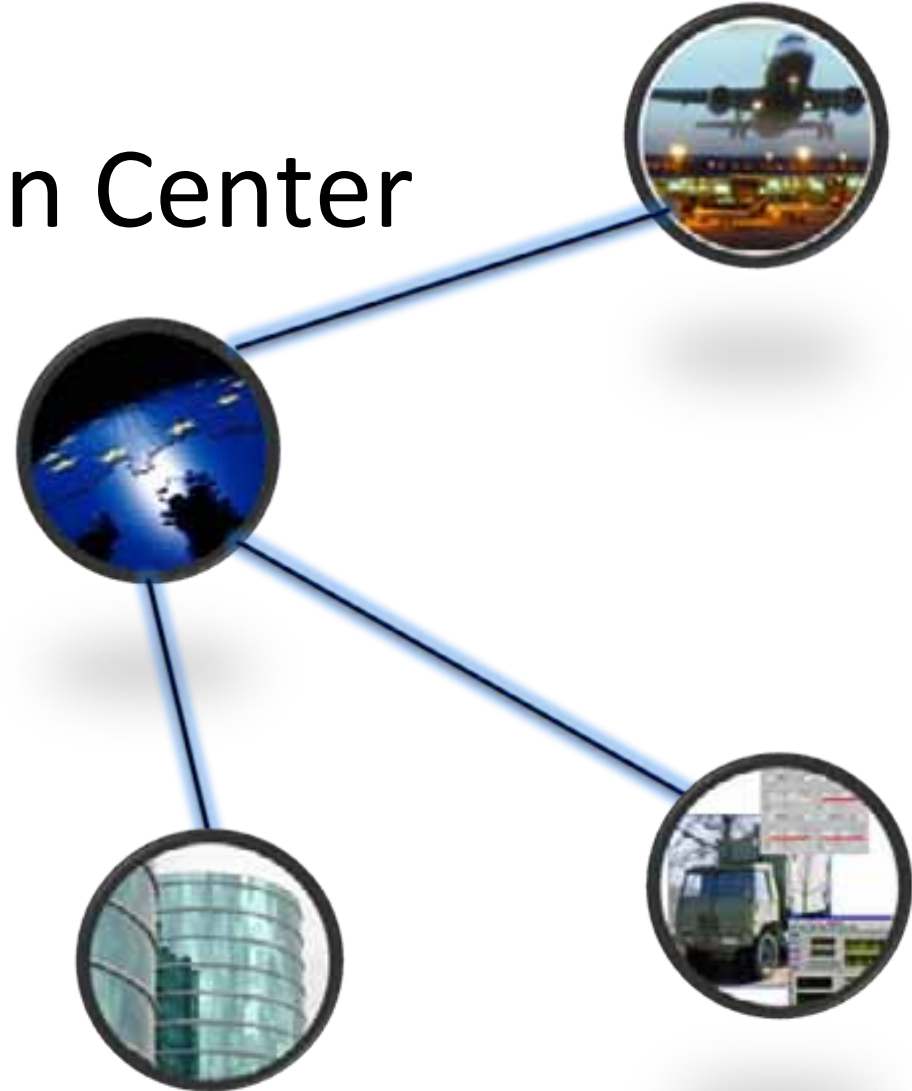




# Logistics Distribution Center Node Optimization

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PlusOneMinusOne  
Dr. Emin Anarım  
Boğaziçi University  
Dr. Tolga Kurt  
PlusOneMinusOne





# About P1M1

- R&D Organization building software on GIS based solutions.  
[www.p1m1.com](http://www.p1m1.com)
- Located in Boğaziçi University Campus
- All algorithms are developed in-house
- Location based forecasting and optimization solutions
- Finance, Telecom, Logistics, Energy, Defense, Health and Airlines



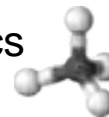


# The Team

- 13 Software Engineers, 8 Ph.D. Level Researchers (Computer Science, Electrical Engineering, Math and Geography fields ), 5 Senior University students, 3 MS Students composed of electrical engineers, industrial engineers and software engineers.
- Vast Experience in GIS based optimization
- ORACLE as Database Partner
- In-depth experience at Oracle based Integration
- ESRI as GIS partner
- Intel as Processing Partner



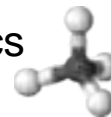
ORACLE





# INTRODUCTION

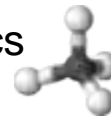
- Logistic Route Planning is a version of Vehicle Route Planning (VRP) problem well known and addressed in the literature.
- It is also one of the aims of Network Analyst tool by ESRI. PlusOneMinusOne utilizes Network Analyst and goes a bit further.
- For a logistics operation, for the delivery department, not only the best routes are required, but also the optimal route starting point hubs are required as well.
- These hubs correspond to transfer centers and distribution centers for the logistic operation. However, only VRP problem by itself is an NP-complete problem, which gets even harder with there are multiple potential starting points multiple carriers, which can potentially deliver to multiple points that can switch within the group. PlusOneMinusOne utilizes Network Analyst and heuristic matching pursuit algorithms in order to find the best node locations which will result in better route planning solutions





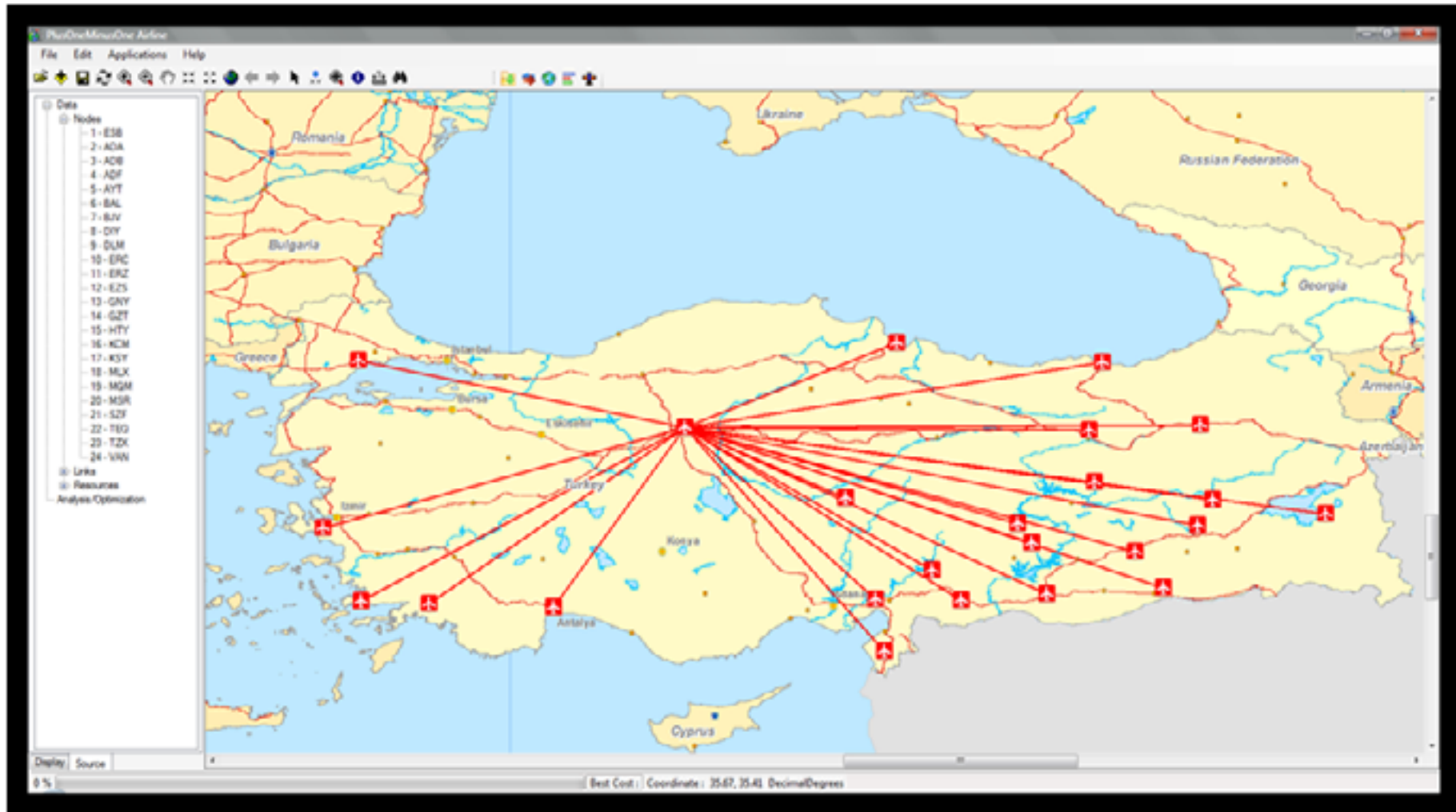
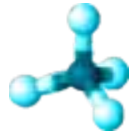
Airlines, Finance, Energy, Telecom

# VARIOUS P1M1 SOLUTIONS



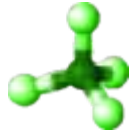


# P1M1 AIRLINE



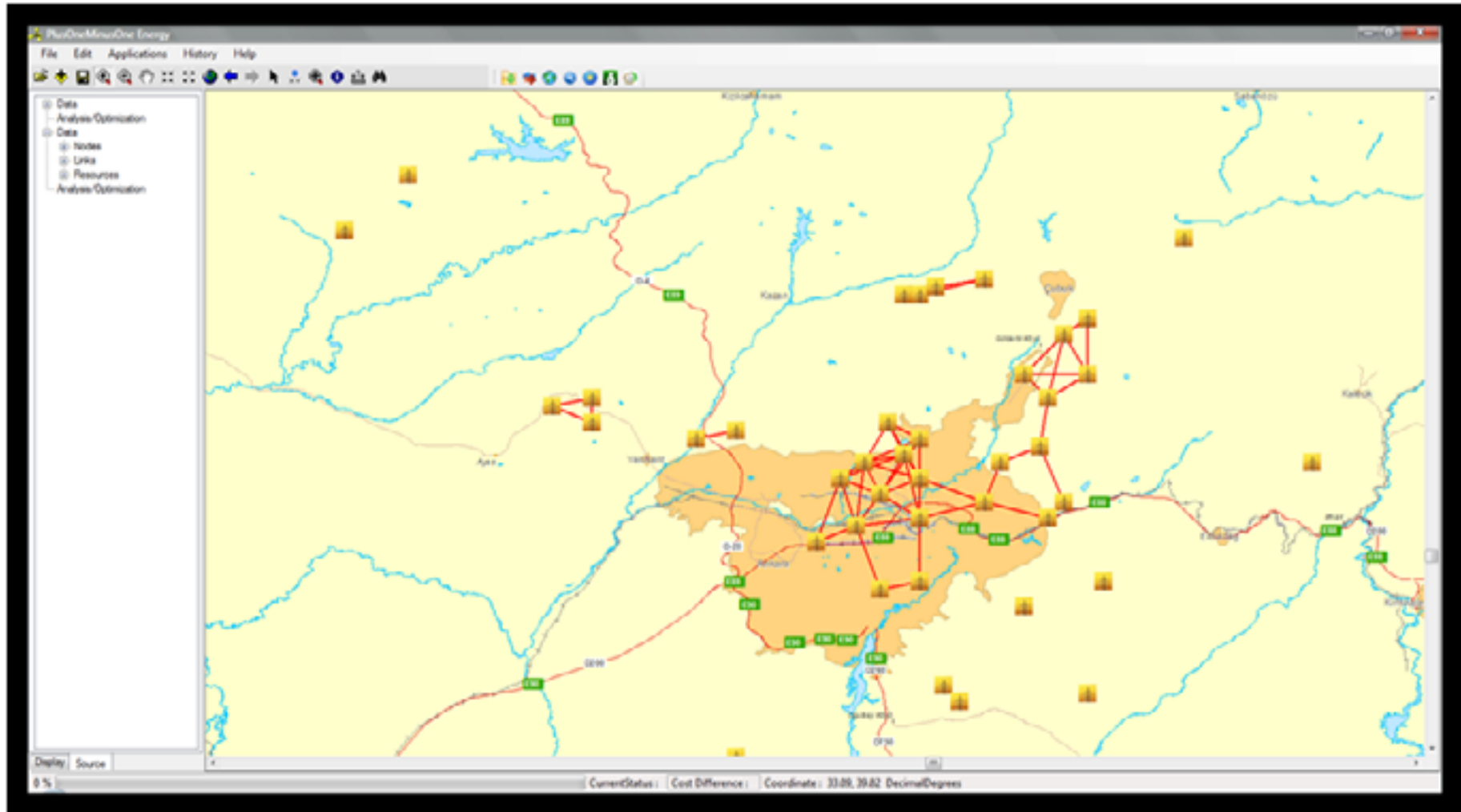
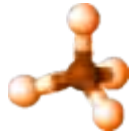


# P1M1 FINANCE





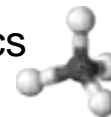
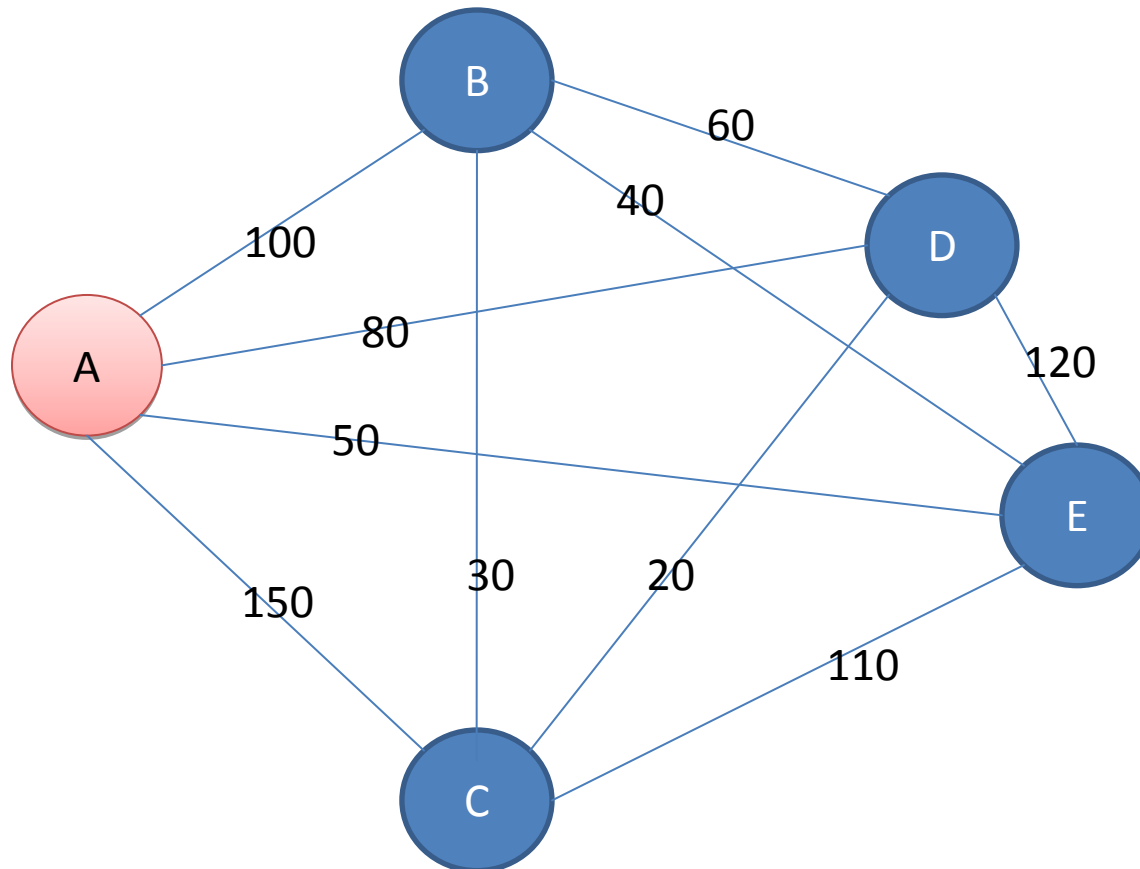
# P1M1 ENERGY

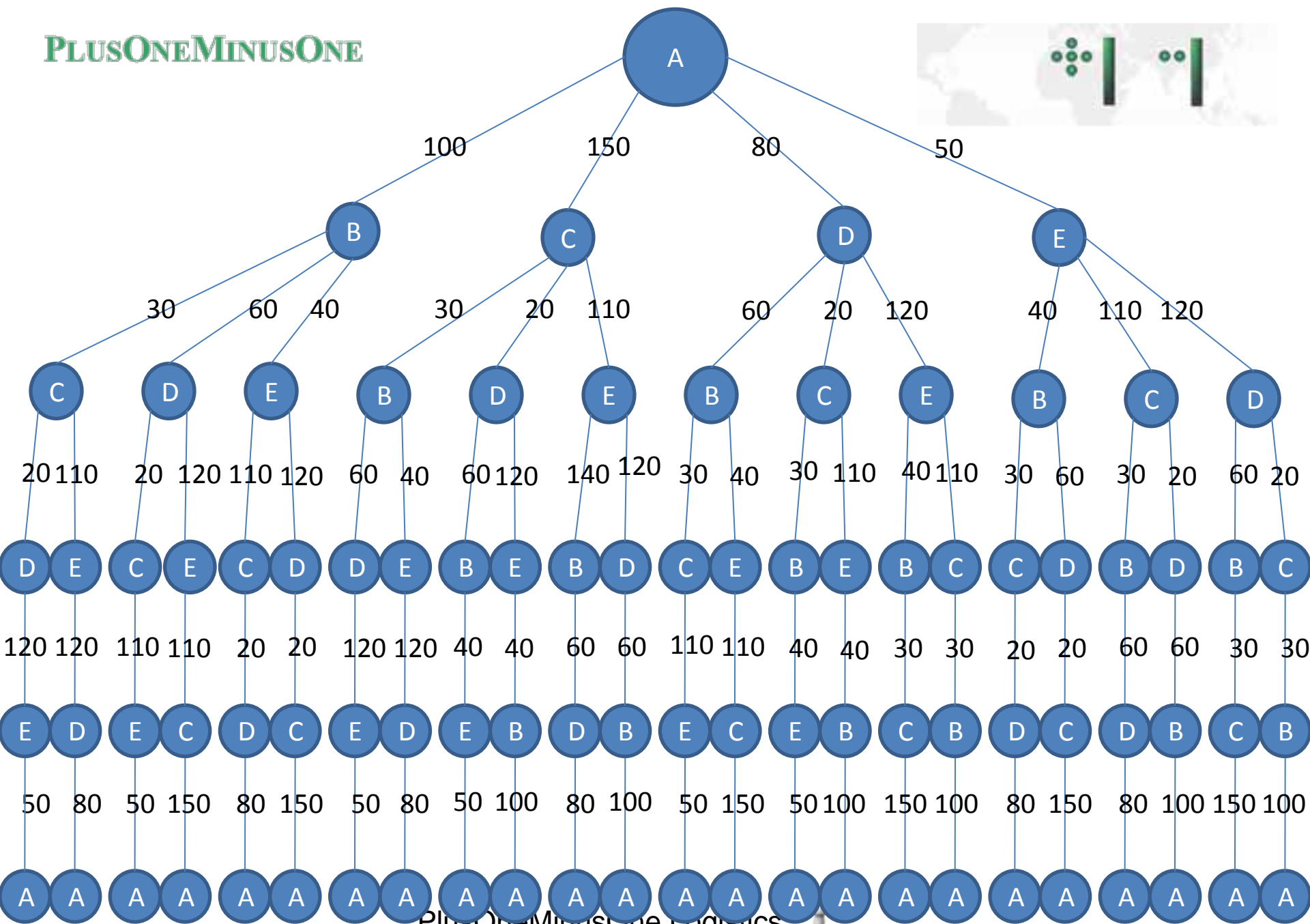




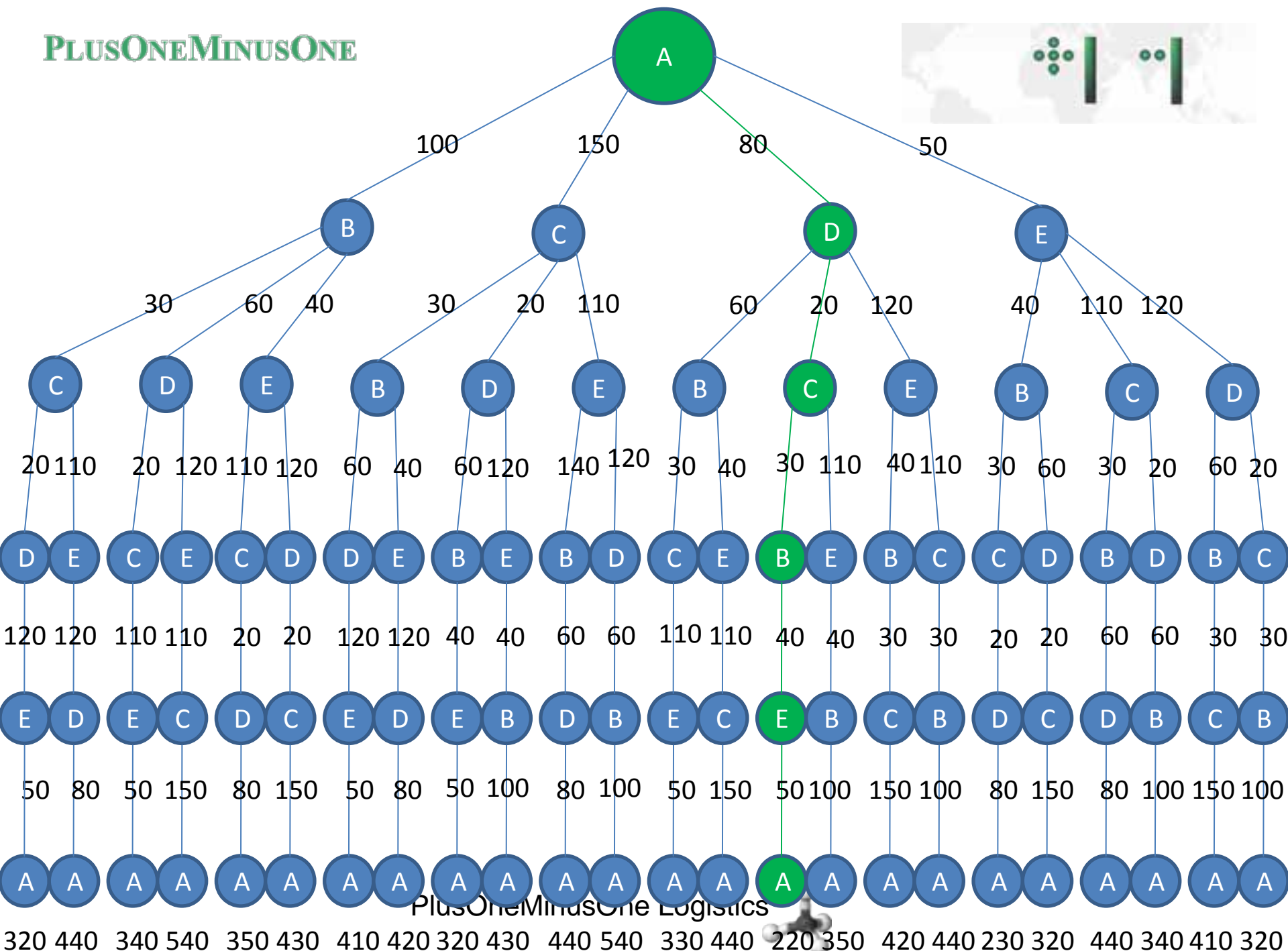


# Traveling Salesman Problem



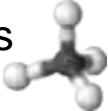
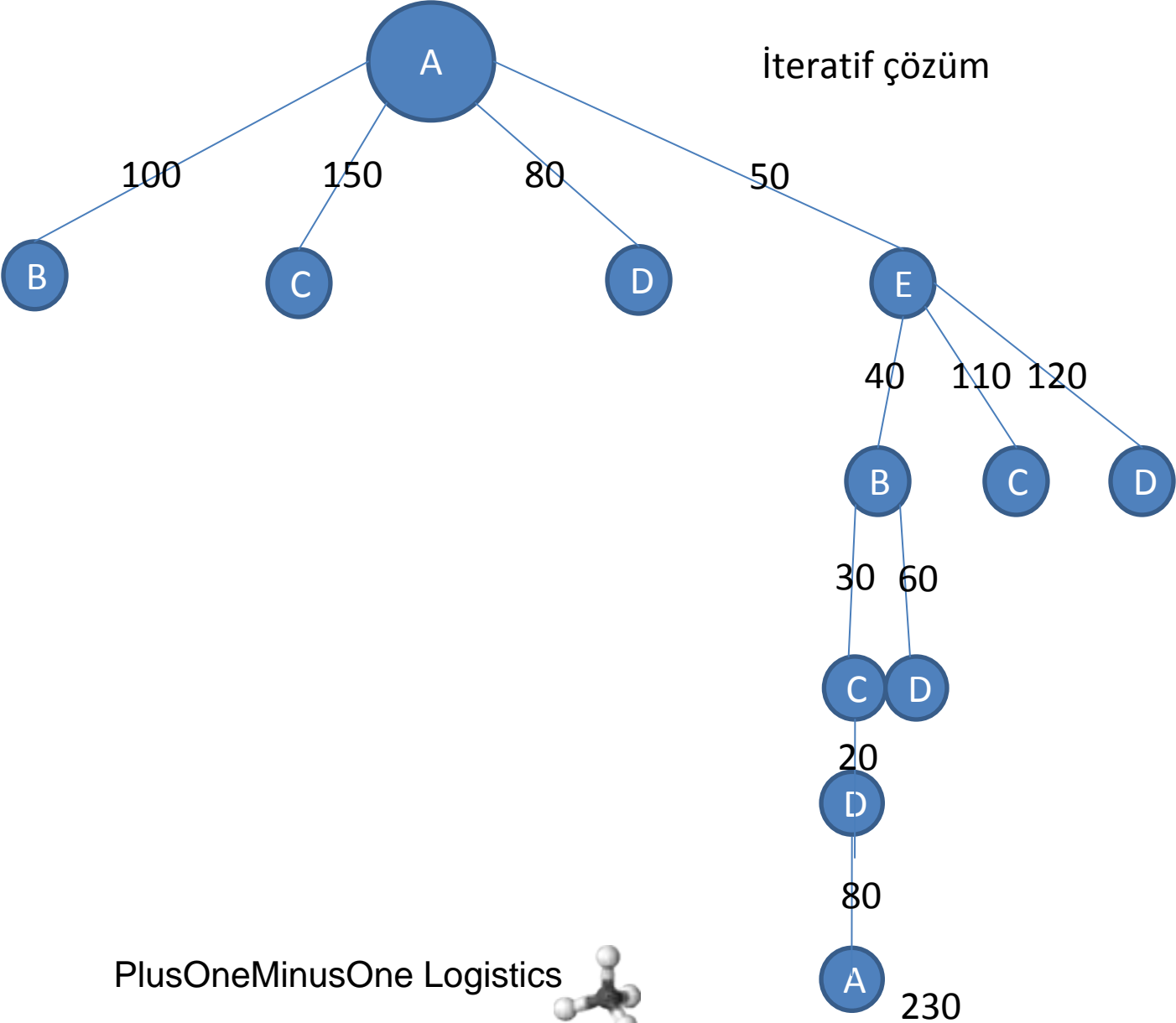


# PLUSONEMINUSONE

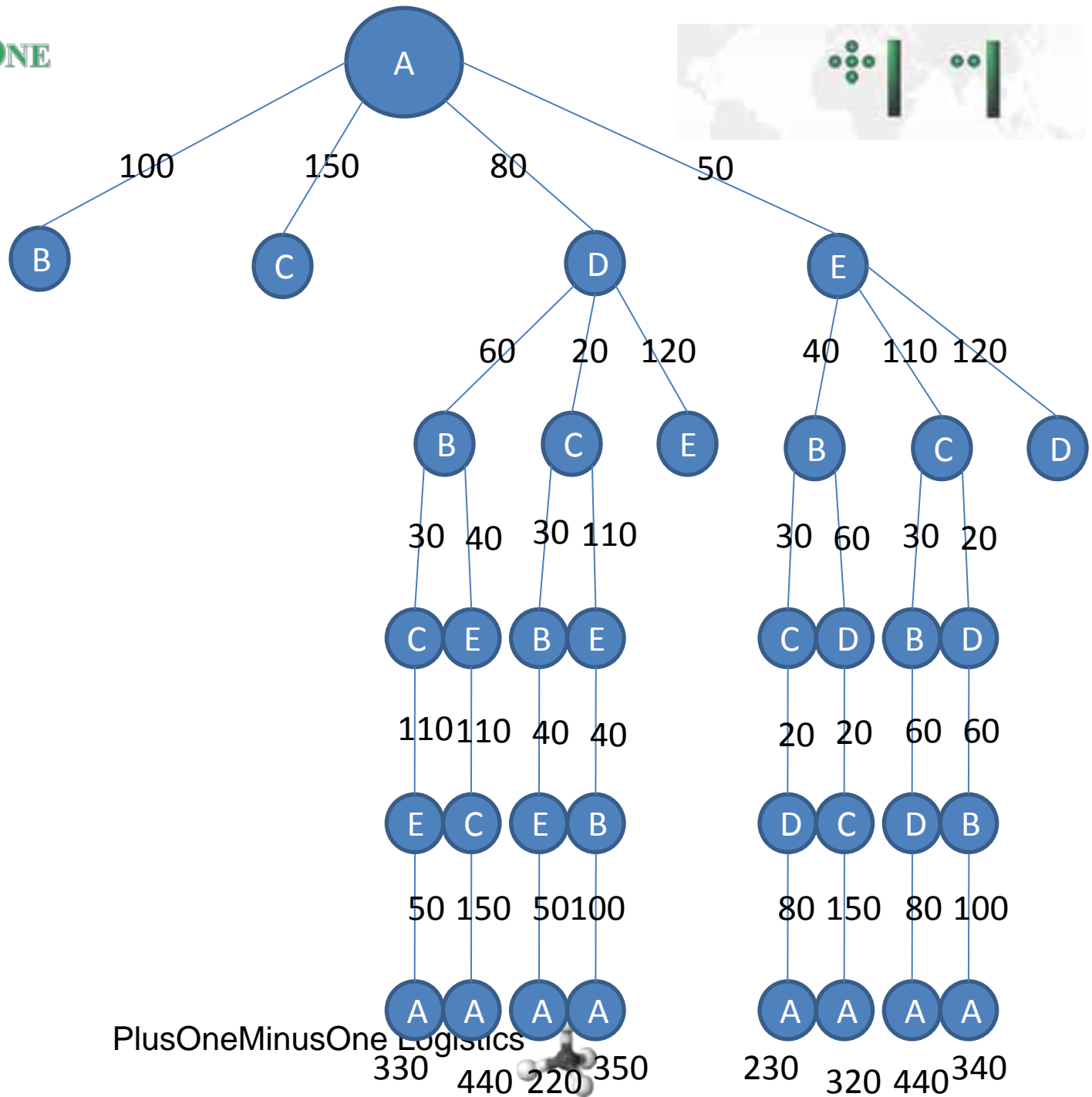




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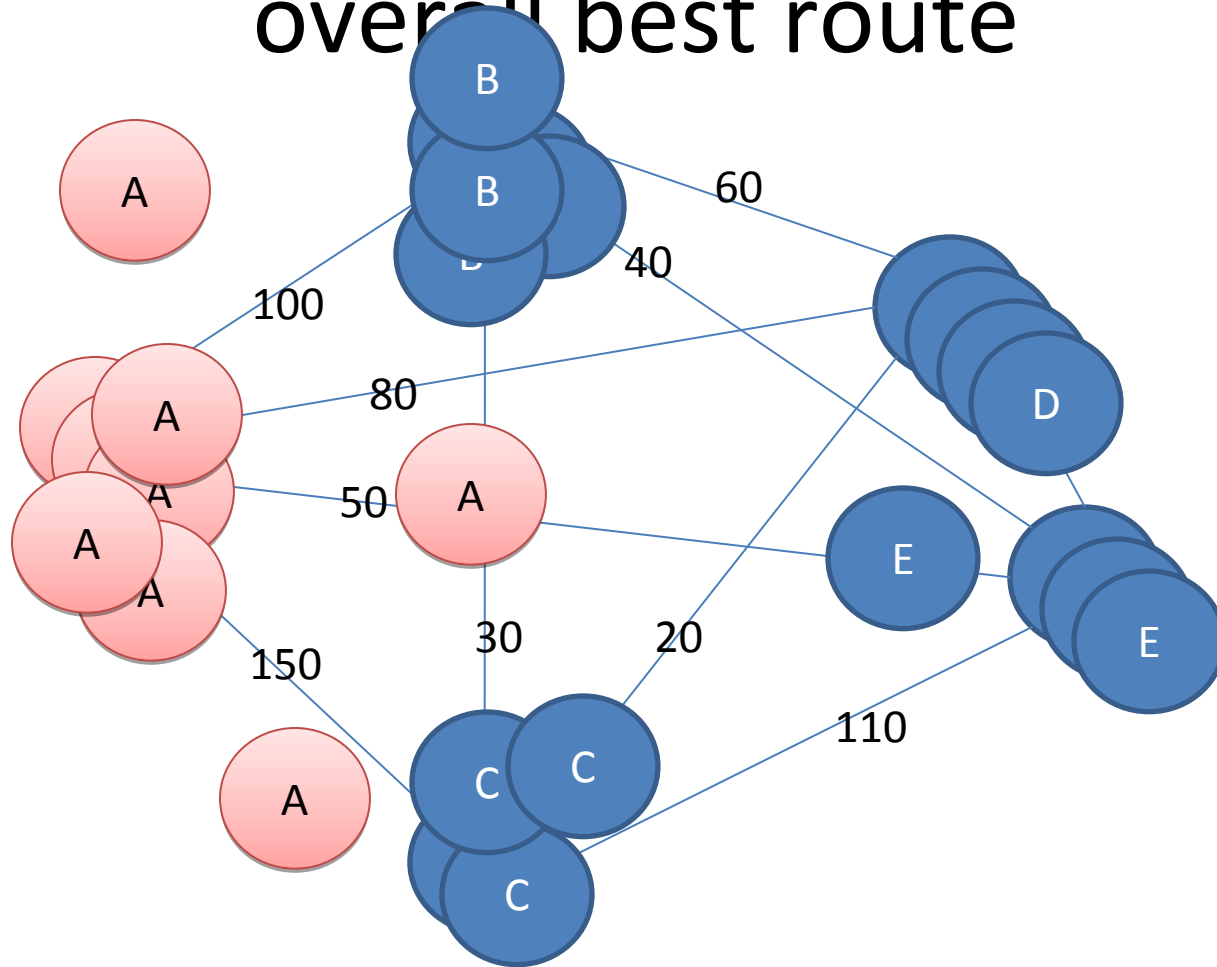


# PLUSONEMINUSONE



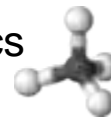


# Finding the source that gives the overall best route



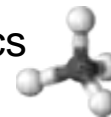


# Optimizing Flow - Overview





# Optimizing Flow – Nodes, Links, Resources

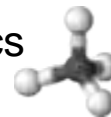






# Demand Inputs

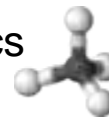
- Inputs of the system are:
  - 28x28 matrix, that holds, the total demand from each node to any other node in the system
  - The deadlines for receiving the cargo
  - The cost of each vehicle for each element of the matrix
  - Backhaul requirements





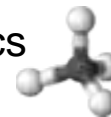
# Optimizing Flow – Outputs

The system provides an output as a list of routes, bachauls and assigned vehicles.





# Optimizing Flow – I Nodes, Links, Resources





# Nodes, Links

Edit Link

Template

Link : 3 - ADANA TM <-> BOGAZICI TM

Link Properties Custom

Link ID: 3

Source Node : 0 - ADANA TM

Destination Node : 7 - BOGAZICI TM

Link Type : Indirect Link

Groups : 0 - Group A

Attachments

A.jpg  
A.pdf

Open Remove Add

Cancel Save Changes

Edit Node

Template

Node : 1 - AFYON TM

Node Properties Custom

Node ID : 1

Node Name : AFYON TM

Address 1 : Organize Sanayi Bolgesi 2.cad

Address 2 : Afyon

Address 3 :

Groups : 1 - Group-B

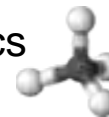
Node Type : Transfer Center

Coordinates

	DEG	MIN	SEC
Latitude :	30.5538	0	0
Longitude :	38.8029	0	0

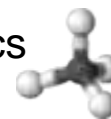
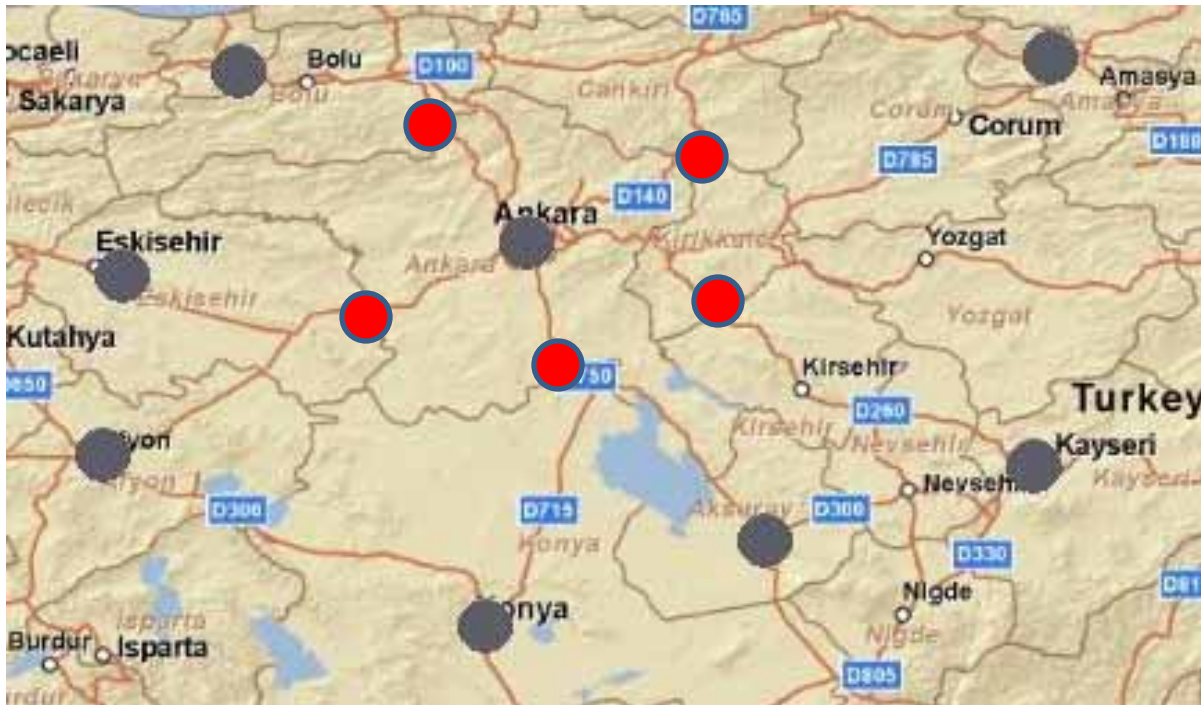
Capture Coordinate (From Map)

Cancel Save Changes





# Finding the Transfer Center that gives the best cost/flexibility





Algorithms for a better future...



[www.p1m1.com](http://www.p1m1.com)

[contact@plusoneminusone.com](mailto:contact@plusoneminusone.com)

