TEAM VISION

LogiX

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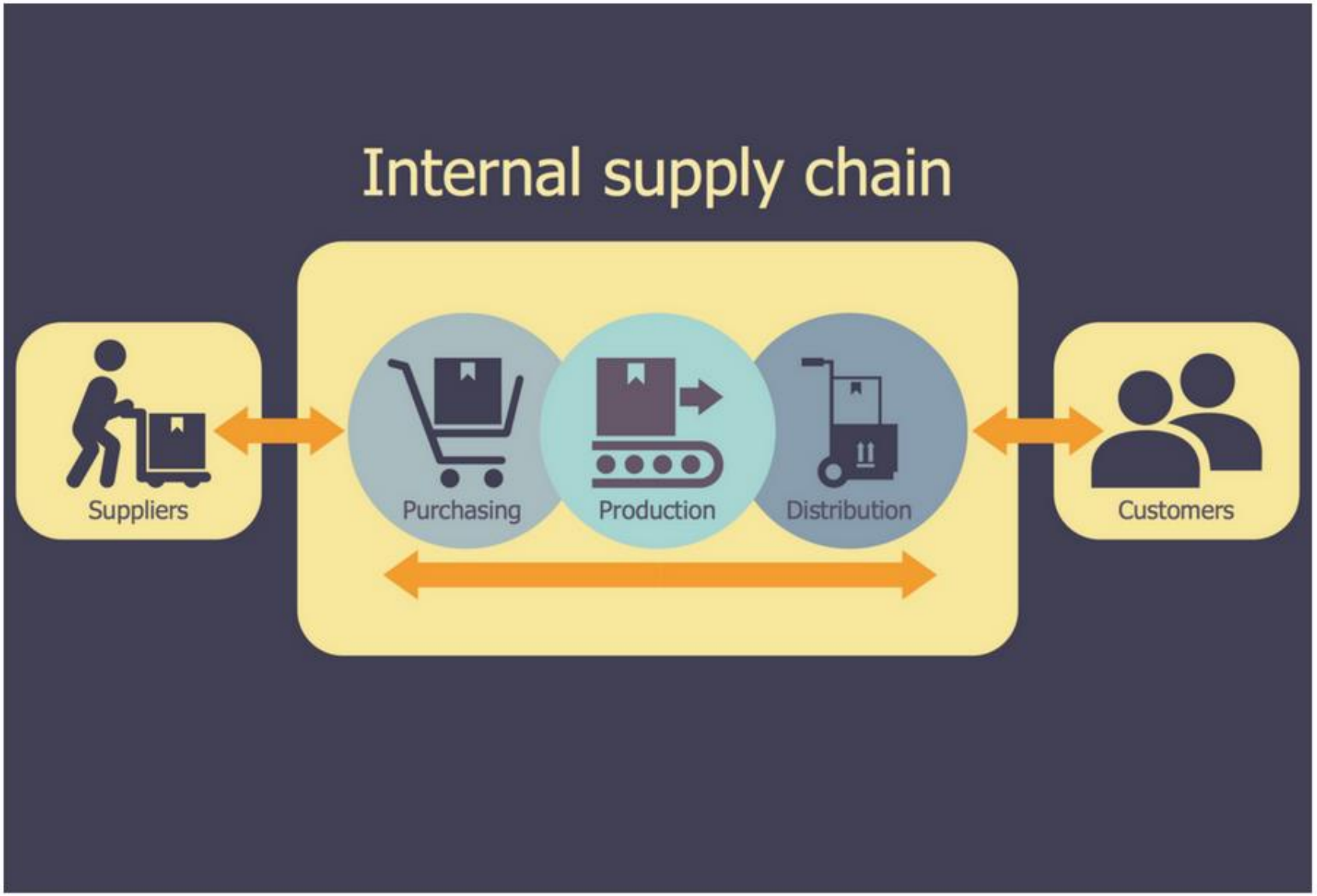
LogiX
LET THE TECH DO IT.

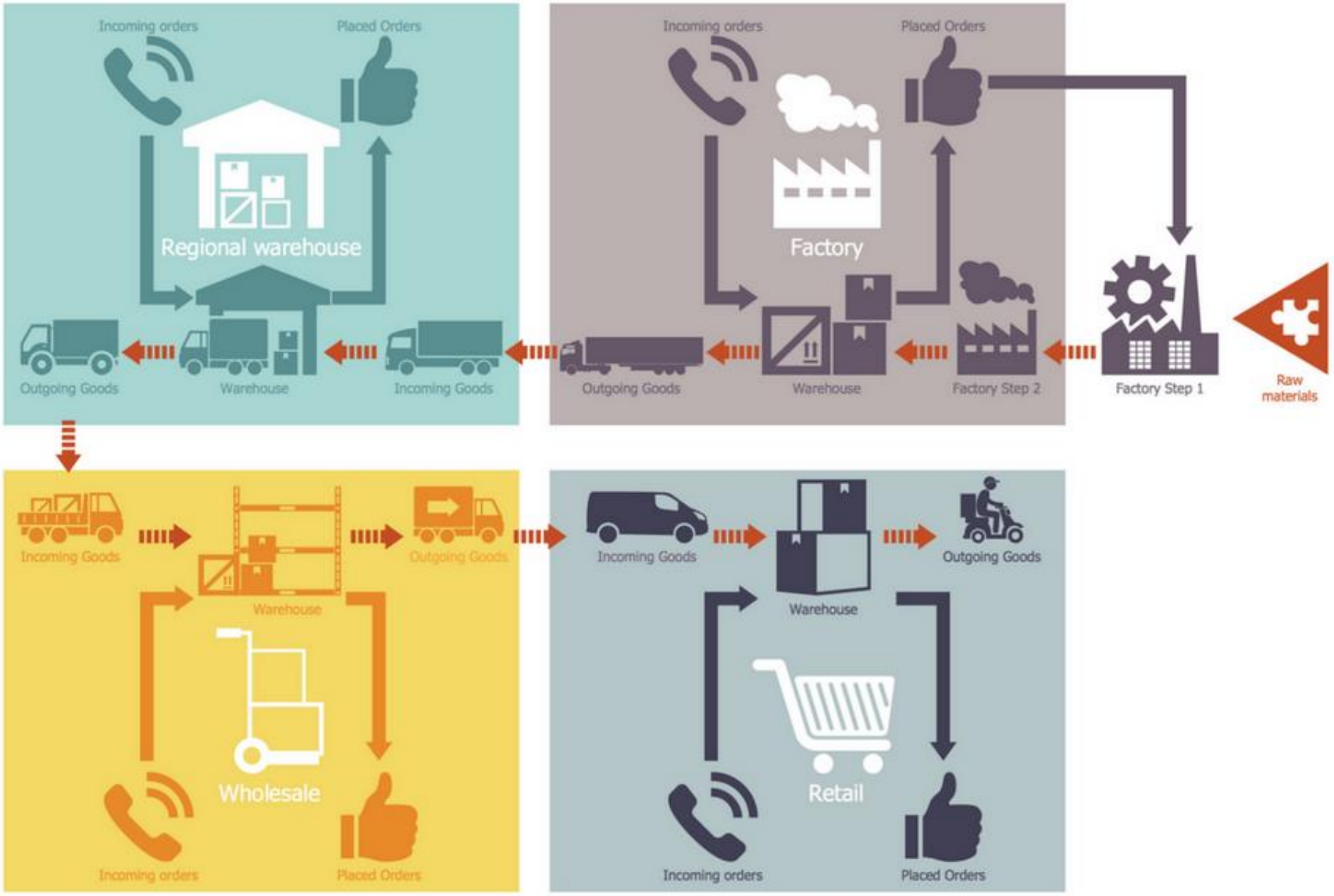
Digital Twin in Logistics & Transportation.

UNDERSTANDING THE ROOT PROCESS

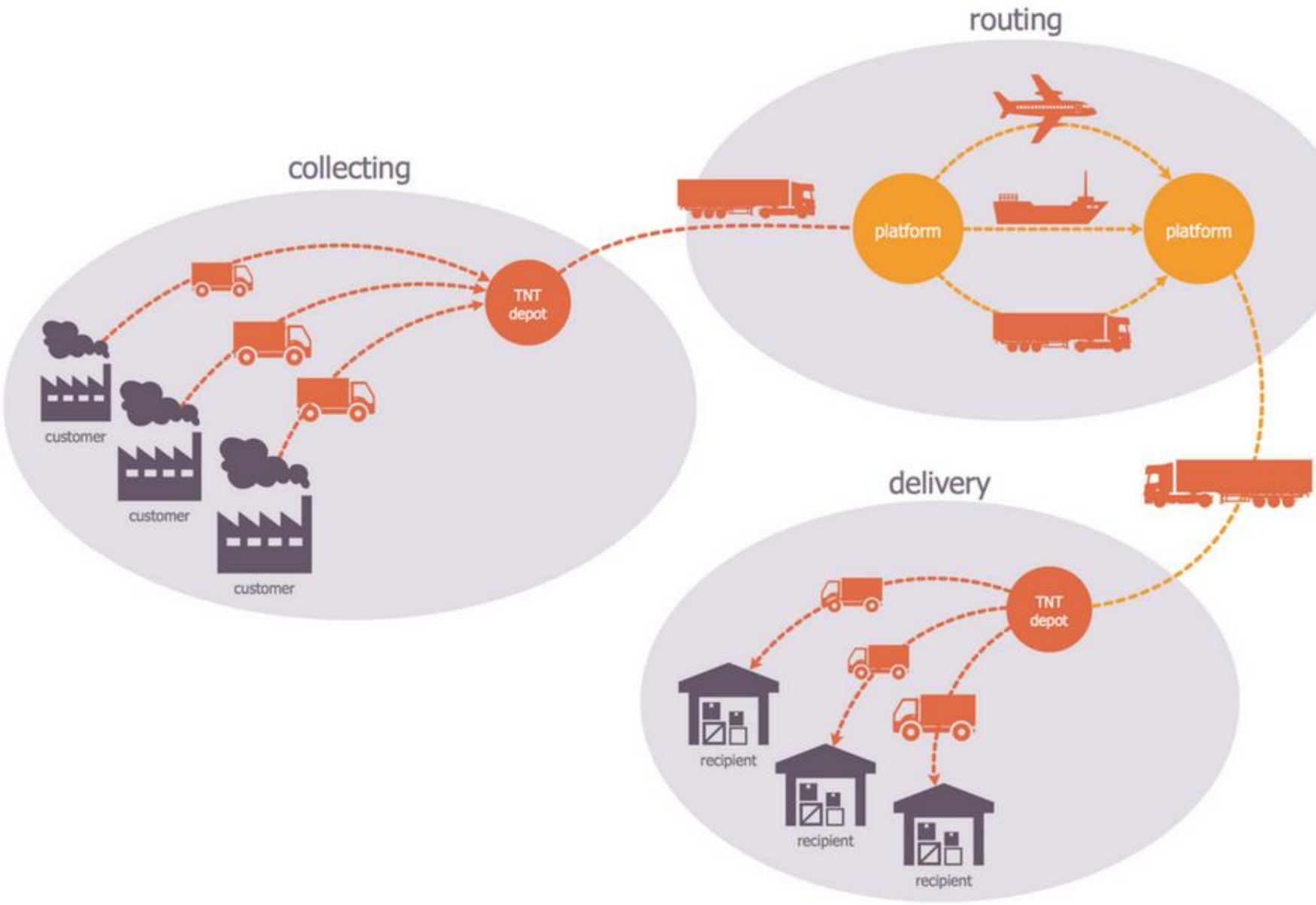
A COMPANY'S SUPPLY CHAIN



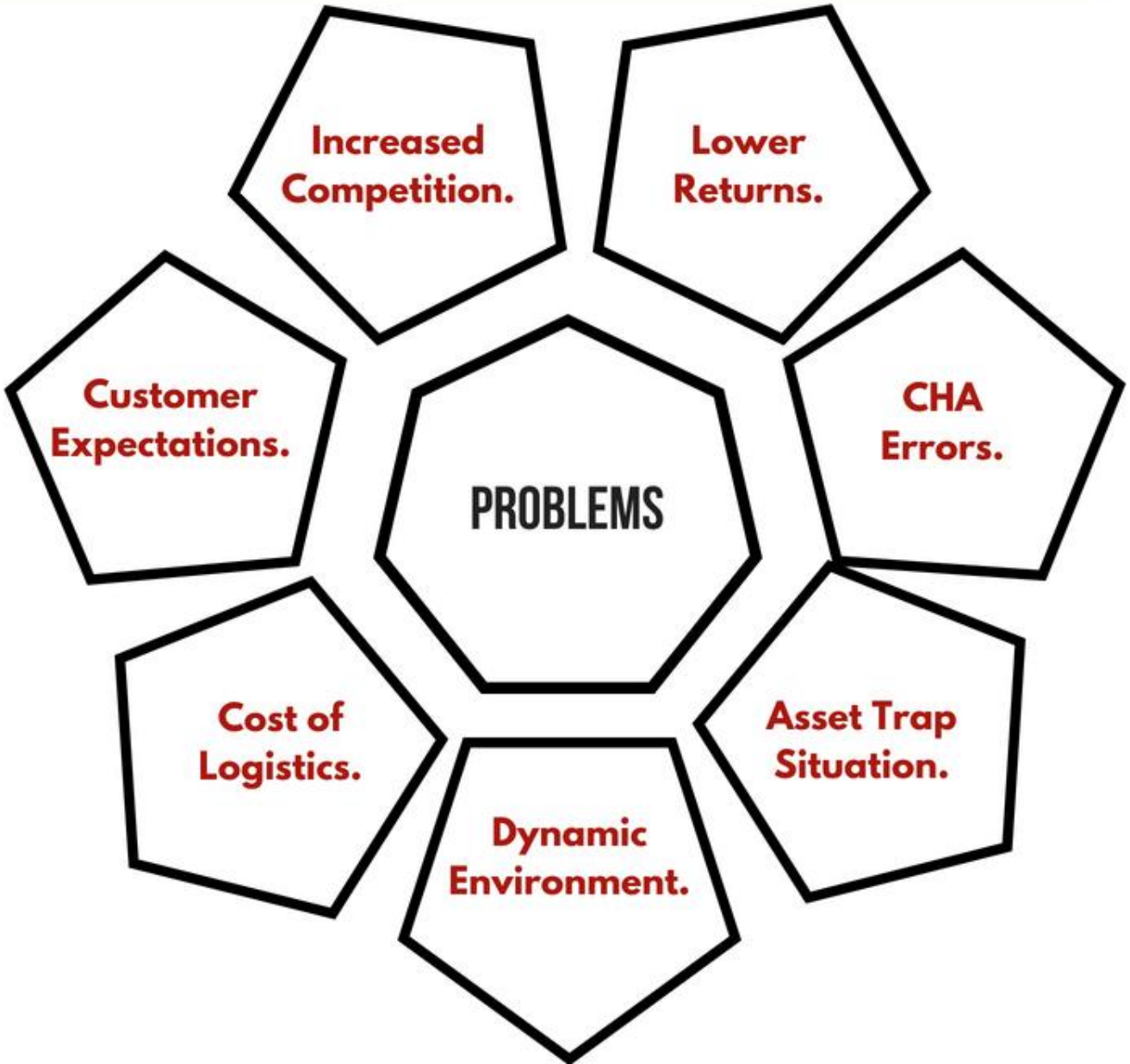
DISTRIBUTION FLOW CHART



3PL PROVIDER'S FLOW OF PROCESS



WHAT THE GLOBAL LOGISTICS INDUSTRY IS FACING?



PROBLEM STATEMENT- WHAT PROBLEM ARE WE ADDRESSING?

• Typically, the loss incurred due to the damage caused to the products is at least **150%** of the price of the products being shipped. The average cost per truck accident, is **$148,279,** as provided by the Federal Motor Carrier Safety Administration, it would take additional revenue of $7,413,950 to pay the costs of the accident, assuming an average profit margin of 2%. **The amount of revenue required to pay for the costs varies inversely to the profit margin**. Further, the cost of a truck accident with a fatality is considerably higher at $7,633,600.

• The through-cycle capital market performance of the transportation and logistics sector is below investors' requirements. Over the last ten years, the companies in our sample have generated an average total return to shareholders (TRS) of 7.2 percent, a figure well below the sector's cost of capital (10.5 percent). **Need to improve ROIC (Return on Invested Capital)**

LOGISTICS METRICS

Logistics metrics are quantitative measurements that track certain processes within the logistics framework.

Table 9.1 Results of a logistics metrics survey (Byers and Cole, 1996)

Logistics metric	*Ranking*[a]	
	Transportation	*Distribution*
On-time delivery	6.83	6.67
Complete and damage-free delivery	6.83	6.33
Accurate freight bills	6.17	5.8
Timely response to inquiry and claims	6	5.8
Order cycle time	5.5	6.6
Average transit time	6.4	5
Percentage backorders	4	6.14
Order accuracy and completeness	6	6.57
Customer communication	6	6.33
Service level	6.5	6.14
Inventory accuracy	5	6.5
Forecasting accuracy	5	5.75
Order selection	5	6
Order administration	4	5.67
Order shipping	4	6.2
Percentage loss or damage in storage	4	6.17
Throughput dollars per total inventory	0	6.4
Order throughput cycle time	6	6.8
Value of inventory adjustments	0	6.33
Replenishment cycle time	5	6
Percentage transaction processing errors	0	5.5
Number of orders shipped per year	1	5.5
Total logistics costs as a percentage of sales	6	6.25
Net profit as a percentage of sales	6	6.8

[a] Metrics were ranked by managers in the transportation and distribution functions, respectively. They were ranked on a scale of 1 to 7, with 1 being 'not important' and 7 'very important'.

- The best design for a logistic system or component(s) of a logistics system truly depends upon the metric(s) used for measuring the performance
- Logistics metrics vary based upon the boundary of the system and the different areas and the ability to define and measure them quantitatively
- A system that measures up very high in one metric may not measure very well in some other criteria
- The objective is to design a system that meets or exceeds the expectations in most of the selected metrics

We present to you-

LogiX

LET THE TECH DO IT.

"Cost optimization and reducing losses by using a Digital Twin."

WHAT IT'S ALL ABOUT?

- A digital twin is a virtual model of a process, product or service and was named one of Gartner's Top 10 Strategic Technology Trends for 2017.
- Lessons are learned and opportunities are uncovered within the virtual environment that can be applied to the physical world — ultimately to transform any business.

CHOSEN INDUSTRY: TRANSPORTATION IN THE LOGISTICS INDUSTRY

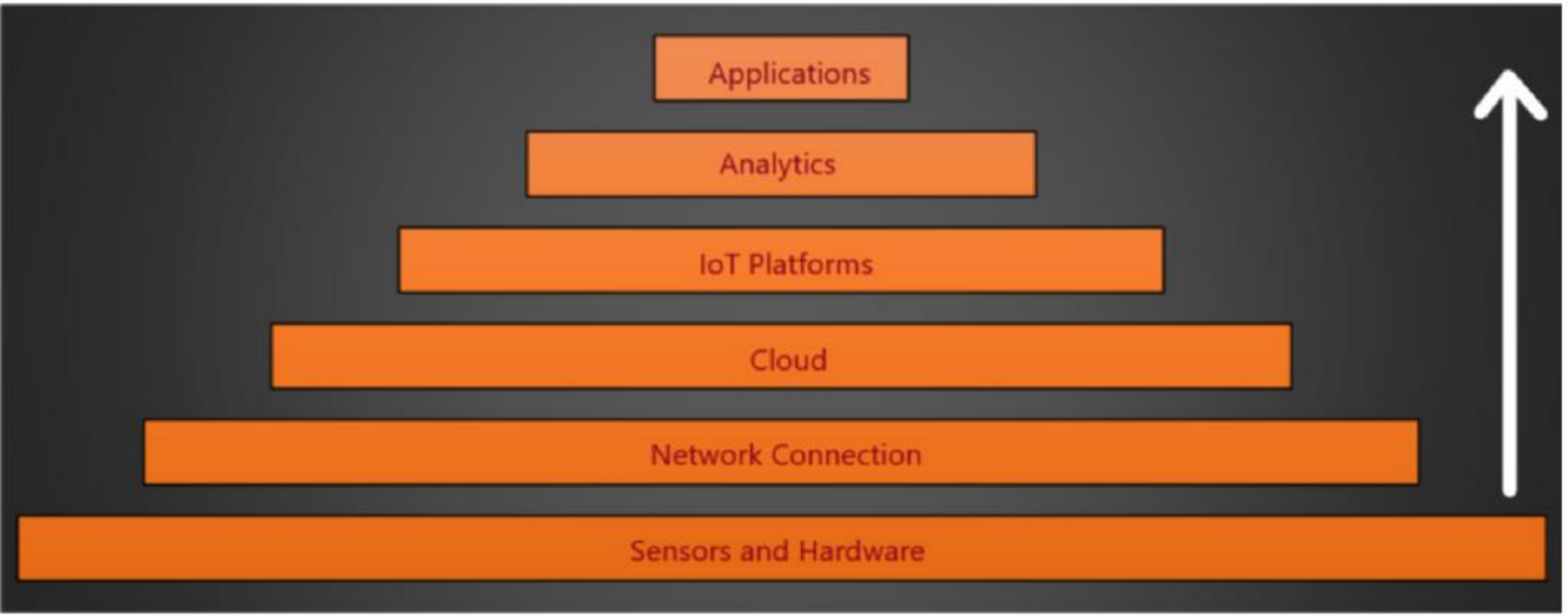
Like most other industries, transportation and logistics (T&L) is currently confronting immense change; and like all change, this brings both risk and opportunity. New technology, new market entrants, new customer expectations, and new business models.

WHY DIGITAL TWIN?

- Drive innovation and performance.
- Improve the customer experience.
- Implementation of predictive maintenance.
- Manufacturing extremely high quality products.
- Gain deep engineering insights across a digital thread.

Mathematical modeling and data science for predicting the behavior of the physical system to create the digital twin.

THE TECH PYRAMID OF LogiX



We aim at developing a Digital Twin, overlaying over the Logistics Supply Chain of Processes (Storage and Transport Network).

The Digital Twin will ensure twinning of

- **Commodity - from the warehouse, where the goods are marked with trackers, and our array of IoT enabled sensors;**
- **Commodity - transportation over road/air**
- **Commodity - at the ports where the communication between Control Operation and Shipping Port will work seamlessly by avoiding the usual erroneous CHA tilll it reaches the destination Port.**
- **Truck drivers - for fatigue/ distraction/accident avoidance**

LOGIX MODELS A DIGITAL TWIN OF THIS PHYSICAL SYSTEM.

Factory Warehouse Pickup Address

1-Pickup

2- Carry-in, Inspection

Nationwide CFS Network

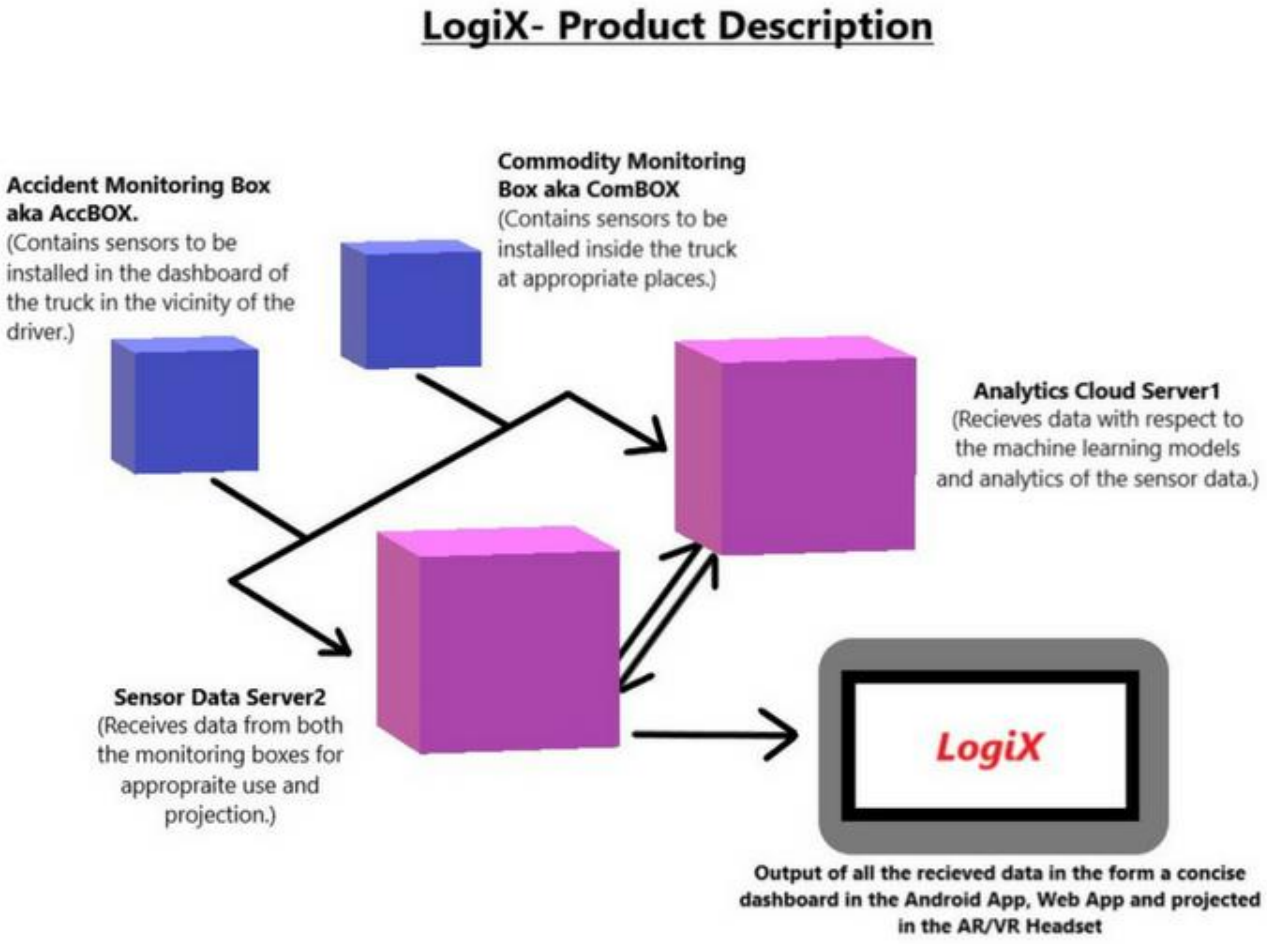
3- Packing /Storage/Containerization

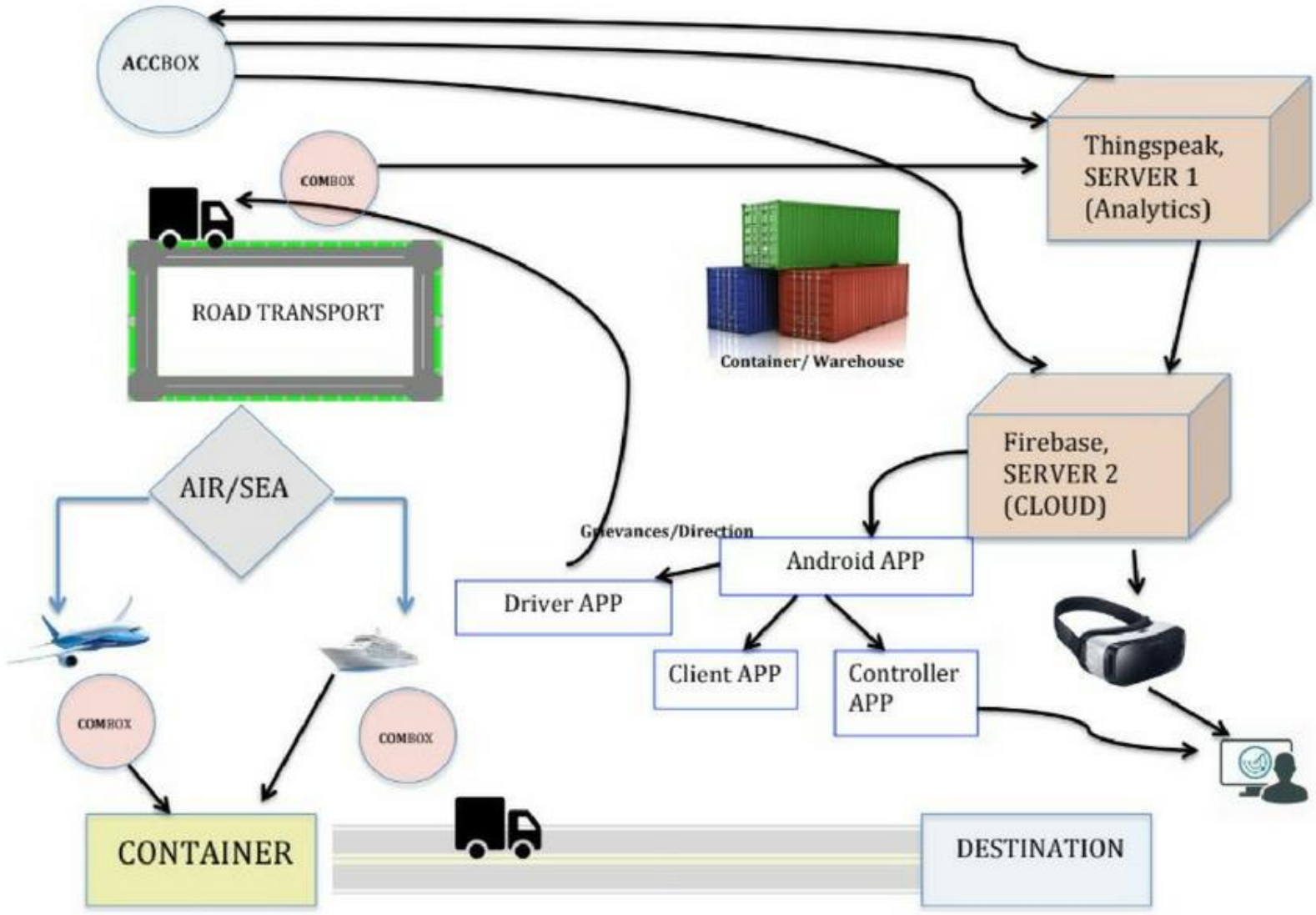
4- Custom clearance, Shipping to destination

Destination CFS

5-Unloading / storage

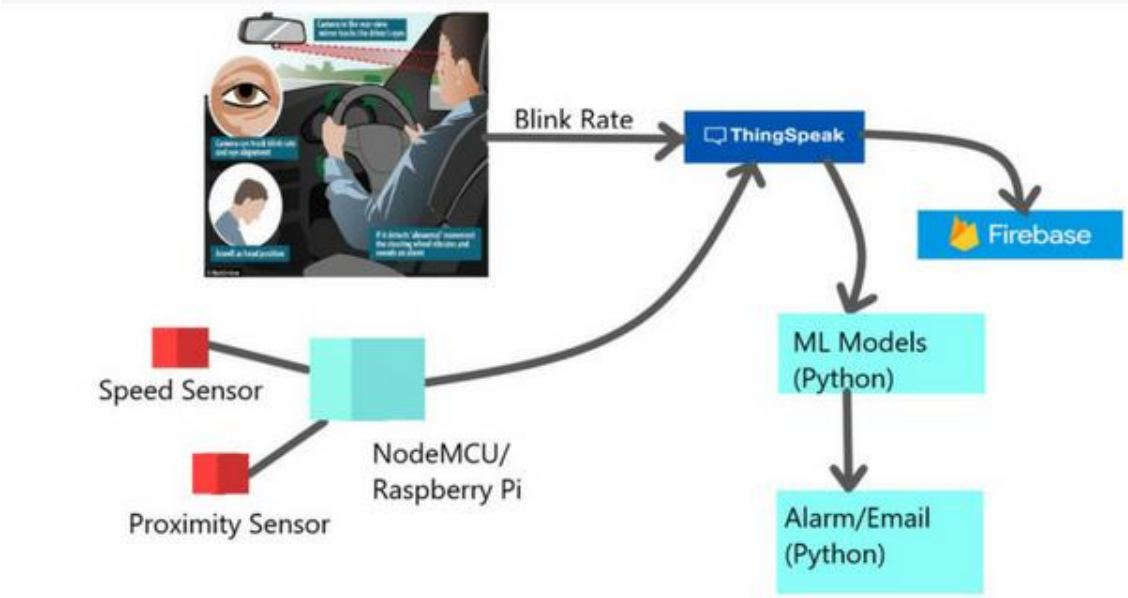
THE PRODUCT


LogiX- Product Description
Accident Monitoring Box aka AccBOX.
(Contains sensors to be installed in the dashboard of the truck in the vicinity of the driver.)
Commodity Monitoring Box aka ComBOX
(Contains sensors to be installed inside the truck at appropriate places.)
Analytics Cloud Server1
(Recieves data with respect to the machine learning models and analytics of the sensor data.)
Sensor Data Server2
(Receives data from both the monitoring boxes for appropraite use and projection.)
LogiX
Output of all the recieved data in the form a concise dashboard in the Android App, Web App and projected in the AR/VR Headset


ACCBOX
COMBOX
ROAD TRANSPORT
Thingspeak, SERVER 1 (Analytics)
Container/ Warehouse
Firebase, SERVER 2 (CLOUD)
AIR/SEA
Grievances/Direction
Android APP
Driver APP
Client APP
Controller APP
COMBOX
COMBOX
CONTAINER
DESTINATION

SENSORS AND DEVICES

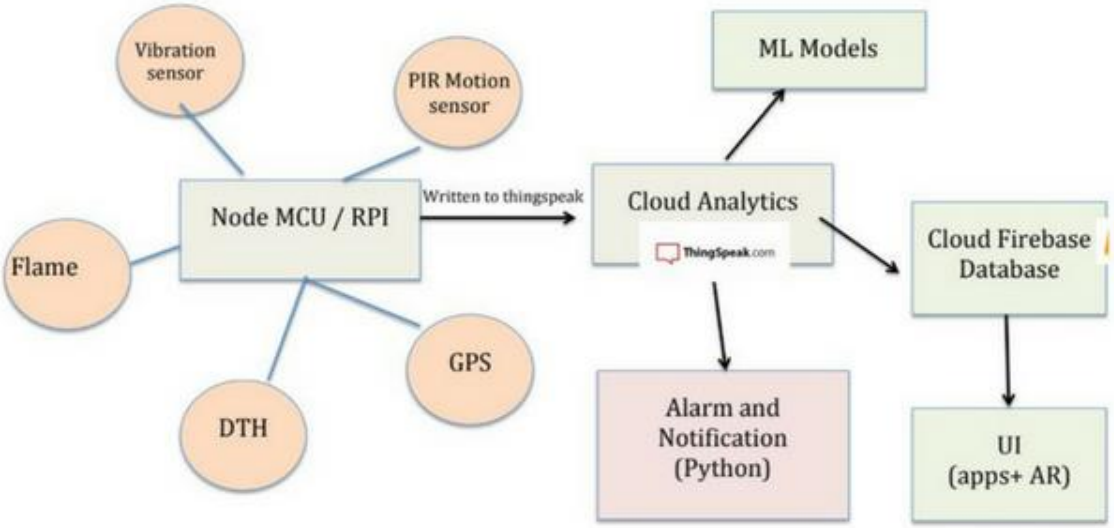
AccBox- Accident Box



- The mathematical model of the AccBOX is implemented and trained in Python 3.5 using five different machine learning models.
- The models are further used to analyze incoming data and predict accidents (Danger/Warning).
- The acquired data from the sensors and camera is sent to Server1- ThingSpeak.

SENSORS AND DEVICES

ComBox- Commodity Box



- The ComBOX comes as a separate package consisting all physical sensors which are inside the truck at the appropriate places.
- Real-time sensor data is sent to Server1- ThingSpeak from this package.
- We have used the sensors namely DHT, Vibration, Flame, Motion, Proximity Sensor connected to three NodeMCUs and one Raspberry Pi model.

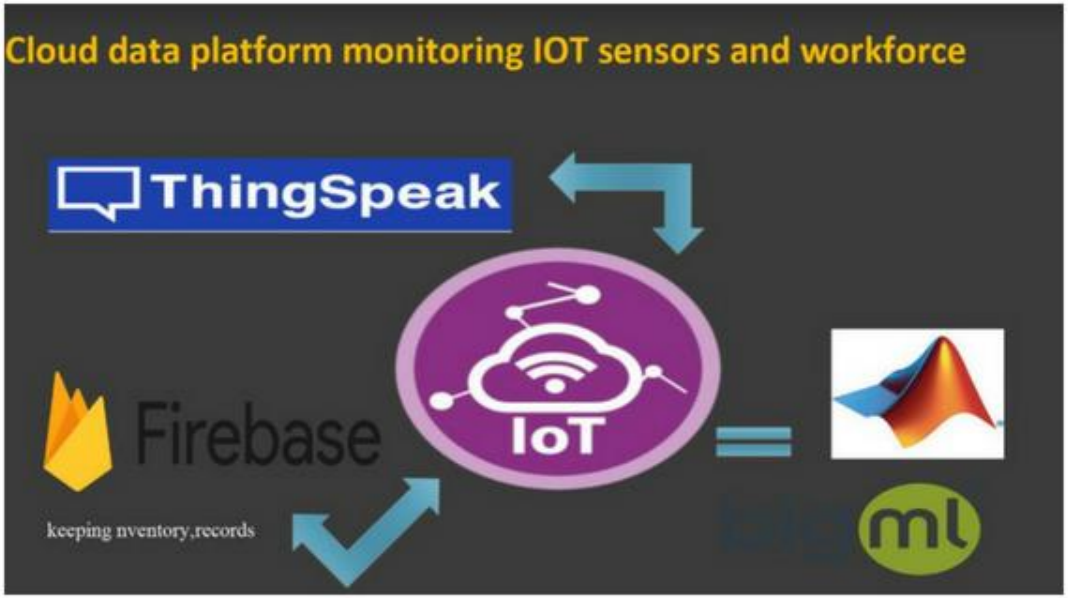
NETWORK CONNECTIVITY

- We will be using 1Ghz wireless communication for uploading data to the cloud.
- ·**Range of Sub 1Ghz wireless:** Sub 1Ghz offers more range than the 2.4Ghz. As range is an important criteria for our IOT product, then the Sub 1Ghz is a better choice. Sub 1Ghz wireless transmission offers 1.5-2 times more distance coverage than the 2.4Ghz spectrum. Also, the Sub 1Ghz wireless spectrum has a long range mode that can have more than 100 km coverage for an IOT application
- **Lower Power Consumption:** Wireless Sub 1 Ghz RF needs a lower power signal from the transceiver compared to the 2.4Ghz spectrum to get the same output power signal at the receiver. This makes the sub 1Ghz RF a great choice for battery operated IOT sensor devices.
- **Interference:** IOT Sensor products using the wireless Sub 1Ghz spectrum can handle interference better. This is because they operate on a lower frequency with fewer existing applications using that spectrum. Also, the lower frequency ISM bands enable the Sub 1Ghz transmissions to weave between buildings in an urban environment better.

CLOUD & IoT PLATFORM

Sensors equipped on the smart machinery, aggregates real time raw data, passed through analytics engine and sends the mode of output to the Digital Twin Platform.

CLOUD & IoT PLATFORM



THINGSPEAK

ALL SENSOR DATA FROM ACCBOX AND COMBOX ARE UPLOADED TO A CHANNEL ON SERVER1- THINGSPEAK, AS DIFFERENT FIELDS.

THE UPLOADED PARAMETERS FROM ACCBOX ARE SENT BACK TO PYTHON TO SOUND ALARMS AND SEND EMAIL NOTIFICATIONS

THE UPLOADED DATA ON THINGSPEAK IS FURTHER SENT TO SERVER2- FIREBASE.

FIREBASE

FIREBASE IS SERVER2.

FIREBASE IS USED AS A CLOUD DATABASE TO UPLOAD ALL REAL-TIME SENSOR DATA INCOMING FROM SERVER1- THINGSPEAK.

DATA FROM FIREBASE IS DIRECTED TO THE ANDROID APPS AND VR-HEADSET FOR PROVIDING THE USER INTERFACE.

MATHEMATICAL MODEL AND ANALYTICS

- Machine learning has a been applied to solve the accident prediction problem, cost prediction problem.
- The approach we have used is not to generalise one algorithm for all the scenarios (as there is no one best machine learning algorithm), rather use an ensemble of machine learning algorithms for every situation.
- These algorithms were trained on meaningful datasets and will all ‘vote’ for a specific outcome in real-time.
- The outcome which is most favourable or which is chosen by the most number of models will be the outcome sent to the Analytics and Cloud servers real-time.

BigML- Machine learning for export cost prediction (DeepNet)

Machine Learning model for Accident prediction- ACC BOX

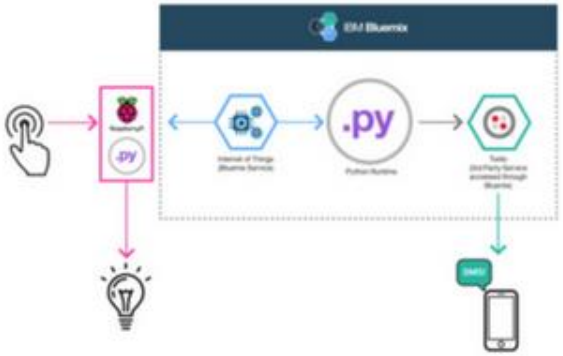
Python- for analysing sensor values from COM BOX

Python in IoT

The sensor values from the ACC BOX and the COM BOX are sent to the Analytics BOX where the data gets converted into meaningful data to help make accurate conclusions and decisions.

The data is sent to the pre-trained Machine learning models and also to a python module which is used to make conclusion based on the data of the sensors in real-time.(Eg: If the temperature of a commodity falls below a certain threshold, then an Alert Signal is triggered.

The Alert signals are conveyed through E-mail and through an Audible Alarm to alert the Control operator of that particular Alert.

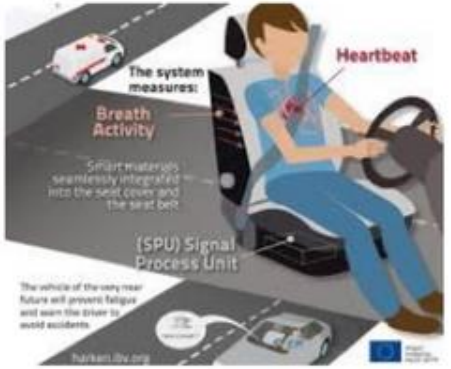


Accident Prediction

Machine learning has a been applied to solve the accident prediction problem, cost prediction problem and the IoT sensor learning problem for product safety. The approach we have used is not to generalise one algorithm for all the scenarios (as there is no one best machine learning algorithm), rather use an ensemble of machine learning algorithms for every situation. These algorithms were trained on meaningful datasets and will all 'vote' for a specific outcome in real-time. The outcome which is most favourable or which is chosen by the most number of models will be the outcome sent to the Analytics and Cloud servers real-time.

We have used 5 learning algorithms. They are:

- **Logistic Regression**
- **Random Forests**
- **K-nearest neighbours**
- **Neural Networks**
- **Support Vector Machines**



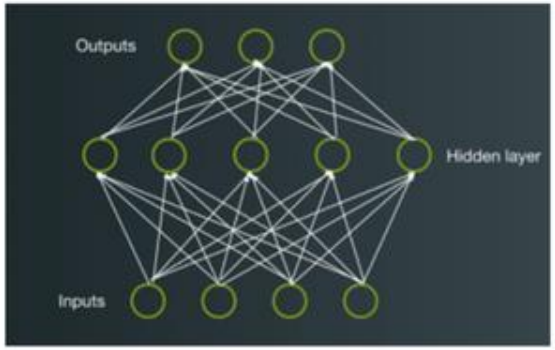
All of the above algorithms are used for classification and not regression. We have also used 2 numerical quantities for our error measurement. They are:

1) Accuracy
2) F1-Score (Harmonic Mean of precision and recall)

BigML

BigML is a Machine learning REST API to easily build, run, and bring predictive models for our supervised and unsupervised machine learning tasks and also create sophisticated machine learning pipelines

We have used decision forests for estimating costs for each item separately. And we combined all these models under a single heading using deep neural network. Deepnets have a combination of the advantages of both Logistic Regression and Decision Trees



Deepnets

Decision Trees

APPLICATIONS

Augmented Reality in Transportation Optimization

Transfer Station

Usual Policy

Printed Cargo Lists and load instruction for storing individual pallets

Time Consuming Inefficient

With AR

- AR devices register if a delivery is complete and ready for pick-up
- Capturing pallet and parcel numbers and volume using markers or advanced object recognition technology
- Automated confirmation of pick-up by AR after the correct number of undamaged parcels is recognised

AR devices can check (printed) trade documents and identify commodity code classification

Real-time translation of parcel labels or foreign trade terms, such as Import/Export Documents

Can significantly reduce port and storage delays

APPLICATIONS

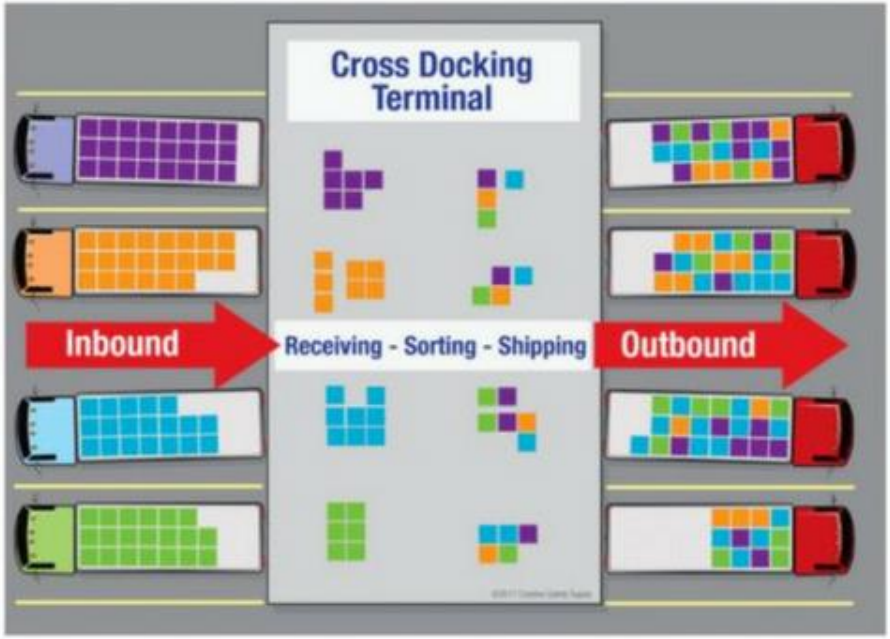
AR can boost pick productivity increase from 6% up to as much as 15%

Without AR-Twin

Regular Practise involves the cases being individually opened, identifying the items, checking the condition of the products, sorting and finally allocating them unique code for fulfilling the outbound order.

This requires a lot of man-power and logistics usually hires, temporary workers to complete the job on the go.

This usually results in significant errors and misleading allotment of commodities to locations.



CROSS DOCKING SYSTEM AT A LOGISTICS ENTERPRISE

With AR-Twin

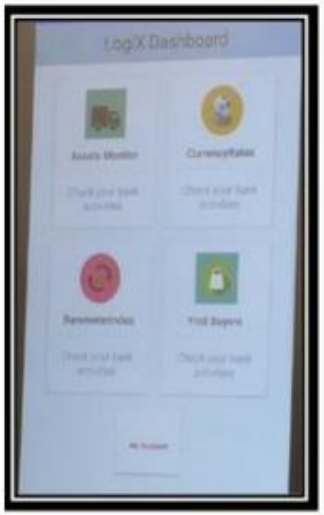
AR equipped headsets with built in scanners and LogiX Twin Database, can read the contents of the individual commodity inside the cases, without having them open for inspection.

Further through LogiX IoT, the damaged goods are easily identified.

The AR can read the package QR and can determine if the package that was transported was faulty or not

APPLICATIONS

THE DIGITAL TWIN ANDROID APP



The main dashboard features all that the twin captures of the Physical System, these are asset monitor that runs real time on the containers and predicts in the case of an accident. The Currency rate is a feature of cost estimation that gives the current US Forbes currency rate.

The commodity monitor, feeds on input given by COMBOX of LogiX twin, and decides the best course of action that need be taken in case of a case damage that affects the goods.

The fleet monitor captures accident prediction cases of the Logistics Asset Truck, depicts its real time location the container it is carrying driver info, and drivers chance at causing an error that results in a loss affecting the roadmap of events.

The client side app feeds in information to the grievance side of the twin that tells the Twin about the kind of accident that has caused the event and the best course of action redeeming lower cost expense to the Logistics base.

CONNECTING THE DOTS- THE BUSINESS CASE

KEY OBSERVATIONS FROM THE LOGISTICS BIZ

Loss incurred due to damage– **150% of the product cost**

$17,000-average cost of an accident during local transportation.

Increased competition and CHA errors- **increased customer expectations** and the need to **improve quality and faster service**.

Need to improve **ROIC**-The through-cycle capital market performance sector is **below investors' requirements.**

Possible saving of about **$50 billion dollars** if logistic costs reduce and optimized.

WHAT END CUSTOMER WANTS

Real-Time Provisioning & Activation

Anytime-Anyplace-Anywhere Business

Tailored & Customized Products, Service Choices

Innovation in Product Design & Service Delivery, Pricing Models

Service Delivery Quality & Assurance

Richer Experience, Enhanced Digital Services across Channel

Greater Partner Collaboration & VAS/ 3rd Party Services

Transform Industry – Accurate data analysis and useful insights

Better Customer Connect and providi the best analysis of data

Accident monitoring and disaster management

HOW LogiX WILL ADDRESS

Sensors and IoT system- various sensors will allow one to maintain Transport visibility and security.

Integrated Logistic Management- harmonizing all service offerings across segment & market

Digital Twin- providing better visibility for improved services.

Creating a **GEO-Fence** over the transport route – integrating **Business Process Transformation.**

Fleet and Asset Management through GPS, sensors, algorithms- ML algorithms for cost estimations.

Integrating Augmented Reality headset – optimized accessibility.

FINANCIAL MODEL/ POSSIBLE BUSINESS MODEL

Value-based Pricing and a SaaS Model.

Pay a nominal fee for the sensors and hardware set up in required transportation unit (Rs. 30,000-Rs.50,000); starting at a higher price point if there is a willingness to pay among the stakeholders followed by raising the prices as more value is added to the product after appropriate customer evaluation and feedback.

An annual or a monthly subscription fee for data analysis and collection- proper insights, disaster management, accident management, Shipping and Asset Managment etc.

CUSTOMER ACQUISITION

THROUGH WIDE EXPOSURE, LOGIX TARGETS ANYONE THAT SEEKS BETTER LOGISTICS HANDLING.

TARGET CUSTOMERS

- Logistics/Transportation Companies.
- Small businesses involved in the delivery of goods.
- Governmental organizations concerned with transport and logistics etc.

SELLING POINTS

- Advanced technology and quality improvement with proper implementation.
- Cost effective and accommodating.
- Data analysis with additional insights and helper docs and manuals.

ADVERTISEMENT

- Social Media and Internet Advertising.
- New Age Digital Marketing
- Niche Marketing
- Traditional mediums with max/min costs.
- Tie-up with the Government for implementation.

RETAIL

- Selling through online registration and selected mediums/official website.
- Direct sales with the company for proper set-up and delivery of the product.
- Setting up effective pricing strategy models.

TARGET OF AT LEAST 50+ CUSTOMERS IN A MONTH.

what we aim to achieve at the end?

Through our solution we aim to bring down accident losses to a minimal amount , less than 5% of the losses incurred due to the above scenarios taking place, and ensure timely delivery of the goods.

Improving the sector would facilitate a 10% decrease in indirect logistics cost, leading to a growth of 5-8% in exports.

The progress of logistics sector holds an immense value for Indian economy.

THINK LogiX- THINK AHEAD.