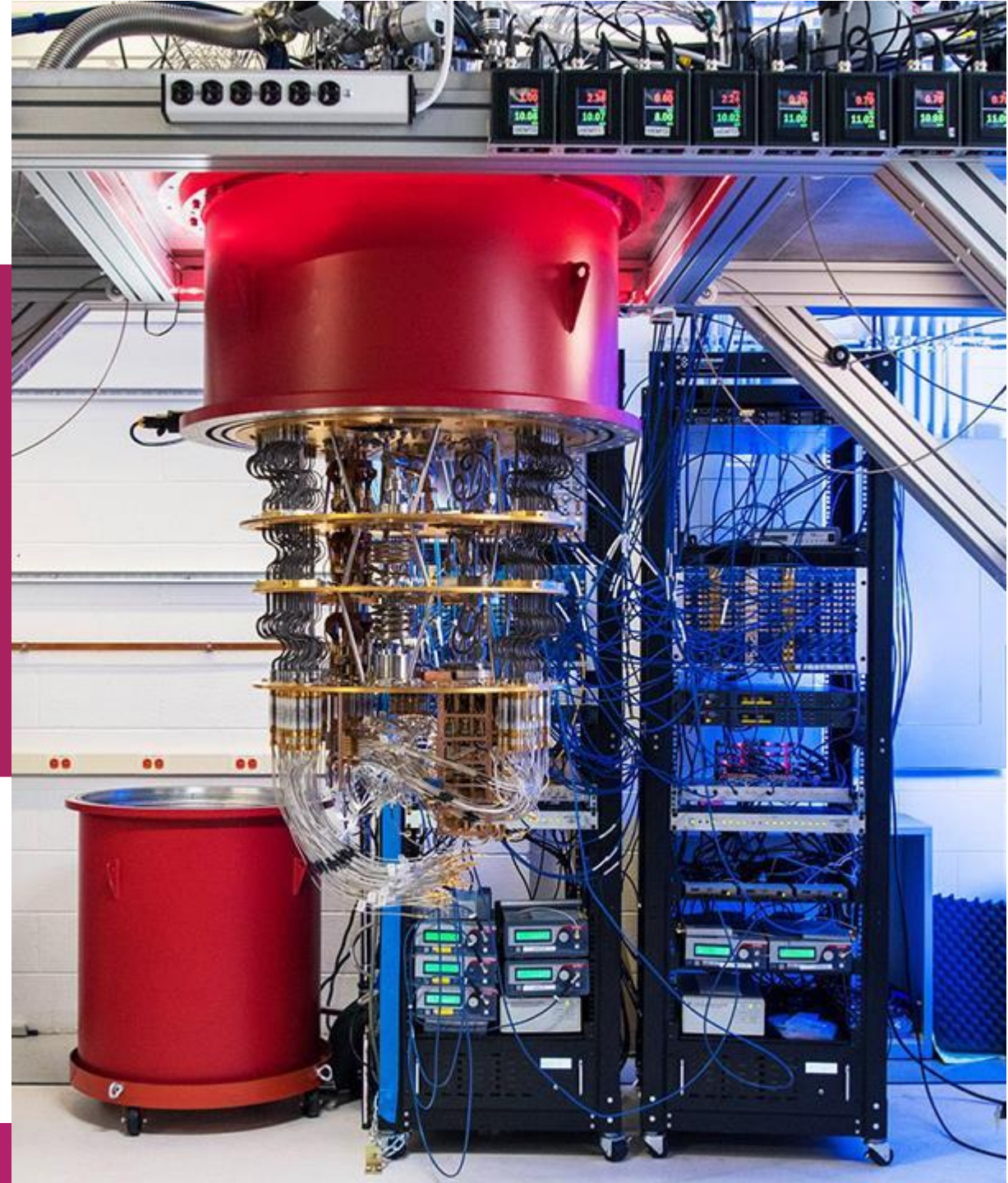# Capacitated Vehicle Routing Problem

# Capacitated vehicle routing optimization

## Problem Description

- Obtain optimal route and number of trucks to minimize the cost function

## Data Description

- Data set: co-ordinates, demands of customers (OR-Library by J.E Beasley)
- Data Type: CSV
- Data Size : 199 customers

## Algorithm Description

- Minimize the cost of running the trucks
- Keep capacity of truck into consideration
- Algorithms used:
- Genetic algorithm, Dwave Hybrid Solver

## Quantum system achieved the following over Classical computing system

- 68.74 % Reduced Time taken in optimization

| | Classical | Quantum |
|---|---|---|
| Infrastructure | 32 GB RAM, 8-core Linux 18.04 Machine | D-Wave 2000Q Hybrid Solver |
| Dataset | Demands and co-ordinates of 199 customers and depot; capacity of truck =200 | |
| Algorithm | Genetic algorithm | D-Wave Hybrid Solver |
| Run Time | 476s 18ms | 148s 54ms |
| Cost (minimization) | 1700.55 | 1777.36 |
| Number of trucks | 17 | 17 |
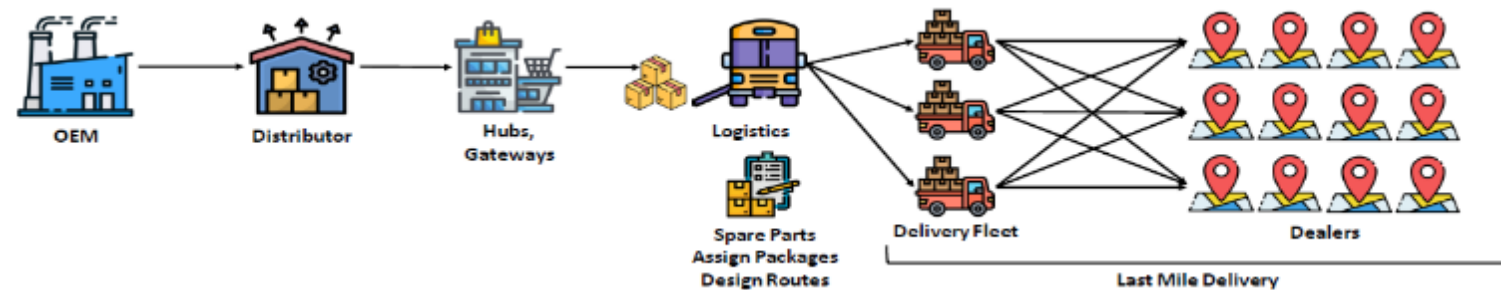
## Business Challenges

- Dispatch Management System **- Low automation footprint and high dependence on manual steps**

- KPIs such as cost of operations and on time performance are not at par with business requirements

## Business Objective

- Improve the last mile delivery operations by

  - Increasing On time performance (% deliveries within appointment window)

  - Reducing Total cost of routes ($)

  - Reducing Empty Miles (miles & $)

## Mphasis EON based Last Mile Route Optimizer Solution

- Route optimization solution by integrating D-Wave Quantum Annealing Platform for last mile container delivery

- Implemented Mphasis EON to build a scalable and customizable route optimizer

- Rate card-based: 81% 'empty trailer' moved @ top 3 min. cost

- Achieved increased productivity and measurable cost savings via reduced cost of operations, equitable allocation of work and increased on-time performance
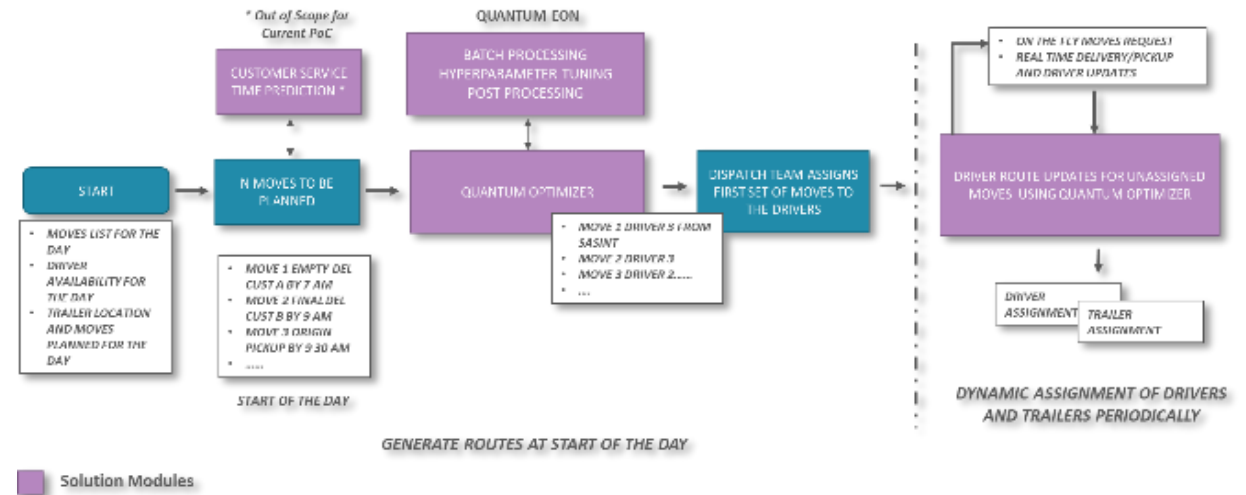
# NEXT Labs – Exploring the Next in Cognitive, Cloud and Quantum

NEXT Labs is focused on disruptive and break-through innovations across Cognitive, Cloud and Service Transformation

## Cognitive and AI

- DeepInsights™
- PACE-ML
- Autocode.AI
- Optimize.AI
- HyperGraf™ (Customer 360 Analytics)
- InfraGraf® (Predictive Maintenance)

## Quantum Computing

- EON Quantum Computing Framework
- Quantum Consulting & Algorithm Development

## Thought Leadership

- Journals and Conferences

## Cloud

- Cloud Suite powered by Cognitive
- Cloud Marketplace based Offerings

## Consulting

- Design workshops for AI driven proof of value
  Quantum Computing Workshop

## Patents

- Protect IP

### NEXT labs

### Mission

**Unlocking new growth trajectories**

**Becoming the preferred Innovation Partner for our clients**

**Enabling differentiation in the Social, Mobile, Analytics and Cloud, Cognitive Computing, IoT, and Automation spac**

### The AIconics
Winner – Best Application of Artificial Intelligence (AI) for Financial Services

### STRATUS 2018 AWARD
Stratus Awards for Cloud Computing' in the Artificial Intelligence category

### one globe

### EXPRESS IT AWARDS

### Paragon 2017 Awards
ISG Paragon Awards™ Americas in Imagination Category, 2017

# Mphasis
## The Next Applied

## THANK YOU

### About Mphasis

Mphasis (BSE: 526299; NSE: MPHASIS) applies next-generation technology to help enterprises transform businesses globally. Customer centricity is foundational to Mphasis and is reflected in the Mphasis' Front2Back™ Transformation approach. Front2Back™ uses the exponential power of cloud and cognitive to provide hyper-personalized ($C=X2C^2_{TM}=1$) digital experience to clients and their end customers. Mphasis' Service Transformation approach helps 'shrink the core' through the application of digital technologies across legacy environments within an enterprise, enabling businesses to stay ahead in a changing world. Mphasis' core reference architectures and tools, speed and innovation with domain expertise and specialization are key to building strong relationships with marquee clients. Click here to know

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