



# CROSS-BORDER INSTITUTE

# SMART CORRIDORS – SMART BORDERS – SMART CITIES

- *Key messages*
  - *Borders Matter*
    - *No “borderless world” in sight*
    - *Canada’s cross-border economy*
    - *Cross-border supply chains*
  - *Air traffic control as a new border paradigm*
  - *Leverage technological transformation in logistics*
  - *Smart borders and smart cities*

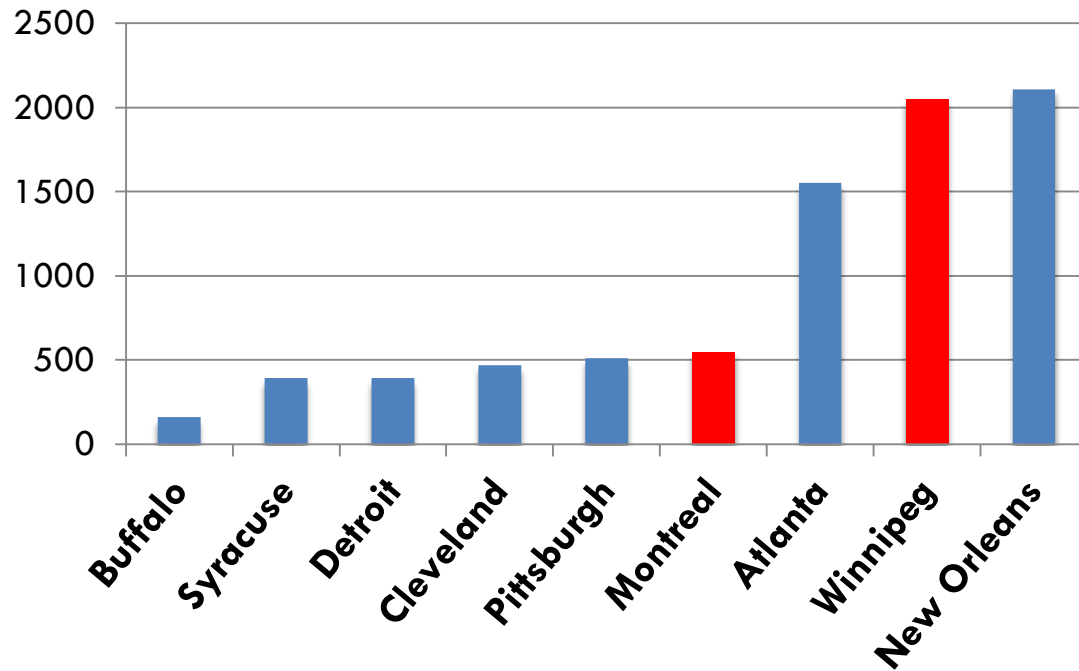


## BORDERS MATTER: STYLIZED FACTS

- *Canada is a trading nation – but focused on the US*
- *Two components of Canada-US trade*
  - *Petroleum and other commodities*
  - *Cross-border supply chains*
- *Ontario's peculiar geography*



# HIGHWAY DISTANCE (KM) FROM TORONTO





# ■ ONTARIO'S HIGHWAY BORDER CROSSINGS

- *Number and locations constrained by Great Lakes*
- *Detroit, Niagara and St. Clair Crossings Dominate*
- *Served by major highway corridors*
- *Commercial crossings*
  - *Cross-border supply chains*
  - *Major role for automotive*
  - *Traffic is regional, continental and global*



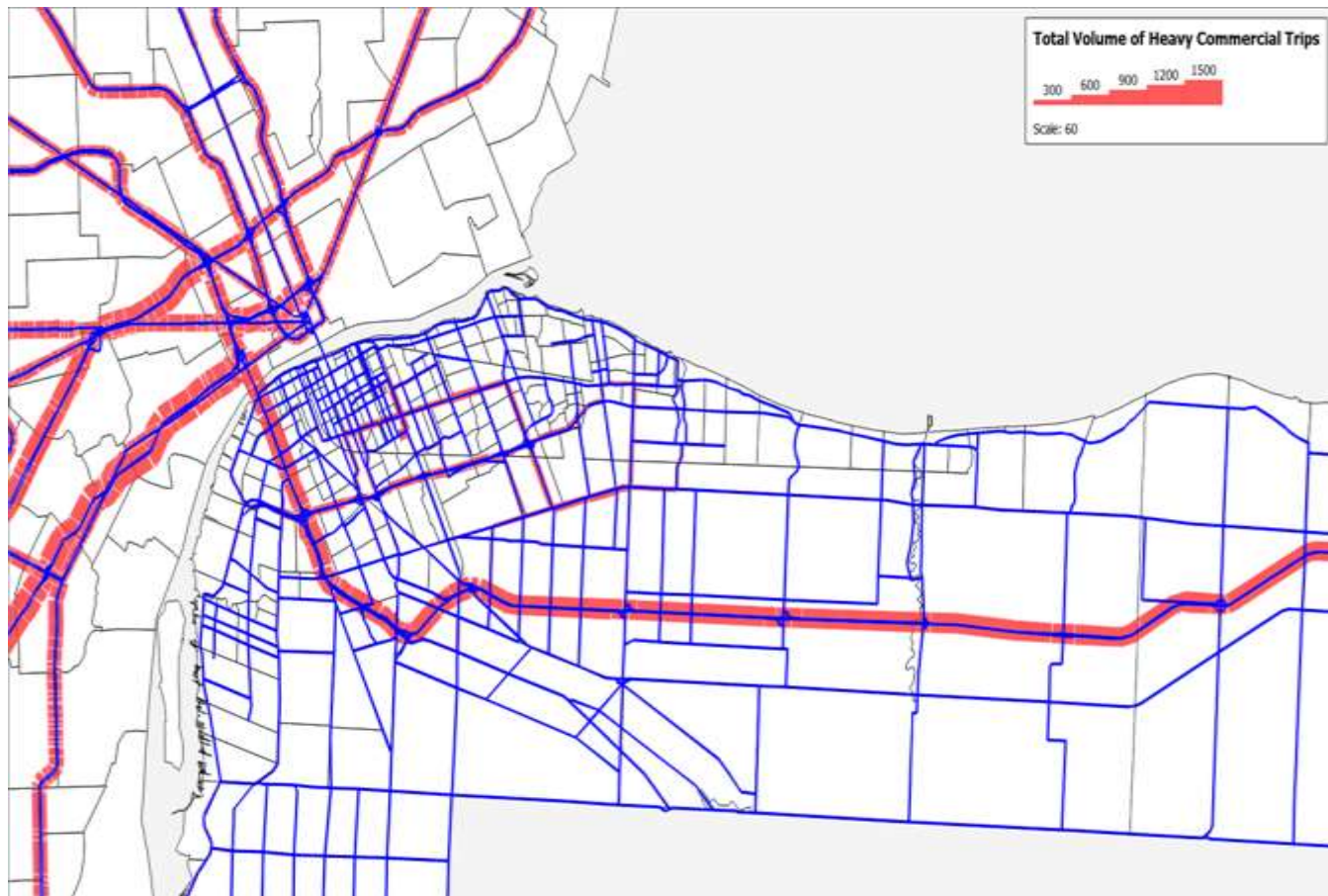




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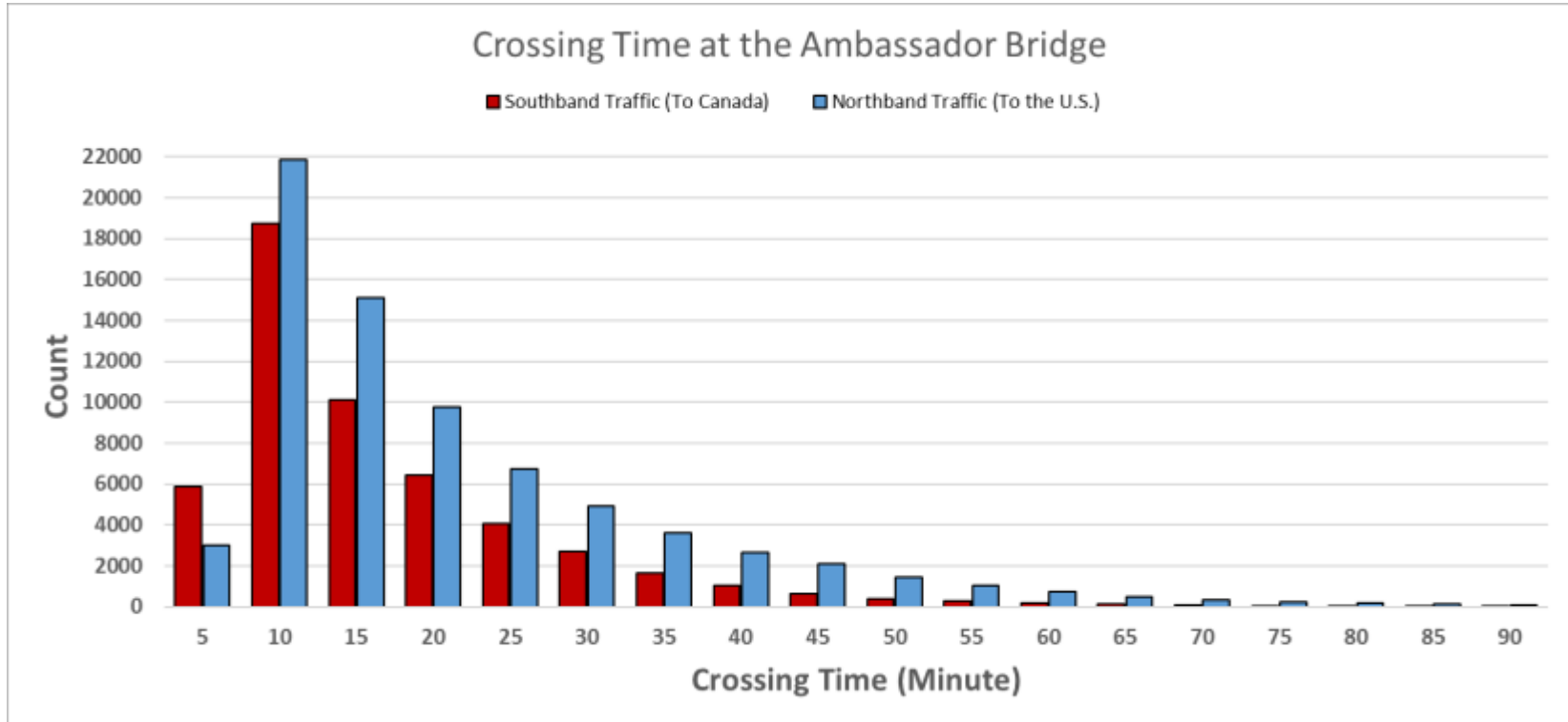
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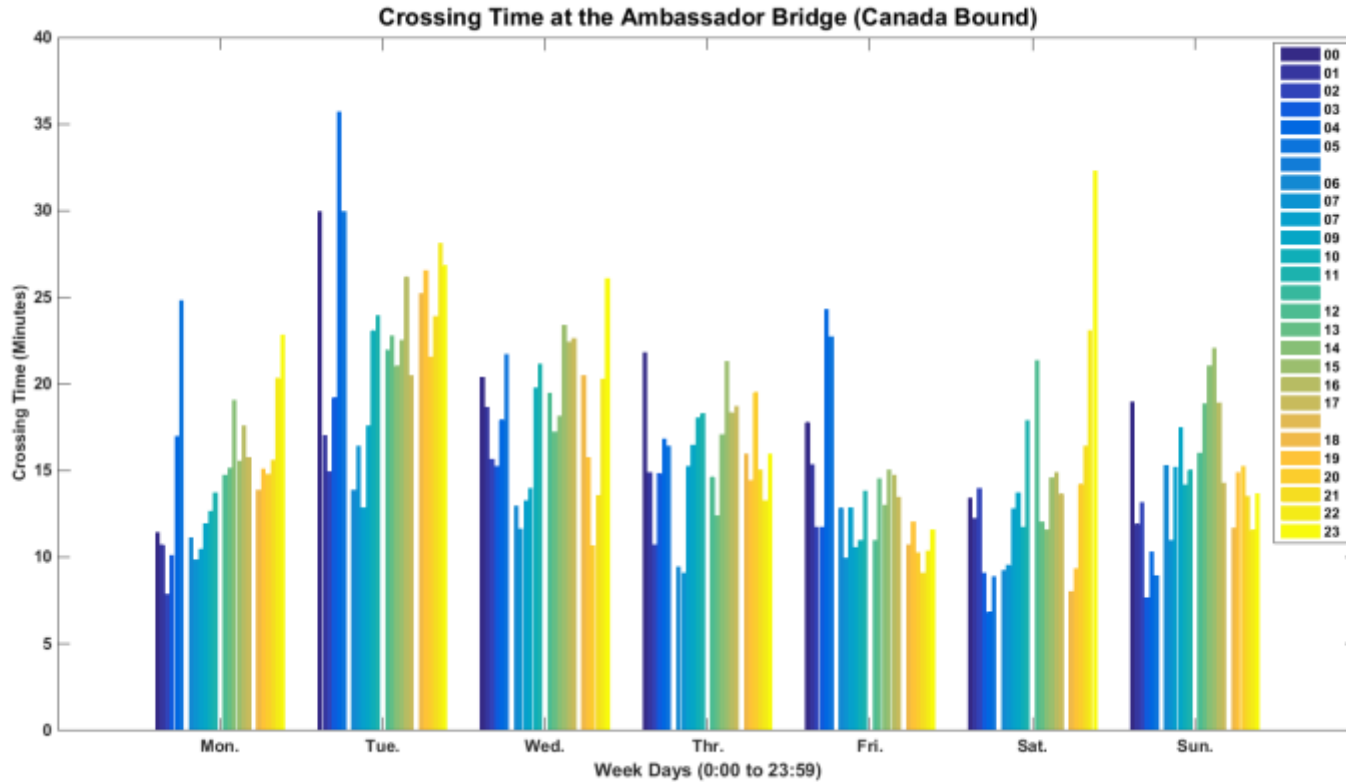
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# VARIABILITY IN CROSSING TIME AT AMBASSADOR BRIDGE (2016 DATA)

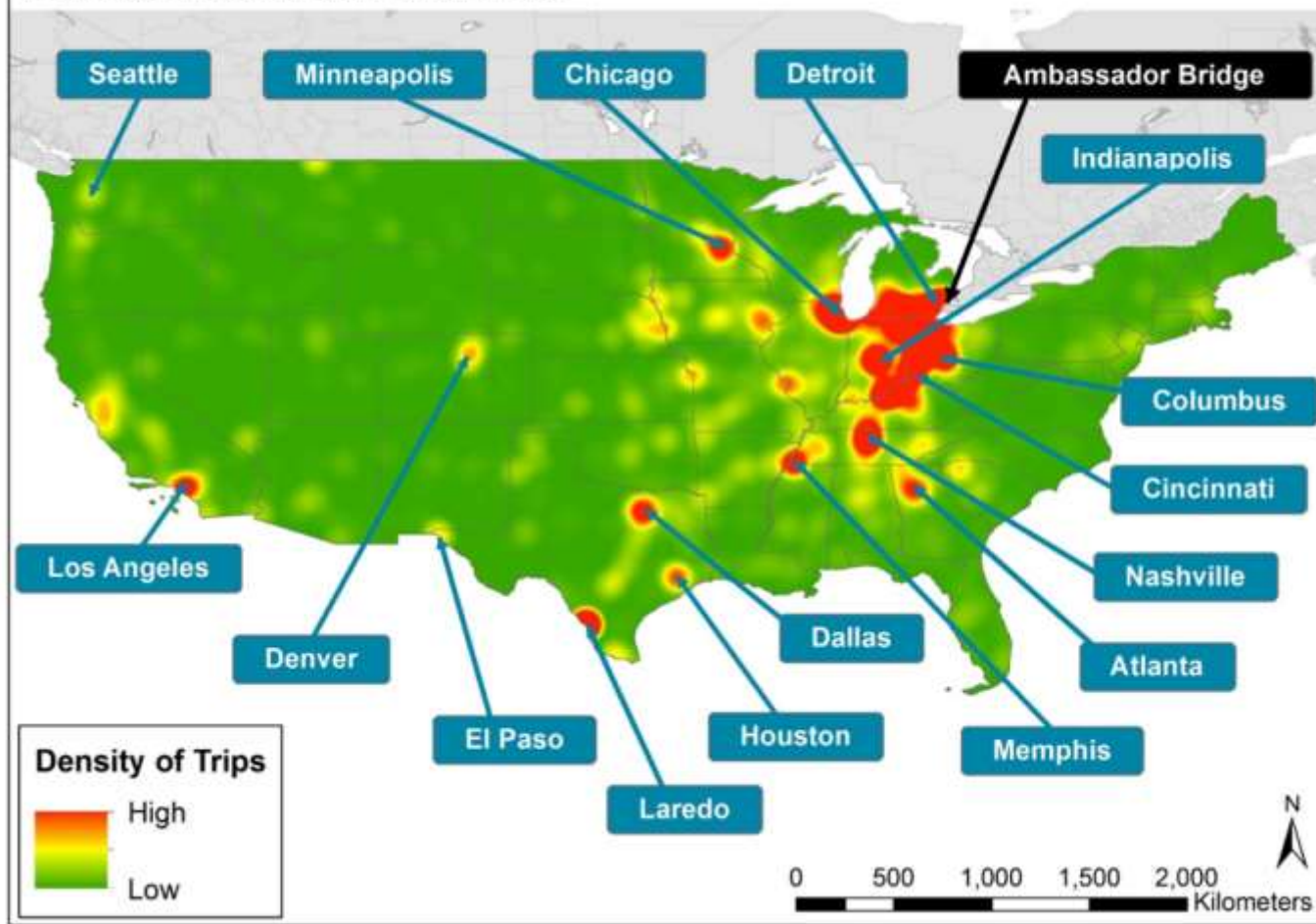


# CROSSING TIME BY HOUR AND WEEKDAY 2016



## Origin Density of Truck Trips Crossing the Ambassador Bridge (2013)

Source: GPS sample data - Cross-Border Institute



## AIRPORT ANALOGY

- *Congestion occurs because most border functions must occur at a single point in space and time*
- *Highway POE is like an airport with no air traffic control*
- *Limited information exchange one hour in advance*
- *Technology developments in logistics – move toward ground-based air traffic control*



# HIGHWAY POE (CANADA, PEACE BRIDGE)



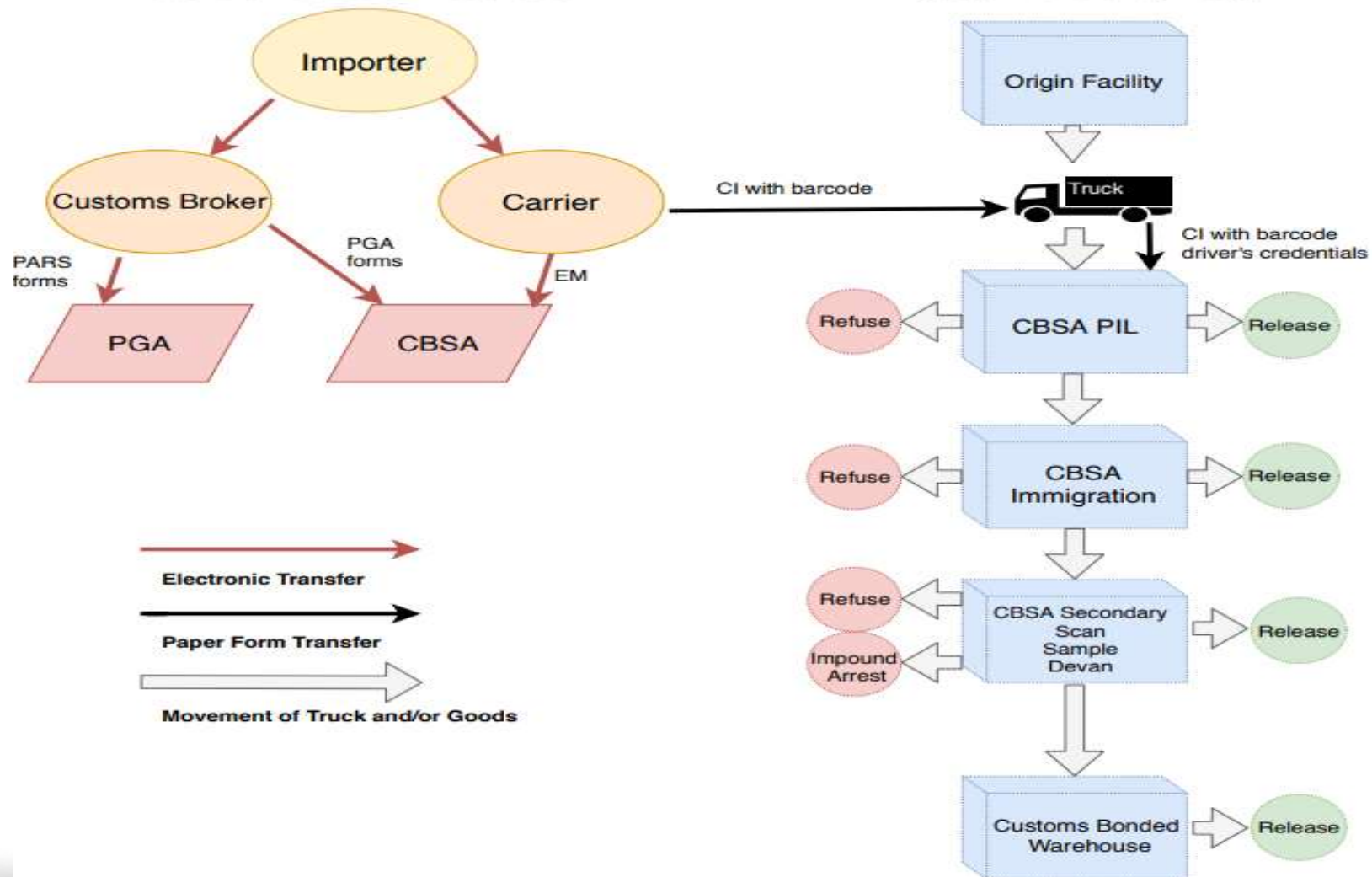
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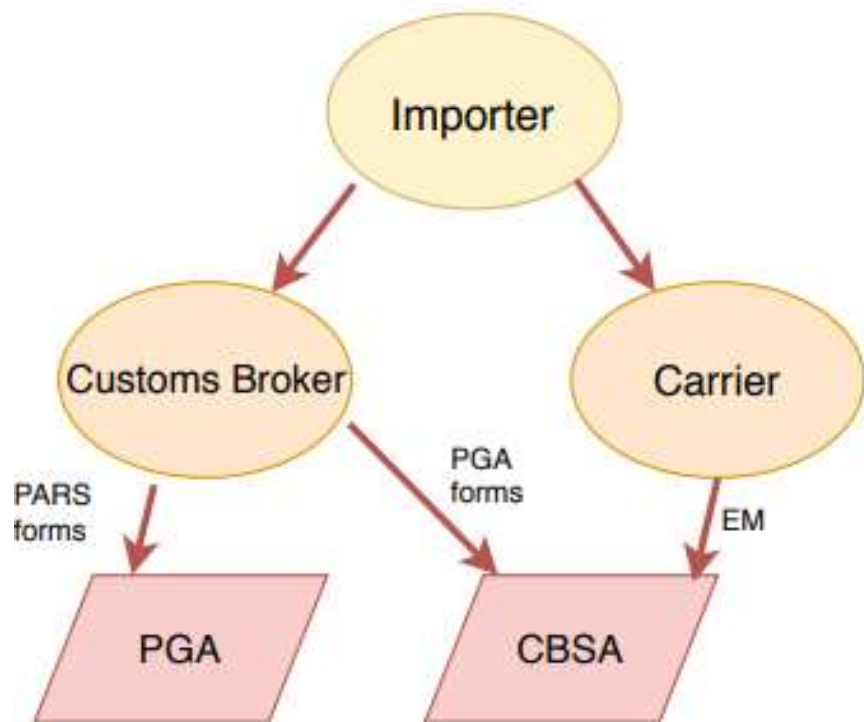
## Electronic Transfer of Documents

## Physical Movement (Truck)

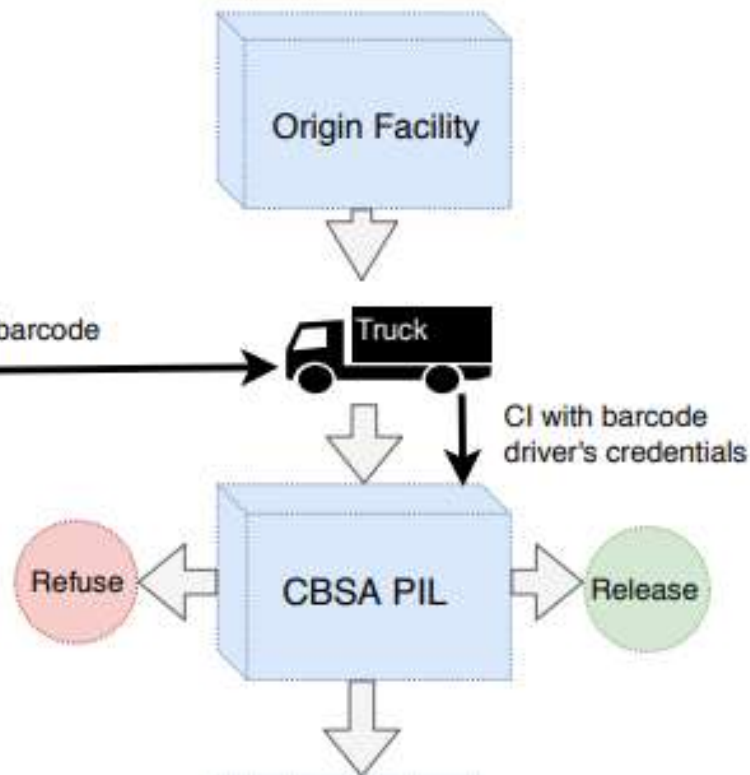


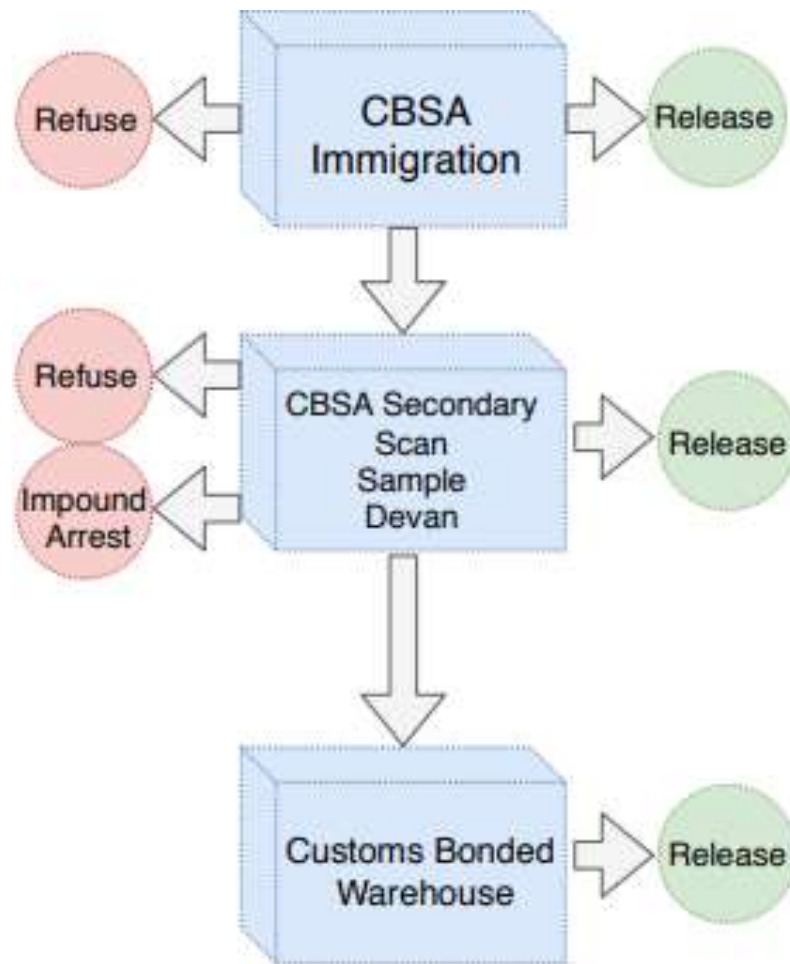


## Electronic Transfer of Documents



## Physical Movement (Truck)





# TECHNOLOGY BOOM IN LOGISTICS

The Amazon logo, featuring the word "amazon" in white lowercase letters on a black background, with a curved orange arrow underneath.The Walmart logo, consisting of the word "Walmart" in blue and a yellow six-pointed starburst icon.The IBM logo, featuring the letters "IBM" in a blue, horizontally-striped font.

MAERSK

UBER FREIGHT



elementum

inovex



FLEXPORT



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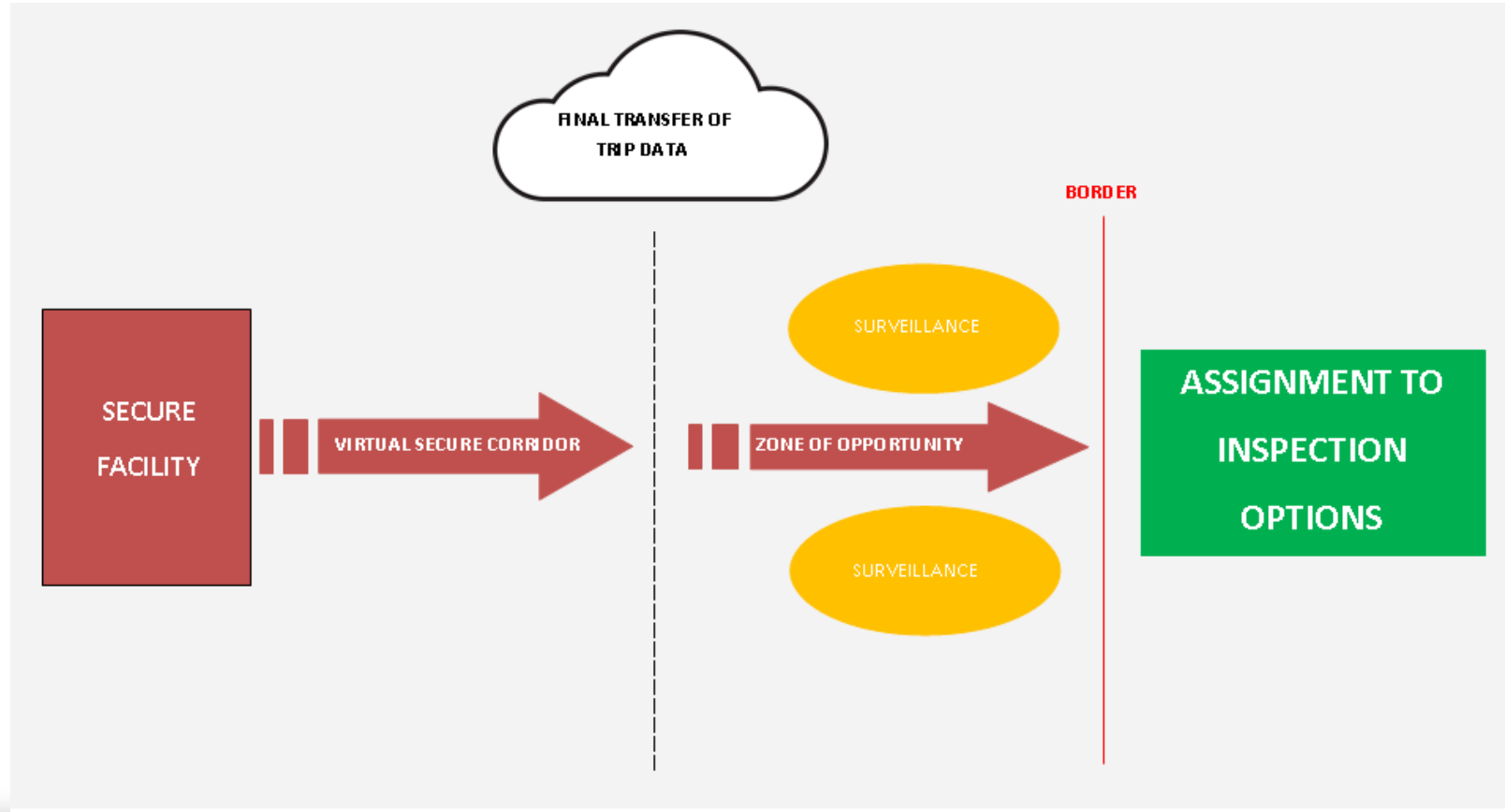
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## ■ KEY TECHNOLOGIES

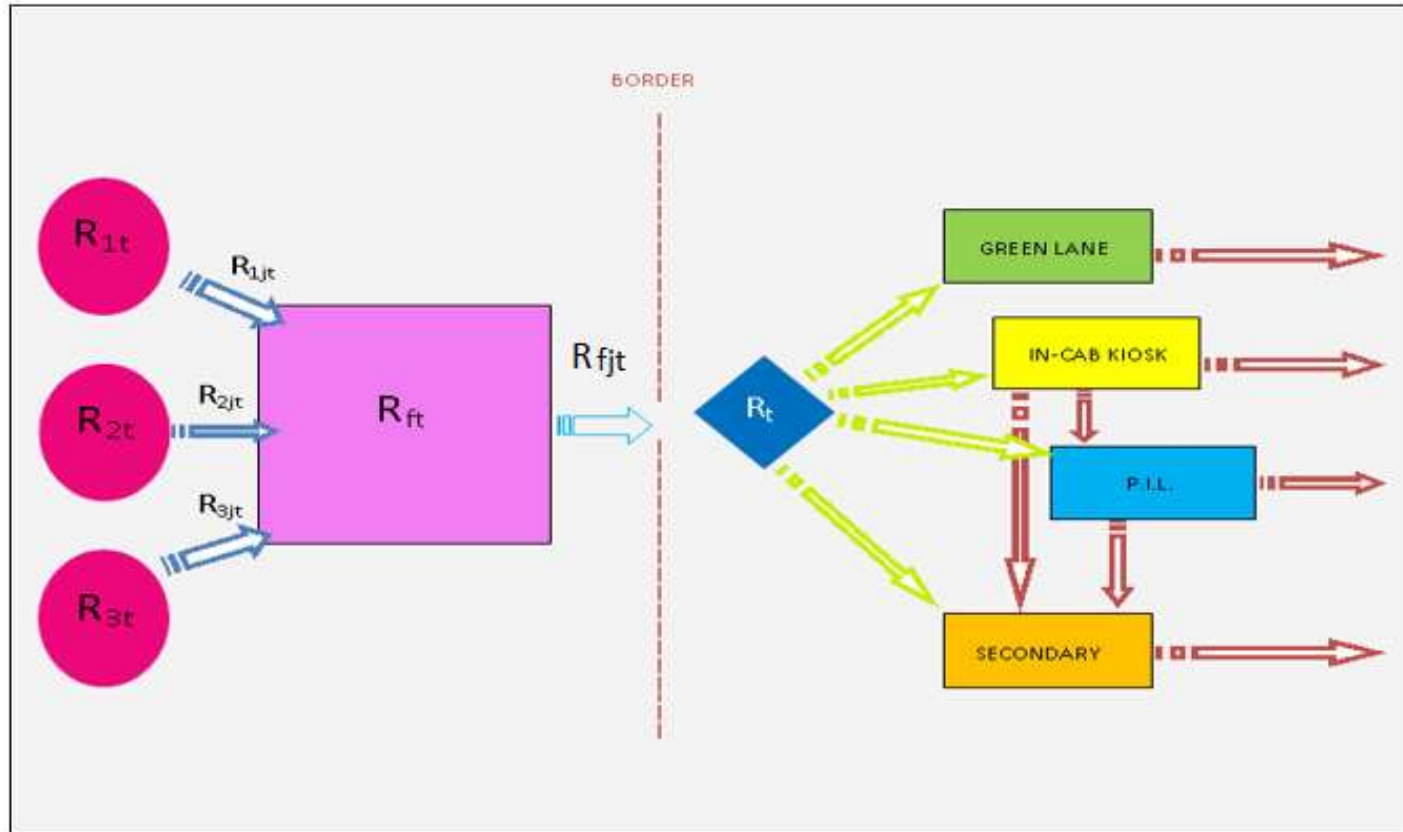
- Geomatics (Global Positioning Systems)
- Internet of Things (IoT)
- Artificial Intelligence / Machine Learning
- Distributed Ledger Technology (Blockchain)
- Automated vehicles



# VIRTUAL SECURE CORRIDOR WITH REAL TIME GPS DATA

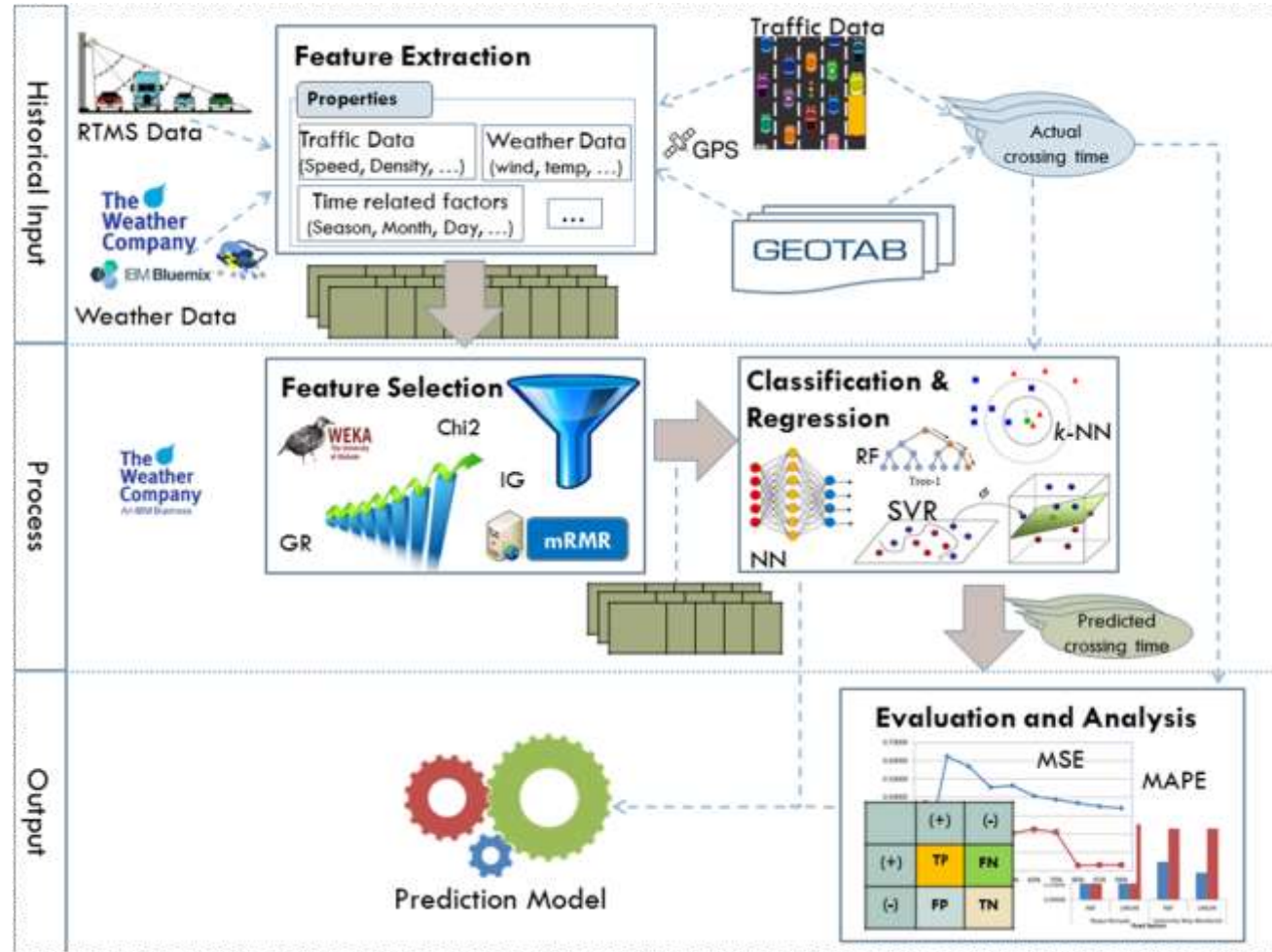


# CONTINUOUSLY UPDATED RISK ASSESSMENT





# CROSSING TIME PREDICTION REAL TIME DATA FUSION AND MACHINE LEARNING



# ARTIFICIAL INTELLIGENCE APPLICATIONS

## *Opportunities*

- *Targeting*
- *Natural language processing*
- *Object recognition*

## *Challenges*

- *Legal implications of “black-box” models*
- *Training data*
- *Getting the “division of labour” right (people / AI)*



# SMART BORDERS AND SMART CITIES

- *Consistency in standards, interfaces, platforms etc.*
- *Smart cities -> Smart borders (with feedback)*
- *Privacy and data security*
- *The goal: low border friction without comprehensive harmonization*





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# ■ QUESTIONS?

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