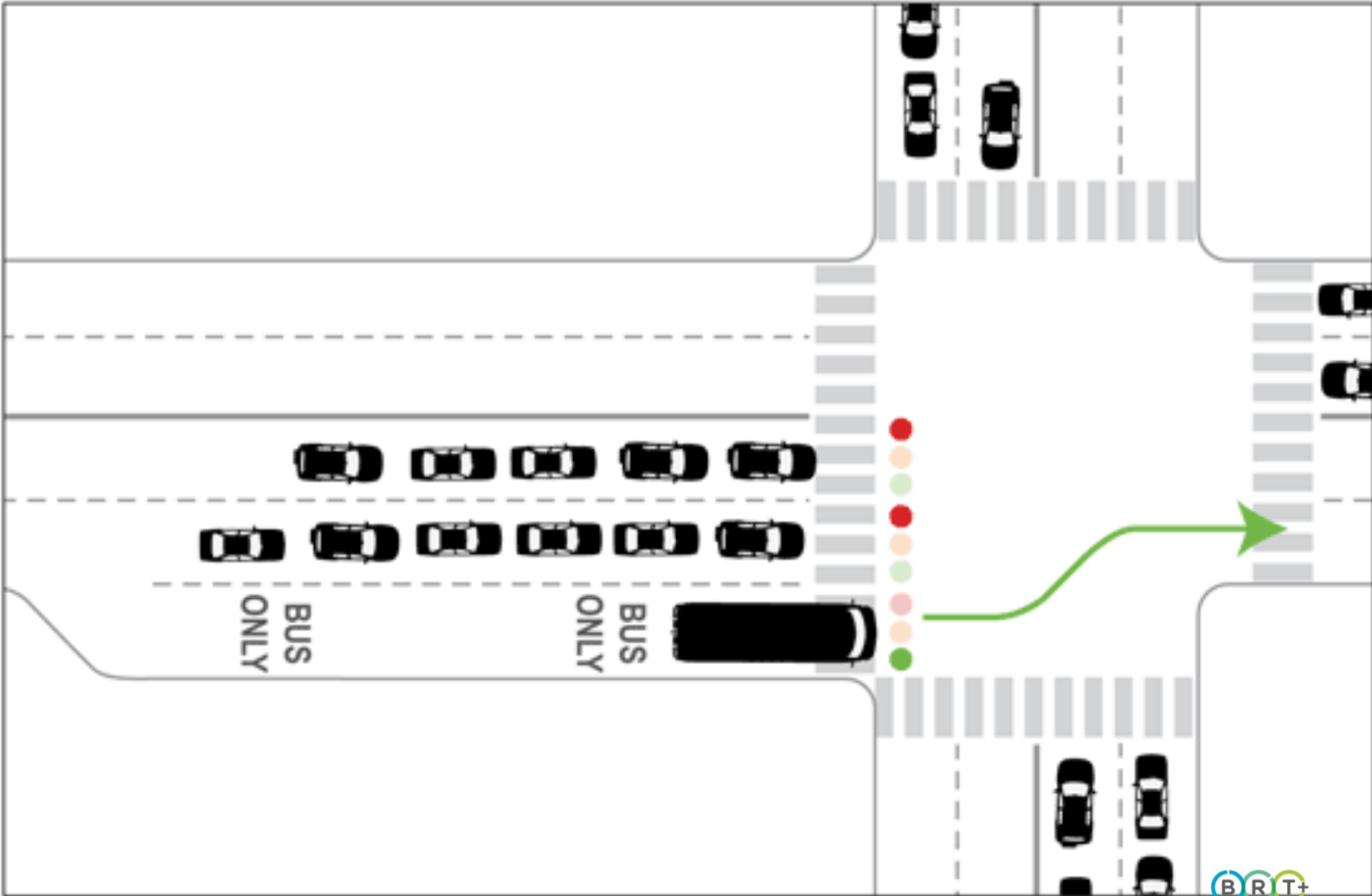
Let's answer **three** questions

- 1 Why bunching occurs?
- 2 What are the impacts?
- 3 Is there a solution?

Contents

- + BRT+ CoE
- + Reliability is key component to satisfy transit users
- + **Technology to increase reliability: Priority & *Bus Assist***
- + Experiences in Chile and Sweden
- + Conclusions y Recommendations





Source: mto.gov.on.ca



You are
doing fine

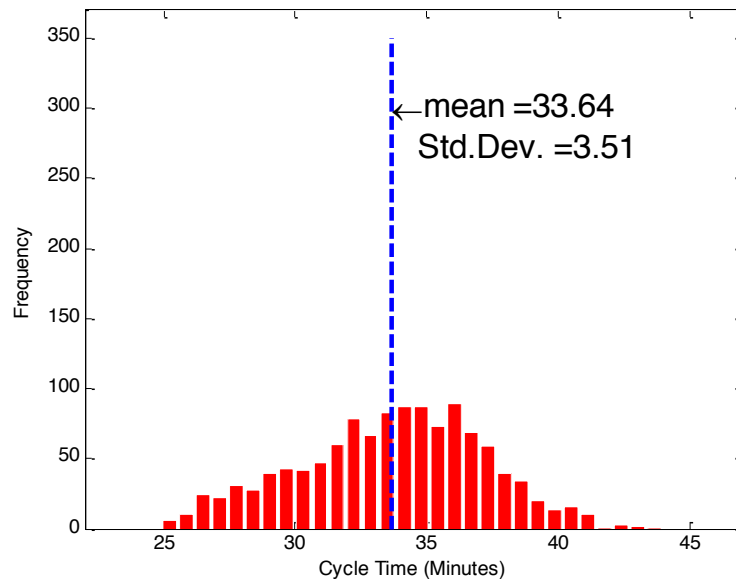
Wait at
headers or
control
points

You are
running
late

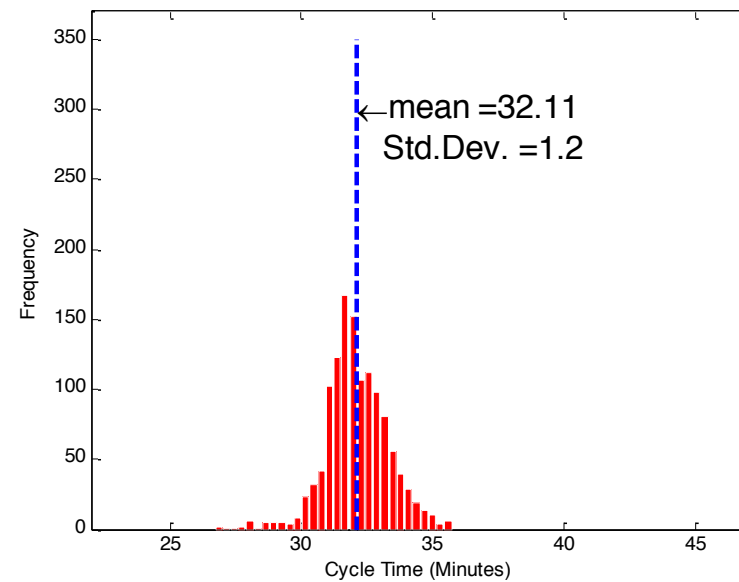
Go slower



Cycle Time



Without Control



HRT

The BRT future should be written with double R

BRRT

Bus **Rapid** and **Reliable** Transit



Contents

- + BRT+ CoE
- + Reliability is key component to satisfy transit users
- + Technology to increase reliability: *Priority & Bus Assist*
- + **Experiences in Chile and Sweden**
- + Conclusions y Recommendations

Experiences

Santiago, Chile

Transantiago

Redbus Urbano



Lund, Sweden

Skånetrafiken



Monitoring

Real-time Information

BusAssist
transit



Linear Synoptic



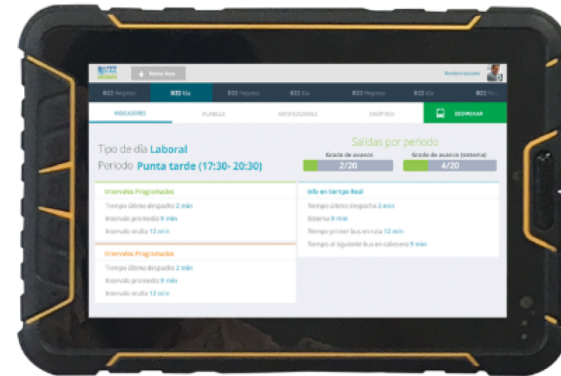
Map Synoptic

Dispatcher

Buses y drivers



Web Plataforma



Mobil App



Console on the bus

Communication with driver and regulation (Android)

BusAssist
transit



Smart Dispatcher



Optimization tool, that propose the time and buses for the following departures according to :

- Current location of buses and recent dispatches
- Availability of buses at the header and next arrivals

Main objective to increase indicators of frequency and regularity

14:59	15:07	15:55	98	14:50	CJRC-40	Elena Moya Bruna (11min, 29min)	98	14:58* (5)	CJRD-17	14:58 15:34	✓ 1.32
14:49	15:13	16:02	98	14:56	CJRD-17	JARA RECARBARREN, JOSE ESTEBAN (2min, 12min)	98	15:07* (11)	CJRC-39	15:07	✓
14:47	15:24	16:08	98	15:02	CJRF-91	Carlos Gonzalez Flores (6min, 28min)	98	15:13* (6)	CJRF-43	15:13	✓
14:24	15:28	16:16	98	15:13	CJRC-97	Eugenio Espinoza Alarcon (25min, 26min)	98	15:24* (3)	CJRD-84	15:24	0.72
14:34	15:36	16:23	98	15:13	CJRC-39	Manuel Cayuman Huenchuman (7min, 7min)	98	15:28* (5)	CJRC-61	15:28	✓
14:38	15:43	16:31	98								
14:46	15:51	16:38	98								



Tool for Smart Dispatching at Headers



Seleccionar línea

14:57 B04 Retorno

Punta Mediodía

Actualizar

Sentidos Indicadores Despachos Períodos

Marcelo Alejandro Pirul Vera

06 54 Actualizar

Código interno/Patente Código/Nombre

Observaciones Despachar Limpiar

Salidas por intervalos

Progreso: 11 / 12 92%

Progreso (Sistema): 12 / 12 100%

Programa de Operación

Salida	Llegada	Plazas
06:30	06:31	49
06:40	06:31	49
06:50	06:38	49
07:00	06:44	98
07:10	07:03	49
07:20	07:12	49
07:30	07:30	49
07:40	07:41	49

Despachos

Salida	Patente	Nombre	Plazas	Observaciones
06:39	CJRF-16	Marcos Navarrete Robledo (9min, 31min)	98	
06:51	CJRF-83	Felix Herrera Ramirez (7min, 10min)	98	
07:03	CJRG-84	Jose Lartiga Segura (0min, 15min)	98	
07:18	CJRT-75	URRA URRA, JOSE ALFREDO (6min, 9min)	49	
07:28	CJRF-81	Yamil Rojas Soto (2min, 19min)	98	
07:39	FLXB-92	Roberto Caceres Beltran (3min, 23min)	49	
07:48	FLXB-60	Rosamel Miranda Alegria (4min, 4min)	49	
07:56	FLXB-56	Oscar Fajardo Orellana (7min, 21min)	49	

Sistema GPS REGRESO

Sistema	Patente	Hora de paso	Multas minutos
06:31 (2)	CJRF-16	06:31 06:51 06:57	✓ ✓ ✓
06:31 (5)	FLXB-60	06:31 06:49 06:56	✓ ✓ ✓
06:38 (2)	CJRB-72	06:38 06:56 07:03	✓ ✓ ✓
06:44 (3)	CJRF-83	06:44 07:05 07:13	✓ ✓ ✓
07:03 (6)	CJRG-84	07:03 07:28 07:36	1.93 5.93 6.43
07:12 (11)	CJRT-75	07:12 08:03 08:12	✓ ✓ ✓
07:30 (6)	CJRF-81	07:30 07:59 08:08	1.17 17.38 17.88

Planned

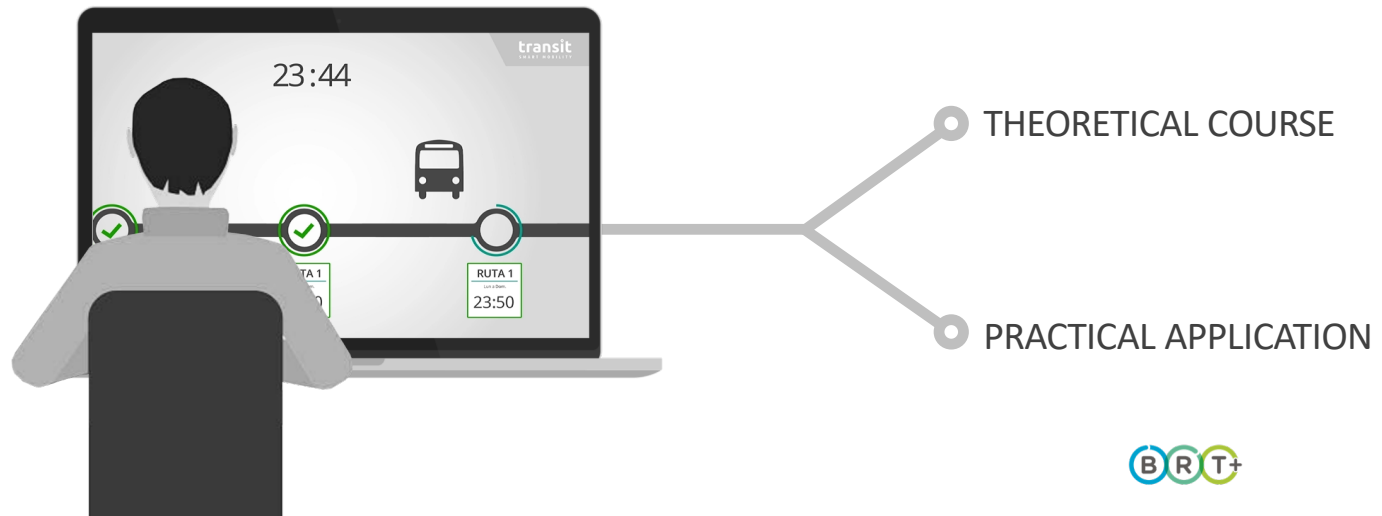
Dispatched

GPS



TRAINING

TEACHING REQUIRED METHODS TO DISPATCH CORRECTLY



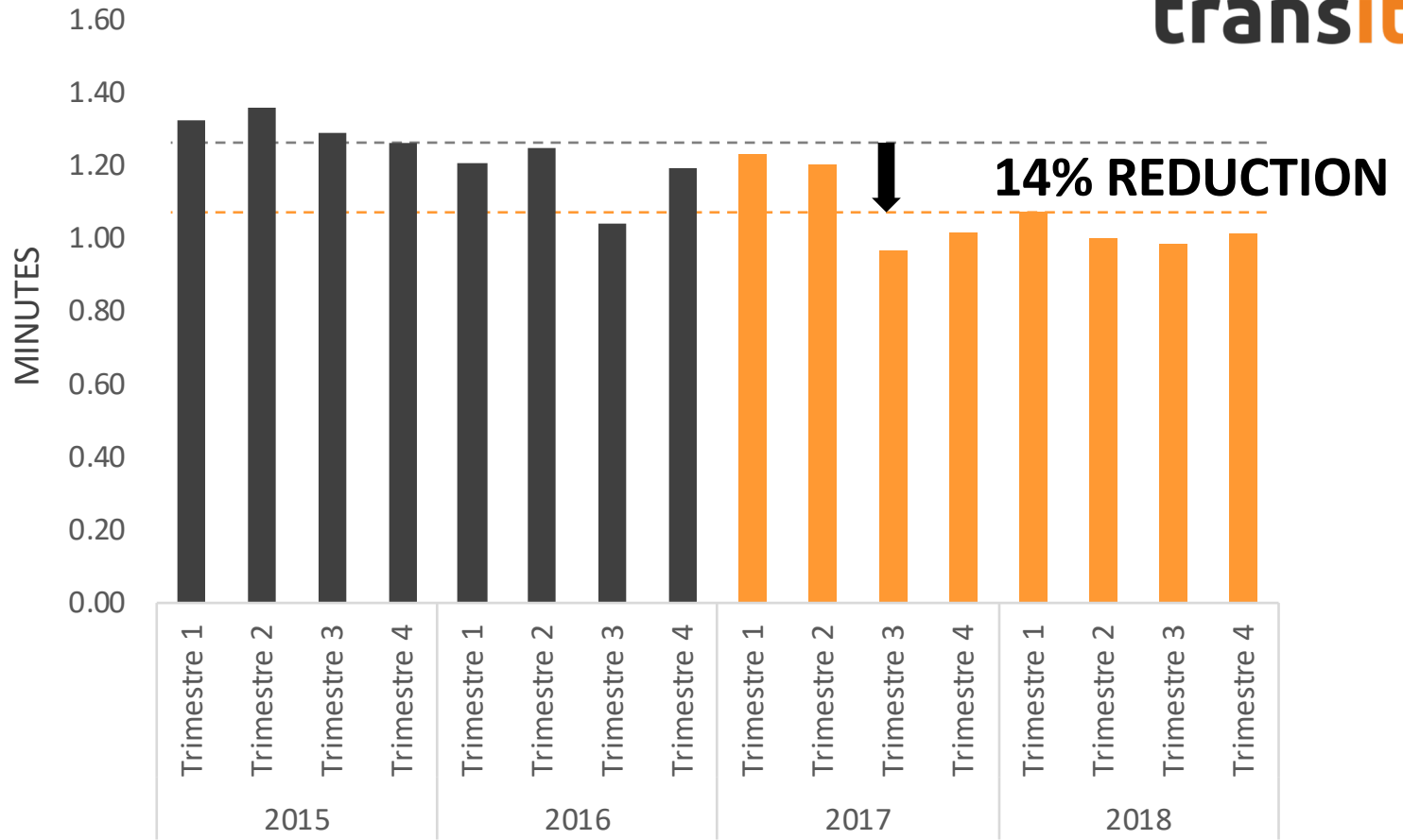
TIME

EXCESS WAITING TIME (EWT)

AT THE DISPATCHING SITE

EXCESS WAITING TIME

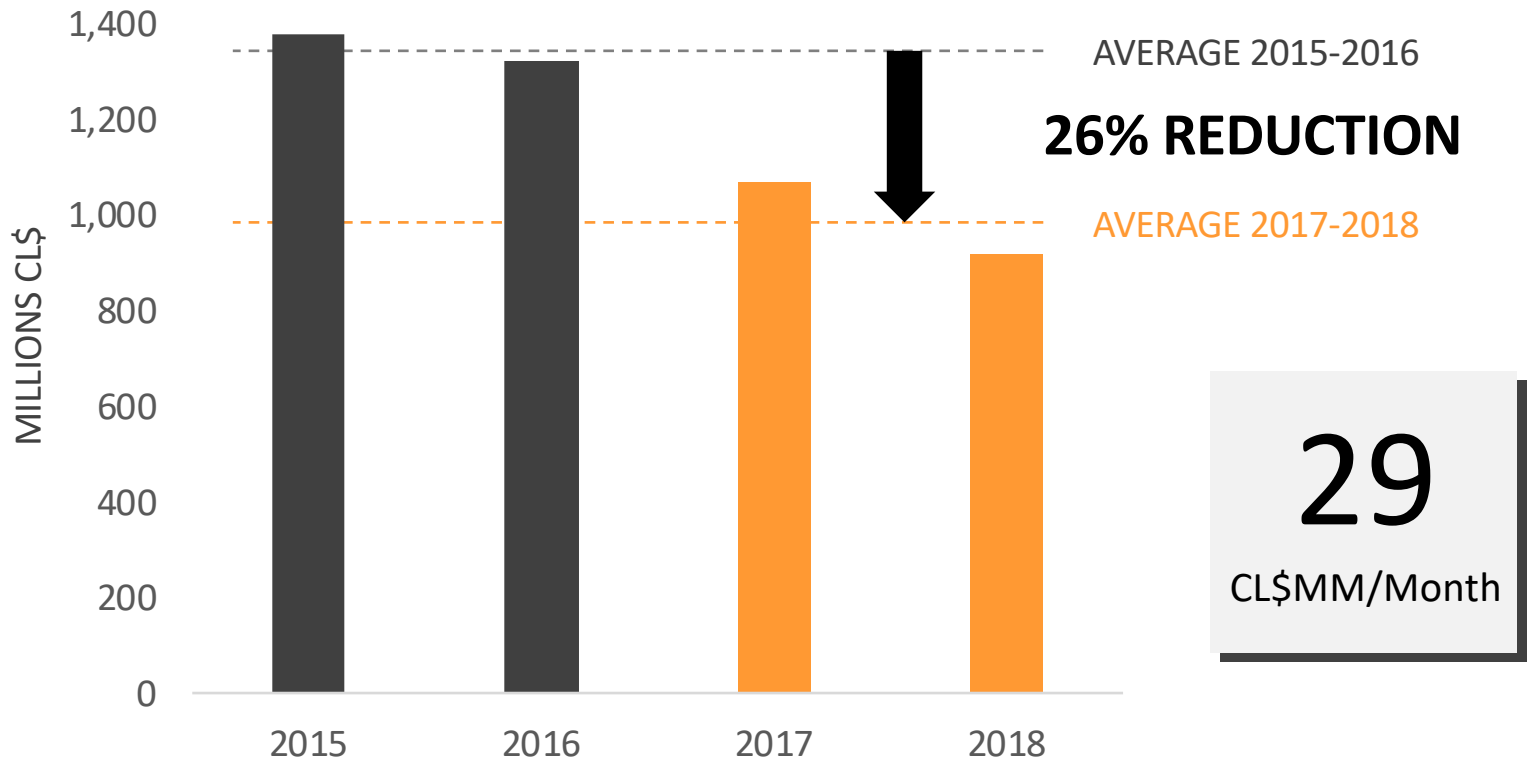
At dispatching header



COSTS

Annual FINES

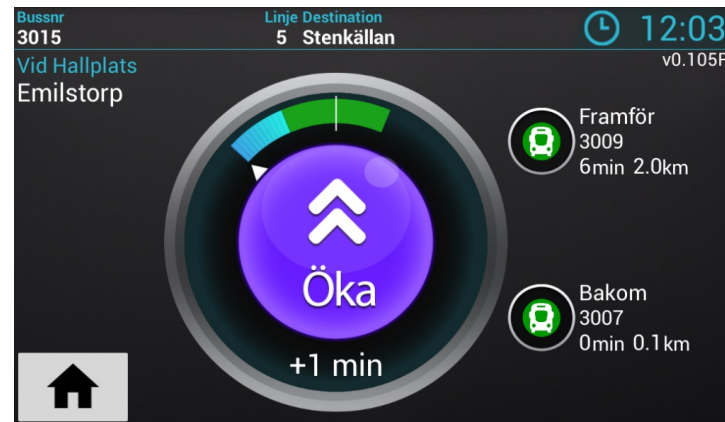
Redbus (Transdev-Chile) Case Costs: Annual Fines



Lund Case

Work with government authority of Scania region in Sweden:

- Idiomatic, distance and time barriers
- More technical requirements
- New types of operation (with punctuality or route services with shared segments)
- Focus on design and UX



BusAssist
transit



Conclusions

- Reliability is a key metric in the user experience
- To achieve Reliability we need Regularity
- To guarantee regularity we need:
 - ➔ Support of an intelligent system that adapts dynamically to the operating conditions
 - ➔ Commitment of drivers and operators
 - ➔ KPI and management of continuous improvement