

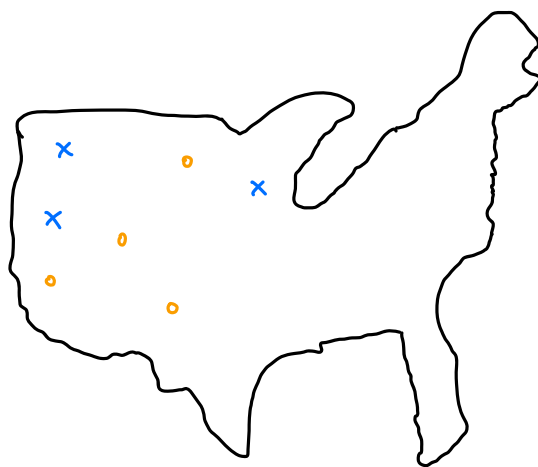
2.5 Transportation Problems

Example (Hillier, Lieberman Chapter 8): P & T company

↳ canned peas are prepared at canneries (x) in 3 cities across the US

↳ then shipped to 4 warehouses (o) across the US

Goal: minimize shipping cost but ensure supply

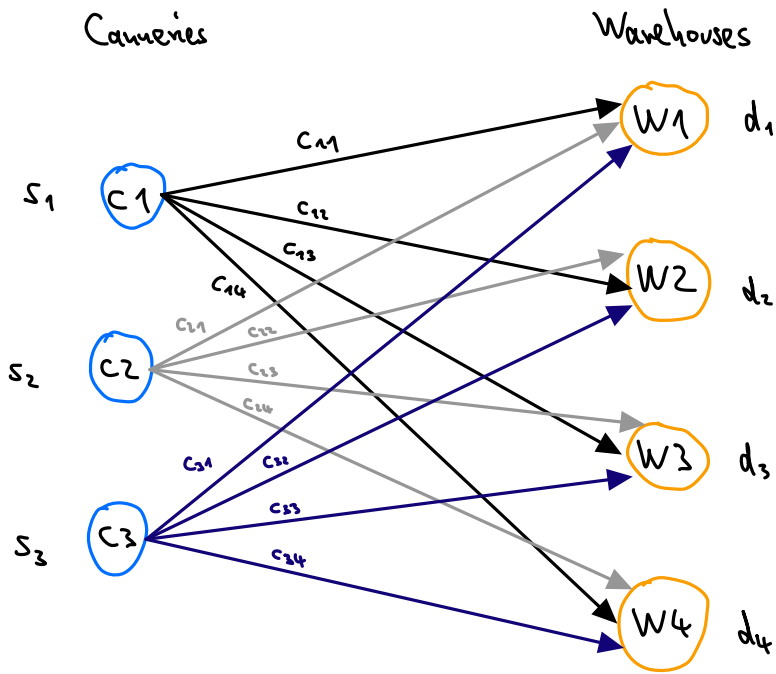


Data:

		Shipping cost per truckload				Output (supply)
		Warehouses				
		1	2	3	4	
Cannery	1	c_{11}	c_{12}	c_{13}	c_{14}	} $S_i, i=1, \dots, m$ ($m=3$ here)
	2	c_{21}	c_{22}	c_{23}	c_{24}	
	3	c_{31}	c_{32}	c_{33}	c_{34}	
Allocation (demand)		d_1	d_2	d_3	d_4	
		} $d_j, j=1, \dots, n$ ($n=4$ here)				

decision variables: x_{ij} = number of truckloads shipped from cannery i to warehouse j

Network view of the transportation problem:



This leads to the following LP transportation problem:

- **Minimize** transportation cost $z = c_{11}x_{11} + c_{12}x_{12} + \dots + c_{mn}x_{mn} = \sum_{i=1}^m \sum_{j=1}^n c_{ij}x_{ij}$
- subject to: $x_{i1} + x_{i2} + x_{i3} = s_i$ (everything is shipped away from canary i)
 - i.e., $\sum_{j=1}^n x_{ij} = s_i$ for all $i = 1, \dots, m$ (all canaries)
 - might want to relax this to $\sum_{j=1}^n x_{ij} \leq s_i$ (at most as much as we have is shipped away)
 - ↳ see next class
- and $x_{1j} + x_{2j} + x_{3j} + x_{4j} = d_j$ (warehouse j receives the necessary supply)
 - i.e., $\sum_{i=1}^m x_{ij} = d_j$ for all $j = 1, \dots, n$ (all warehouses)
 - might want to relax this to $\sum_{i=1}^m x_{ij} \geq d_j$ (warehouses receive at least the necessary supply)
 - ↳ see next class
- and $x_{ij} \geq 0$.