



Network optimization

Presenter: Anatoly Zherebtsov, Head of development

Optimize

Design

Experiment

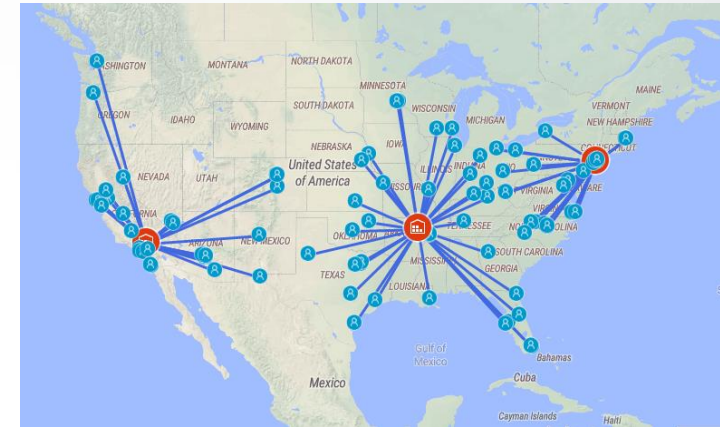
Innovate



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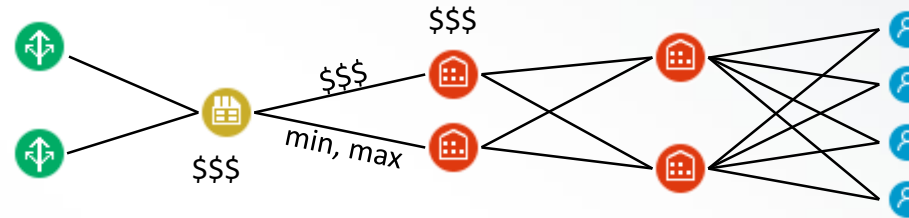
What is Network Optimization?

- Objective:
 - Find the “best” configuration of supply chain facilities and optimal flows in each period while considering the network structure and constraints from suppliers to customers
- Network Optimization uses the following information:
 - Demand
 - Locations of suppliers, customers, existing and potential facilities
 - Transportation Flows
 - Inventory Storages
 - Costs (DC fixed/variable & transportation)
 - Constraints
 - Time Periods
- Default criteria:
 - Maximizing Profit
- Simplifications:
 - Optimization models work with flows, not individual shipments
 - Flows are uniform across a time period (i.e. 5000 tons per month)



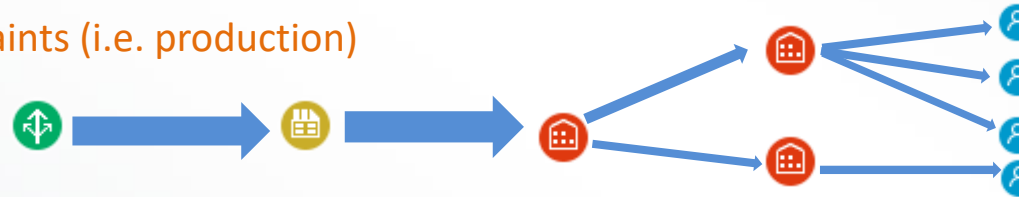
What is Network Optimization?

- Optimization models describe the supply chain as a set of all possible flows and facilities and corresponding constraints:



- The optimal solution is the best set of flows and facilities considering:

- A profit maximizing objective
- Adherence to all constraints (i.e. production)



- Outputs from network optimization are values of flows (transportation & production) and storages (inventory) in each time period and associated costs

Iteration	Period	From	To	Flow
1	1	Month 01	Site 7	
2	1	Month 01	Site 10	
3	1	Month 01	Site 1	
4	1	Month 01	Site 1	
5	1	Month 01	Site 3	
6	1	Month 01	Site 3	
7	1	Month 01	Site 7	
8	1	Month 01	Site 10	
9	1	Month 01	Site 6	
10	1	Month 01	Site 3	
11	1	Month 01	Site 7	
12	1	Month 01	Site 7	

Iteration	Period	Site	Initial State	New State
1	1	Month 01	Site 1	Closed
2	1	Month 01	Site 3	Closed
3	1	Month 01	Site 6	Closed
4	1	Month 01	Site 7	Closed
5	1	Month 01	Site 10	Closed
6	1	Month 01	DC 1	Closed
7	1	Month 01	DC 2	Closed

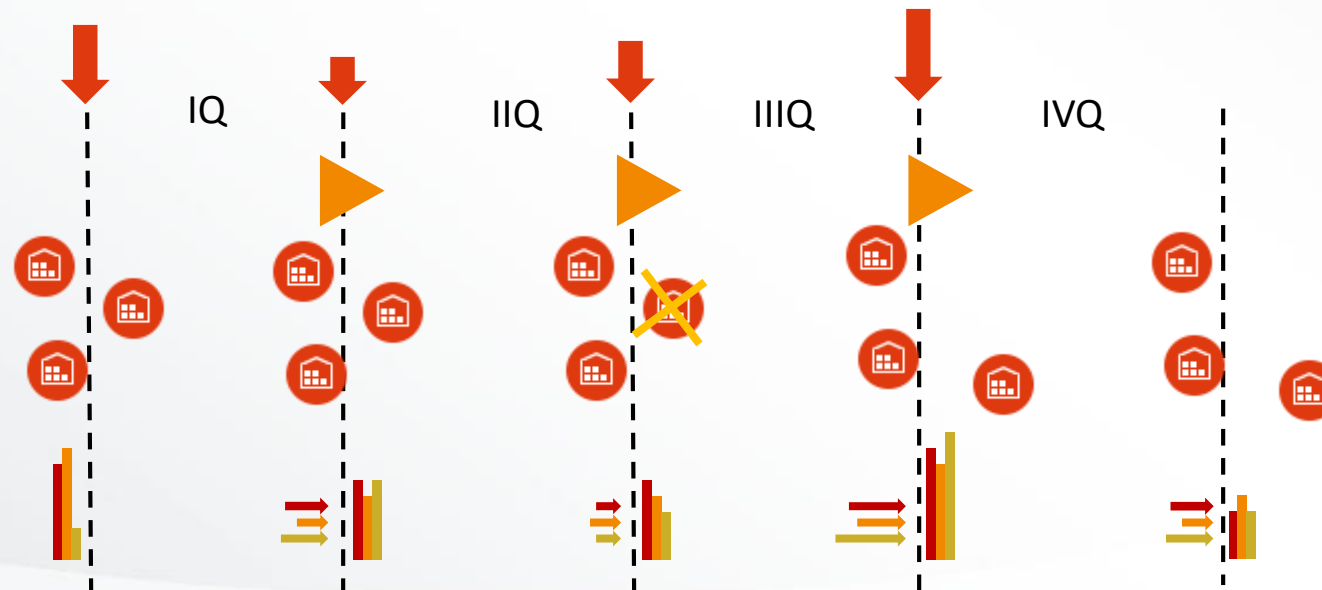
Iteration	Period	Facility	Production	
1	1	Month 01	Site 10	
2	1	Month 01	Brewery	
3	1	Month 01	Site 1	
4	1	Month 01	Site 3	
5	1	Month 01	DC 1	
6	1	Month 01	Site 7	
7	1	Month 01	DC 2	131,887.5
8	1	Month 01	Site 6	56,814.4
9	1	Month 02	Site 10	91,911.02
10	1	Month 02	Brewery	0.0
11	1	Month 02	Site 1	118,688.9
12	1	Month 02	Site 3	61,230.95

Product	Demand min	Demand max	Satisfied	Pri	
1	Beer	2,532.43	2,532.43	2,532.43	10
2	urg Beer	4,634.17	4,634.17	4,634.17	4
3	Beer	4,023.18	4,023.18	4,023.18	4
4	rg Beer	2,437.77	2,437.77	2,437.77	2
5	rchen Beer	5,755.76	5,755.76	5,755.76	5
6	al Beer	7,104.55	7,104.55	7,104.55	7
7	ut... Beer	4,459.33	4,459.33	4,459.33	4
8	rt Beer	2,532.34	2,532.34	2,532.34	2
9	Beer	4,617.01	4,617.01	4,617.01	4
10	g-NL Beer	5,665.62	5,665.62	5,665.62	5
11	g Beer	2,944.43	2,944.43	2,944.43	10
12	hol... Beer	3,529.25	3,529.25	3,529.25	10

Inventory purch...	Production	Revenue	Penalties	Profit (NetOpt)
1	238,638,166.34	272,729,332.96	7,418,688.84	14,725,915.09

Master Planning

- Scenario is split by periods
- Demand is defined separately for each period
- The output of one period is the input for the next period
- A site can be closed/opened during a period
- Inventory can be planned for the beginning and the end of a period



Demand shape



Network Optimization: Constraints & Penalties

- Constraints & penalties are used to tell the optimizer which solutions are workable and what are the preferences
 - **Constraints** - (hard by default) limit certain supply chain parameters
 - **Penalties** - make constraints soft, allowing you to analyze why the defined hard constraints could not be satisfied, and learn how to handle this case
- Types of constraints
 - **Hard constraints** - (penalty is set to 0) cannot be violated, which may result in infeasible solution
 - **Soft constraints** - (penalty is greater than 0) can be violated, penalties will be paid, solution will be definitely found.

Upcoming events



11 Jun Simulation for Business: Case Studies and Best Practices. Seminar in **Birmingham, UK**

18 Jun Supply chain design and digital twinning. Seminar in **Bangalore, India**

18 – 20 Jun anyLogistix Training in **Bangalore, India**

25 – 27 Jun anyLogistix Training in **Oakbrook Terrace, IL, USA**

17 Jul Supply chain design and digital twinning. Seminar in **Hong Kong**

17 – 19 Jul anyLogistix Training in **Hong Kong**



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