AWS re:Invent

STP202

Flexport: Using AI/ML to make global shipping easy

Chien Chou

VP of Engineering

Flexport

AWS re:Invent

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aws

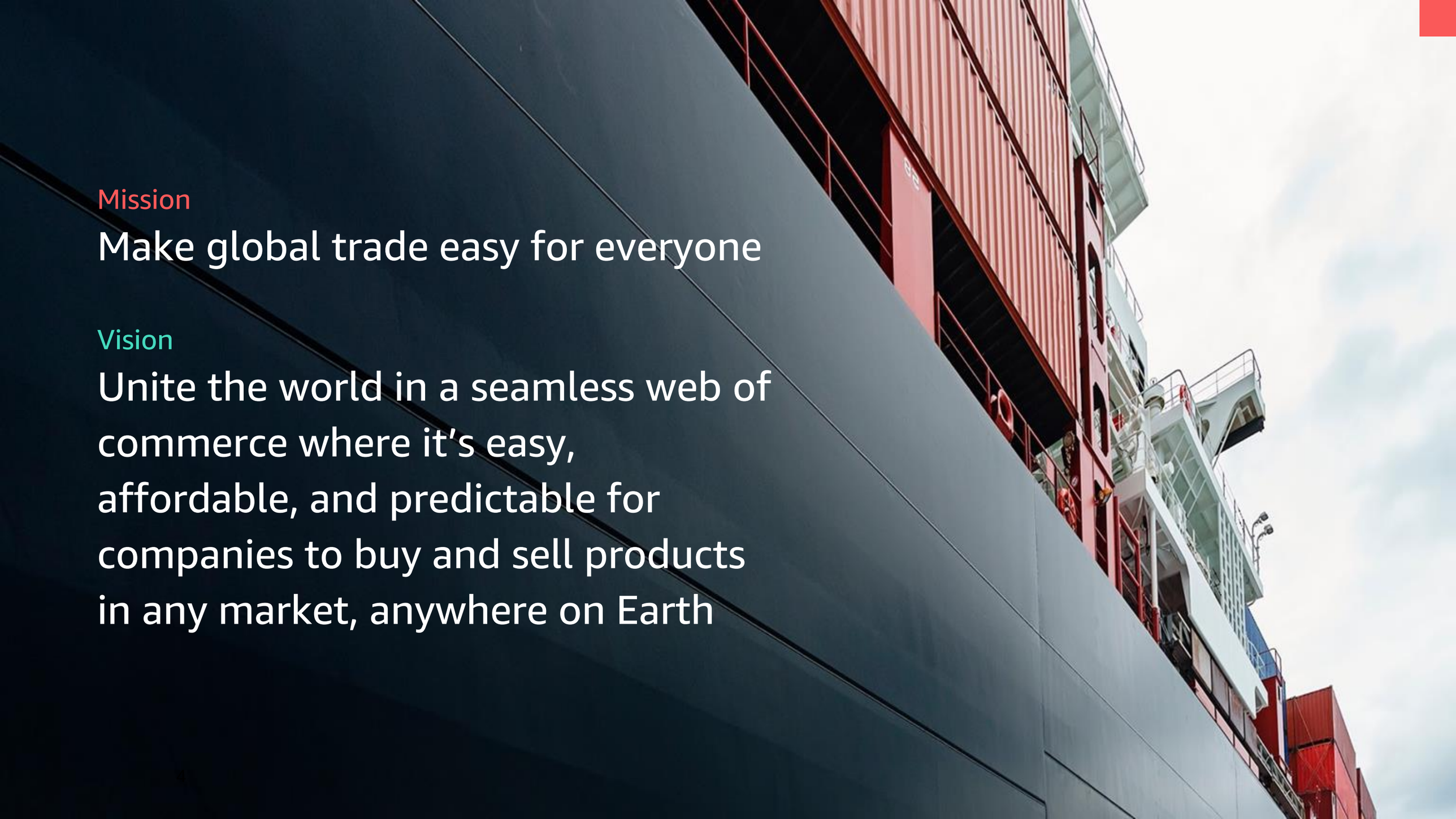
Agenda

Introduction

Event-driven architecture and workflow

Document digitization

Graphical representation



Mission

Make global trade easy for everyone

Vision

Unite the world in a seamless web of commerce where it’s easy, affordable, and predictable for companies to buy and sell products in any market, anywhere on Earth

$7T

Global logistics

$2T

Freight forwarding services

TAM for Flexport**

3%

Market share for #1 freight-forwarding player

*** Transportation and Logistics in a Changing World, BCG*

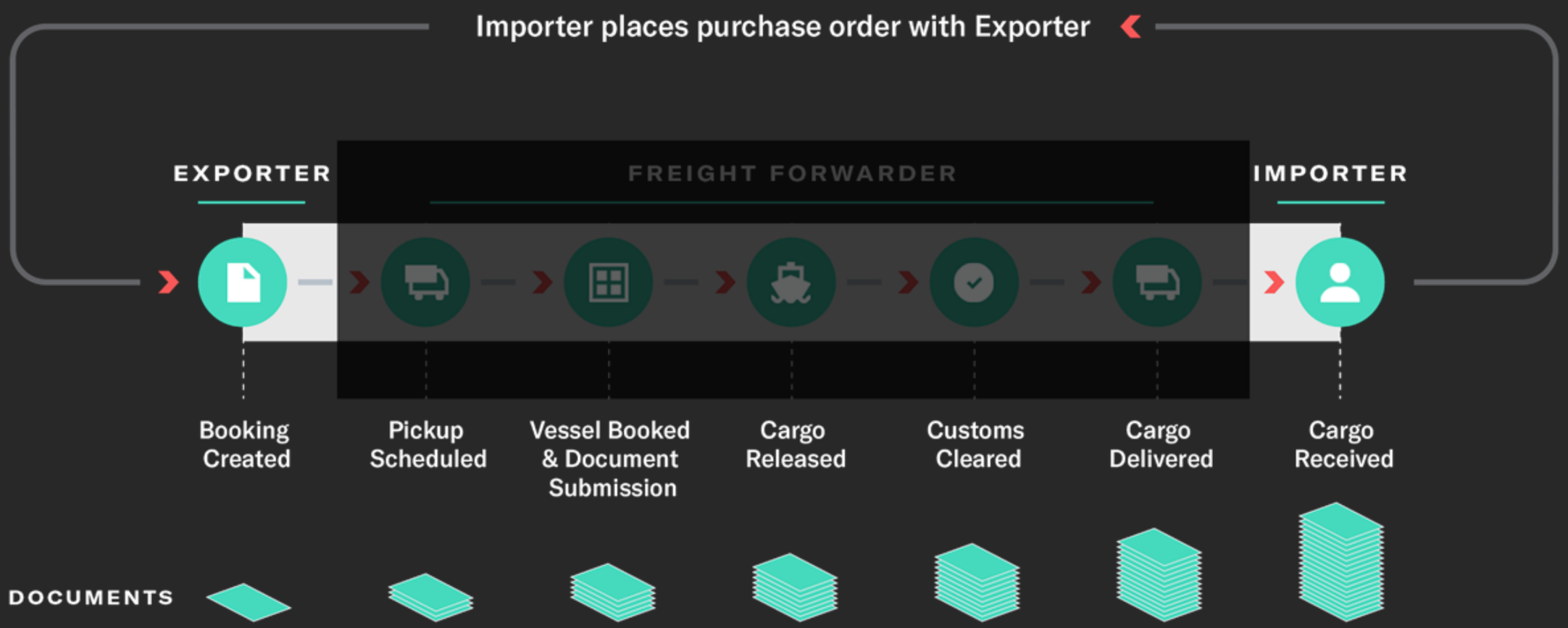
Complex supply chain



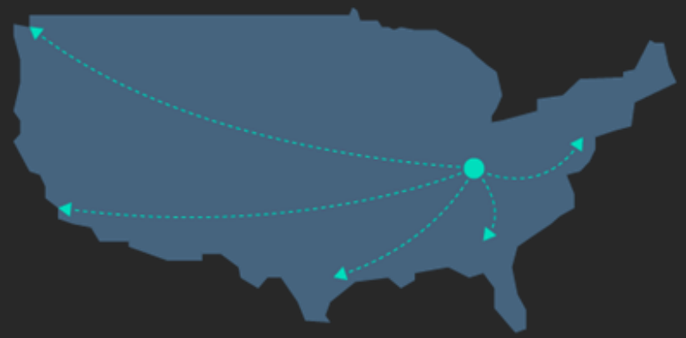
Relay race of unstructured data



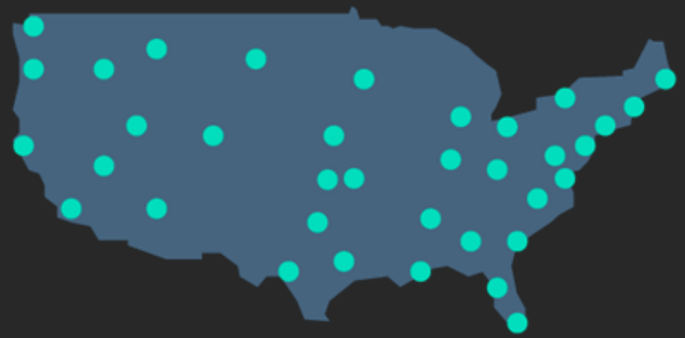
Human Operated Black Box



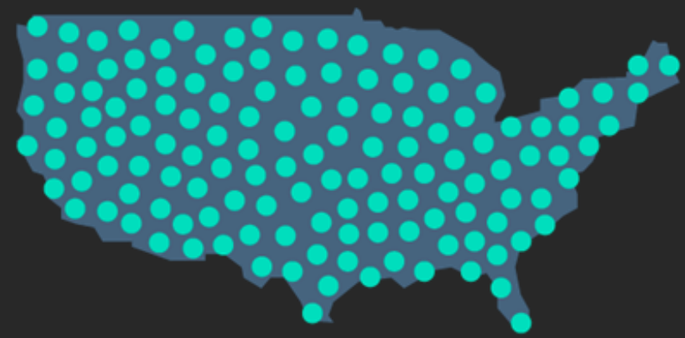
Rethink supply chain technology



Old Economy:
3 Week Delivery



New Economy:
2 Day Delivery



Future Economy:
2 Hour Delivery

Distribution Center

Event stream and workflow

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Data sources

- Track and trace
- Documents
- Emails
- Finance
- Ops actions
- Third party sources
- Consignee
- Shipper
- Weather

Collect data



Kinesis: Event log/ stream

Stream

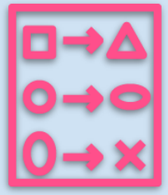
Stream

Stream

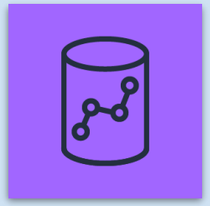
Real time



Document OCR/data extraction



Workflow and rules engine



Knowledge graph

Batch process



Model training



Forecast optimization



Feature computation/data summarization

Serve data





Database



Core



Reports

Booking Form
Shipping Order
Delivery Order
SI Form
VGM Form
ISF Form
ISF Entry
MBL
HBL
CI
PL
Arrival Notice
7501
3461
Delivery Order
Proof of Delivery

The freight forwarder generates a **Delivery Order** in order to dispatch a trucker to pick up the stuffed container and go to the delivery location to deliver the container

Delivery Order

Seller
Flexport CN
Trucker CN
Carrier CN
Customs CN
Customs US
Carrier US
Trucker US
Flexport US
Buyer



Document digitization

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Our Challenge

2x

Projected growth

$2

Labor cost to serve a bill

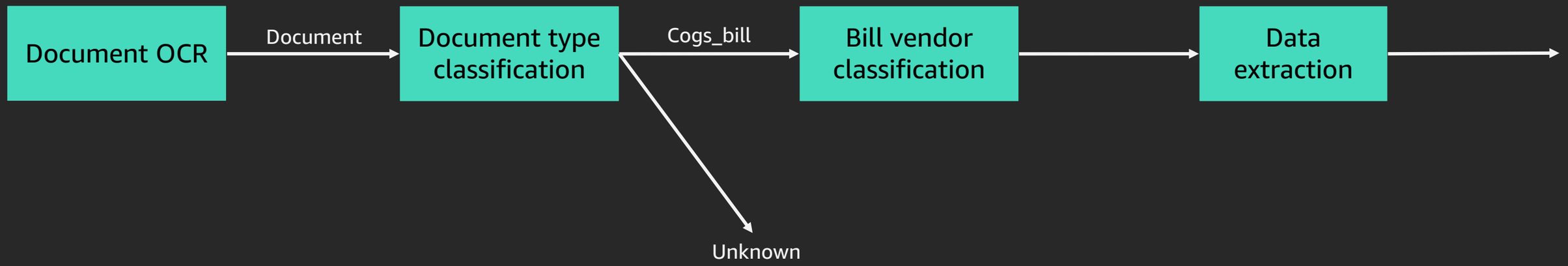
100K

Approximate # of bills per month

500+

Number of types of bill templates

OCR/ML pipeline



Bill

ARRIVAL NOTICE/FREIGHT BILL

To :
FLEXPORT INTERNATIONAL LLC
760 MARKET STREET, 9TH FLOOR
SAN FRANCISCO CA 94102

For Vessel Actual Arrival & Cargo Tracing : www.shipmentlink.com

CARGO PICK UP LOCATION
Berth 233, Terminal Island (LAX)
389 TERMINAL WAY
TERMINAL ISLAND
CALIFORNIA 90731
TEL NO. : 1 310 2210220

BILL OF LADING NO.	SEAWAY E-MAIL RELEASE	ORI. RECEIVED	FREIGHT RELEASE	CUSTOMS RELEASE
		NO	NO	NO

ARRIVING VESSEL / VOYAGE NO.	VESSEL ETA.	FLAG	FIRMS CODE

PLACE OF RECEIPT	PORT OF LOADING	PORT OF DISCHARGE	BERTH/PIER/SHED

PLACE OF DELIVERY	I.T.NO./I.T. DATE/I.T.DESTINATION	DEST ETA.

SHIPPER
FLEXPORT INTERNATIONAL (SHANGHAI) CO., LTD
180 HUA SHEN ROAD BUILDING 1 6F
UNIT 610
FREE TRADE EXPERIMENTAL ZONE
SHANGHAI, CHINA *

NOTIFY PARTY
FLEXPORT INTERNATIONAL, LLC
760 MARKET STREET, 9F SAN FRANCISCO
CA 94102 UNITED STATES
ATTN:ARRIVALNOTICE@FLEXPORT.COM
OPS@FLEXPORT.COM
T:+1415-688-4477 EIN352508264

CONSIGNEE
FLEXPORT INTERNATIONAL, LLC
760 MARKET STREET, 9F SAN FRANCISCO
CA 94102 UNITED STATES
ATTN:ARRIVALNOTICE@FLEXPORT.COM
OPS@FLEXPORT.COM
T:+1415-688-4477 EIN352508264

ALSO NOTIFY PARTY

COLLECT CHARGES:

CONTAINER NUMBER / CARGO DESCRIPTION

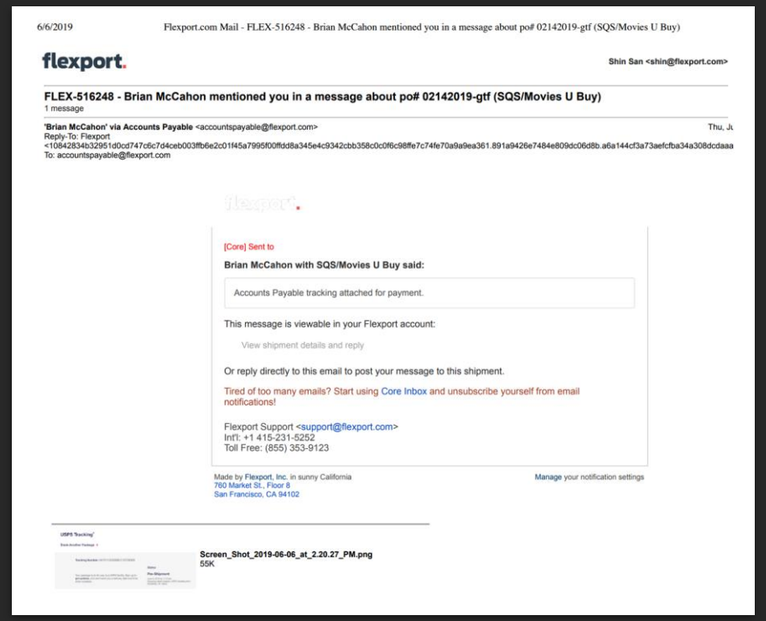
1 x 4SH

TOTAL COLLECT U.S.$ PLEASE PAY	NO. OF CNTR	TTL. PACKAGE	WEIGHT	MEASUREMENT
			KGS	CBM

MASTER's House B/L No. :

CHECK OR B/L NOT ACCEPTED AT PIER-DEPOT
CHECK PAYABLE TO: EVERGREEN SHIPPING AGENCY (AMERICA) CORPORATION.

Not Bill



6/6/2019 Flexport.com Mail - FLEX-516248 - Brian McCahon mentioned you in a message about po# 02142019-gtf (SQS/Movies U Buy)

flexport.

Shin San <shin@flexport.com>

FLEX-516248 - Brian McCahon mentioned you in a message about po# 02142019-gtf (SQS/Movies U Buy)
1 message

'Brian McCahon' via Accounts Payable <accountspayable@flexport.com> Thu, Ju
Reply-To: Flexport <10842834b32951d0cd747c6c7d4ceb003ffb6e2c01f45a7995f00ffdd8a345e4c9342cbb358c0c0f6c98ffe7c74fe70a9a9ea361.891a9426e7484e809dc06d8b.a6a144cf3a73aefcfba34a308dcdaaa
To: accountspayable@flexport.com

[Core] Sent to

Brian McCahon with SQS/Movies U Buy said:

Accounts Payable tracking attached for payment.

This message is viewable in your Flexport account:

View shipment details and reply

Or reply directly to this email to post your message to this shipment.

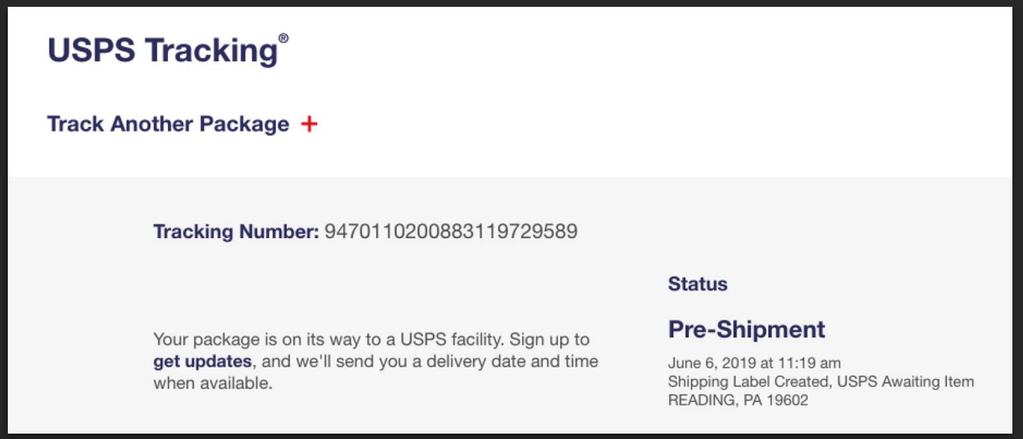
Tired of too many emails? Start using Core Inbox and unsubscribe yourself from email notifications!

Flexport Support <support@flexport.com>
Int'l: +1 415-231-5262
Toll Free: (855) 353-9123

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760 Market St., Floor 8
San Francisco, CA 94102

Manage your notification settings

Screen_Shot_2019-06-06_at_2.20.27_PM.png
55K



USPS Tracking®

Track Another Package +

Tracking Number: 9470110200883119729589

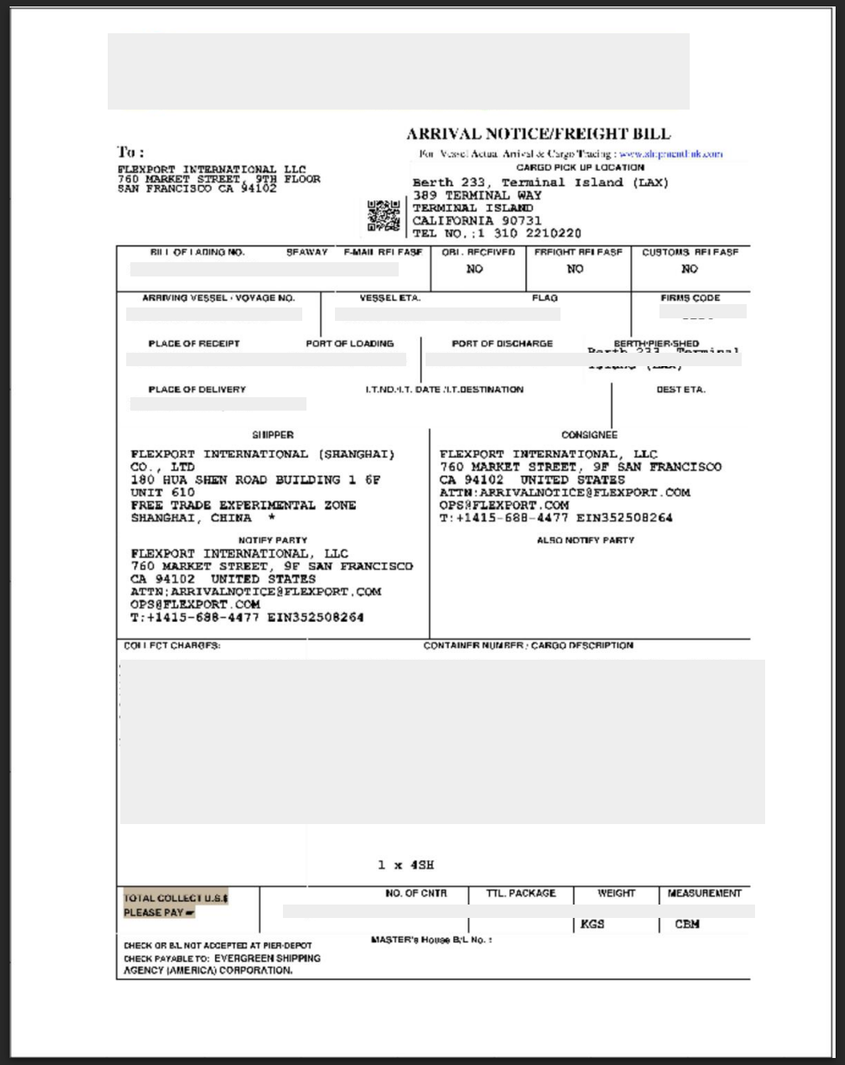
Your package is on its way to a USPS facility. Sign up to **get updates**, and we'll send you a delivery date and time when available.

Status

Pre-Shipment

June 6, 2019 at 11:19 am
Shipping Label Created, USPS Awaiting Item
READING, PA 19602

Vendor 1



ARRIVAL NOTICE/FREIGHT BILL

To :
FLEXPORT INTERNATIONAL LLC
760 MARKET STREET 9TH FLOOR
SAN FRANCISCO CA 94102

For Vessel Actual Arrival & Cargo Tracing : www.shipmentlink.com
CARGO PICK UP LOCATION
Berth 233, Terminal Island (LAX)
389 TERMINAL WAY
TERMINAL ISLAND
CALIFORNIA 90731
TEL NO. : 1 310 2210220

BILL OF LADING NO.	SEAWAY E-MAIL RELEASE	ORI. RECEIVED	FREIGHT RELEASE	CUSTOMS RELEASE
		NO	NO	NO

ARRIVING VESSEL - VOYAGE NO.	VESSEL ETA.	FLAG	FIRMS CODE

PLACE OF RECEIPT	PORT OF LOADING	PORT OF DISCHARGE	BERTH-PIER-SHED
			Berth 233 Terminal Island (LAX)

PLACE OF DELIVERY	I.T.NO./I.T. DATE	I.T.DESTINATION	DEST ETA.

SHIPPER
FLEXPORT INTERNATIONAL (SHANGHAI) CO., LTD
180 HUA SHEN ROAD BUILDING 1 6F
UNIT 610
FREE TRADE EXPERIMENTAL ZONE
SHANGHAI, CHINA *

NOTIFY PARTY
FLEXPORT INTERNATIONAL, LLC
760 MARKET STREET, 9F SAN FRANCISCO
CA 94102 UNITED STATES
ATTN:ARRIVALNOTICE@FLEXPORT.COM
OPS@FLEXPORT.COM
T:+1415-688-4477 EIN352508264

CONSIGNEE
FLEXPORT INTERNATIONAL, LLC
760 MARKET STREET, 9F SAN FRANCISCO
CA 94102 UNITED STATES
ATTN:ARRIVALNOTICE@FLEXPORT.COM
OPS@FLEXPORT.COM
T:+1415-688-4477 EIN352508264

ALSO NOTIFY PARTY

COLLECT CHARGES:

CONTAINER NUMBER / CARGO DESCRIPTION

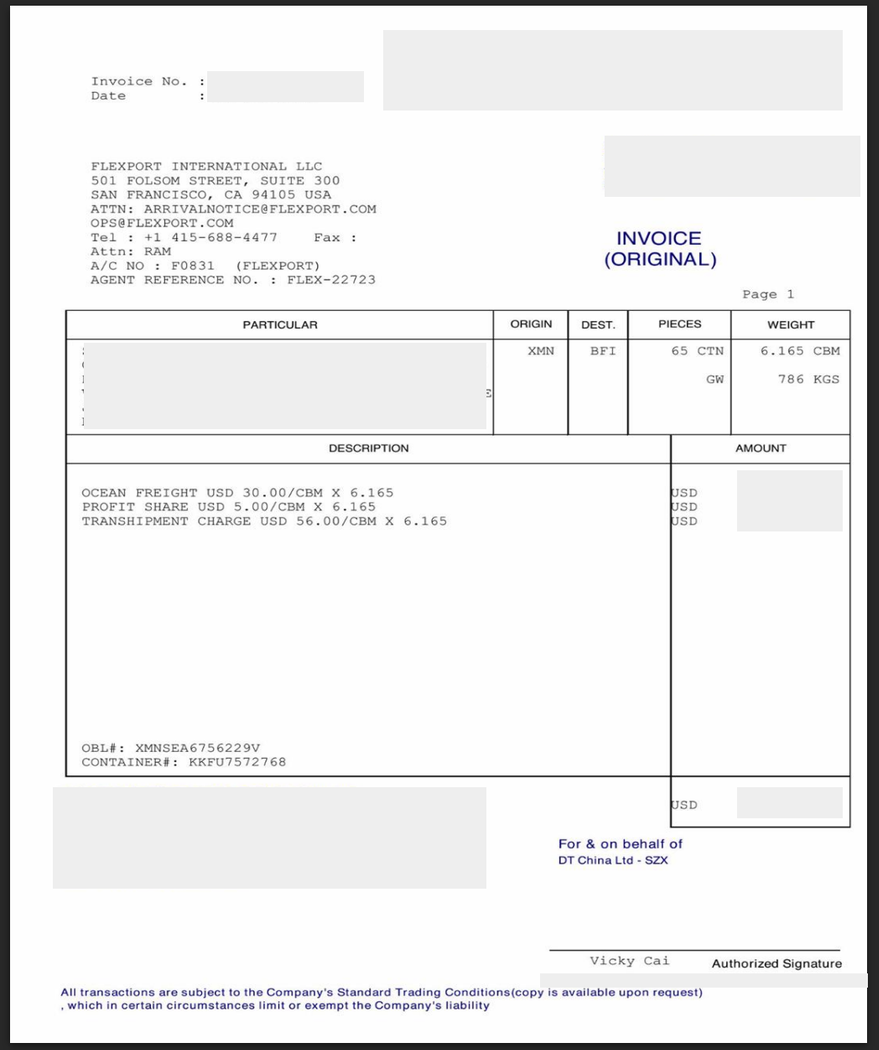
1 x 4SH

TOTAL COLLECT U.S.$ PLEASE PAY	NO. OF CNTR	TTL. PACKAGE	WEIGHT	MEASUREMENT
			KGS	CBM

MASTER's House B/L No. :

CHECK OR B/L NOT ACCEPTED AT PIER-DEPOT
CHECK PAYABLE TO: EVERGREEN SHIPPING AGENCY (AMERICA) CORPORATION.

Vendor 2



Invoice No. :
Date :

FLEXPORT INTERNATIONAL LLC
501 FOLSOM STREET, SUITE 300
SAN FRANCISCO, CA 94105 USA
ATTN: ARRIVALNOTICE@FLEXPORT.COM
OPS@FLEXPORT.COM
Tel : +1 415-688-4477 Fax :
Attn: RAM
A/C NO : F0831 (FLEXPORT)
AGENT REFERENCE NO. : FLEX-22723

INVOICE
(ORIGINAL)

Page 1

PARTICULAR	ORIGIN	DEST.	PIECES	WEIGHT
	XMN	BFI	65 CTN	6.165 CBM
			GW	786 KGS

DESCRIPTION		AMOUNT
OCEAN FREIGHT USD 30.00/CBM X 6.165	USD	
PROFIT SHARE USD 5.00/CBM X 6.165	USD	
TRANSHIPMENT CHARGE USD 56.00/CBM X 6.165	USD	
OBL#: XMNSEA6756229V		
CONTAINER#: KKFU7572768		
	USD	

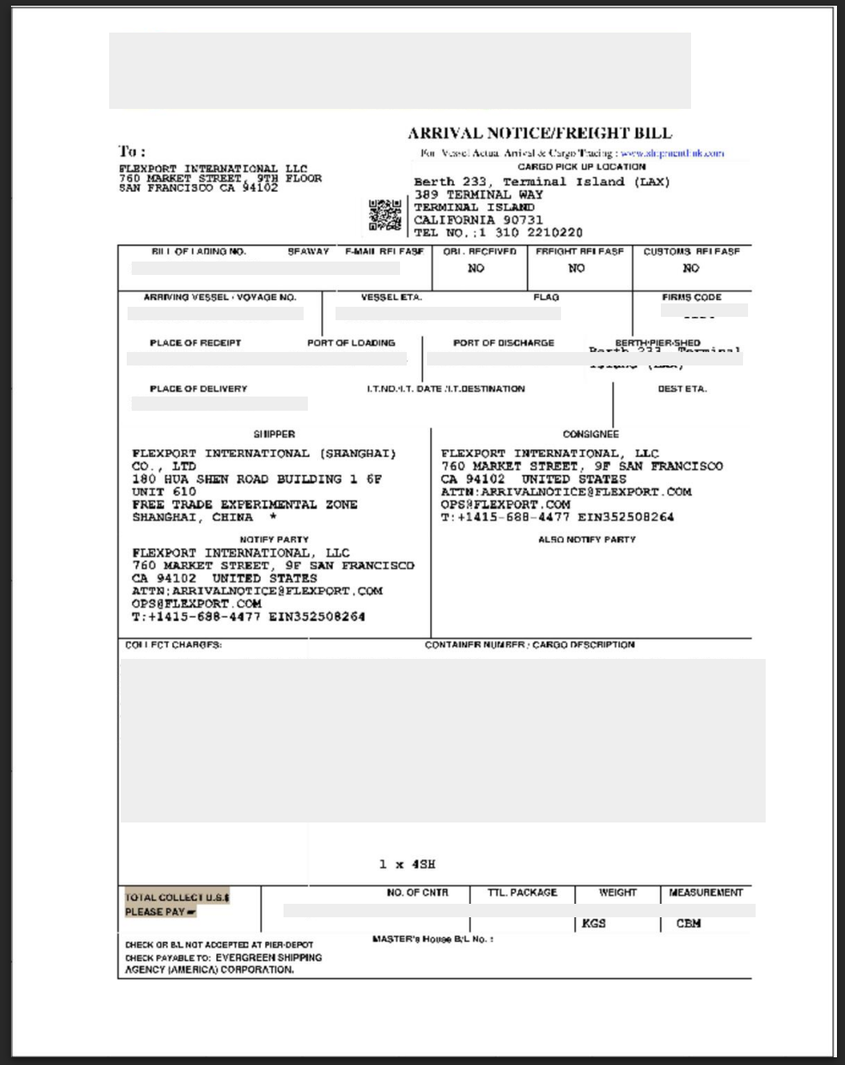
For & on behalf of
DT China Ltd - SZX

Vicky Cai Authorized Signature

All transactions are subject to the Company's Standard Trading Conditions(copy is available upon request) , which in certain circumstances limit or exempt the Company's liability

Data Desired

- Bill Info
  - Allocation
    - Shipment Id
    - Bill of lading
    - Container Id
  - Invoice #
  - Invoice date
  - Issuing/receiving entity
- Line items
  - Charge code/description
  - Amount
  - Currency



ARRIVAL NOTICE/FREIGHT BILL

To :
FLEXPORT INTERNATIONAL LLC
760 MARKET STREET, 9TH FLOOR
SAN FRANCISCO CA 94102

For Vessel Actual Arrival & Cargo Tracing : www.shipmentlink.com

CARGO PICK UP LOCATION
Berth 233, Terminal Island (LAX)
389 TERMINAL WAY
TERMINAL ISLAND
CALIFORNIA 90731
TEL NO. : 1 310 2210220

BILL OF LADING NO. SEAWAY E-MAIL REFEASE	ORI. RECEIVED	FREIGHT RELEASE	CUSTOMS RELEASE
	NO	NO	NO

ARRIVING VESSEL - VOYAGE NO.	VESSEL ETA.	FLAG	FIRMS CODE

PLACE OF RECEIPT	PORT OF LOADING	PORT OF DISCHARGE	BERTH-PIER-SHED
			Berth 233, Terminal Island (LAX)

PLACE OF DELIVERY	I.T.NO./I.T. DATE /I.T.DESTINATION	DEST ETA.

SHIPPER
FLEXPORT INTERNATIONAL (SHANGHAI) CO., LTD
180 HUA SHEN ROAD BUILDING 1 6F
UNIT 610
FREE TRADE EXPERIMENTAL ZONE
SHANGHAI, CHINA *

NOTIFY PARTY
FLEXPORT INTERNATIONAL, LLC
760 MARKET STREET, 9F SAN FRANCISCO
CA 94102 UNITED STATES
ATTN:ARRIVALNOTICE@FLEXPORT.COM
OPS@FLEXPORT.COM
T:+1415-688-4477 EIN352508264

CONSIGNEE
FLEXPORT INTERNATIONAL, LLC
760 MARKET STREET, 9F SAN FRANCISCO
CA 94102 UNITED STATES
ATTN:ARRIVALNOTICE@FLEXPORT.COM
OPS@FLEXPORT.COM
T:+1415-688-4477 EIN352508264

ALSO NOTIFY PARTY

COLLECT CHARGES:

CONTAINER NUMBER / CARGO DESCRIPTION

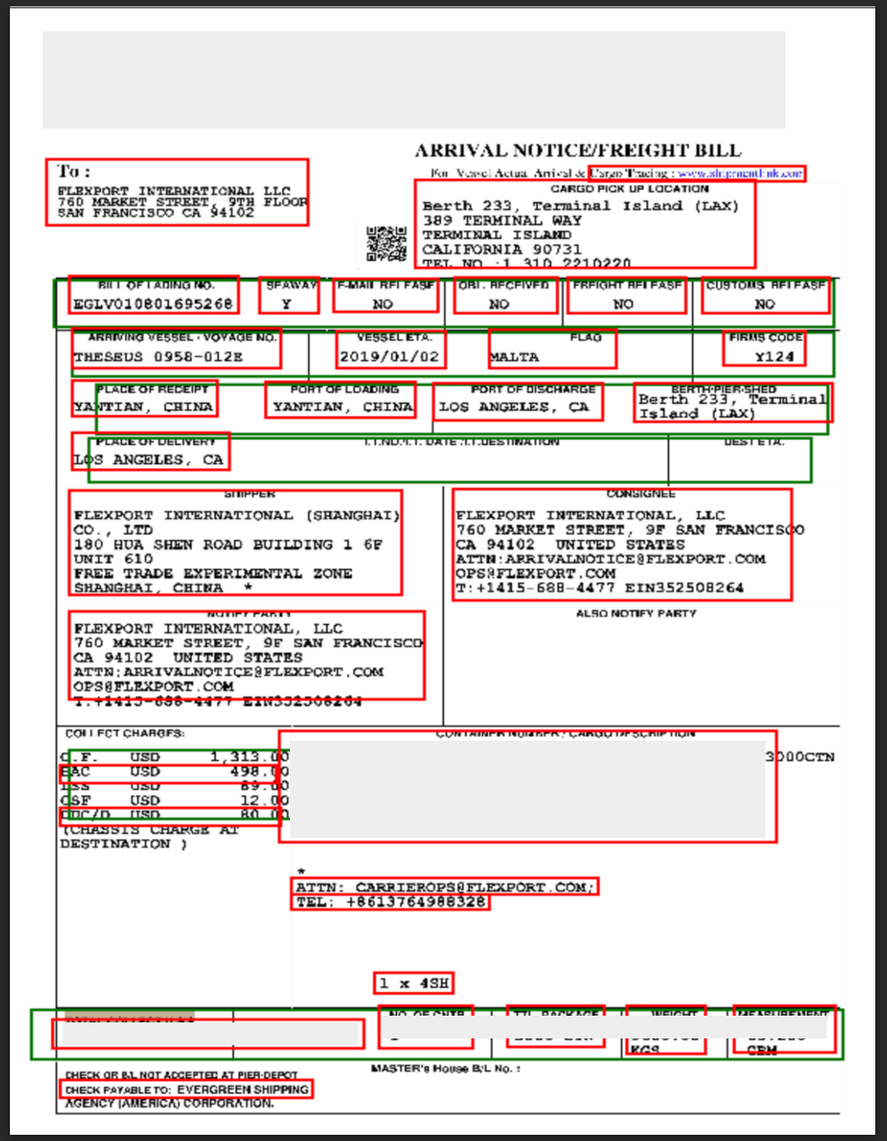
1 x 4SH

TOTAL COLLECT U.S.$ PLEASE PAY	NO. OF CNTR	TTL. PACKAGE	WEIGHT	MEASUREMENT
			KGS	CBM

MASTER's House B/L No. :

CHECK OR B/L NOT ACCEPTED AT PIER-DEPOT
CHECK PAYABLE TO: EVERGREEN SHIPPING AGENCY (AMERICA) CORPORATION.

To structured text



ARRIVAL NOTICE/FREIGHT BILL

To :
FLEXPORT INTERNATIONAL LLC
760 MARKET STREET, 9TH FLOOR
SAN FRANCISCO CA 94102

For Vessel Actual Arrival & Cargo Tracing : www.shipmentlink.com

CARGO PICK UP LOCATION
Berth 233, Terminal Island (LAX)
389 TERMINAL WAY
TERMINAL ISLAND
CALIFORNIA 90731
TEL NO. :1 310 2210220

BILL OF LADING NO.	SEAWAY	E-MAIL RFI FASE	ORI. RECEIVED	FREIGHT RFI FASE	CUSTOMS RFI FASE
EGLV010801695268	Y	NO	NO	NO	NO

ARRIVING VESSEL / VOYAGE NO.	VESSEL ETA.	FLAG	FIRMS CODE
THESEUS 0958-012E	2019/01/02	MALTA	Y124

PLACE OF RECEIPT	PORT OF LOADING	PORT OF DISCHARGE	BERTH/PIER/SHED
YANTIAN, CHINA	YANTIAN, CHINA	LOS ANGELES, CA	Berth 233, Terminal Island (LAX)

PLACE OF DELIVERY	T.T.IND./T. DATE /T.T.DESTINATION	DEST ETA:
LOS ANGELES, CA		

SHIPPER
FLEXPORT INTERNATIONAL (SHANGHAI) CO., LTD
180 HUA SHEN ROAD BUILDING 1 6F
UNIT 610
FREE TRADE EXPERIMENTAL ZONE
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OPS@FLEXPORT.COM
T:+1415-688-4477 EIN352508264

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760 MARKET STREET, 9F SAN FRANCISCO
CA 94102 UNITED STATES
ATTN:ARRIVALNOTICE@FLEXPORT.COM
OPS@FLEXPORT.COM
T:+1415-688-4477 EIN352508264

ALSO NOTIFY PARTY

COLLECT CHARGES:

O.F.	USD	1,313.00
BAC	USD	498.00
ISS	USD	89.00
CSF	USD	12.00
DDC/D	USD	80.00

(CHASSIS CHARGE AT DESTINATION)

CONTAINER NUMBER / CARGO DESCRIPTION

3000CTN

*
ATTN: CARRIEROPS@FLEXPORT.COM;
TEL: +8613764988328

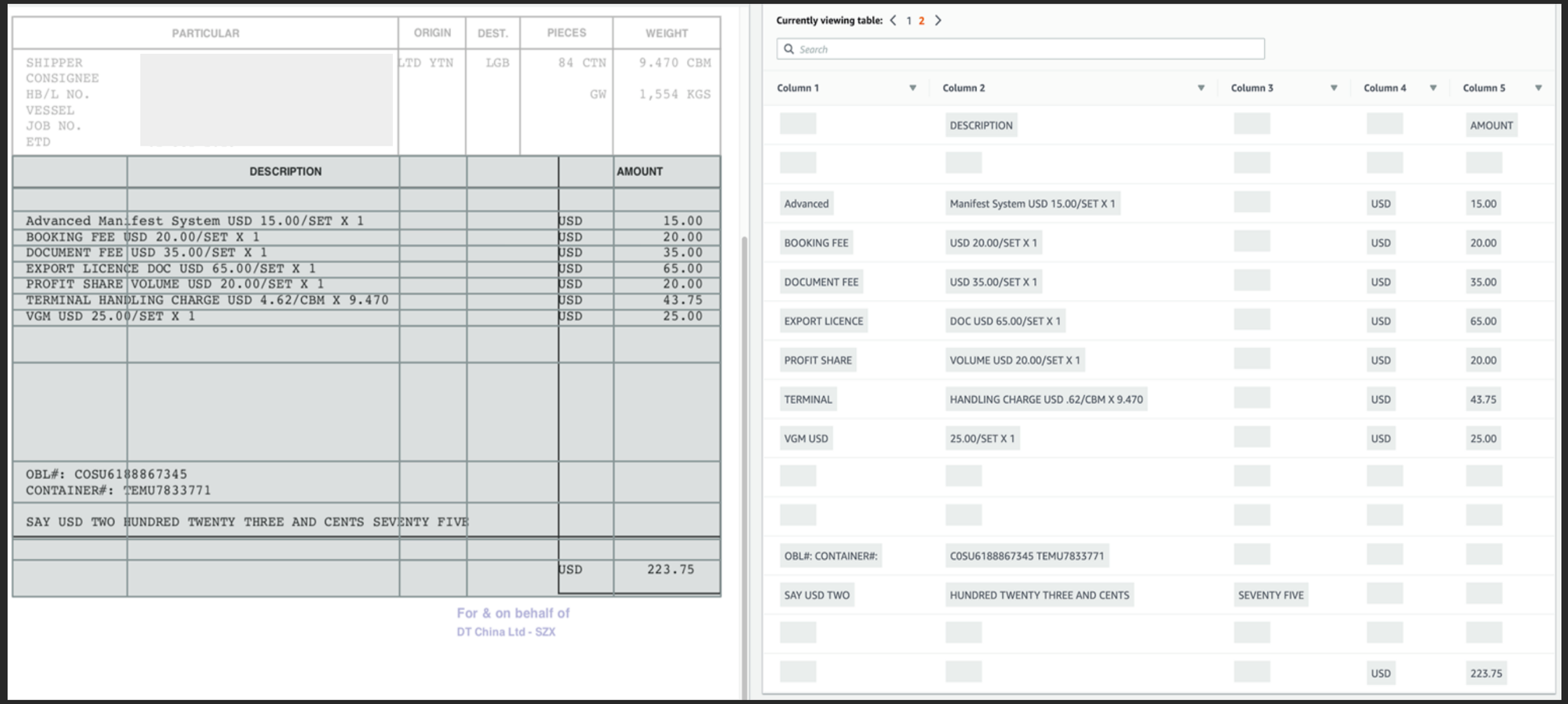
1 x 4SH

NO. OF PKGS	MEASUR	WEIGHT	MEASUREMENT
		KGS	CBM

CHECK OR B/L NOT ACCEPTED AT PIER/DEPOT
CHECK PAYABLE TO: EVERGREEN SHIPPING AGENCY (AMERICA) CORPORATION.

MASTER's House B/L No. :

Amazon Textract



PARTICULAR	ORIGIN	DEST.	PIECES	WEIGHT
SHIPPER CONSIGNEE HB/L NO. VESSEL JOB NO. ETD	LTD YTN	LGB	84 CTN GW	9.470 CBM 1,554 KGS

	DESCRIPTION				AMOUNT
Advanced Manifest System USD 15.00/SET X 1				USD	15.00
BOOKING FEE USD 20.00/SET X 1				USD	20.00
DOCUMENT FEE USD 35.00/SET X 1				USD	35.00
EXPORT LICENCE DOC USD 65.00/SET X 1				USD	65.00
PROFIT SHARE VOLUME USD 20.00/SET X 1				USD	20.00
TERMINAL HANDLING CHARGE USD 4.62/CBM X 9.470				USD	43.75
VGM USD 25.00/SET X 1				USD	25.00
OBL#: COSU6188867345 CONTAINER#: TEMU7833771					
SAY USD TWO HUNDRED TWENTY THREE AND CENTS SEVENTY FIVE					
				USD	223.75

For & on behalf of
DT China Ltd - SZX

Currently viewing table: 1 2

Search

Column 1	Column 2	Column 3	Column 4	Column 5
	DESCRIPTION			AMOUNT
Advanced	Manifest System USD 15.00/SET X 1		USD	15.00
BOOKING FEE	USD 20.00/SET X 1		USD	20.00
DOCUMENT FEE	USD 35.00/SET X 1		USD	35.00
EXPORT LICENCE	DOC USD 65.00/SET X 1		USD	65.00
PROFIT SHARE	VOLUME USD 20.00/SET X 1		USD	20.00
TERMINAL	HANDLING CHARGE USD .62/CBM X 9.470		USD	43.75
VGM USD	25.00/SET X 1		USD	25.00
OBL#: CONTAINER#:	C0SU6188867345 TEMU7833771			
SAY USD TWO	HUNDRED TWENTY THREE AND CENTS	SEVENTY FIVE		
			USD	223.75

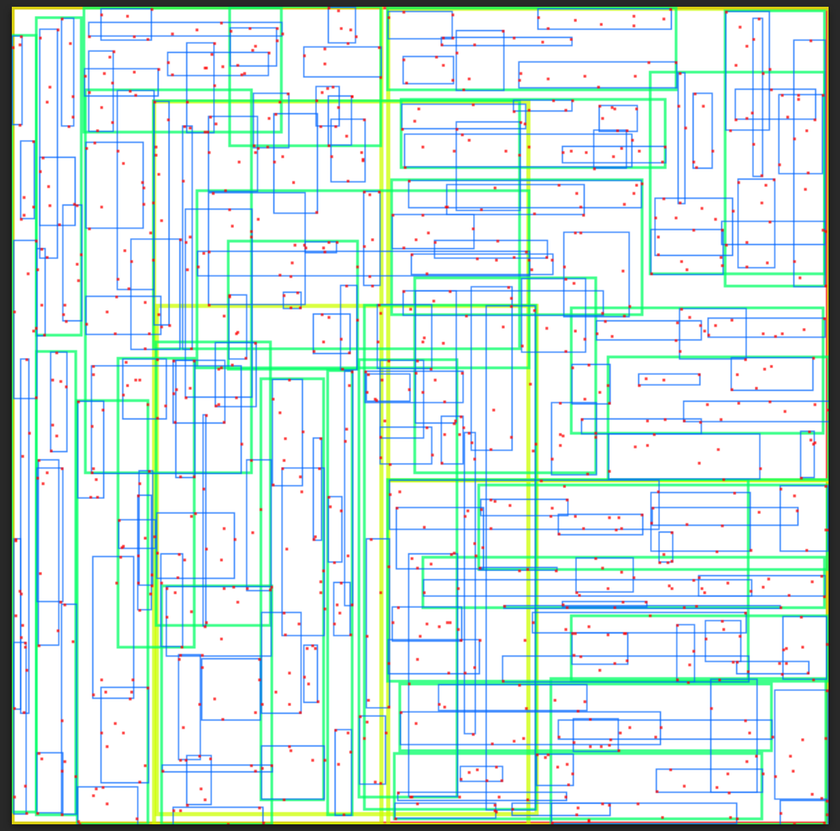
Line items—NLP entity extraction

_____new table_____
DESCRIPTION AMOUNT
Advanced Manifest System USD 15.00/ SET X 1 USD 15.00
CFS CHARGES USD 20.00/CBM X 9.090 USD 181.80
DOCUMENT FEE USD 35.00/ SET X 1 USD 35.00
HANDLING CHARGE USD 32.00/SET X 1 USD 32.00
PICK UP CHARGE USD 227.00/JOB X 1 USD 227.00
TELEX RELEASE FEE USD 15.00/SET X 1 USD 15.00
VGM FEE USD 15.00/SET X 1 USD 15.00
OBL APLUCKLO106452 CONTAINER#: DFSU4134172
SAY USD FIVE HUNDRED TWENTY AND CENTS EIGHTY
MAKE CHEQUE PAYABLE TO
012-611-2-004640-0 USD 520.80

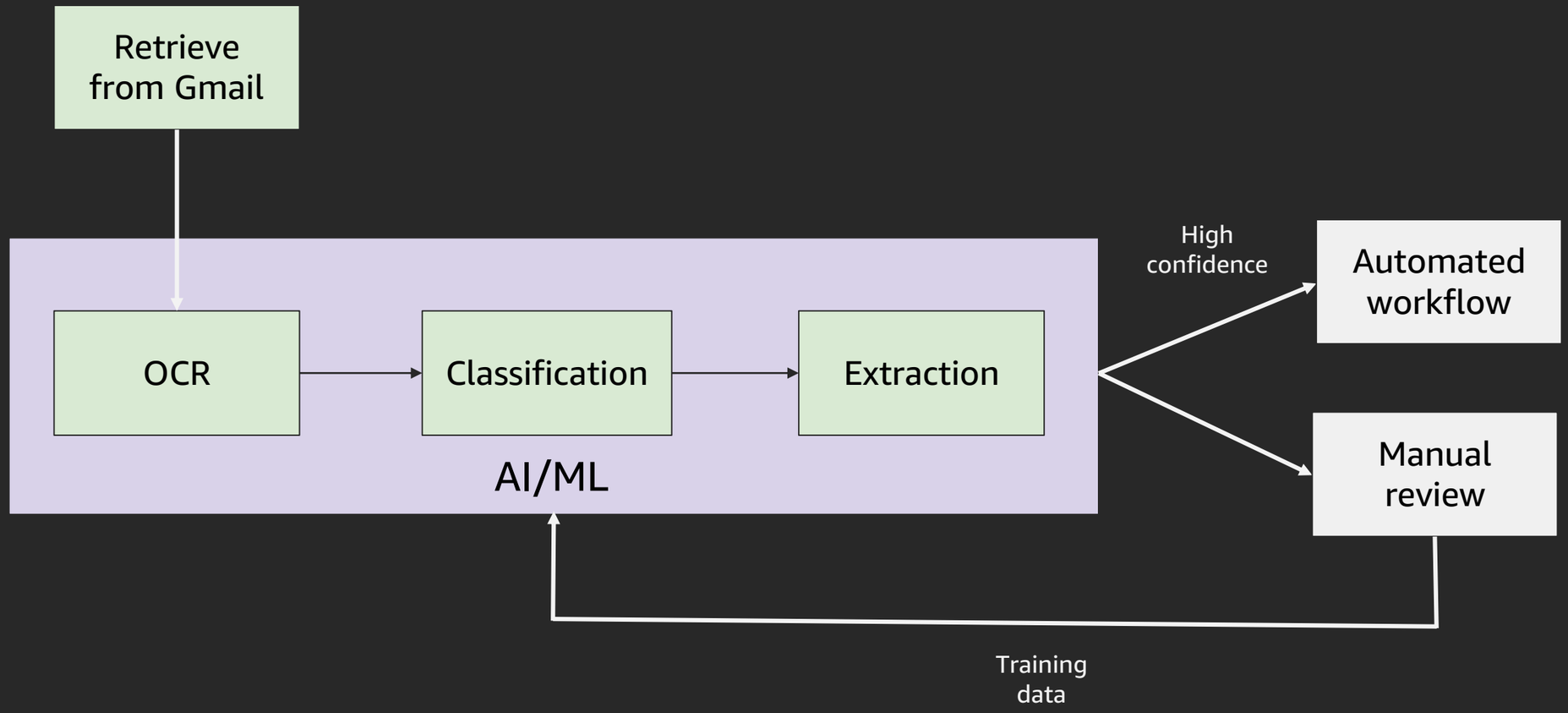
_____new table_____
Delivery Date Container Chassis Description Amount
05/24/2018 NYKU3560707 RDXZ201191 Air Quality Improvement Chassis Rental $25.00 $70.00
Container Drayage Fuel Surcharge by Percent Wait Time at Terminal $402.00 $132.66 $183.75
Rated as hours 2.45 @ 75.
_____new table_____
Container Count: 1 Invoice Total: $813.41
Balance Due: $813.41

Duplicate Line Item Detection

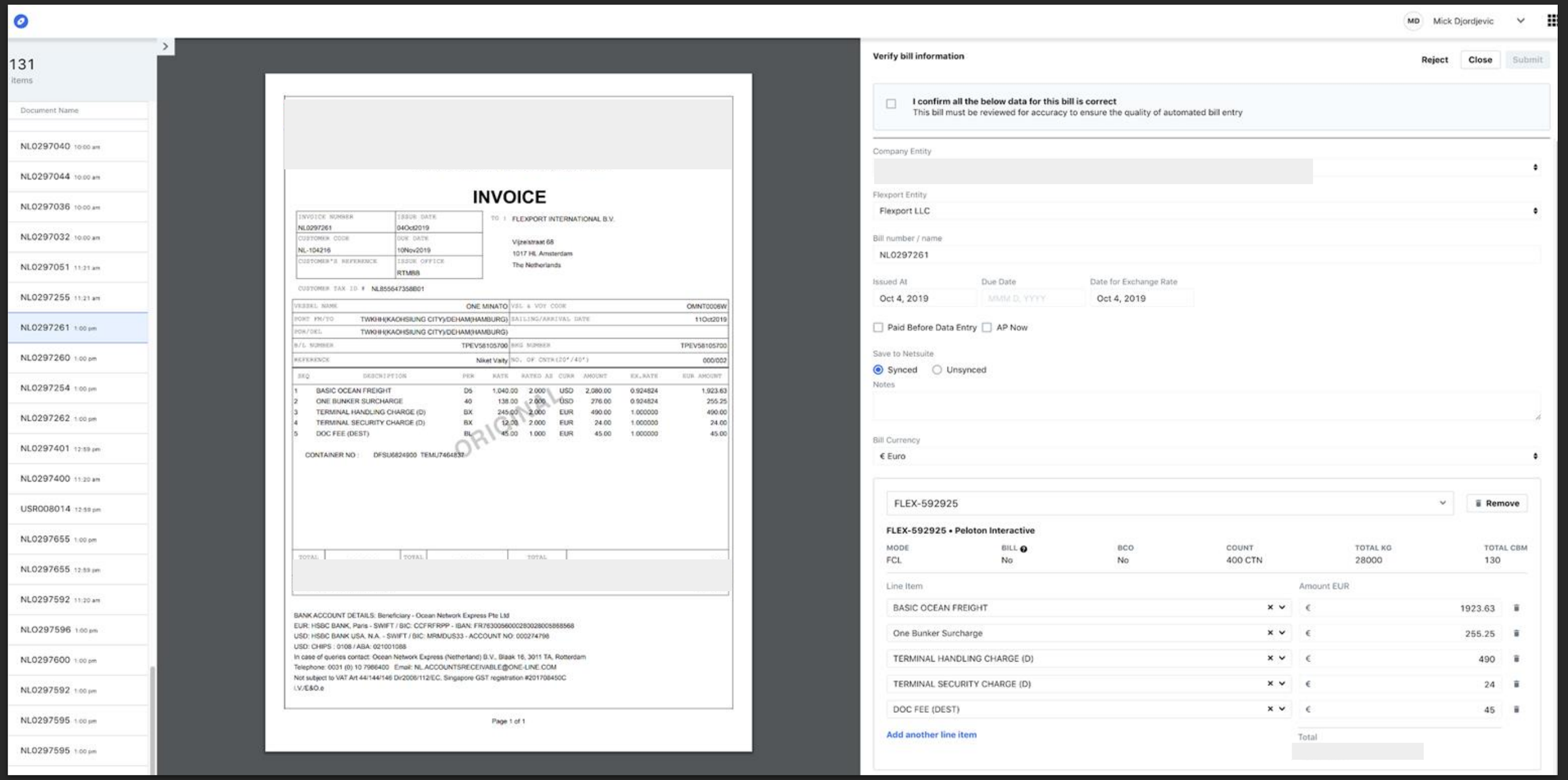
- Detect overlapping line item tables using R-tree spatial index algorithm and mark those line items as potential duplicates



Bill automation workflow

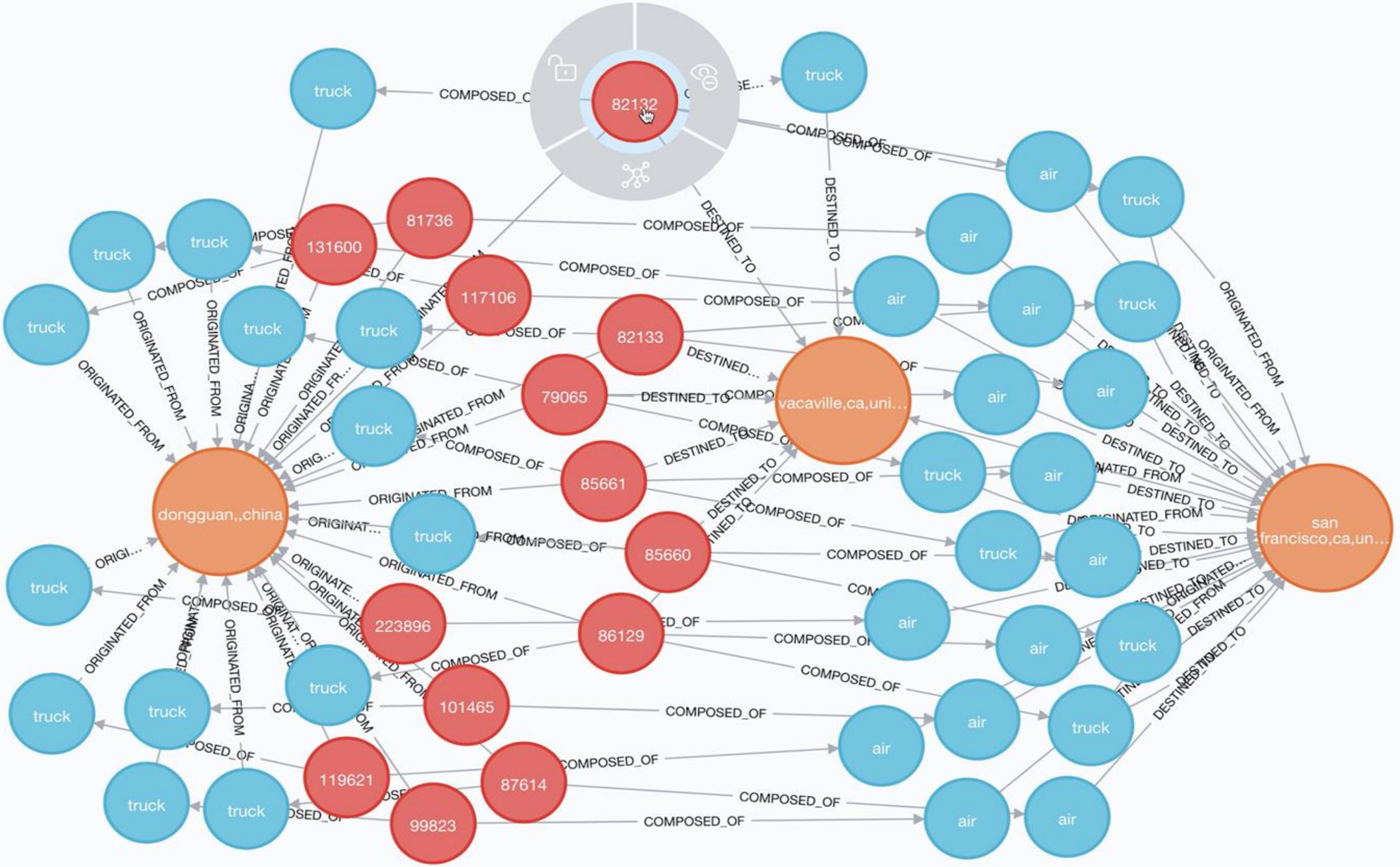


Manual Confirmation



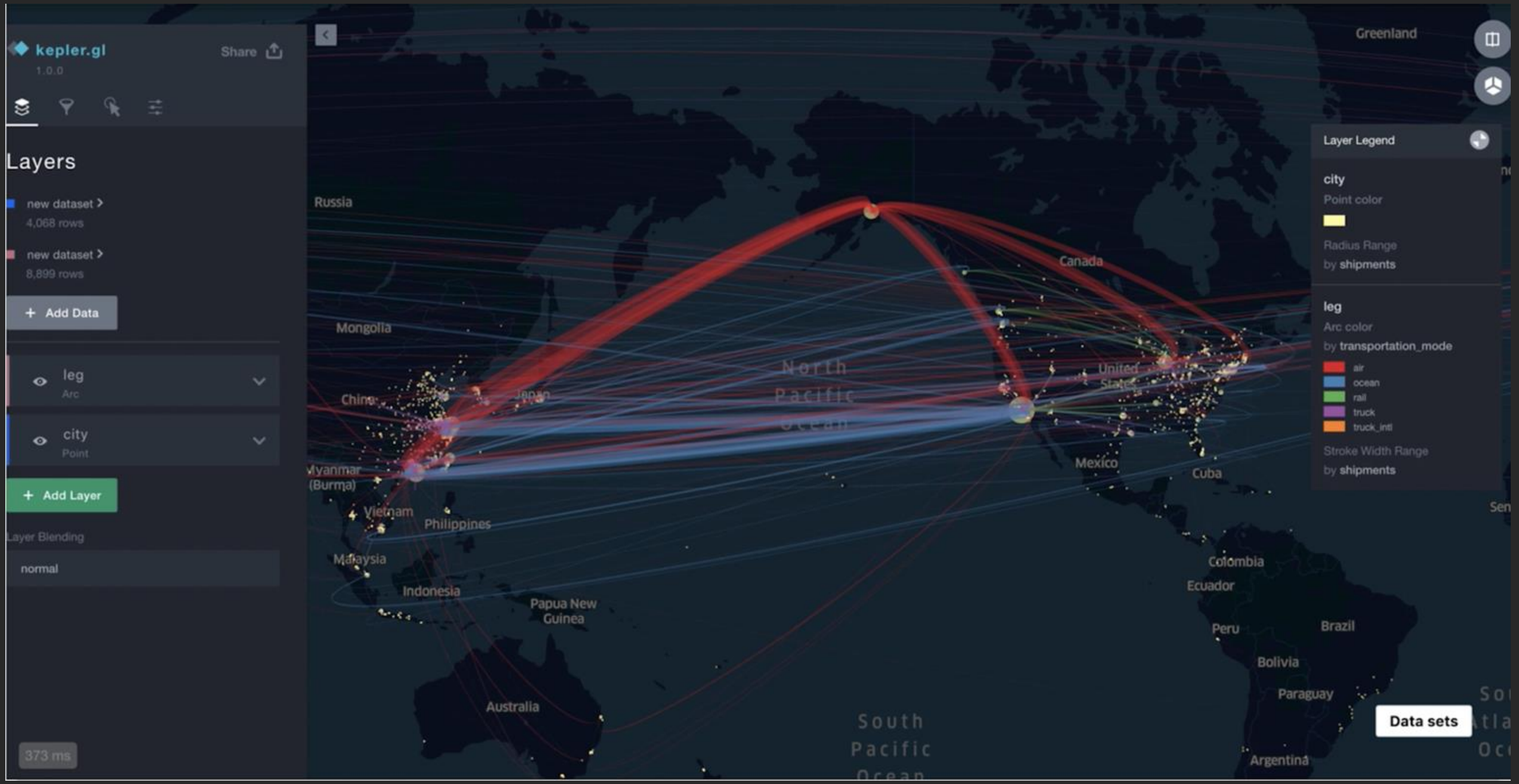
Knowledge graph

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82132
truck
air
131600
81736
117106
82133
79065
85661
85660
86129
223896
101465
87614
119621
99823
dongguan,,china
vacaville,ca,uni…
san francisco,ca,un…
COMPOSED_OF
ORIGINATED_FROM
DESTINED_TO

Shortest path (total time)

```
MATCH (o:City {city_slug: 'dongguan,,china'}),
  (d:City {city_slug: 'san francisco,united states'})
CALL algo.shortestPath.stream(o, d, 'weight', {
  nodeQuery: 'MATCH (c:City) RETURN id(c) AS id',
  relationshipQuery: '
    MATCH (o) -[r:ROUTE_TO]-> (d)
    WHERE r.total_shipments >= 10
    RETURN id(o) AS source, id(d) AS target,
      r.avg_transit_days + r.avg_dwell_days AS weight',
  graph: 'cypher', direction: 'outgoing'
})
YIELD nodeId, cost
RETURN algo.asNode(nodeId), cost
```


kepler.gl
1.0.0
Share
Layers
new dataset
4,068 rows
new dataset
8,899 rows
+ Add Data
leg
Arc
city
Point
+ Add Layer
Layer Blending
normal
373 ms
Greenland
Russia
Canada
Mongolia
China
Japan
North Pacific Ocean
United States
Mexico
Cuba
Myanmar (Burma)
Vietnam
Philippines
Malaysia
Indonesia
Papua New Guinea
Australia
Colombia
Ecuador
Peru
Brazil
Bolivia
Paraguay
Argentina
South Pacific Ocean
Layer Legend
city
Point color
Radius Range
by shipments
leg
Arc color
by transportation_mode
air
ocean
rail
truck
truck_intl
Stroke Width Range
by shipments
Data sets

Thank you!

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