

Finding the most influential group in a complex network

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Agenda

- Understanding services:
 - Importance of service sector
 - Explain the essential features of the service-dominant logic.
 - Identify and critique the six distinctive characteristics of a service operation and explain the implications for managers.
 - Detailed description and classification of services.
- Managing services:
 - Forecasting
 - Managing quality
 - Optimization as a decision making tool

Understanding Services

Service Definitions

Common Theme of all Definitions: Intangibility and Simultaneous Consumption.

Services are deeds, processes, and performances (Valarie Zeithaml & Mary Jo Bitner).

A service is a time-perishable, intangible experience performed for a customer acting in the role of a co-producer (James Fitzsimmons).

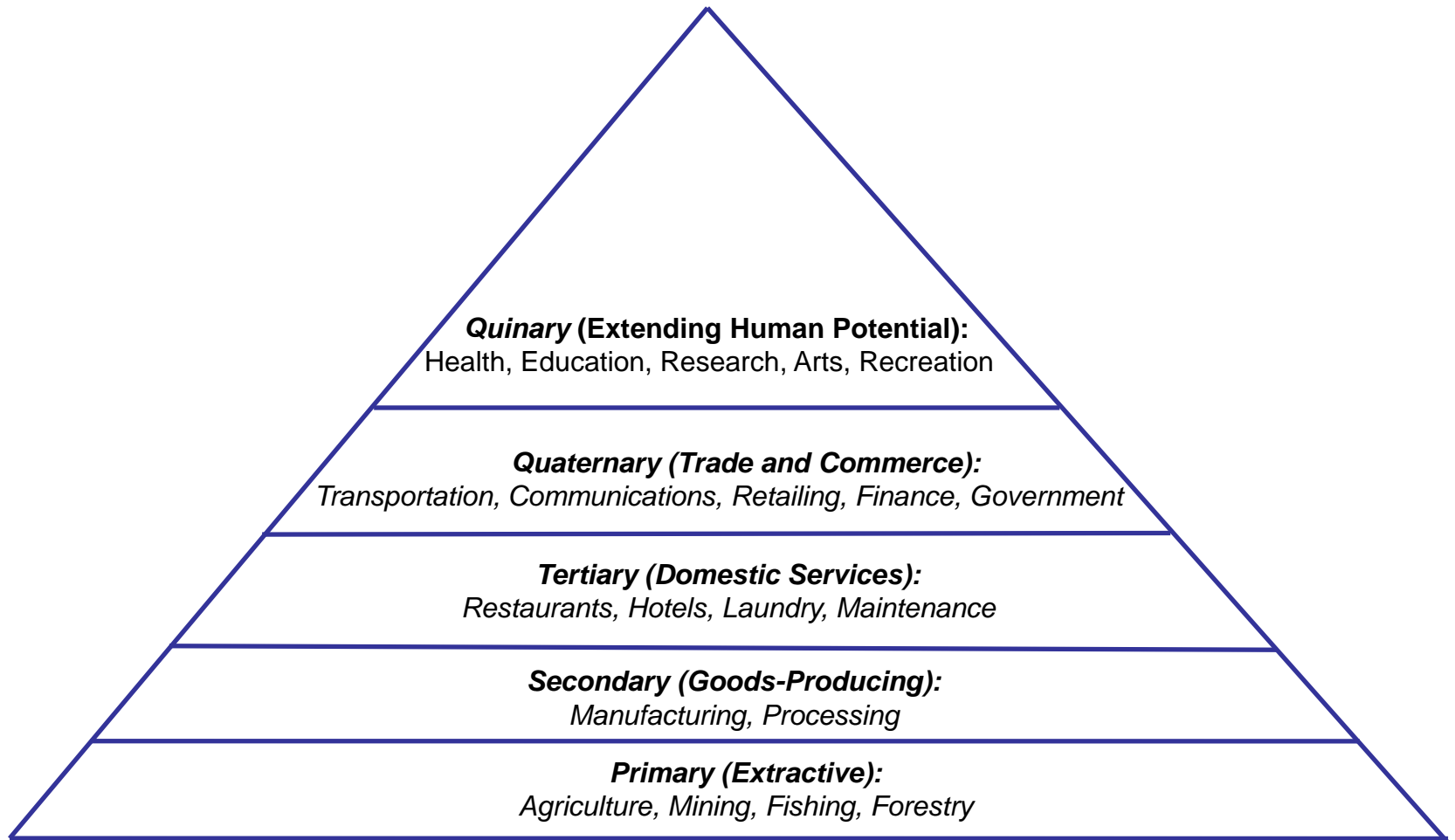
Definition of Service Firms

Service enterprises are organizations that facilitate the production and distribution of goods, support other firms in meeting their goals, and *add value* to our personal lives (James Fitzsimmons).

Percent Employment in Services (top ten by 2010 labor force size)

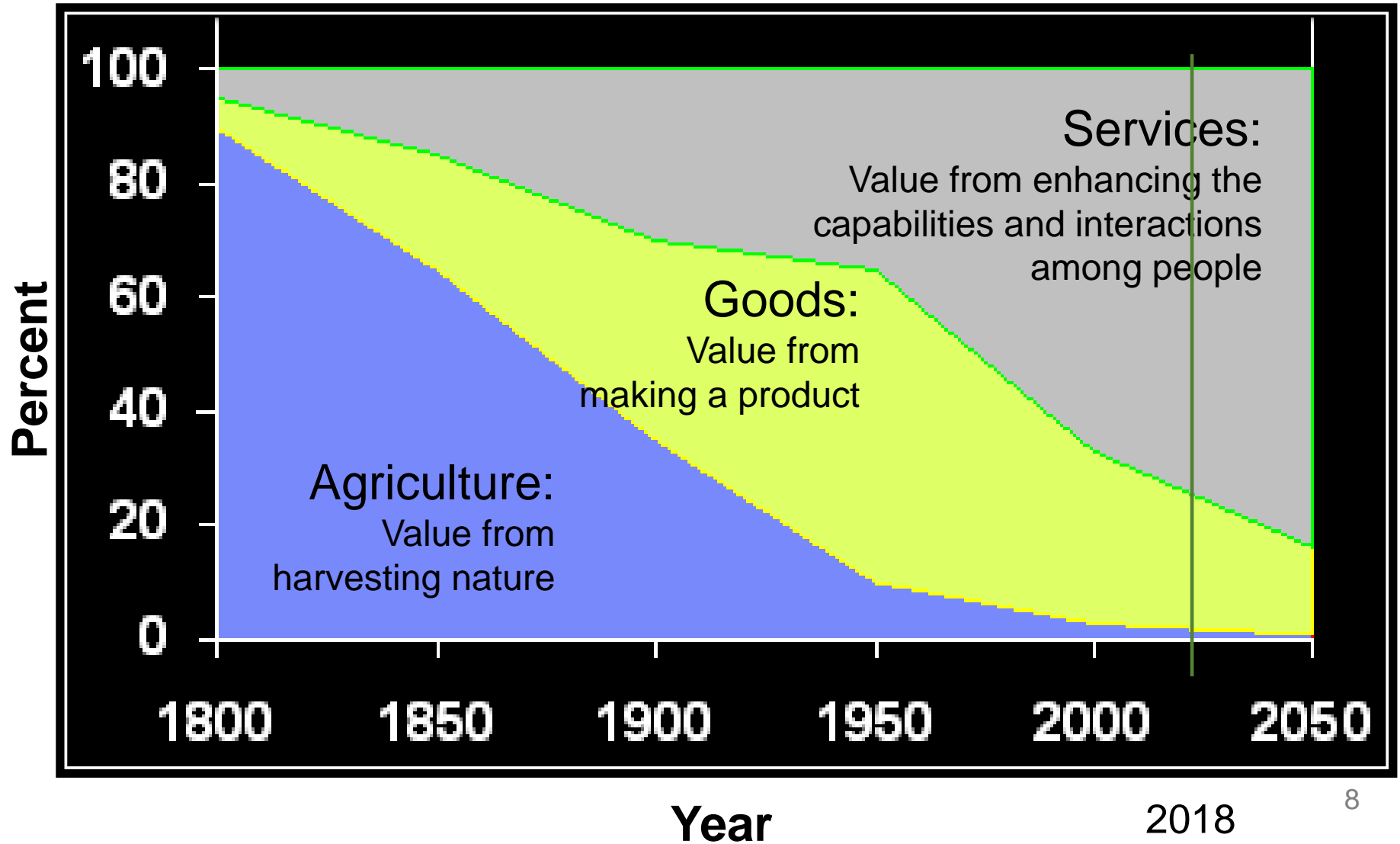
Nation	% of World Labor	% Agri	% Goods	% Services
China	21.0	50	15	35
India	17.0	60	17	23
USA	4.8	2	20	78
Indonesia	3.9	45	16	39
Brazil	3.0	23	24	53
Russia	2.5	12	23	65
Japan	2.4	5	26	69
Nigeria	2.2	70	10	20
Bangladesh	2.2	63	11	26
Germany	1.4	3	28	69

Stages of Economic Activity



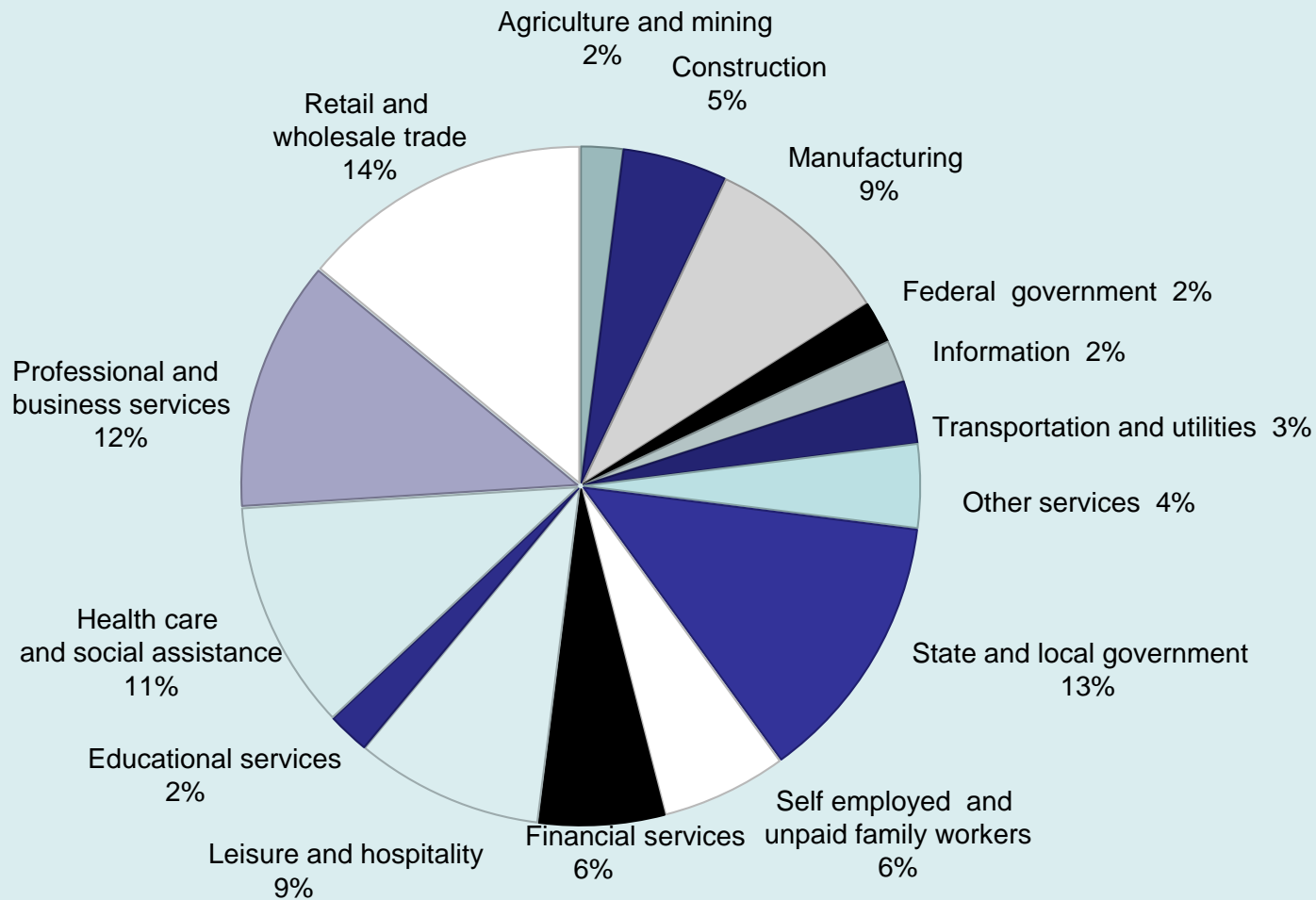
Clark–Fisher hypothesis

Trends in U.S. Employment by Sector



Nature of the Service Sector

Distribution of U.S. Employment, 2009



Nature of the Service Sector

- Services are recession-resistant because:
 - Services cannot be inventoried. So, the production and consumption occur simultaneously for them. Hence, the demand for them is more stable.
 - During a recession, consumers and business firms defer capital expenditures and instead fix up and try to use the existing equipment. This creates service jobs in maintenance and repair.

Typology of Services (Experience-Based) in the 21st Century

Core Experience	Essential Feature	Examples
Creative	Present ideas	Advertising, theater
Enabling	Act as intermediary	Transportation, communications
Experiential	Presence of customer	Massage, theme park
Extending	Extend and maintain	Warranty, health check
Entrusted	Contractual agreement	Service/repair, portfolio mgt.
Information	Access to information	Internet search engine
Innovation	Facilitate new concepts	R&D services, product testing
Problem solving	Access to specialists	Consultants, counseling
Quality of life	Improve well-being	Healthcare, recreation, tourism
Regulation	Establish rules and regulations	Environment, legal, patents

Foundation Premises of Service-Dominant Logic

1. Service is the fundamental basis of exchange.
2. Indirect exchange masks the basis of exchange.
3. Goods are distribution mechanisms for service provision.
4. Operant resources are the source of competitive advantage
5. All economies are service economies.
6. The customer is always a co-creator of value.
7. The enterprise can only offer value propositions.
8. A service-centered view is customer oriented and relational.
9. All economic and social actors are resource integrators.
10. Value is uniquely determined by the beneficiary.

Distinctive Characteristics of Services

- **Customer Participation in the Service Process:** it requires an attention to facility design, opportunities for co-production (benefits).
- **Simultaneity:** Services are created and consumed simultaneously and hence, cannot be stored.
- **Perishability:** A service is a perishable commodity. It cannot be stored, opportunity loss of idle capacity, need to match supply with demand (challenging because of demand uncertainty and variation).

Distinctive Characteristics of Services

- **Intangibility:** Services are ideas and concepts. Creative advertising, no patent protection, franchising to secure benefits of a service concept, importance of reputation.
- **Heterogeneity:** intangible nature of services and customer involvement in delivery process result in variation of service from customer to customer. The development of standards and employee training ensure consistency in providing services.

Managing Services

Management Science Tools

- **Forecasting**

- Qualitative and Quantitative Methods

- **Optimization**

- Demand Allocation Models
- Location Allocation Models

- **Quality Management**

- SERVQUAL
- Statistical Process Control

Forecasting

Seven Steps in Forecasting

1. Determine the use of the forecast
2. Select the items to be forecasted
3. Determine the time horizon of the forecast
4. Select the forecasting model(s)
5. Gather the data
6. Make the forecast
7. Validate and implement results

The Realities!

- **Forecasts are seldom perfect**
- **Most techniques assume an underlying stability in the system**
- **Product family and aggregated forecasts are more accurate than individual product forecasts**

Forecasting Approaches

Qualitative Methods

- **Used when situation is vague and little data exist**
 - **New products**
 - **New technology**
- **Involves intuition, experience**
 - **e.g., forecasting sales on Internet**

Forecasting Approaches

Quantitative Methods

- **Used when situation is ‘stable’ and historical data exist**
 - **Existing products**
 - **Current technology**
- **Involves mathematical techniques**
 - **e.g., forecasting sales of color televisions**

Overview of Qualitative Methods

1. Jury of executive opinion
 - Pool opinions of high-level experts, sometimes augment by statistical models
2. Delphi method
 - Panel of experts, queried iteratively

Overview of Qualitative Methods

3. Sales force composite

- Estimates from individual salespersons are reviewed for reasonableness, then aggregated

4. Consumer Market Survey

- Ask the customer

Overview of Quantitative Approaches

1. Naive approach
 2. Moving averages
 3. Exponential smoothing
 4. Trend projection
 5. Linear regression
 6. Neural Networks
-
- time-series models**
- associative model**

Quality Management

SERVQUAL

- An effective tool based on the service quality gap model for measuring customer satisfaction (GAP 5).
- It measures five dimensions of service quality (Reliability, Responsiveness, Assurance, Empathy, and Tangibles).
- It pairs an Expectation statement with a corresponding Perception statement.
- It uses 22 statements to measure all five dimensions of service quality (22 statements for Expectation and 22 statements for Perception).

Statistical Process Control

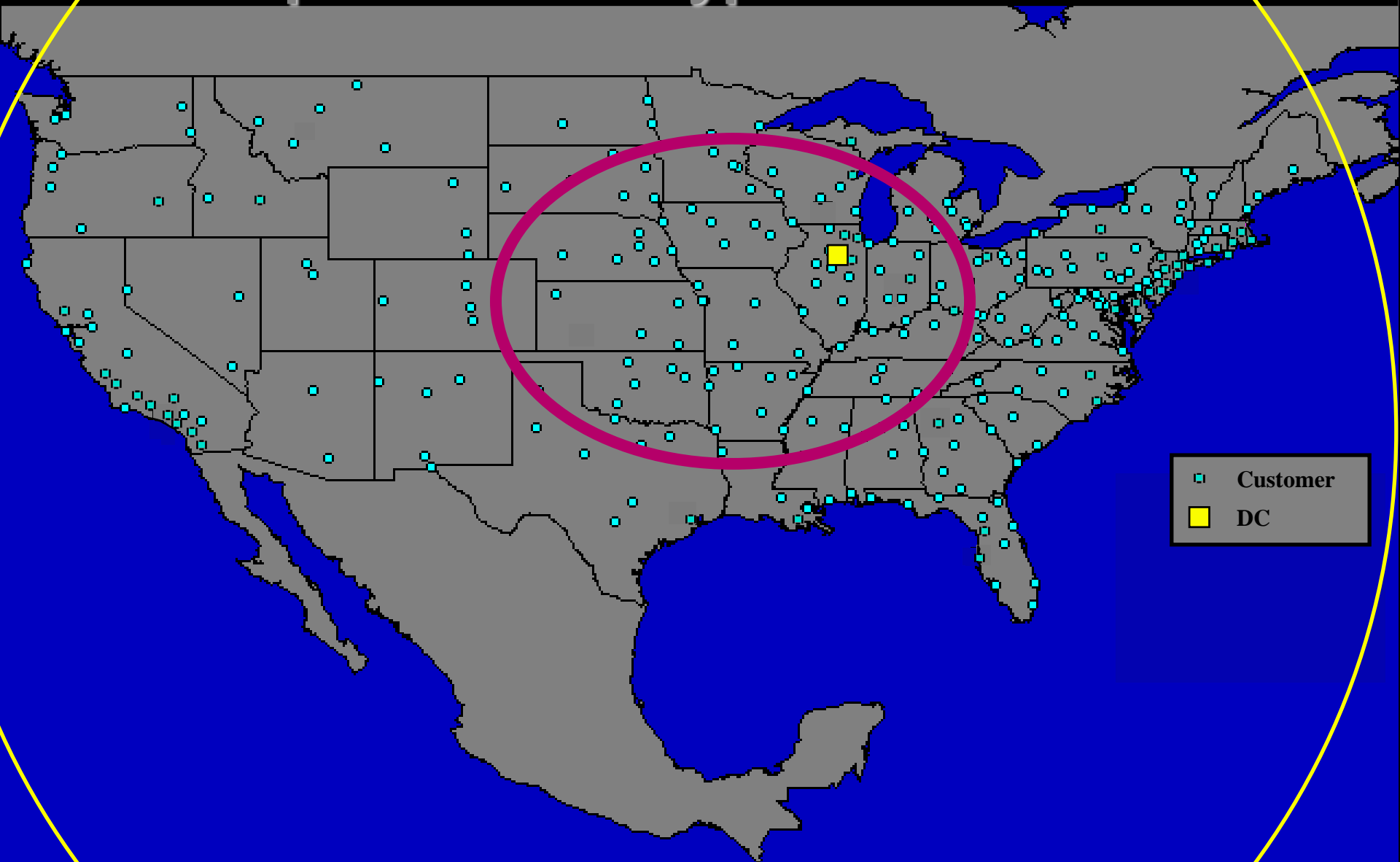
- A process is in control if the measure of performance is within the control limits.
- Risks in Quality-Control Decisions.
- Control Chart: A visual display used to plot values of a measure of performance over time to determine if the process remains in control.
 - The process is in control if the measure of performance is inside the control limits, that is below the *Upper Control Limit (UCL)* and above the *Lower Control Limit (LCL)*.
 - Control charts for mean-type measures of performance:
 - Variable Control Chart (*R*-chart and \bar{X} -chart)
 - Attribute Control Chart (*p*-chart)

Optimization as a decision making tool

Optimization Applications

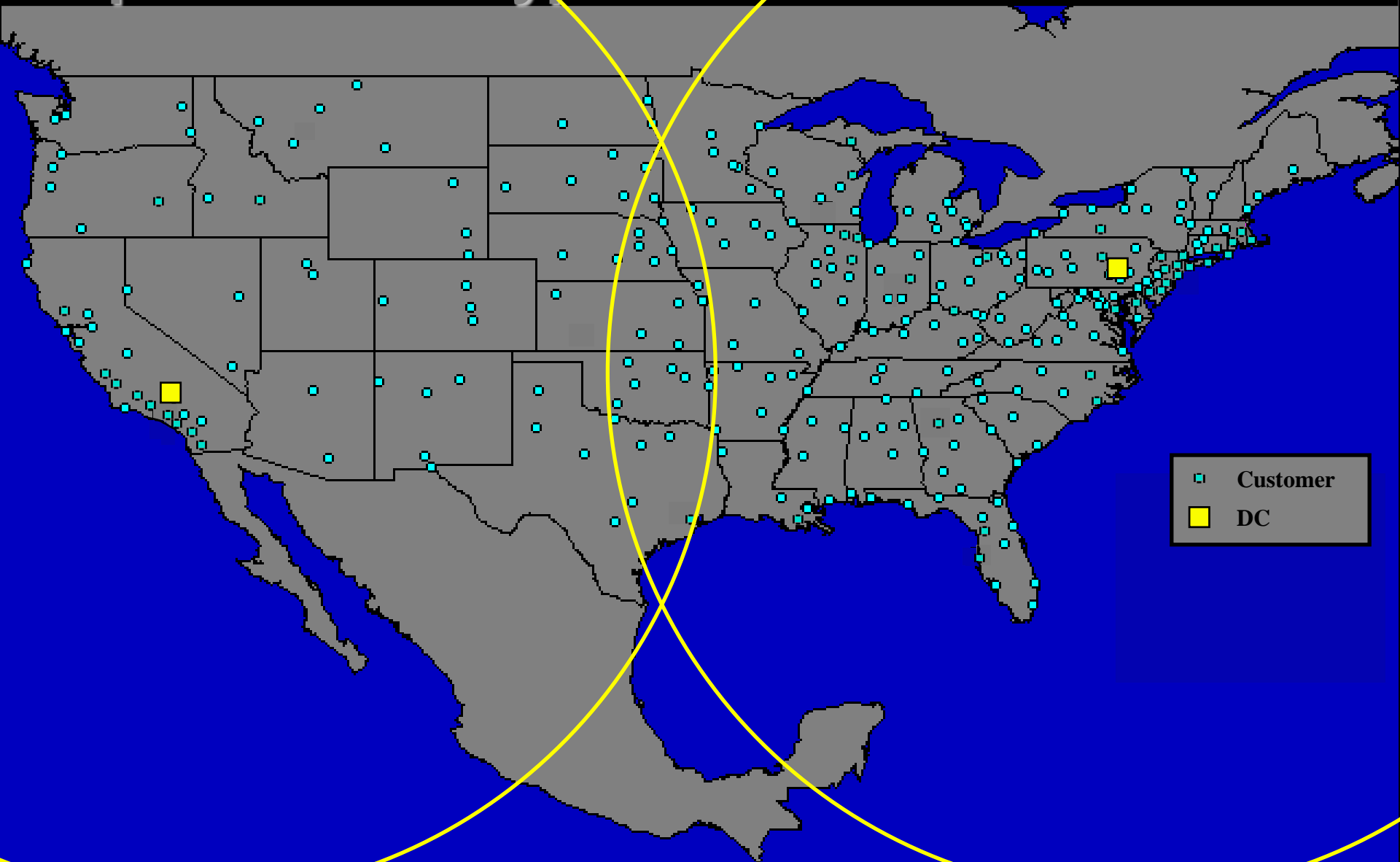
- Operations:
 - Market and supply allocation
 - Facility location
 - Capacity allocation
- Marketing
- Finance

Where inventory needs to be for a one week order response time - typical results --> 1 DC

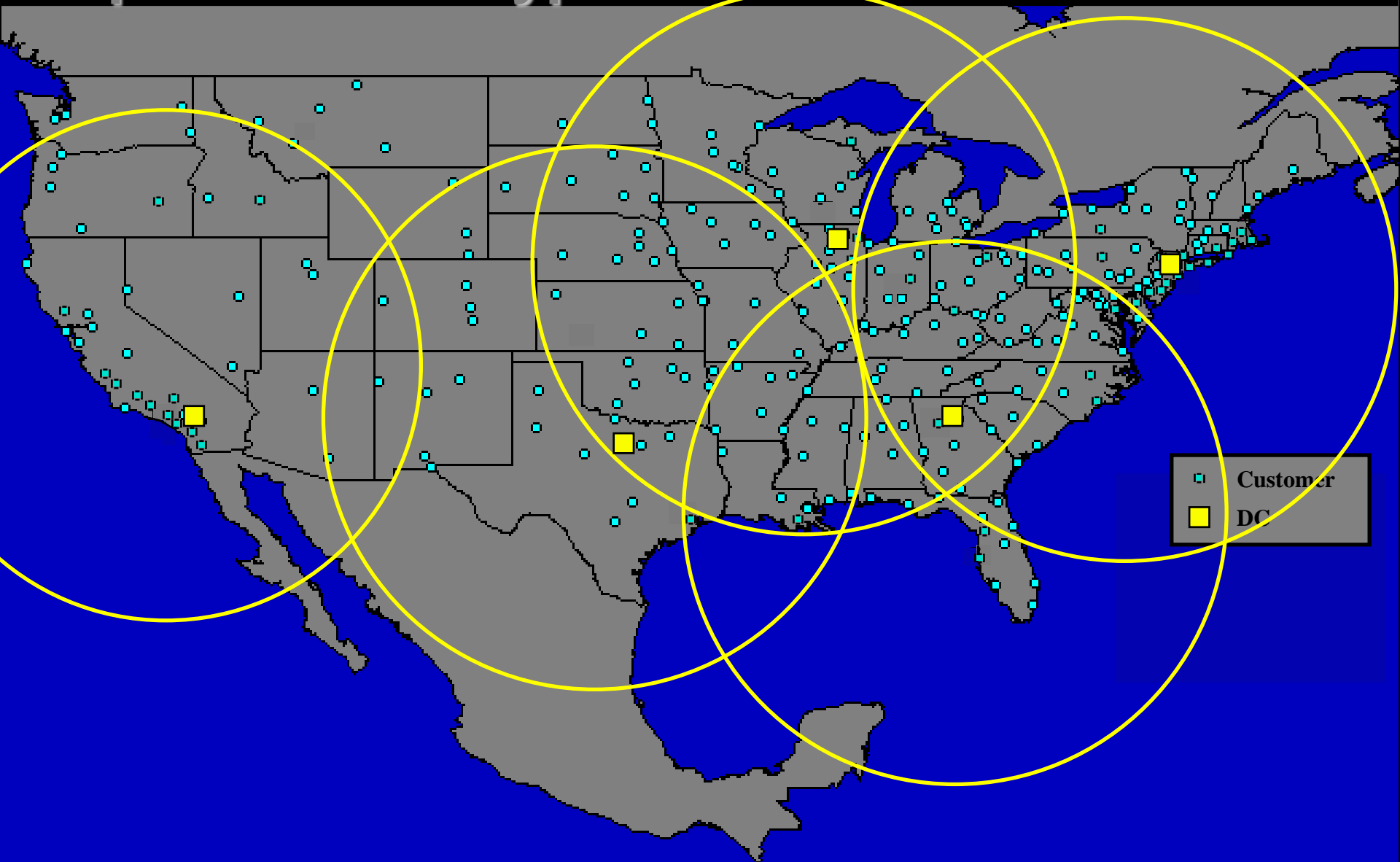


■ Customer
■ DC

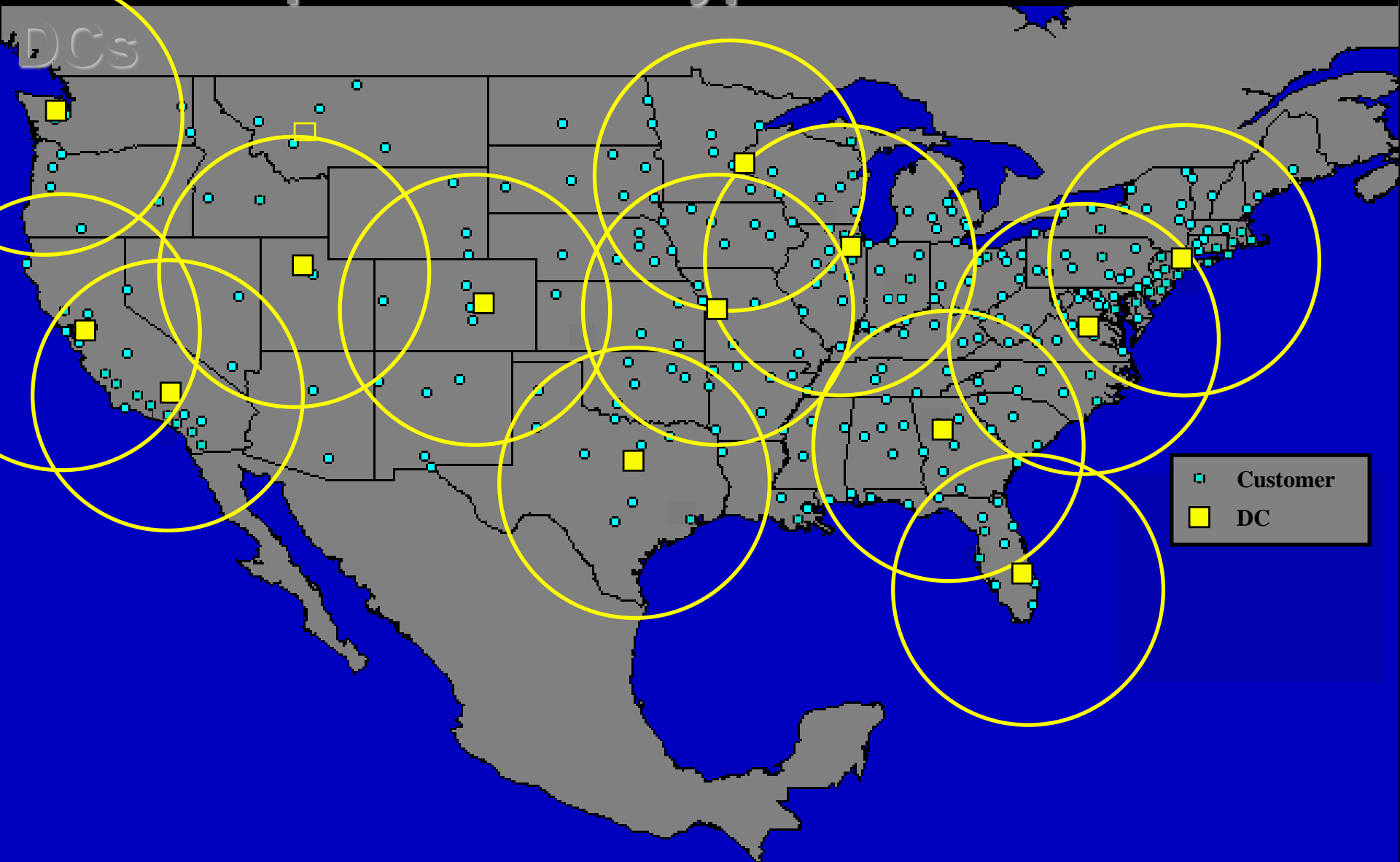
Where inventory needs to be for a 5 day order response time - typical results --> 2 DCs



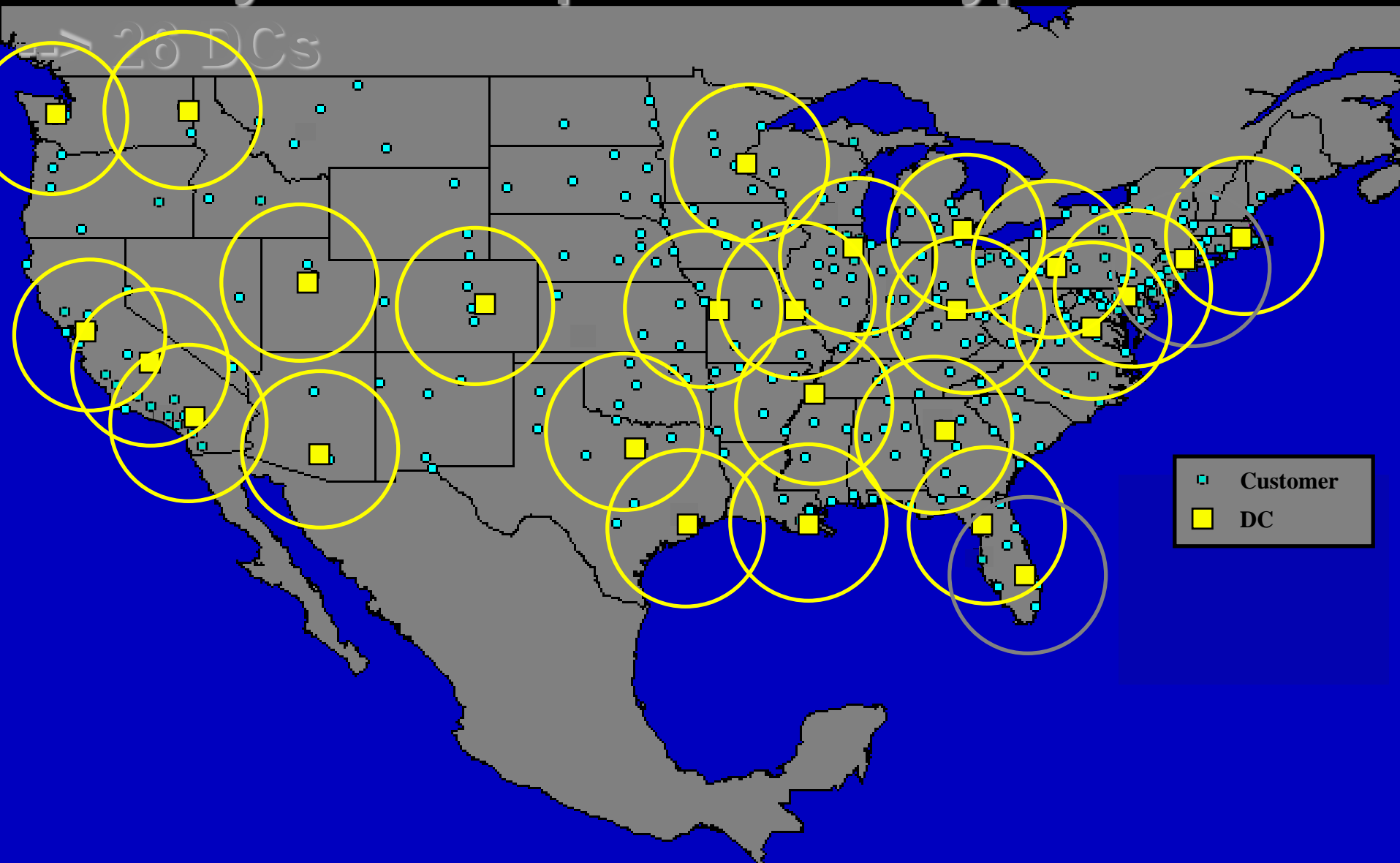
Where inventory needs to be for a 3 day order response time - typical results --> 5 DCs



Where inventory needs to be for a next day order response time - typical results --> 13



Where inventory needs to be for a same day / next day order response time - typical results



Models for Facility Location and Capacity Allocation

Network Optimization Models:

- » Demand Allocation Model
- » Plant Location with Multiple Sourcing
- » Plant Location with Single Sourcing

Demand Allocation Model

◆ Which customer is served by which plant?

◆ Assumption: plant locations are given and fixed.

◆ Parameters:

- n : number of facilities.
- m : number of customers.
- c_{ij} : cost of producing and shipping one unit from site i to customer j .
- D_j : annual demand from customer j .
- K_i : potential annual capacity at site i .

◆ Decisions:

- x_{ij} = Quantity shipped from plant i to customer j .

$$\text{Min} \sum_{i=1}^n \sum_{j=1}^m c_{ij} x_{ij}$$

s.t.

$$\sum_{i=1}^n x_{ij} = D_j, \quad j = 1, \dots, m$$

$$\sum_{j=1}^m x_{ij} \leq K_i, \quad i = 1, \dots, n$$

$$x_{ij} \geq 0, \quad i = 1, \dots, n \text{ and } j = 1, \dots, m$$

Plant Location with Multiple Sourcing

- Parameters:

- n : number of candidate sites.
- m : number of customers.
- f_i : annual fixed cost of locating a plant at site i .
- c_{ij} : cost of producing and shipping one unit from site i to customer j .
- D_j : annual demand from customer j .
- K_i : potential annual capacity at site i .

- Decisions:

- $y_i = 1$ if a plant is located at site i , 0 otherwise.
- x_{ij} = Quantity shipped from site i to customer j .

$$\text{Min } \sum_{i=1}^n f_i y_i + \sum_{i=1}^n \sum_{j=1}^m c_{ij} x_{ij}$$

s.t.

$$\sum_{i=1}^n x_{ij} = D_j, \quad j = 1, \dots, m$$

$$\sum_{j=1}^m x_{ij} \leq K_i y_i, \quad i = 1, \dots, n$$

$$y_i \in \{0,1\}, \quad i = 1, \dots, n$$

$$x_{ij} \geq 0, \quad i = 1, \dots, n \text{ and } j = 1, \dots, m$$

Plant Location with Single Sourcing

- Parameters:

- n : number of candidate sites.
- m : number of customers.
- f_i : annual fixed cost of locating a plant at site i .
- c_{ij} : cost of producing and shipping one unit from site i to customer j .
- D_j : annual demand from customer j .
- K_i : potential annual capacity at site i .

$$\text{Min} \sum_{i=1}^n f_i y_i + \sum_{i=1}^n \sum_{j=1}^m D_j c_{ij} x_{ij}$$

s.t.

$$\sum_{i=1}^n x_{ij} = 1, \quad j = 1, \dots, m$$

$$\sum_{j=1}^m D_j x_{ij} \leq K_i y_i, \quad i = 1, \dots, n$$

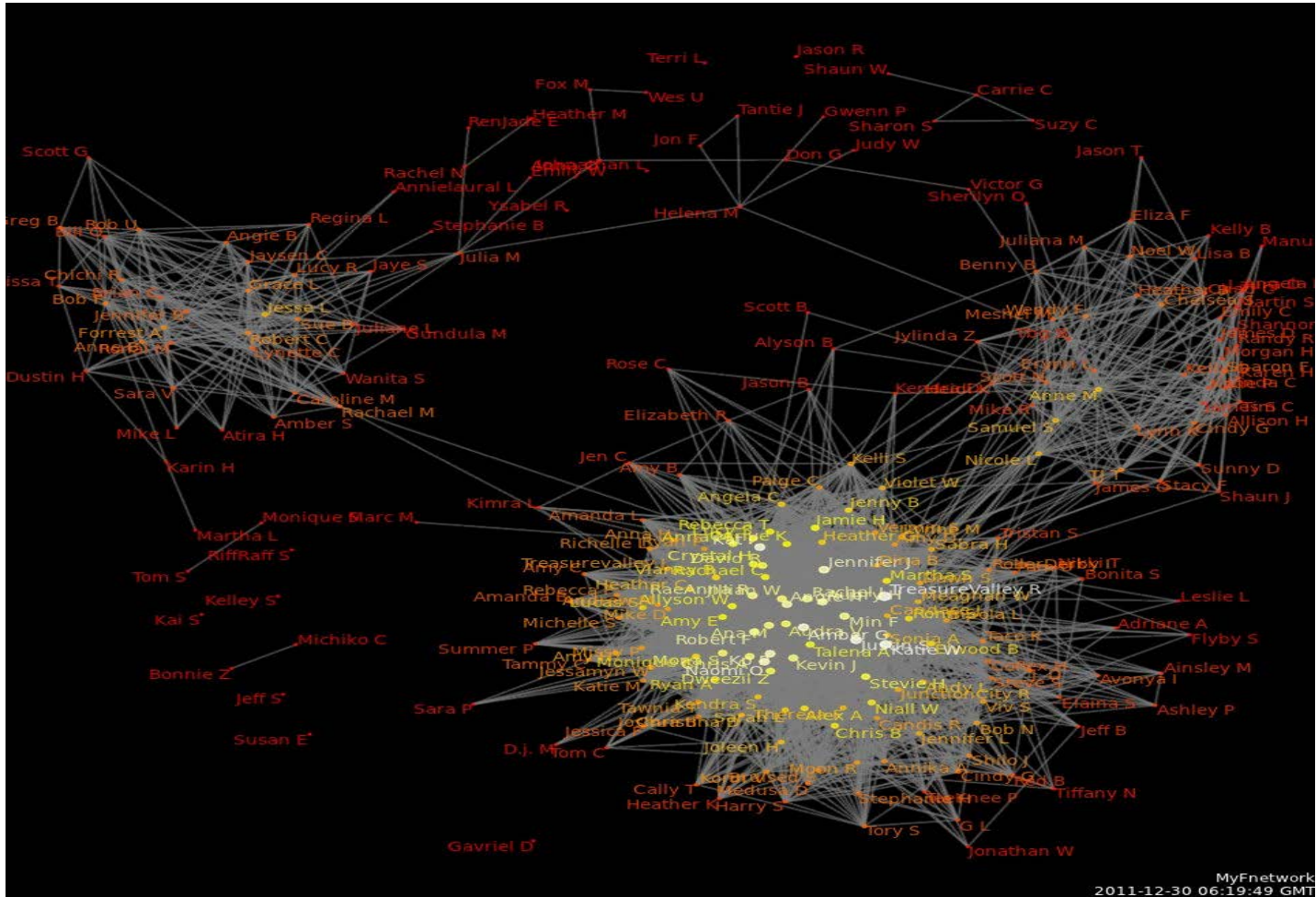
$$y_i \in \{0,1\}, \quad i = 1, \dots, n$$

$$x_{ij} \in \{0,1\}, \quad i = 1, \dots, n \text{ and } j = 1, \dots, m$$

- Decisions:

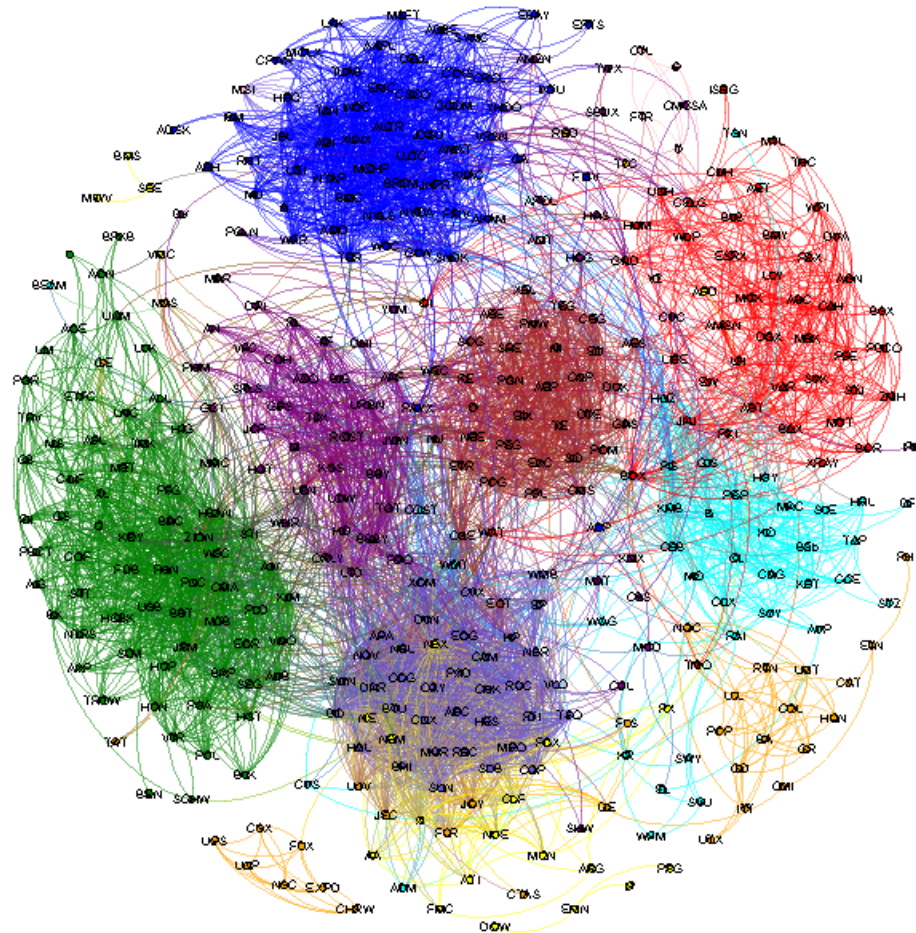
- $y_i = 1$ if a plant is located at site i , 0 otherwise.
- $x_{ij} = 1$ if customer j is supplied by site i , 0 otherwise.

Marketing



Social network of Facebook users. (By Kencf0618 (Own work)[CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0>)], via Wikimedia Commons)

Finance



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