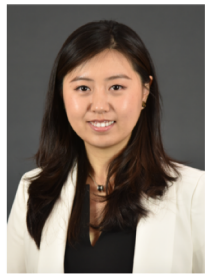
Decoupled Capacity by Powerloop

Supply Chain MANAGEMENT

Elisa Fankhauser



Ge Li

AGENDA

- Industry Background & Sponsoring Company
- Project Description
- Methodology
- Data
- Result & Analysis
- Recommendation
- Conclusion

Industry Background & Sponsoring Company

Uber Freight

- Affiliate of Uber Technologies, Inc.
- Founded in 2017
- ELD mandate has put further pressure on driver capacity
- UF aims to provide more efficient and transparent loads to help shippers and carriers in a better way

Powerloop

- Affiliate of Uber Technologies, Inc.
- Founded in 2018
- Rethinking how to combine tech and trucking to improve driver utilization

POWERLOOP

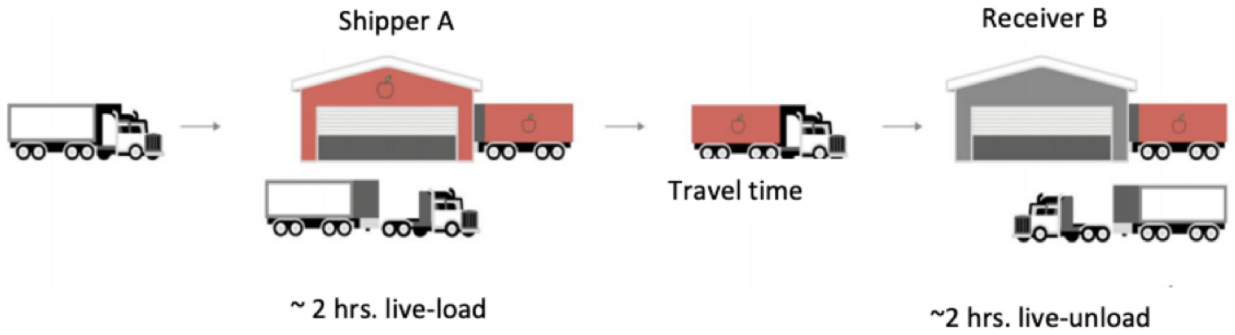
Potential Benefits to Shippers and Carriers

For Shippers:

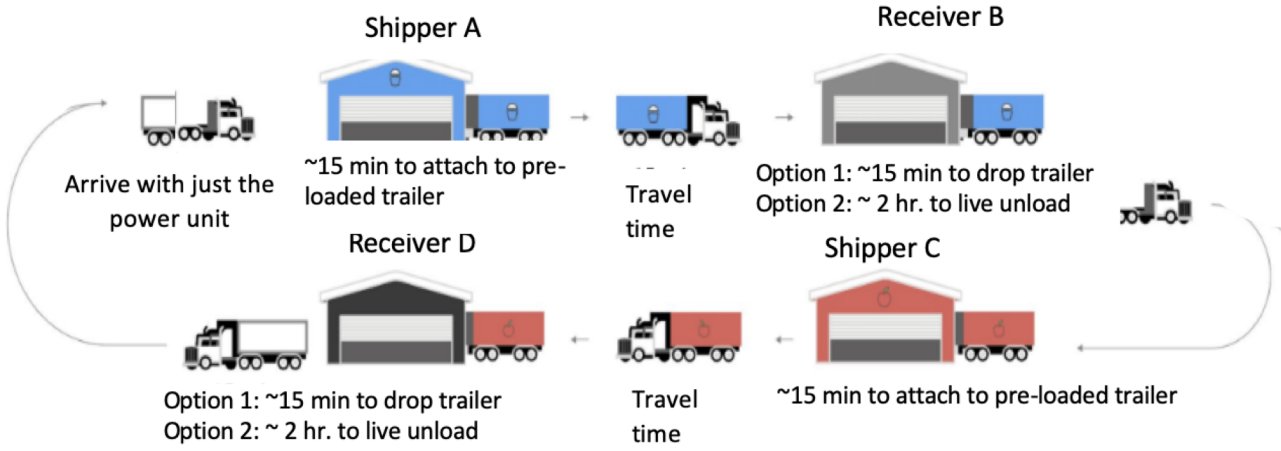
- Access to a large pool of carriers
- Less delays and detention fees
- Improvement in warehousing efficiency and labor utilization
- Become a preferred shipper by carriers

For Carriers:

- Return home each evening
- Increased carrier utilization
- Access to a wide array of freight
- Less capital tied up in assets
- Allows small carriers to participate in a trailer pool program



Traditional Loads



Powerloop Loads

Problem Statement

What benefit can shippers realize in detention fee savings and improved on-time delivery from using Powerloop?

Methodology

Expert Interviews

- 20 Expect Interviews
  - Operations
  - Sales
  - Marketing
  - Engineering

Data Gathering & Cleansing

- 6-month data

Data Analysis

- Trip Type
- Trip ID
- Timestamps
- Geographic
- Performance

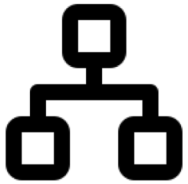
Discrete Event Simulation

- Time series simulation

Data

Trip ID

- Load ID
- Carrier ID
- Shipper ID



Trip Types

- Appt/Window
- LL/DL/DD

Timestamps

- Check-in time
- Check-out time

Geographic

- City/Region (Origin/Dest)
- Trip Distance

Performance

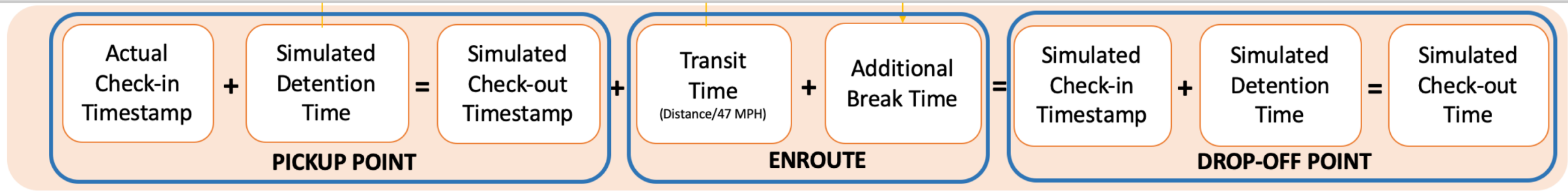
- Actual OTD
- Actual Detention Fee

Assumptions:

- Limited regions studied to the Texas Triangle (Fort Worth, Dallas, Houston, Austin, and San Antonio)
- Removed null value data entries
- Limited to operational loads only (no App booked loads)
- Limited to commercial loads only (no trailer repositioning trips)

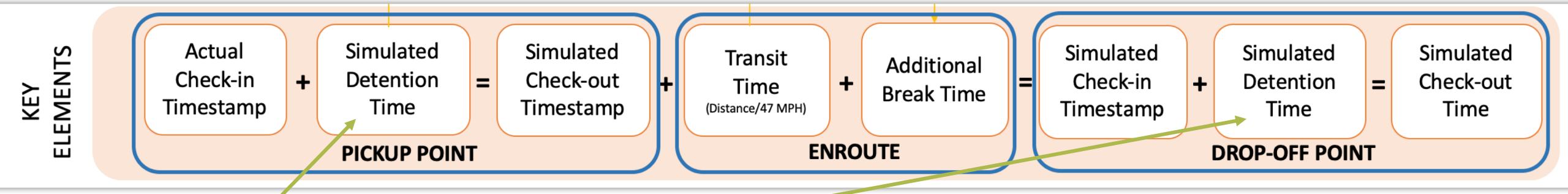
Methodology - Discrete Event Simulation

KEY ELEMENTS



Supply Chain MANAGEMENT

Methodology - Discrete Event Simulation

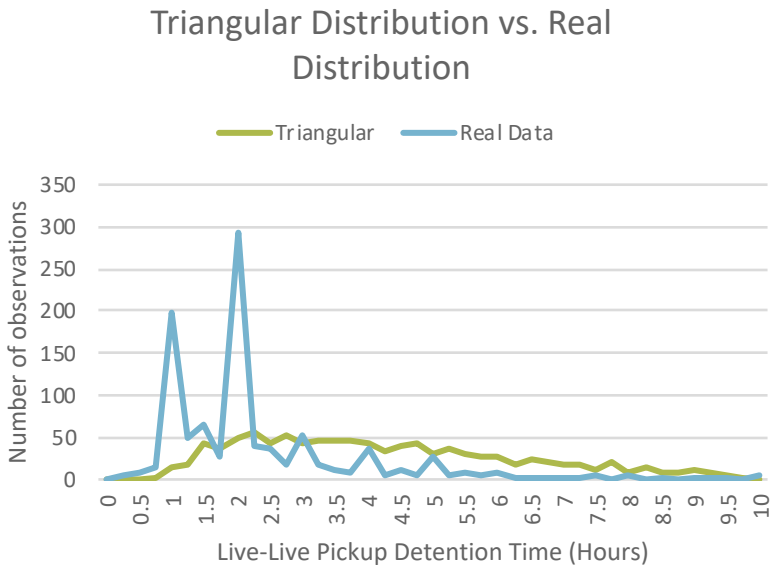


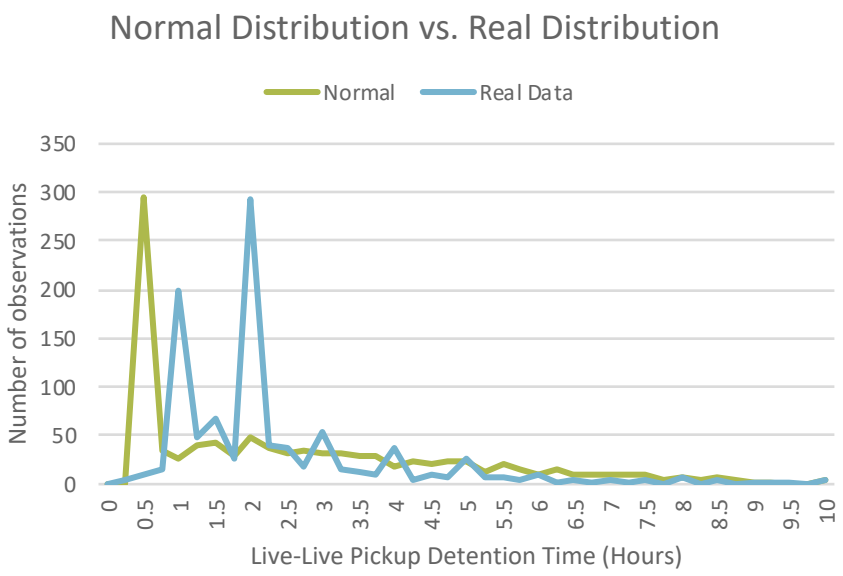
1. Distribution study over the actual detention time

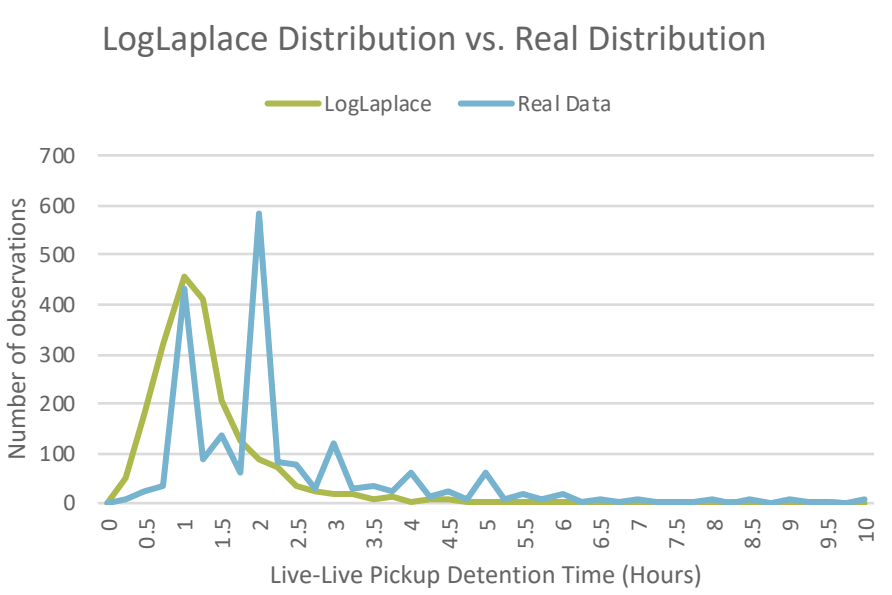
Methodology - Detention Time Simulation

Distribution Tests

- Used Python Fitter to test 80 types of distributions
- Chi-square tested three most fit ones
- None was proved to statistically represent the real distribution



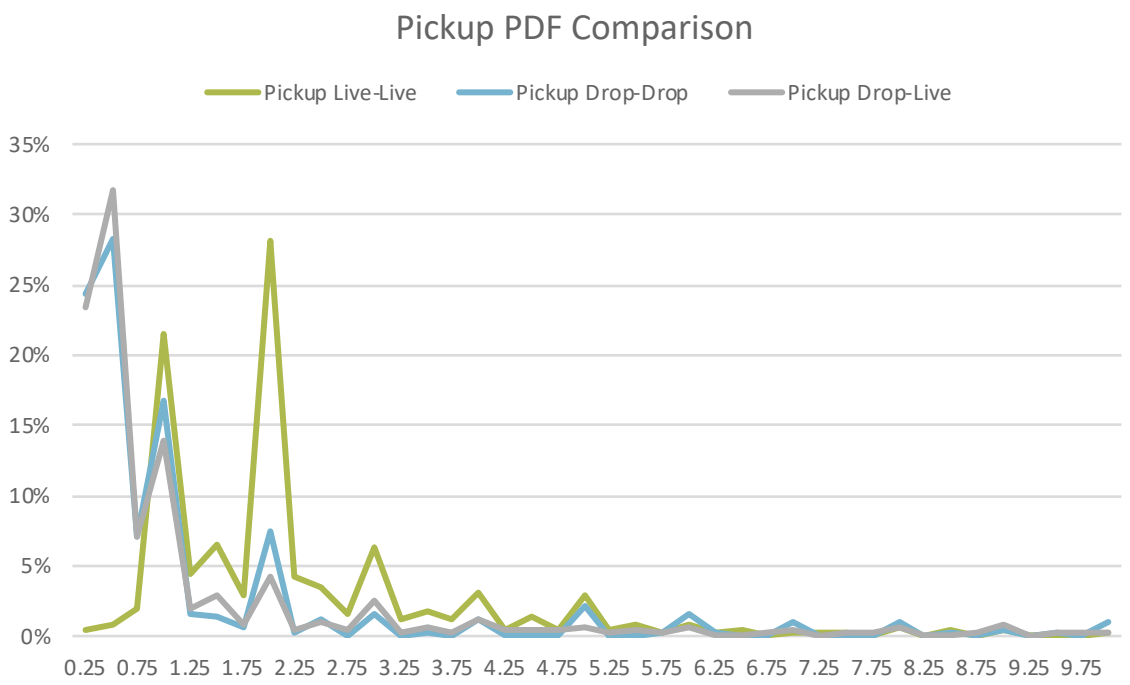


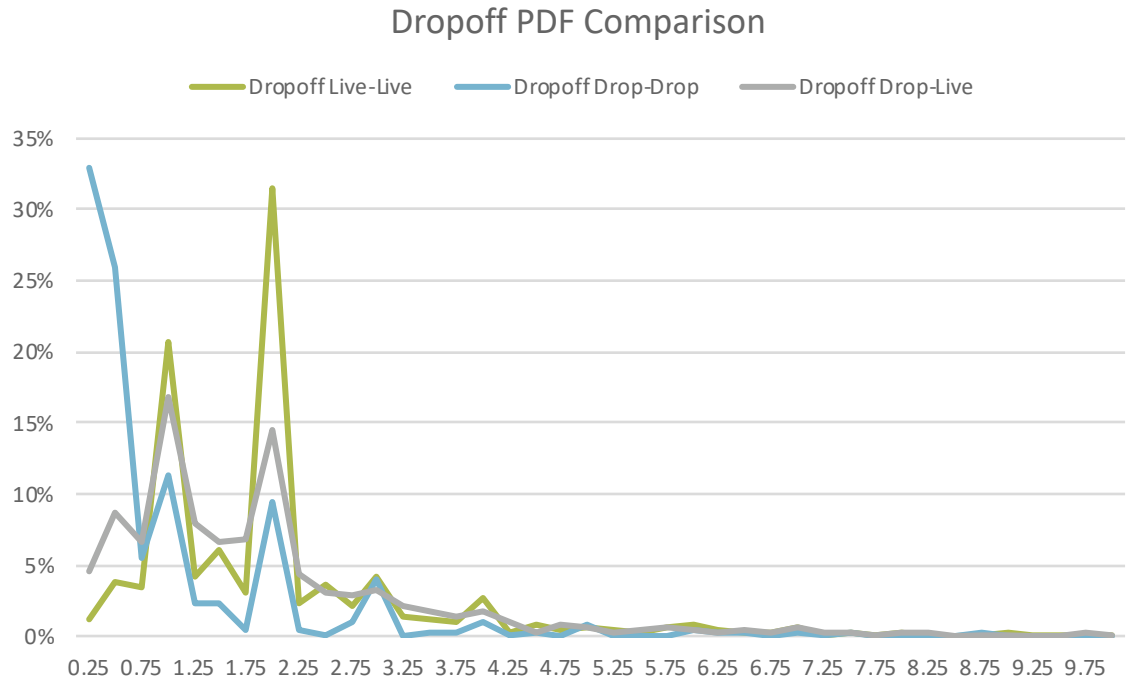


Methodology - Detention Time Simulation

Heuristics Method:

- Generated random numbers based on the probability density function (PDF) of real distributions
- Result represent the real distribution well



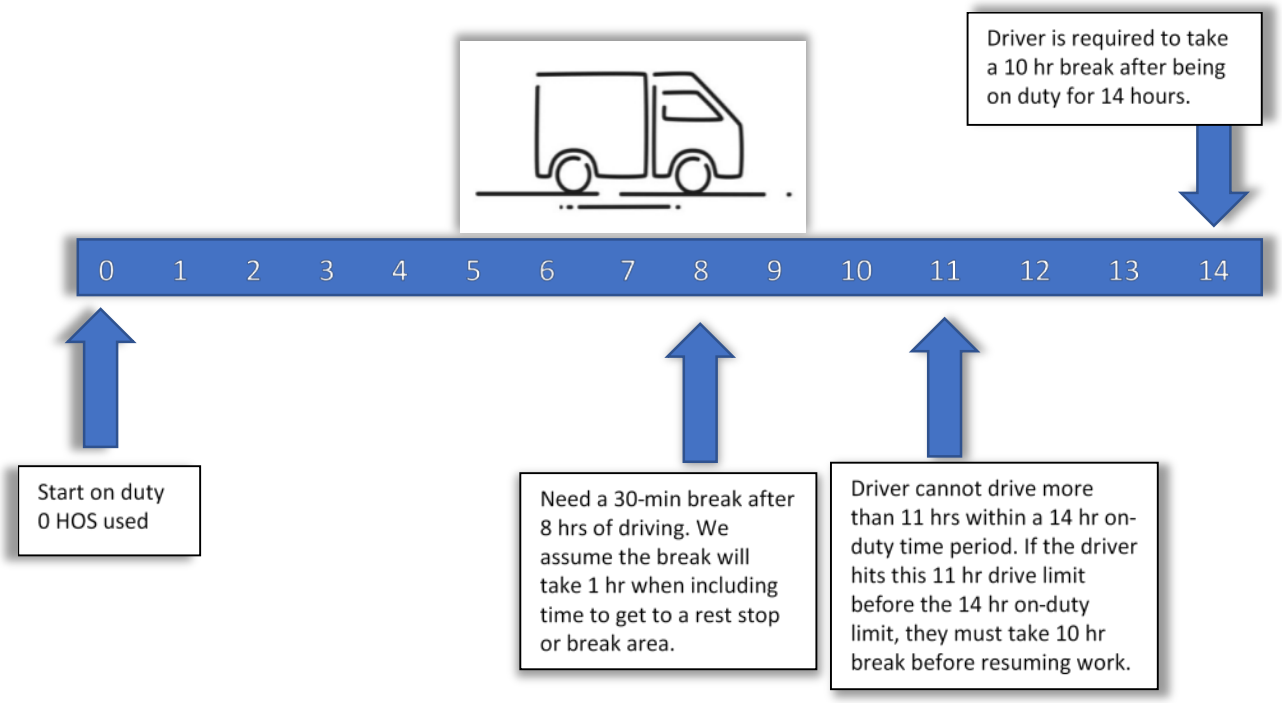


Methodology - Discrete Event Simulation

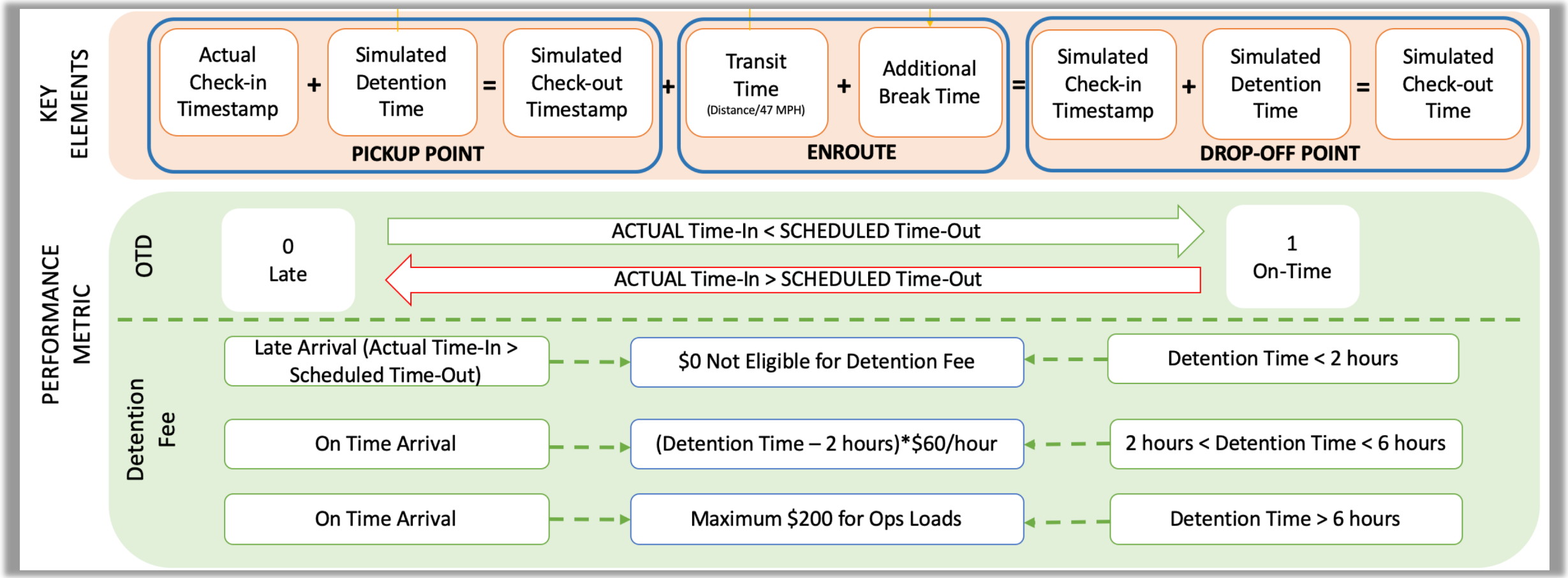
KEY ELEMENTS

Actual Check-in Timestamp	+	Simulated Detention Time	=	Simulated Check-out Timestamp	+	Transit Time (Distance/47 MPH)	+	Additional Break Time	=	Simulated Check-in Timestamp	+	Simulated Detention Time	=	Simulated Check-out Time
PICKUP POINT						ENROUTE				DROP-OFF POINT				

2. Hours of Service (HOS)



Methodology - Discrete Event Simulation



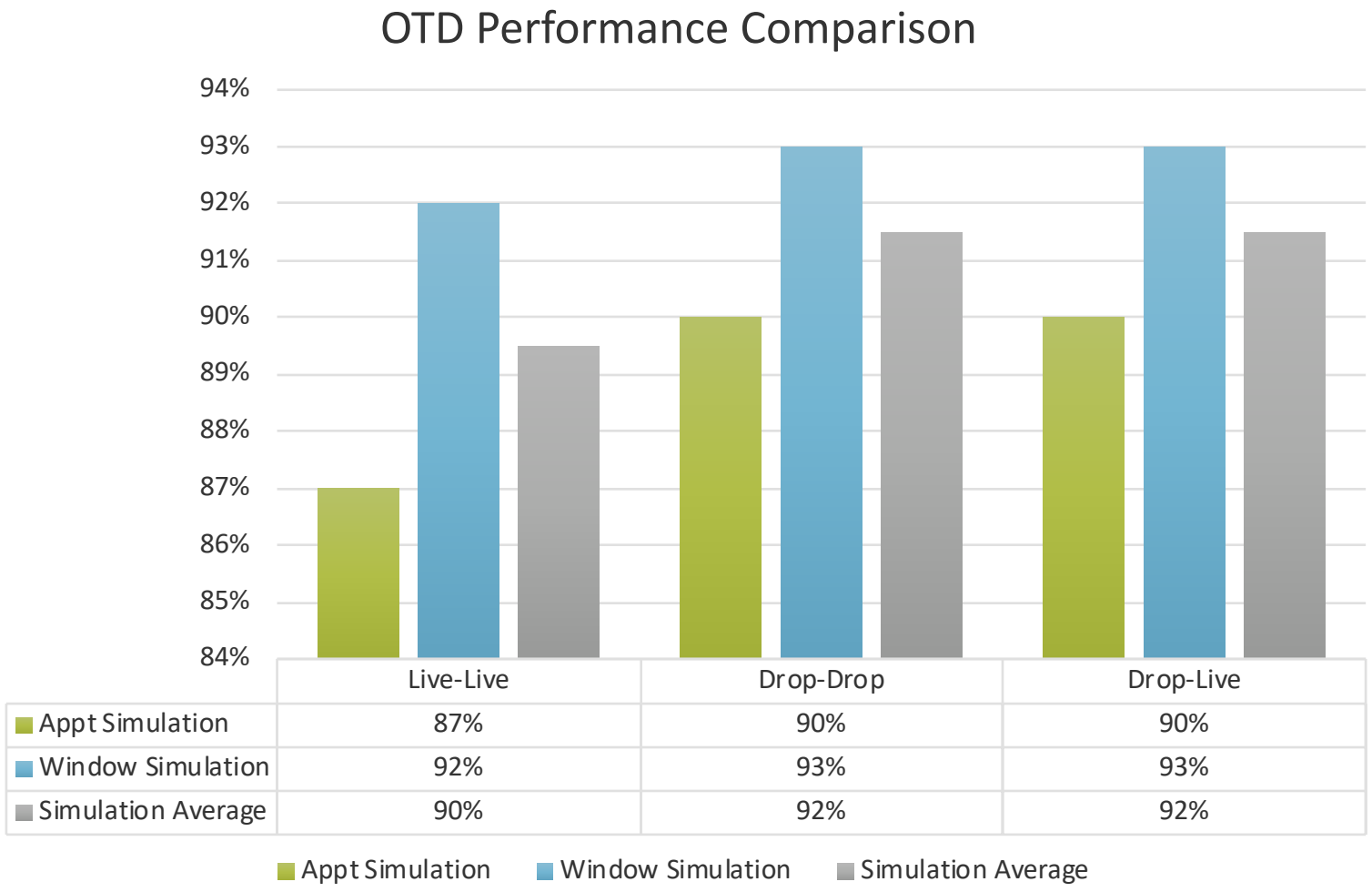
Result & Analysis - OTD

Result:

- Drop-Drop loads could improve OTD by 2% compared to Live-Live loads currently.
- Difference is not significant as DD is still in Learning Curve

Insights:

- Drop loads in general have better OTD
- Drop-Drop loads have the same OTD as Drop-Live loads
- Simulated OTD is lower than actual
- Window schedule types perform better than Appointment schedule types



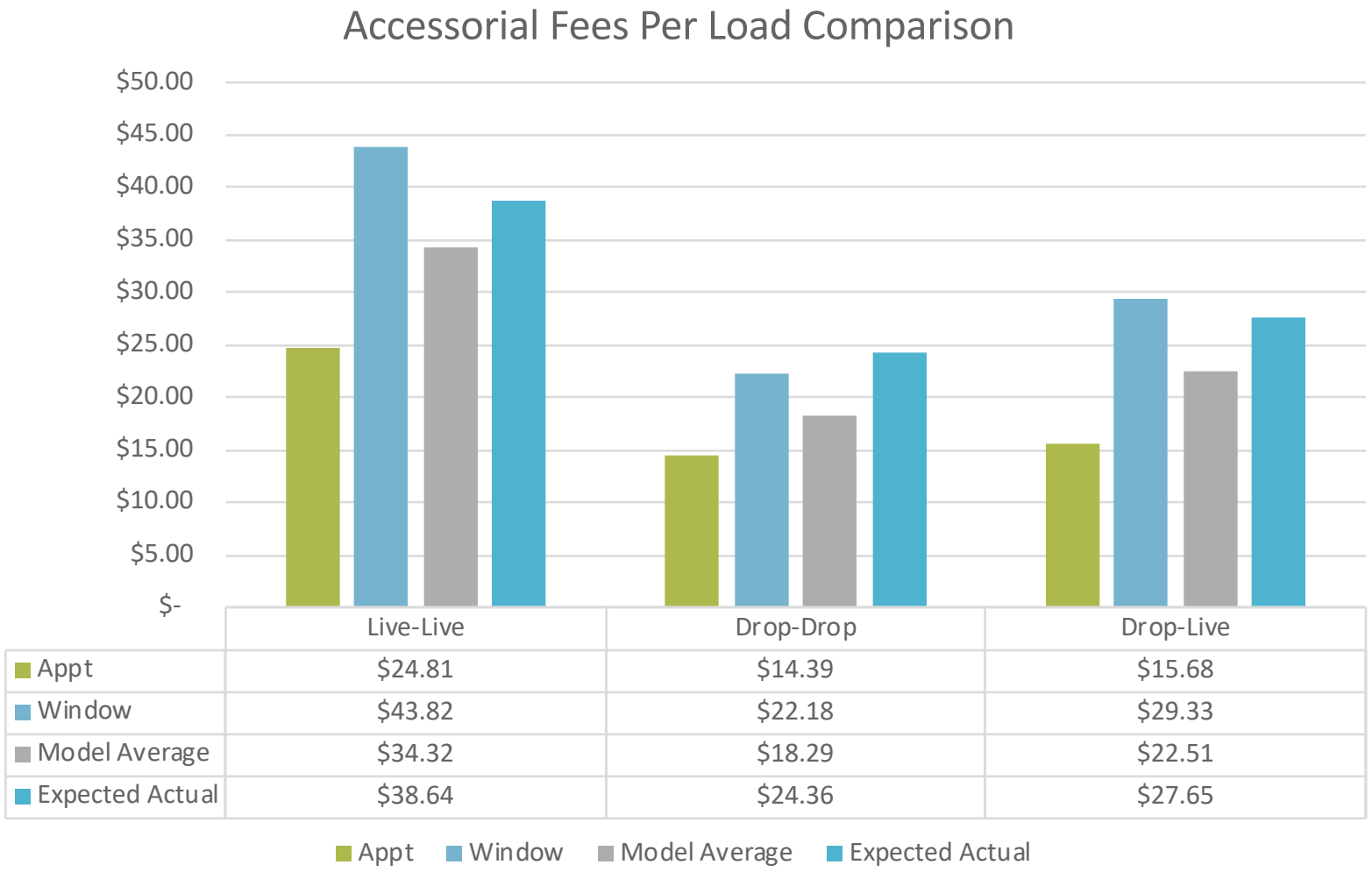
Result & Analysis – Detention Fee Savings

Result:

- Drop-Drop loads could save $16 per load on detention fees compared to Live-Live loads

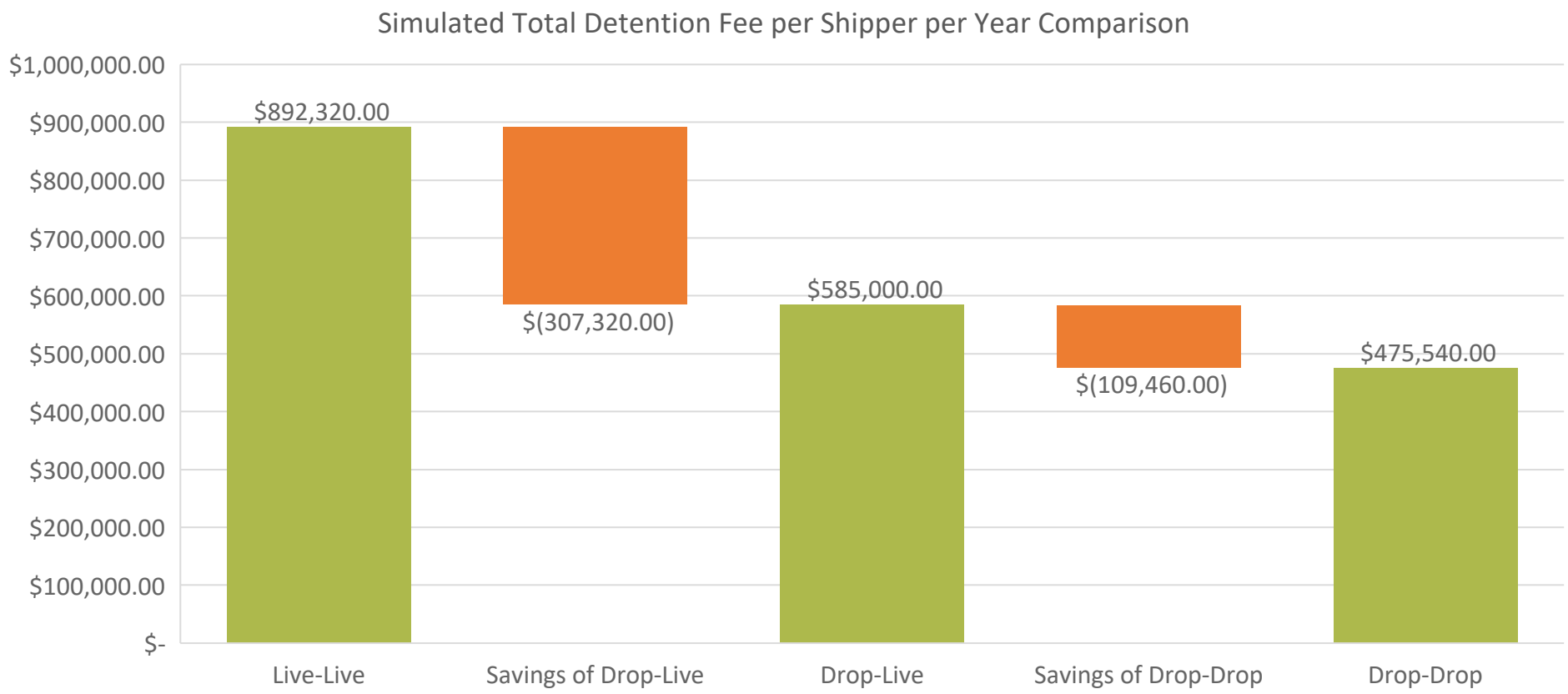
Insights:

- Drop-Drop > Drop-Live > Live-Live
- Window schedule types have higher detention fees than Appointment schedule types



	Live-Live	Drop-Drop	Drop-Live
Appt	$24.81	$14.39	$15.68
Window	$43.82	$22.18	$29.33
Model Average	$34.32	$18.29	$22.51
Expected Actual	$38.64	$24.36	$27.65

Result & Analysis – Detention Fee Savings



Assumptions:

- 100 loads per day per shipper
- 260 business days per year (5 days/week * 52 weeks/year)

Future Researches

- Re-calculate PDF values as Powerloop moves along the learning curve to monitor improvements.

- Track trip identifiers between the inbound and outbound trips to understand effects of the outbound trips to the inbound ones.

- Collect more features of data and conduct future machine learning studies on OTD and detention fee predictions.
  - 6 Features of existing data explains 22% of the expected actual detention fees
    - Delivery distance
    - Appointment type at the pickup facility
    - On-time pickup
    - On-time delivery
    - Detention times at pickup
    - Detention times at drop-off

Conclusion

Powerloop

- Drop-Drop currently improves 2% on OTD than Live-Live
- Expecting higher number upon completing learning curve
- Further studies could be done to testify current hypothesis

- Drop-Drop in theory could save $16 per load on detention fee compared to Live-Live
- Assuming 100 loads per day per shipper, DD could potentially save $400K than LL

Supply Chain MANAGEMENT

Thank You