

# Multiplexity

CRJ 523  
Network Criminology

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# Learning Goals

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- ❖ Multiplexity vs. Homophily
- ❖ How does it happen? (DV, “theory of networks”)
- ❖ Consequences of multiplexity (IV, “network theory”)

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# Multiplexity

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- ❖ Earlier, we were interested in how **homophily** happens.
  - ❖ How attributes of individuals become correlated.

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# Focus Theory

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- ❖ Remember *Focus theory*?
  - ❖ How is homophily created in social networks?

# Focus Theory

- ❖ A **focus** (foci is plural) is an “entity around which joint activities are organized” (Feld, 1981: 1016).
- ❖ A **social context** is a “number of difference foci and individuals, where each individual is related to some foci and not to others” (Feld, 1981: 1016).



Jacob

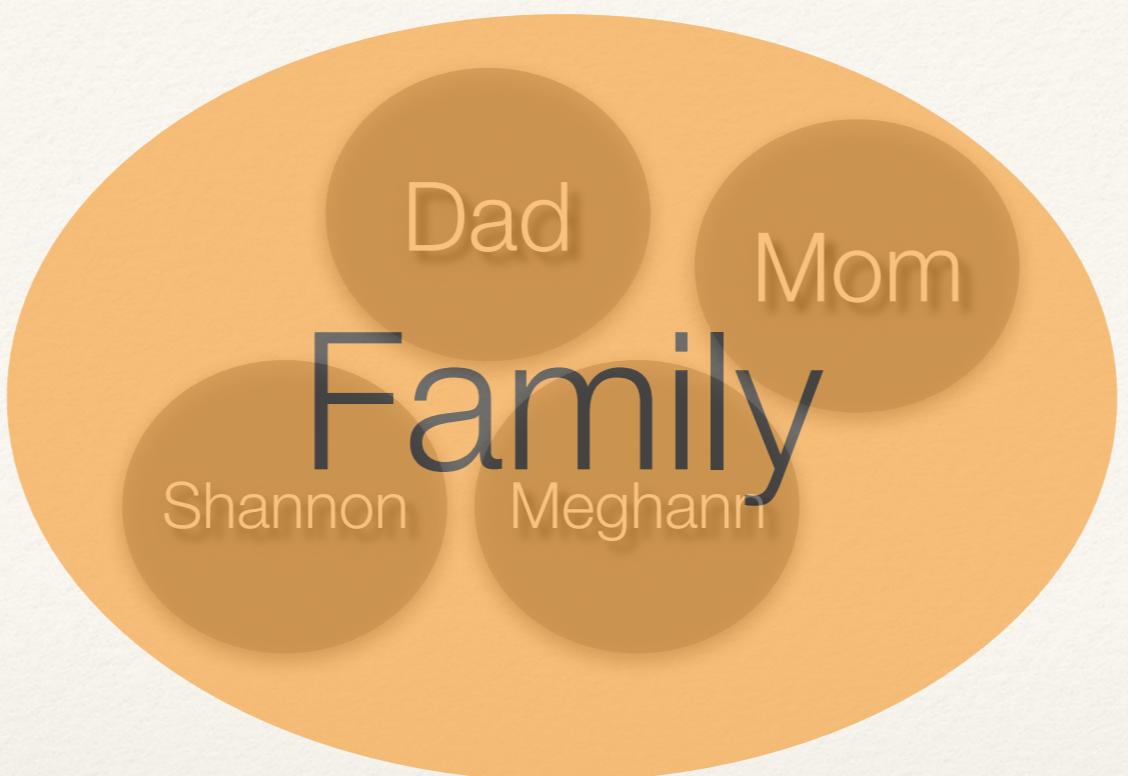
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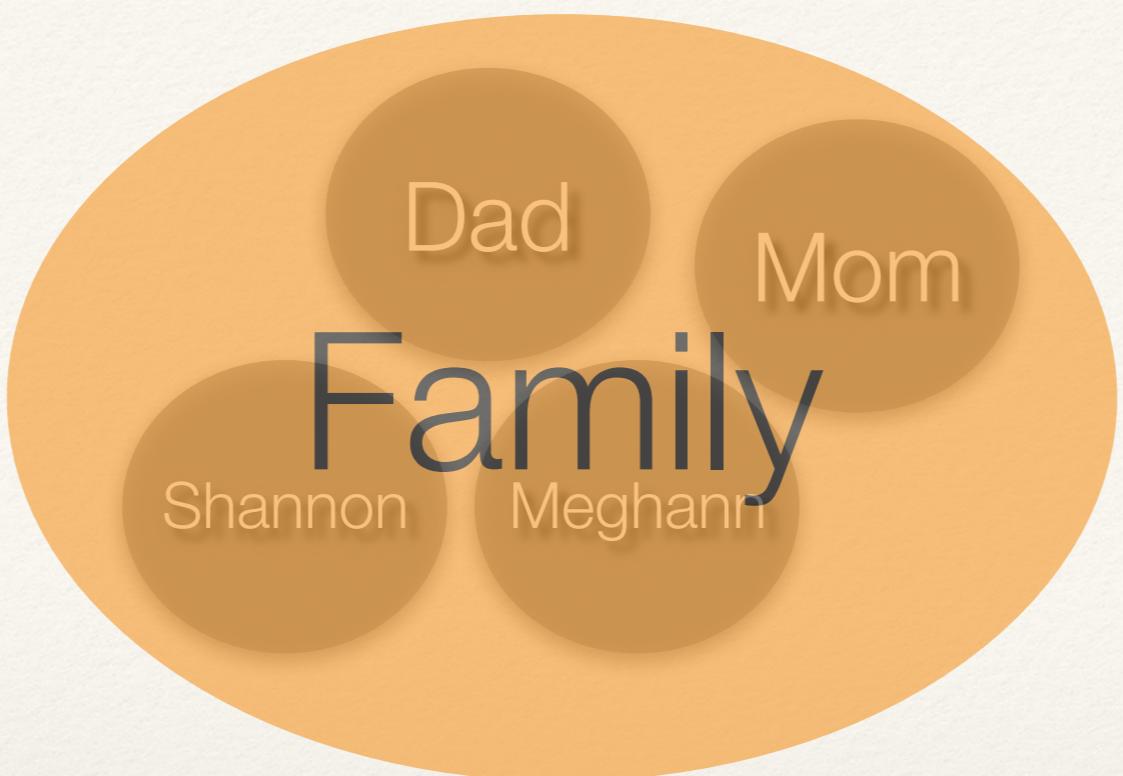
Mom

Shannon

Meghann

Jacob



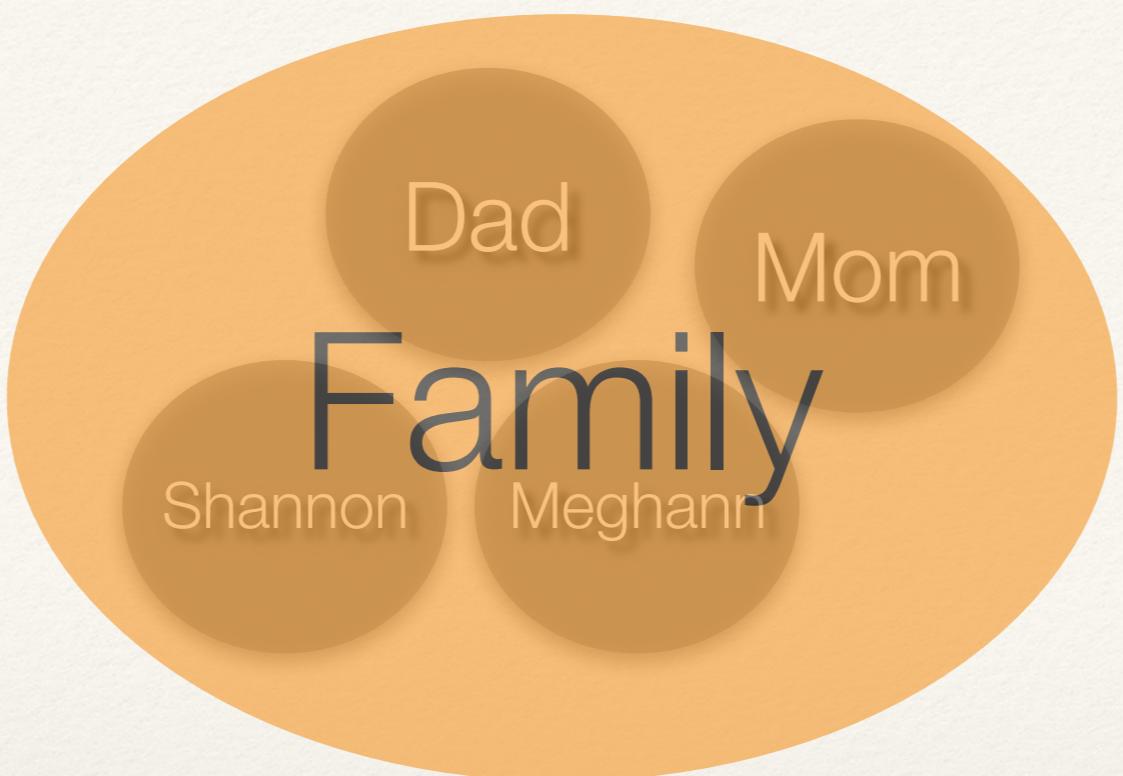


Jacob

Chris

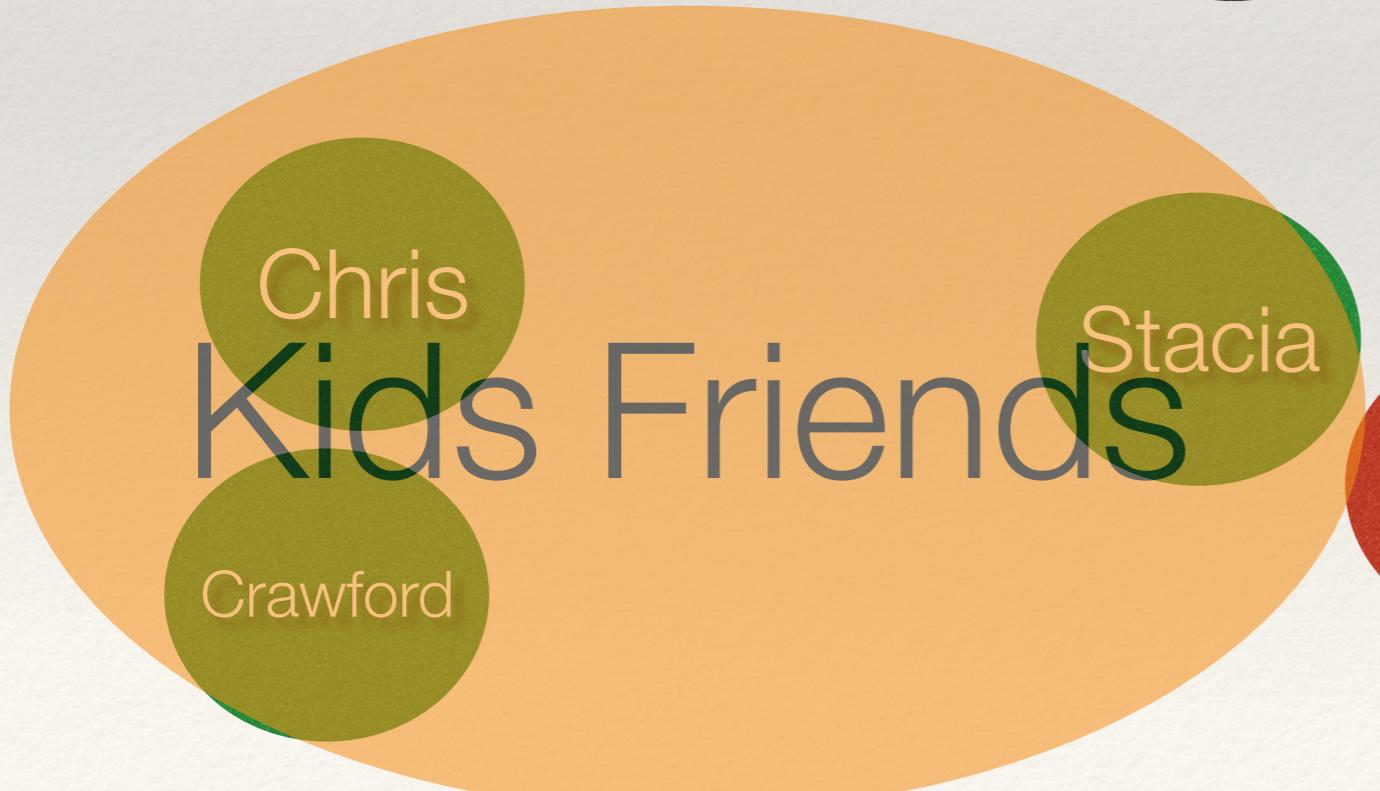
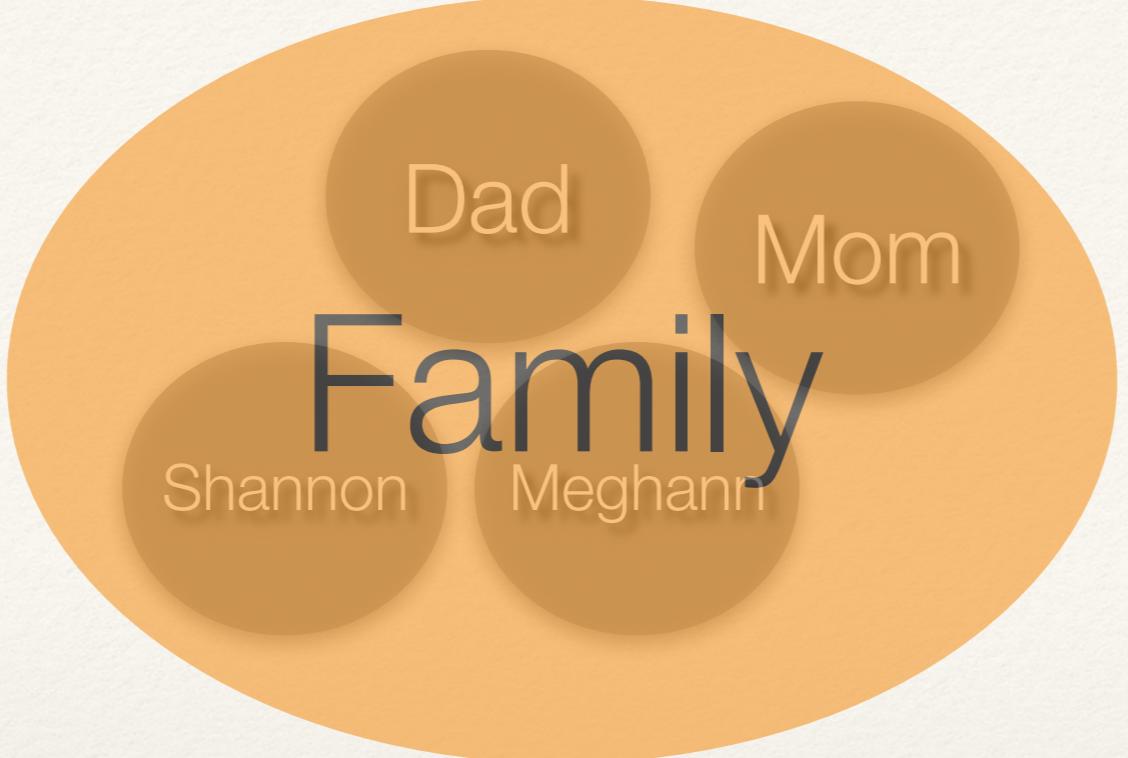
Crawford

Stacia



Jacob





Jacob

Chad

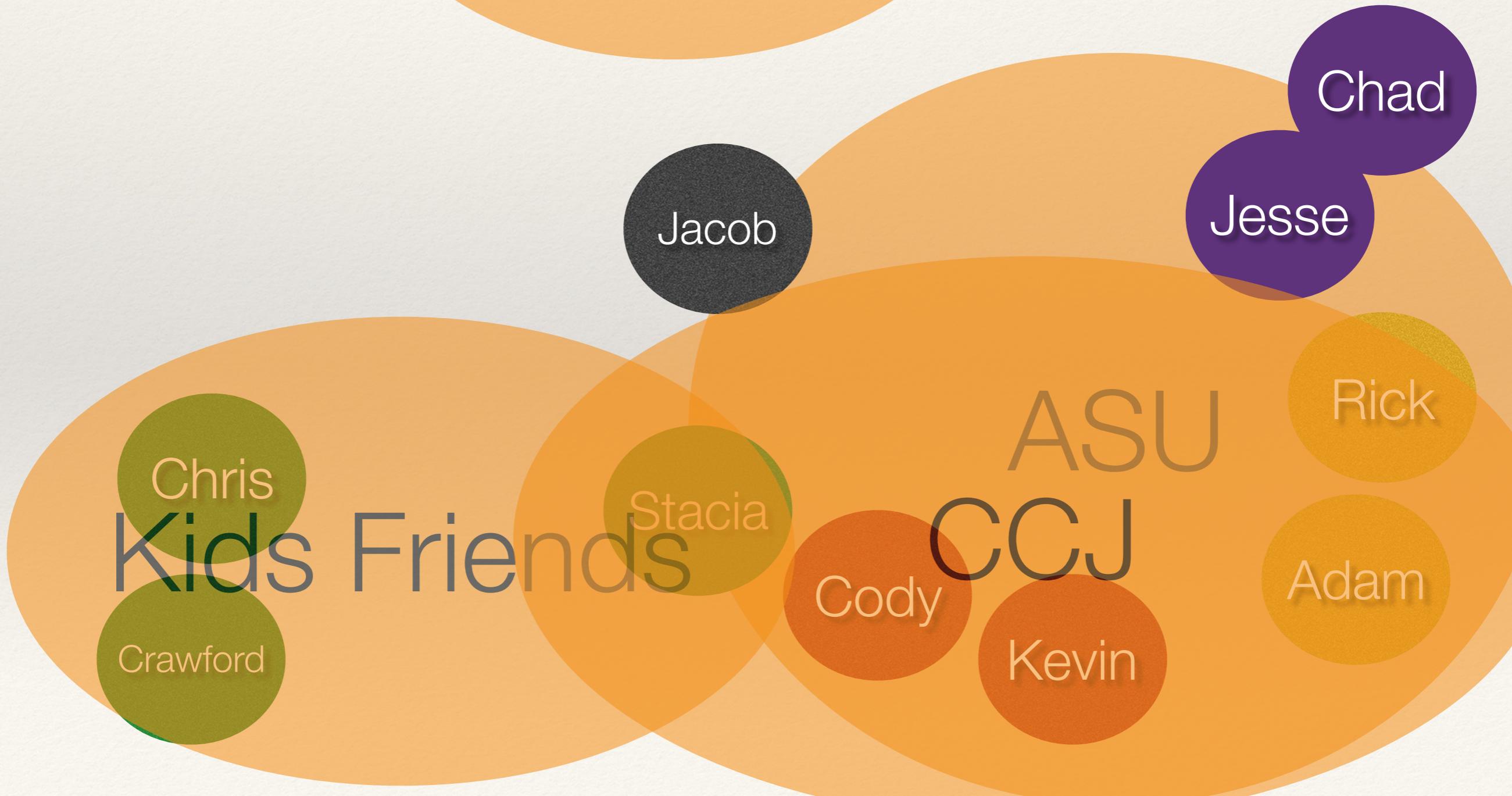
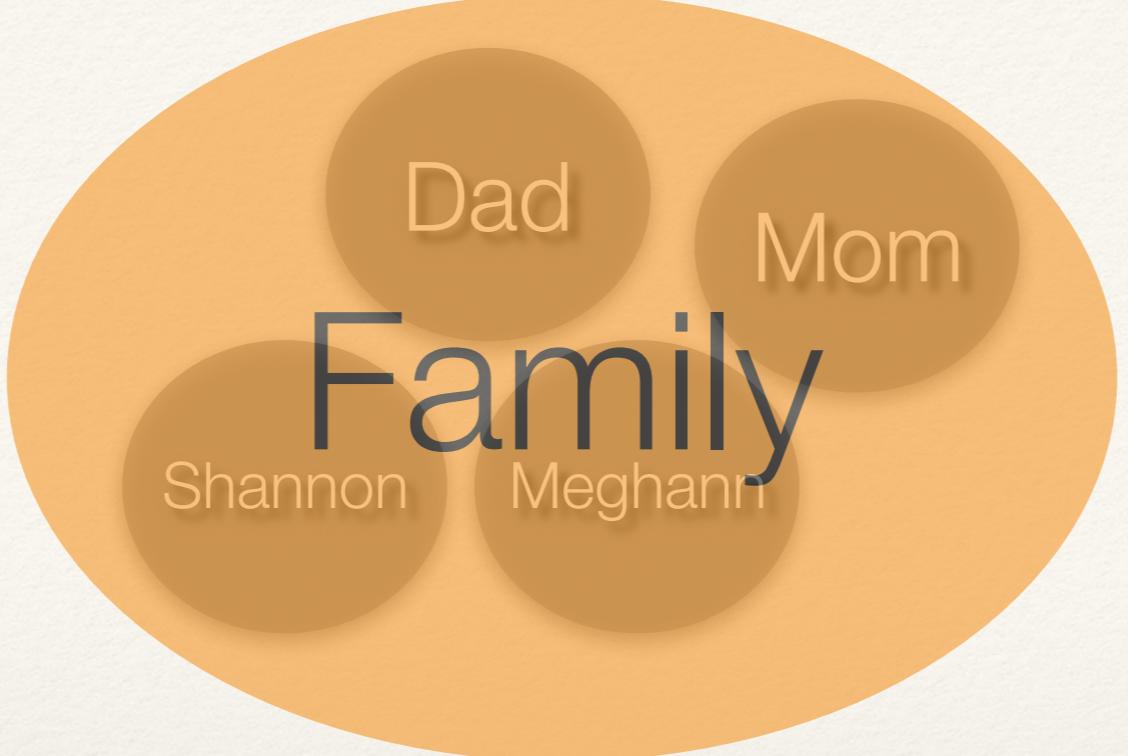
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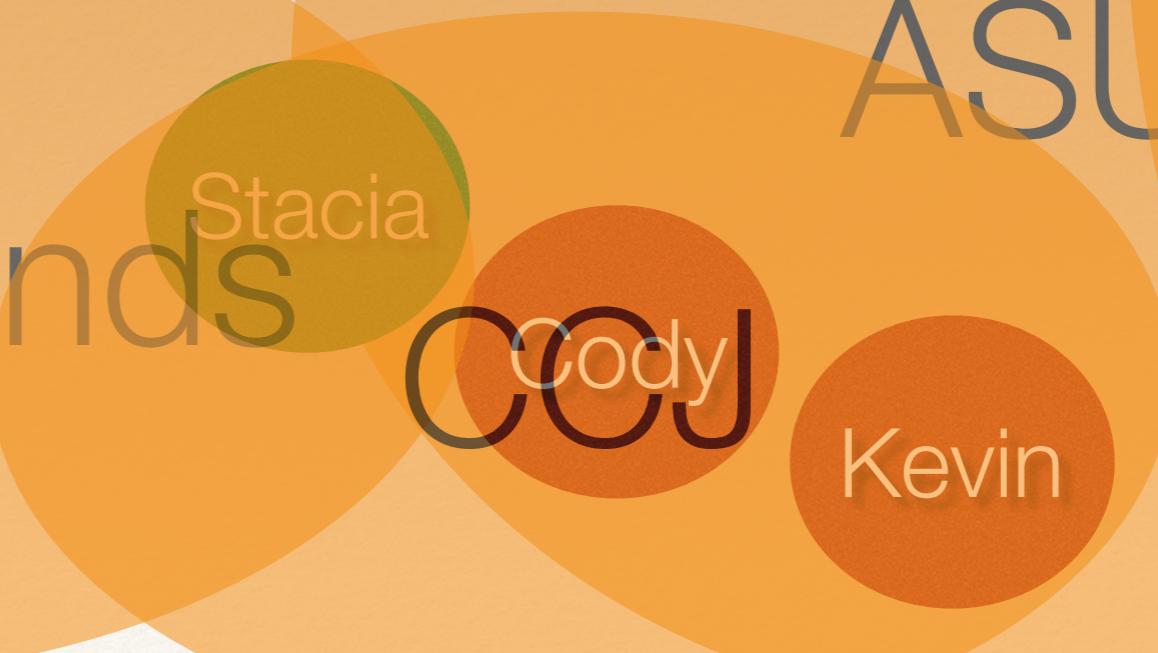
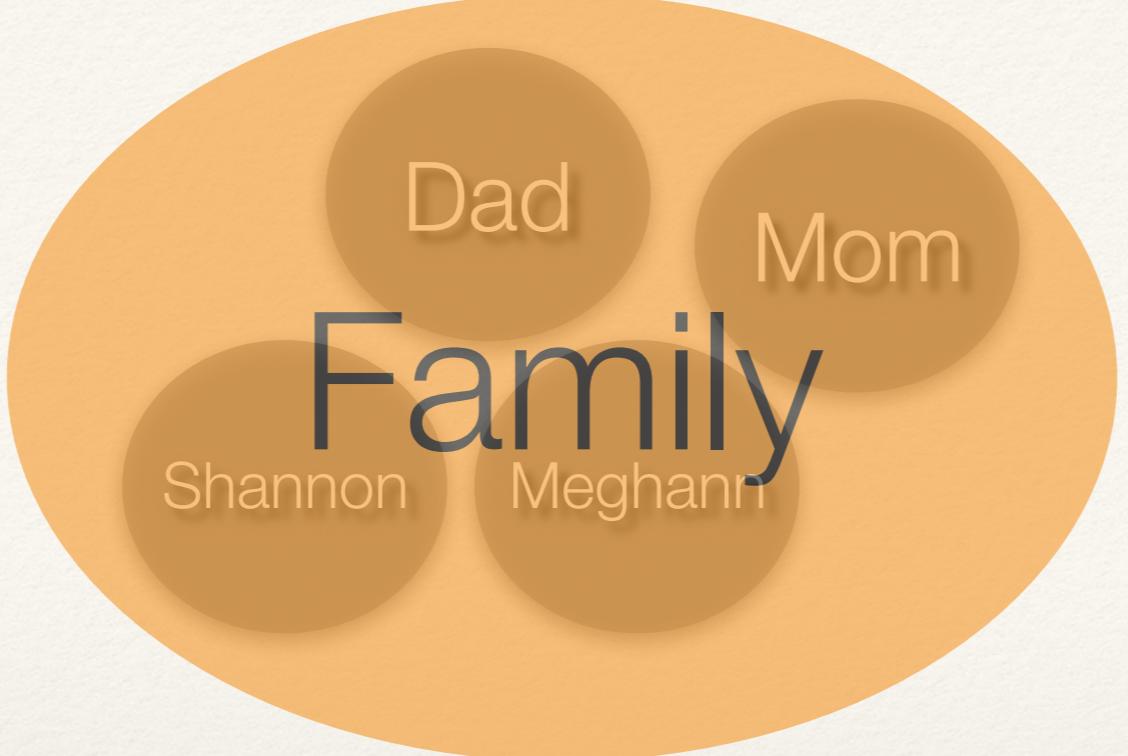
Rick

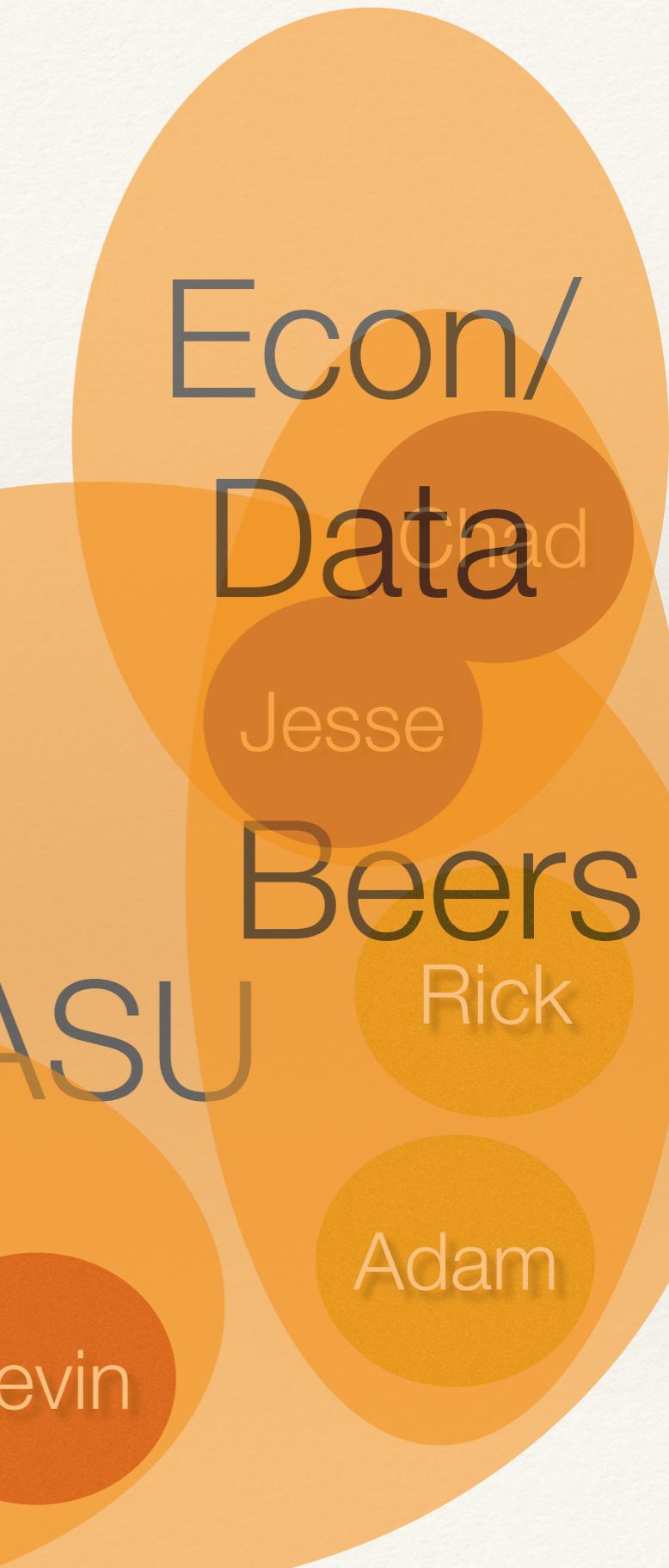
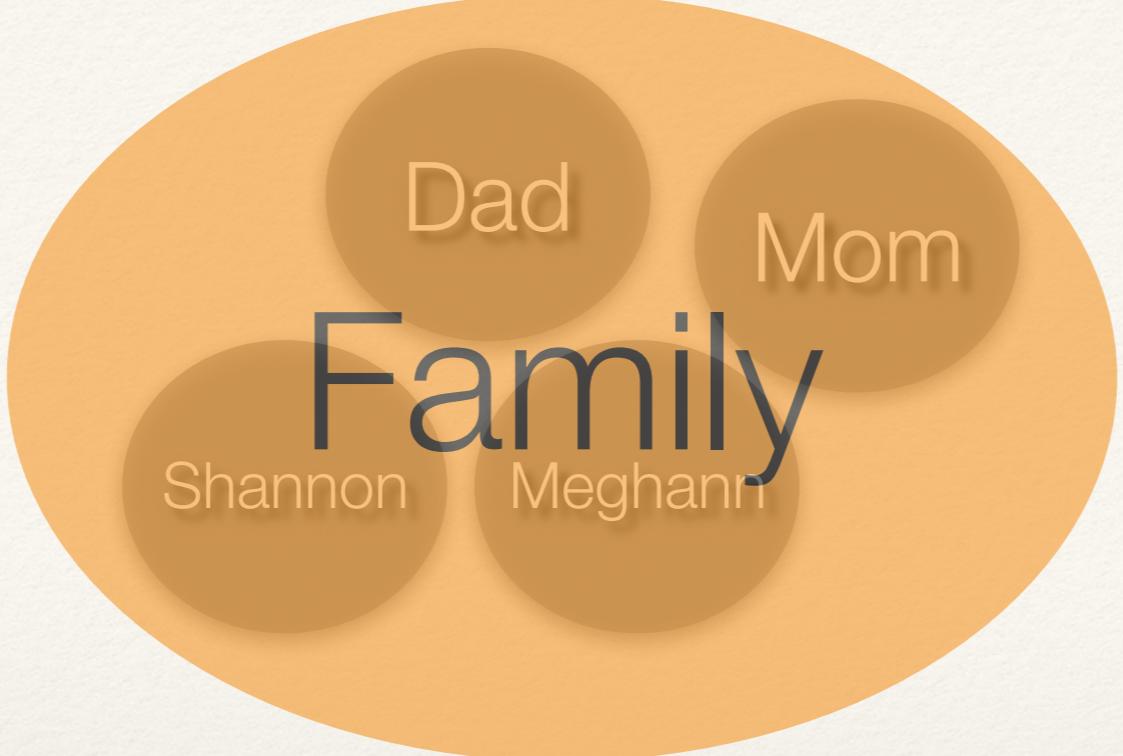
Adam

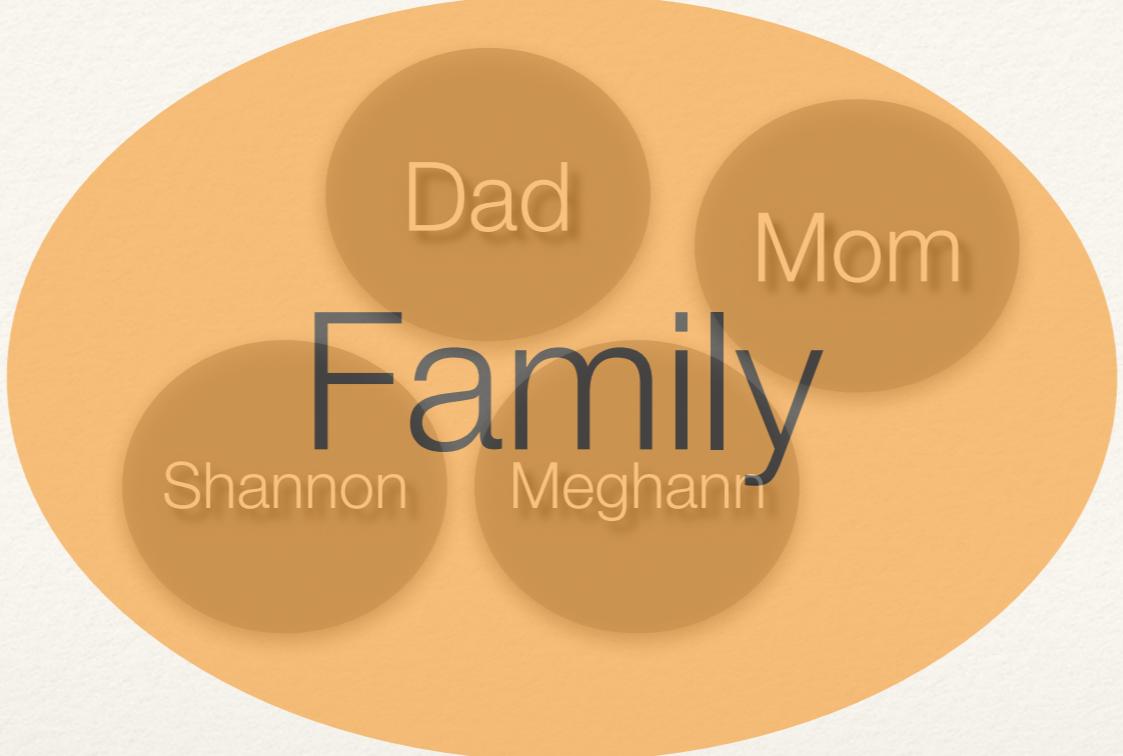
Cody

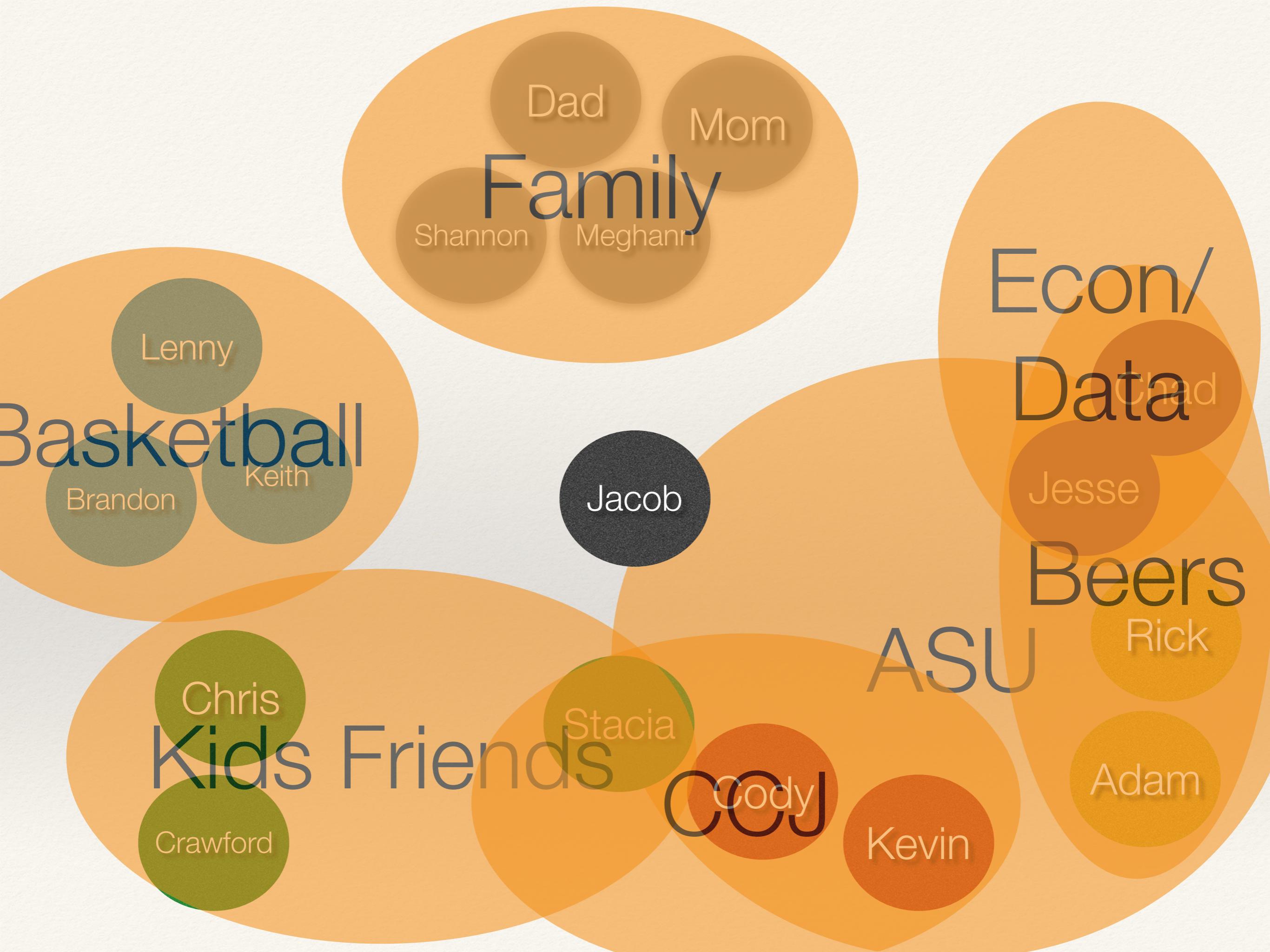
Kevin









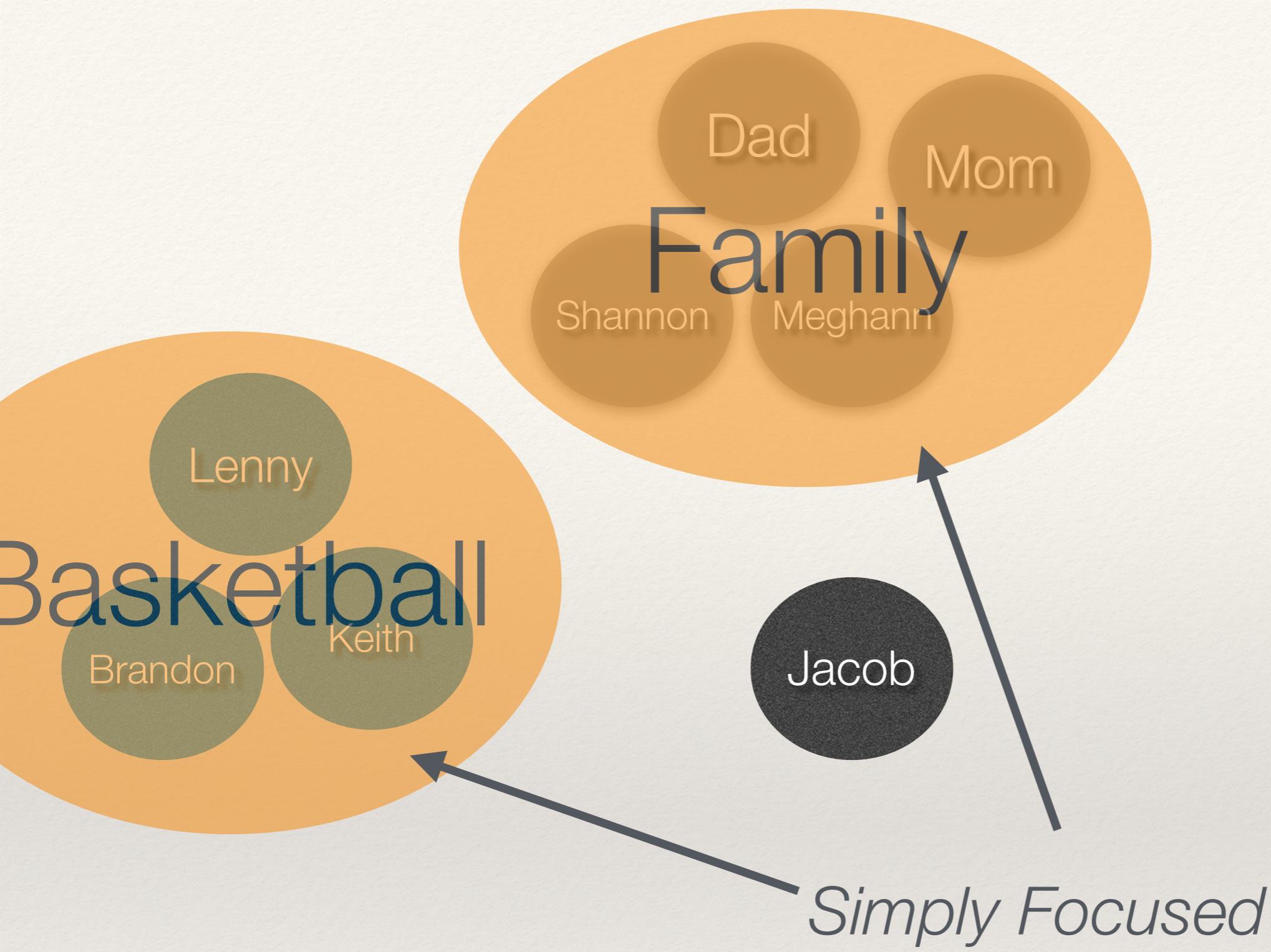


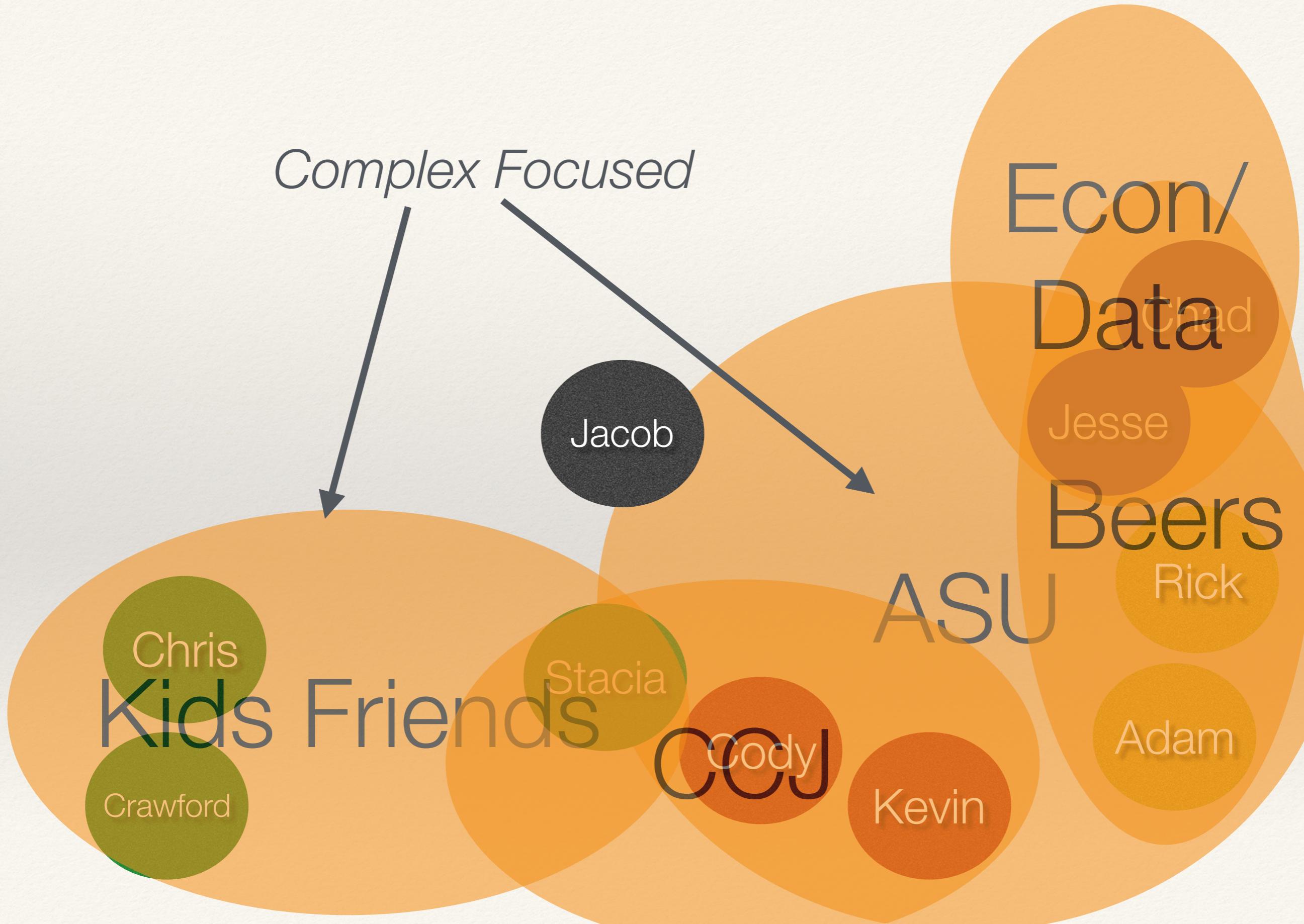
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# Focus Theory

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- ❖ A **simply focused** network is one in which there are multiple foci, but each individual is related to a single focus.
- ❖ A **complex focused** network is one where individuals are organized around a number of different foci simultaneously.





# Focus Theory

- ❖ An implication of **complex focused** networks is that there is a tendency toward transitivity in the network.

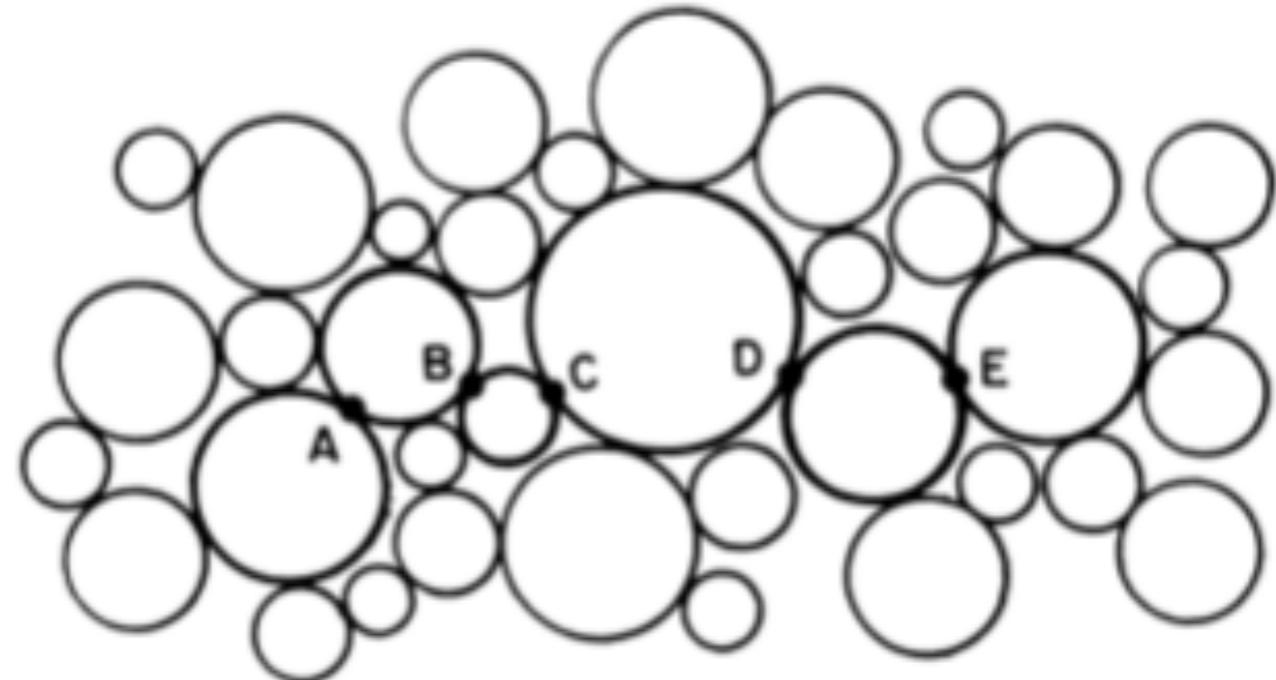
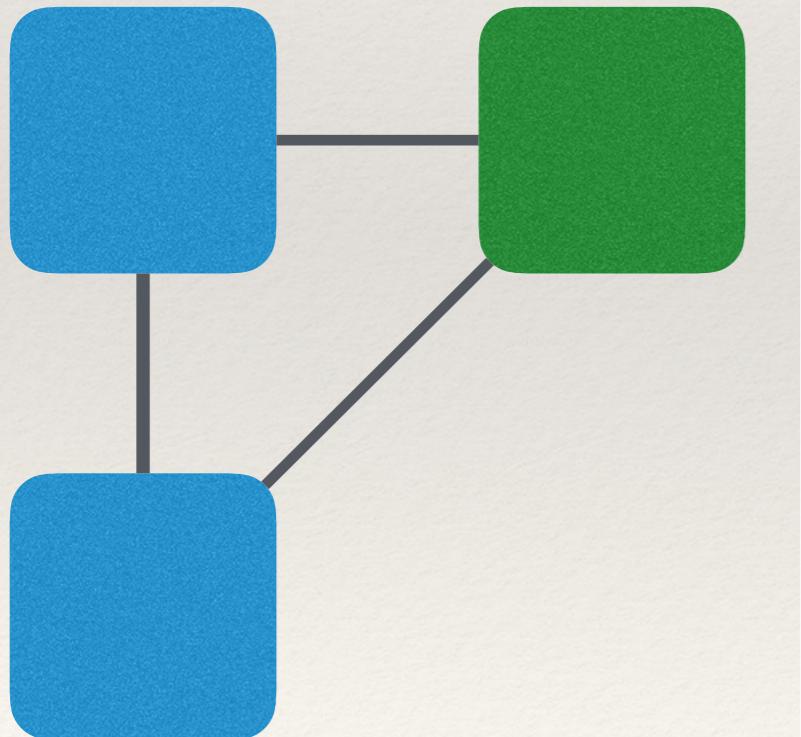


FIG. 1.—A schematic representation of social circles with individuals as the intersections.



Kids Friends

Crawford

Chris

Jacob

Stacia

Cody

Kevin

ASU

Adam

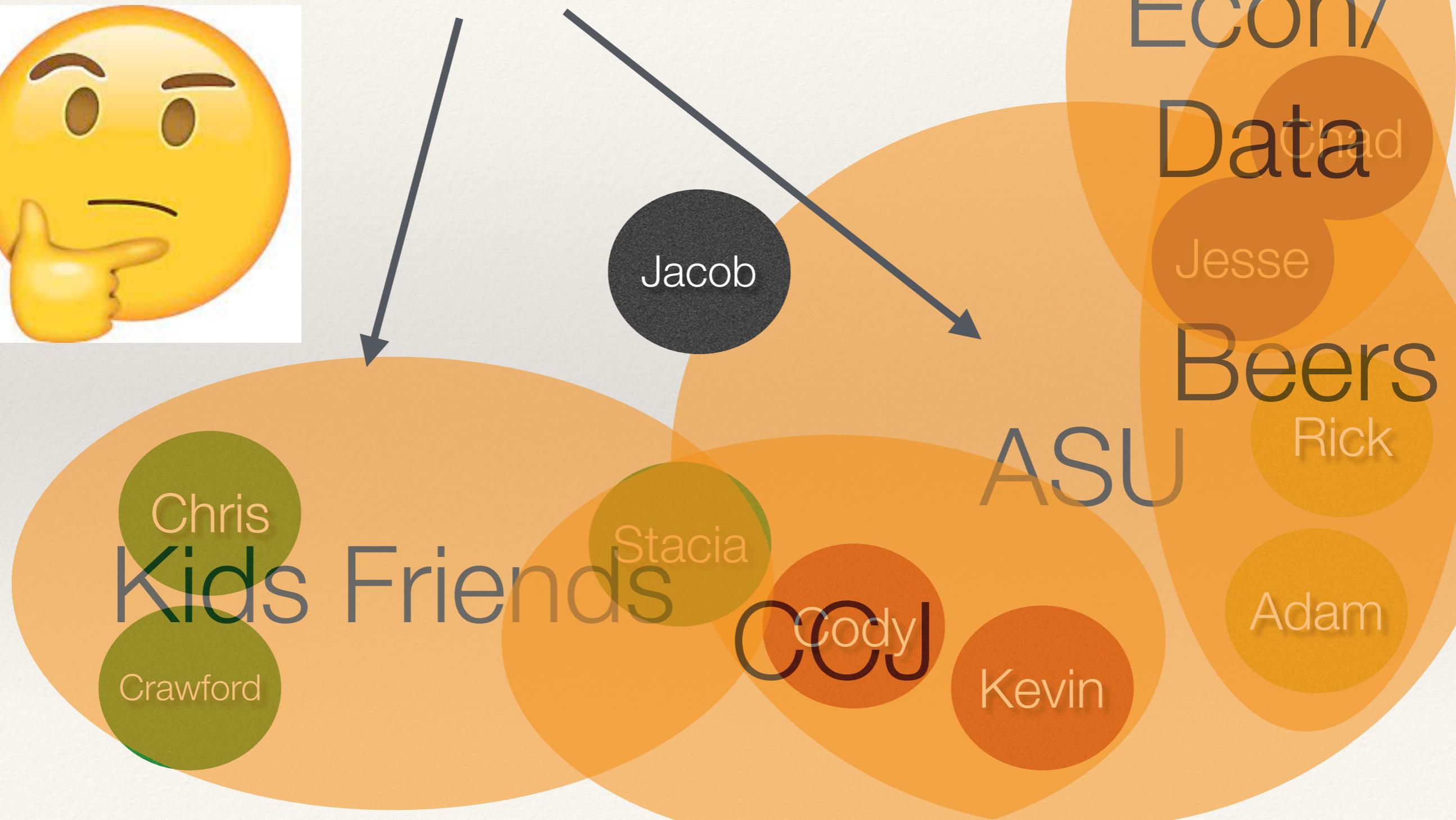
Rick

Chad

Econ/  
Data

Jesse

*Chris and Crawford don't know Chad or Jesse, but they enjoys drinking beers...*



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# Multiplexity

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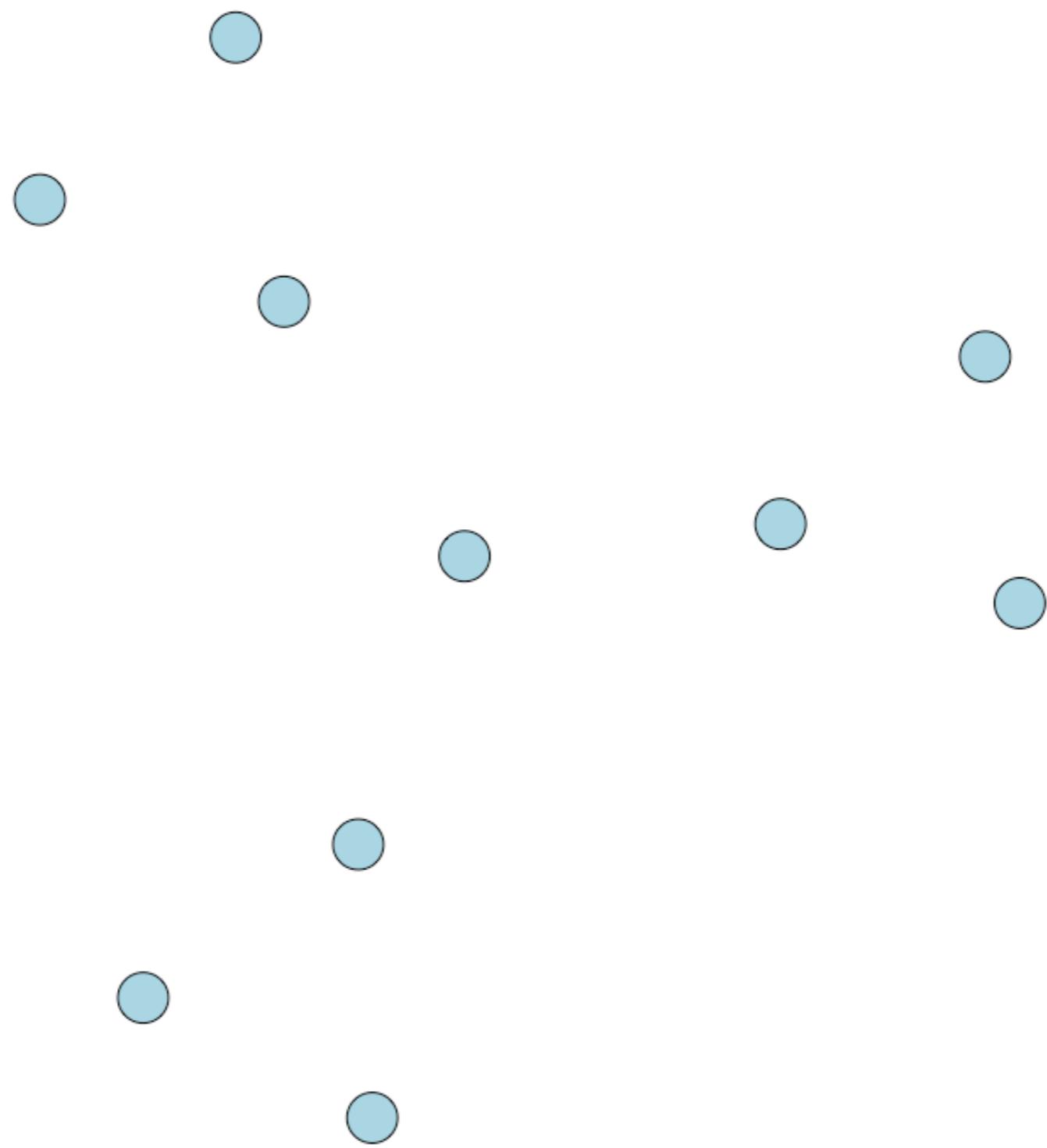
- ❖ This was talked about as **attributes** (“likes beer”).
- ❖ But, what about different types of **relationships**?

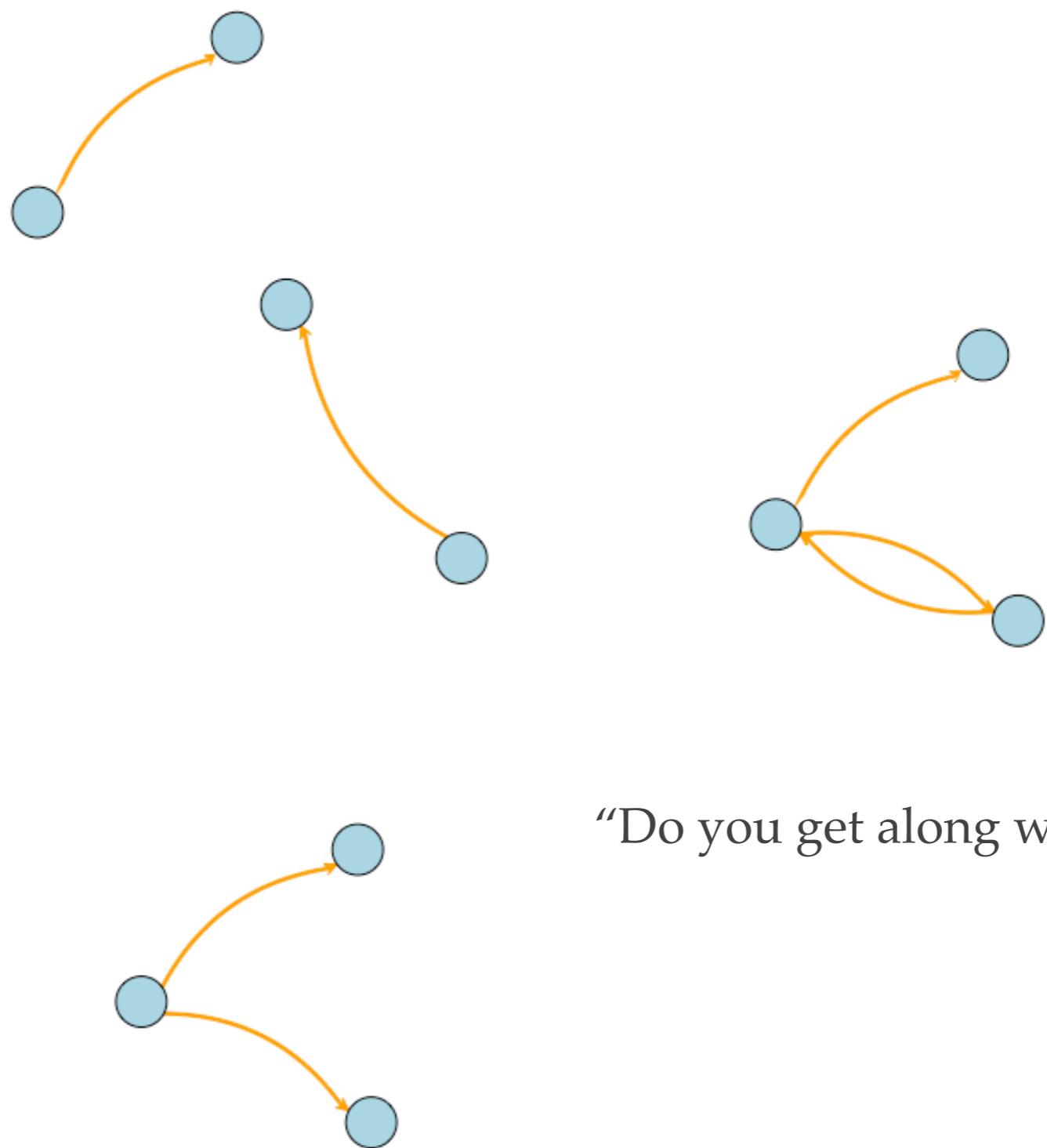
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# Multiplexity

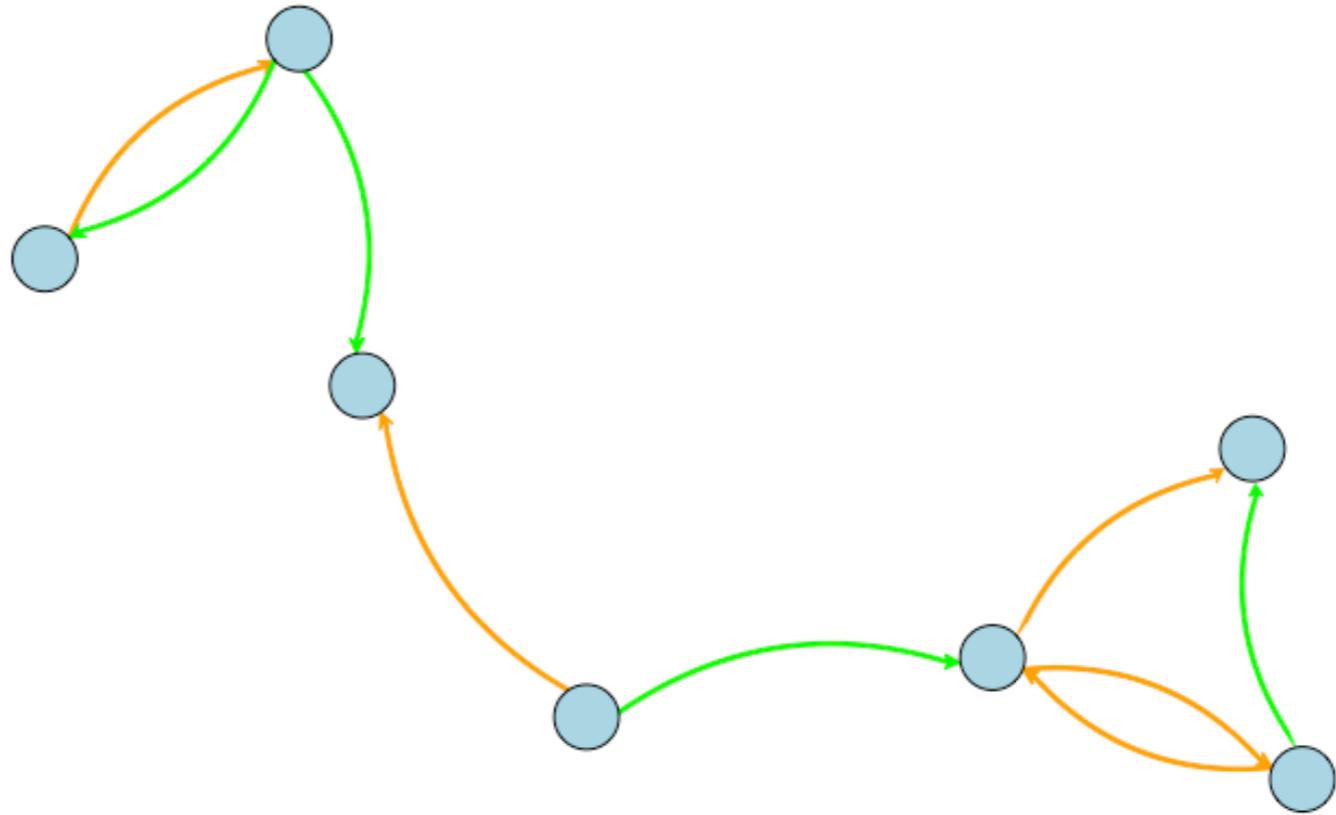
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- ❖ *Networks* can differ with respect to their **edges**:
  - ❖ Simplex (connections among nodes are of one type).
  - ❖ Multiplex (connections among nodes are of multiple types).



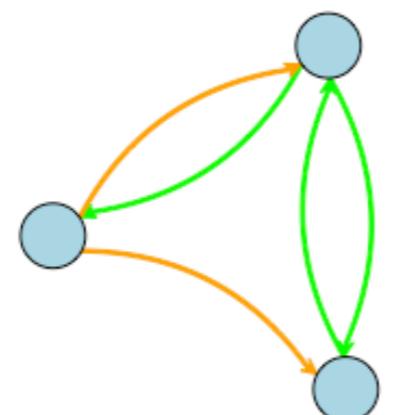


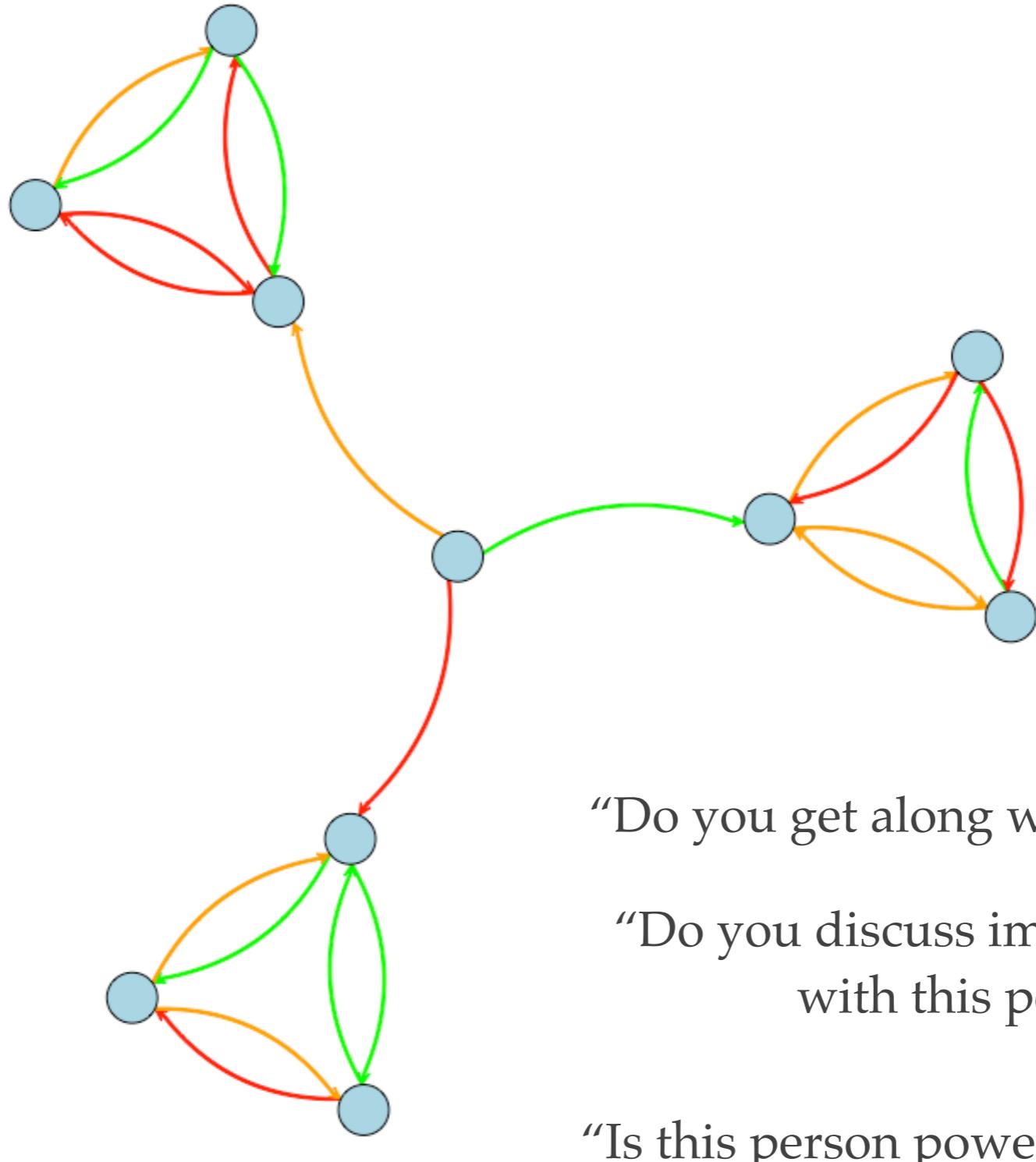
“Do you get along with this person?”



“Do you get along with this person?”

“Do you discuss important matters  
with this person?”





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# Multiplexity

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- ❖ The sentiments of focused interaction might be represented as network edges.
  - ❖ “Likes”, “Is friends with”, etc.

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# Multiplexity

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- ❖ “Theory of Networks” Questions:
  - ❖ Why does a friendship tie form from A to B? (simplex)
  - ❖ Does a friendship tie from A to B make a trust tie from A to B more likely? (multiplex)

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# Multiplexity as an Outcome (DV)

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- ❖ *How do multiplex ties develop?*
- ❖ Network Configurations
  - ❖ What are the dyadic and triadic processes that generate multiplex structures?

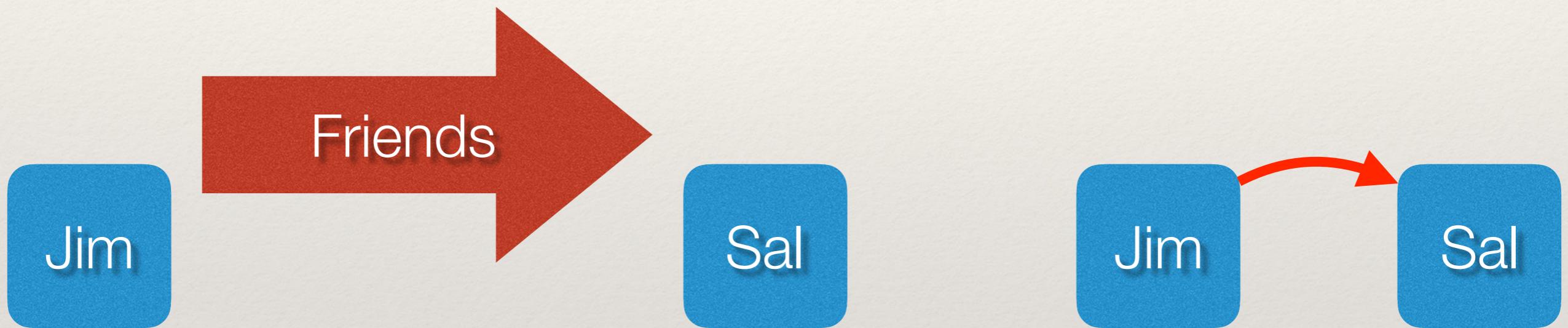
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# Multiplexity as an Outcome (DV)

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- ❖ *How do multiplex ties develop?*
  - ❖ Dyadic processes
    - ❖ Entrainment
    - ❖ Exchange

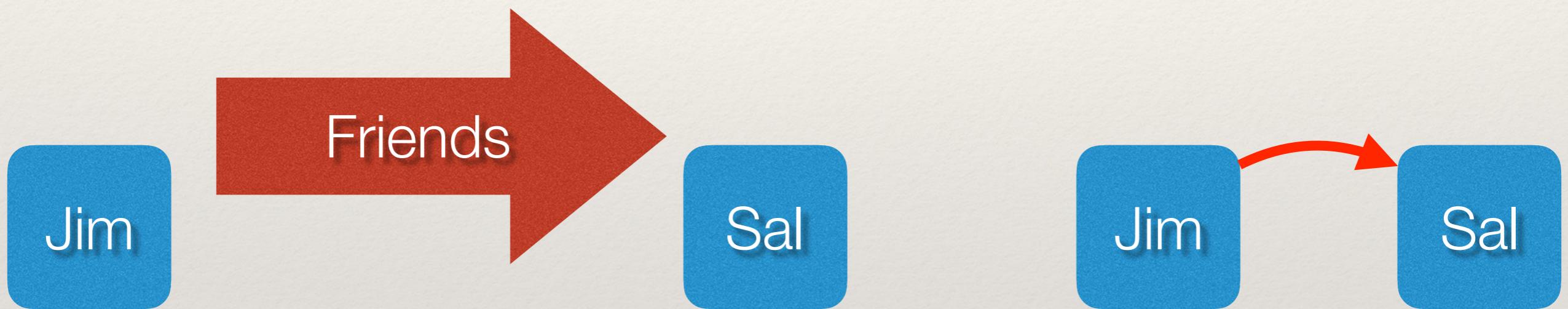
# Entrainment



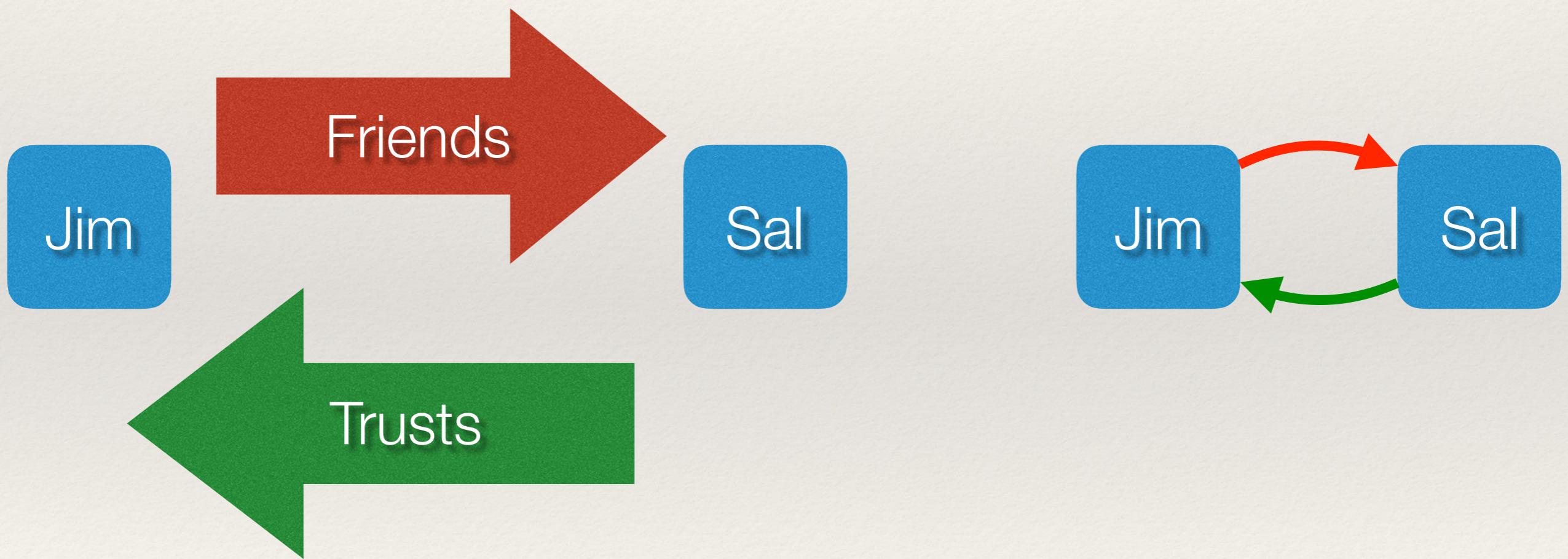
# Entrainment



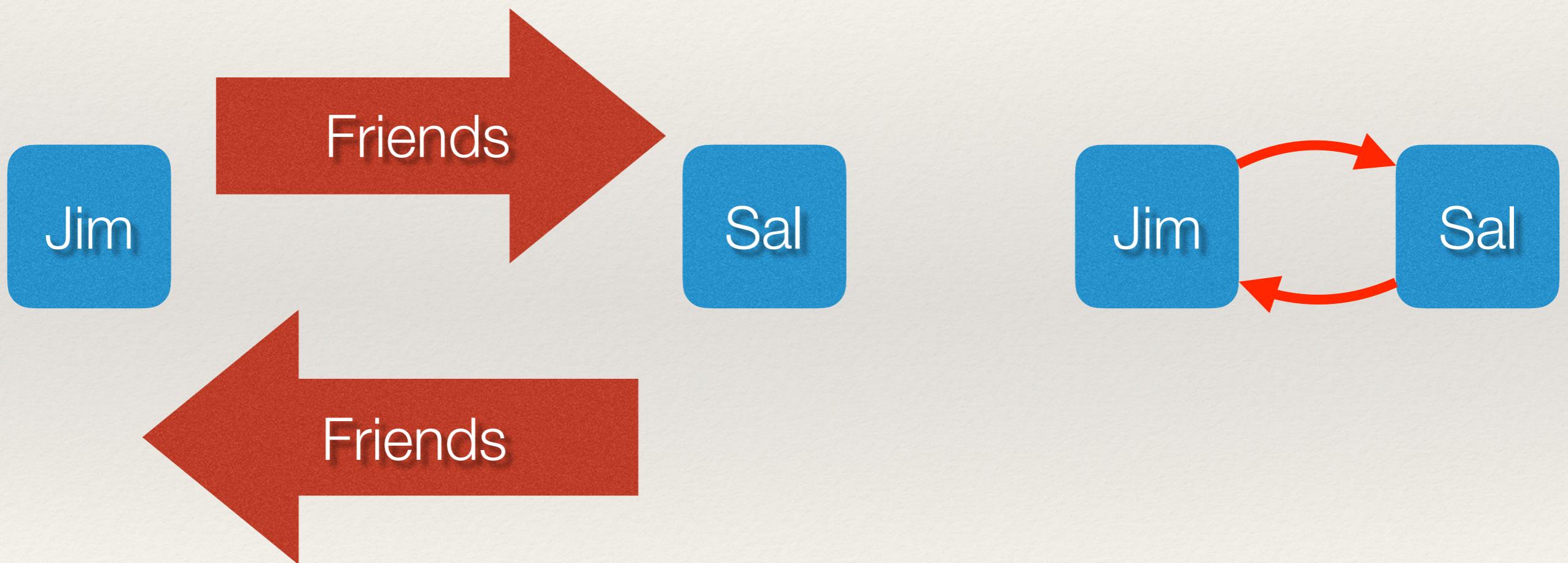
# Exchange



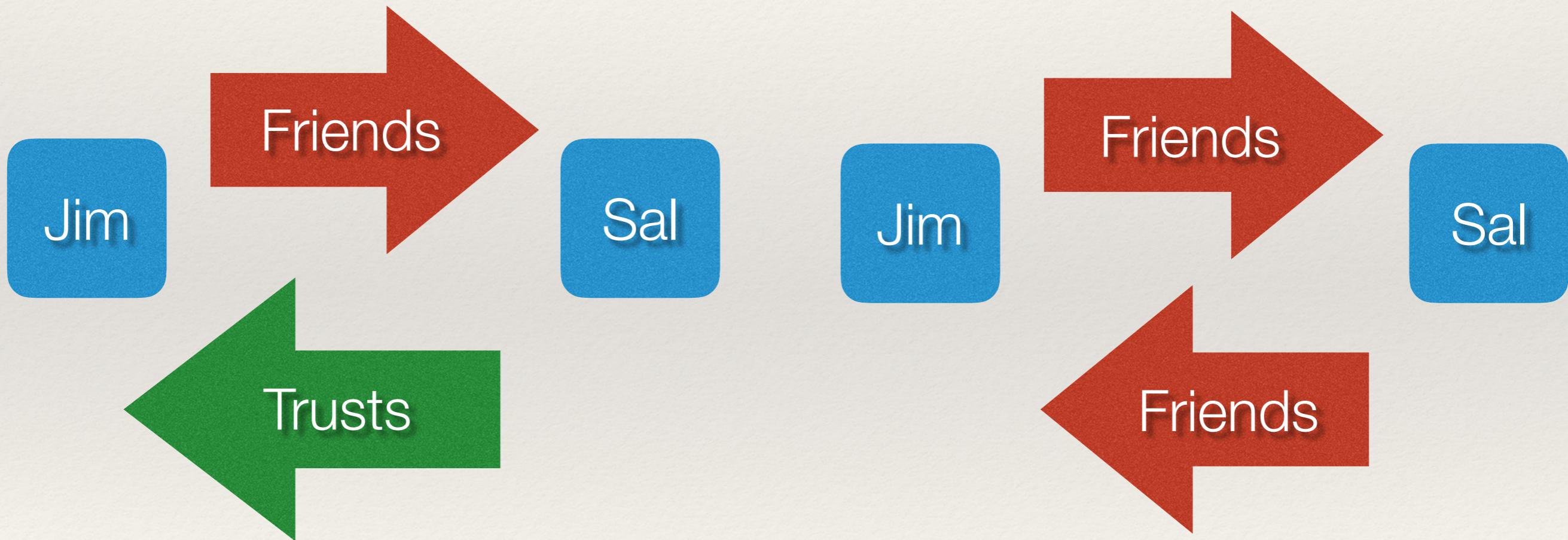
# Exchange



# Reciprocity



# Exchange vs. Reciprocity



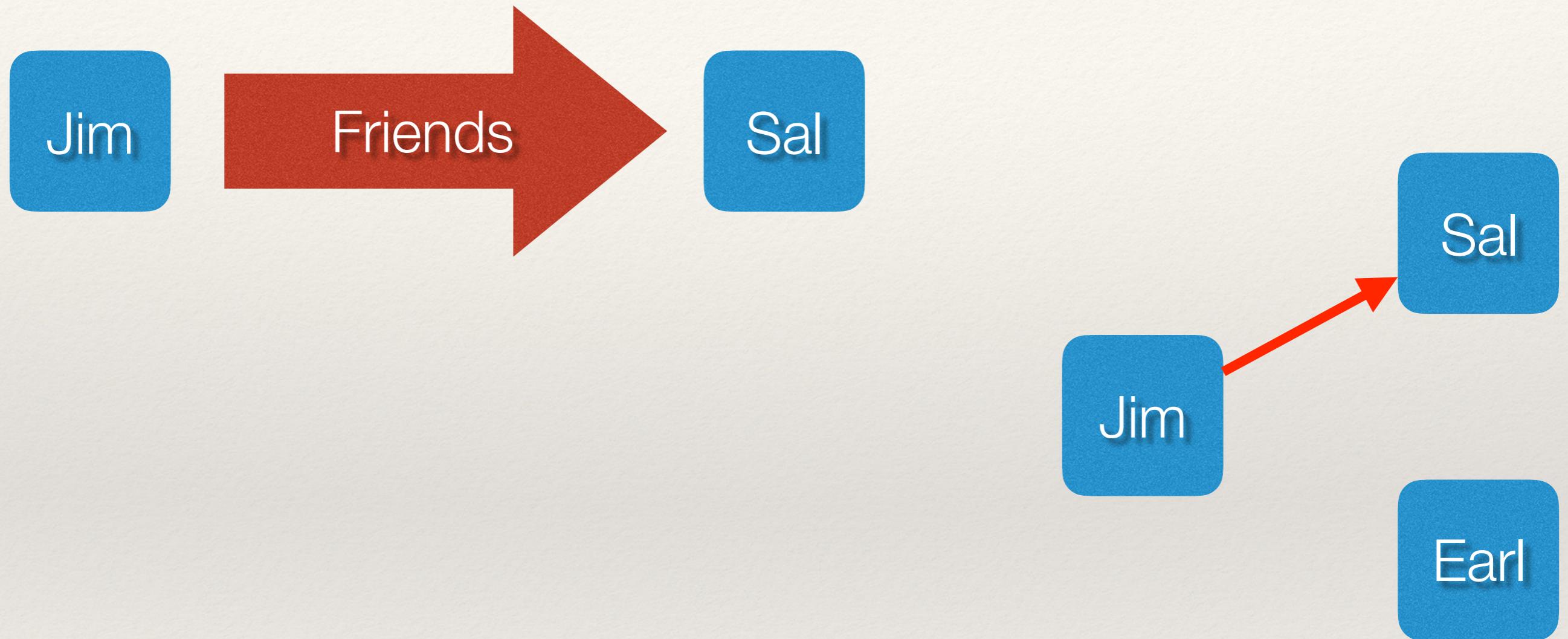
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# Multiplexity as an Outcome (DV)

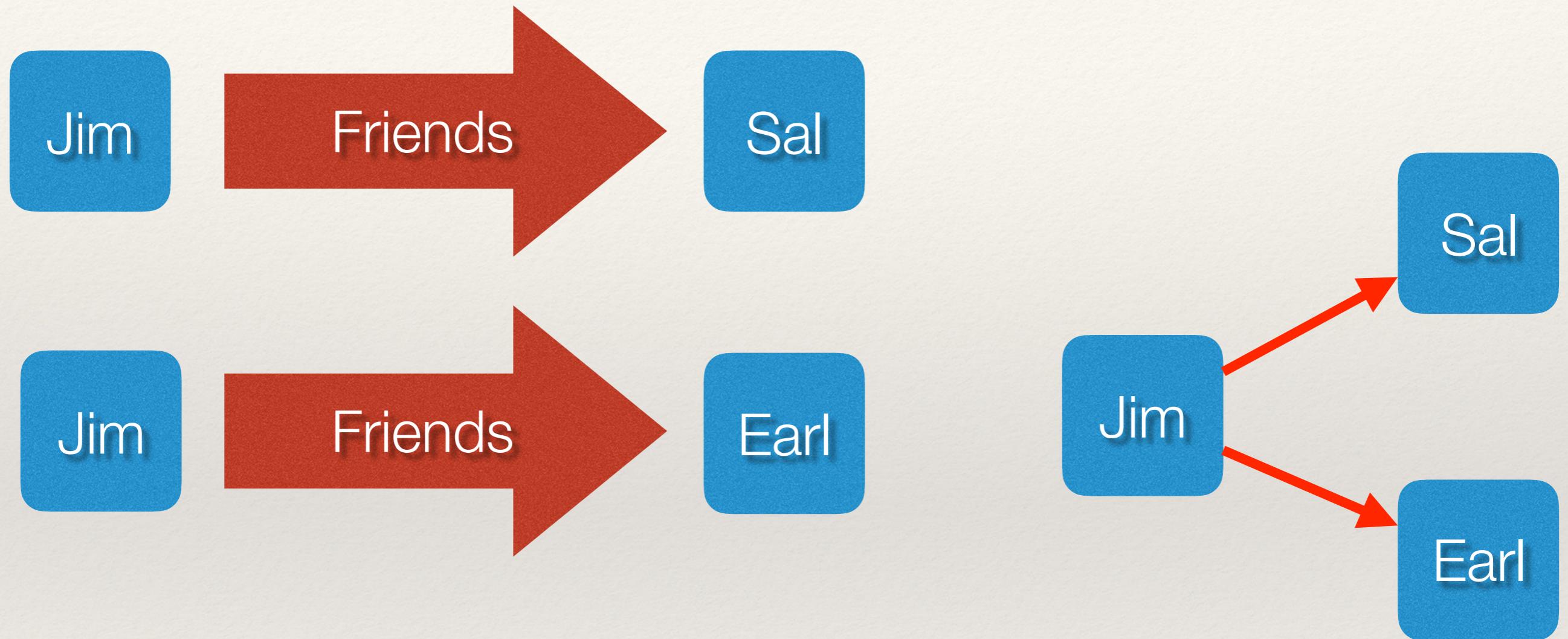
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- ❖ *How do multiplex ties develop?*
  - ❖ Triadic processes
    - ❖ Transitivity
    - ❖ Closure

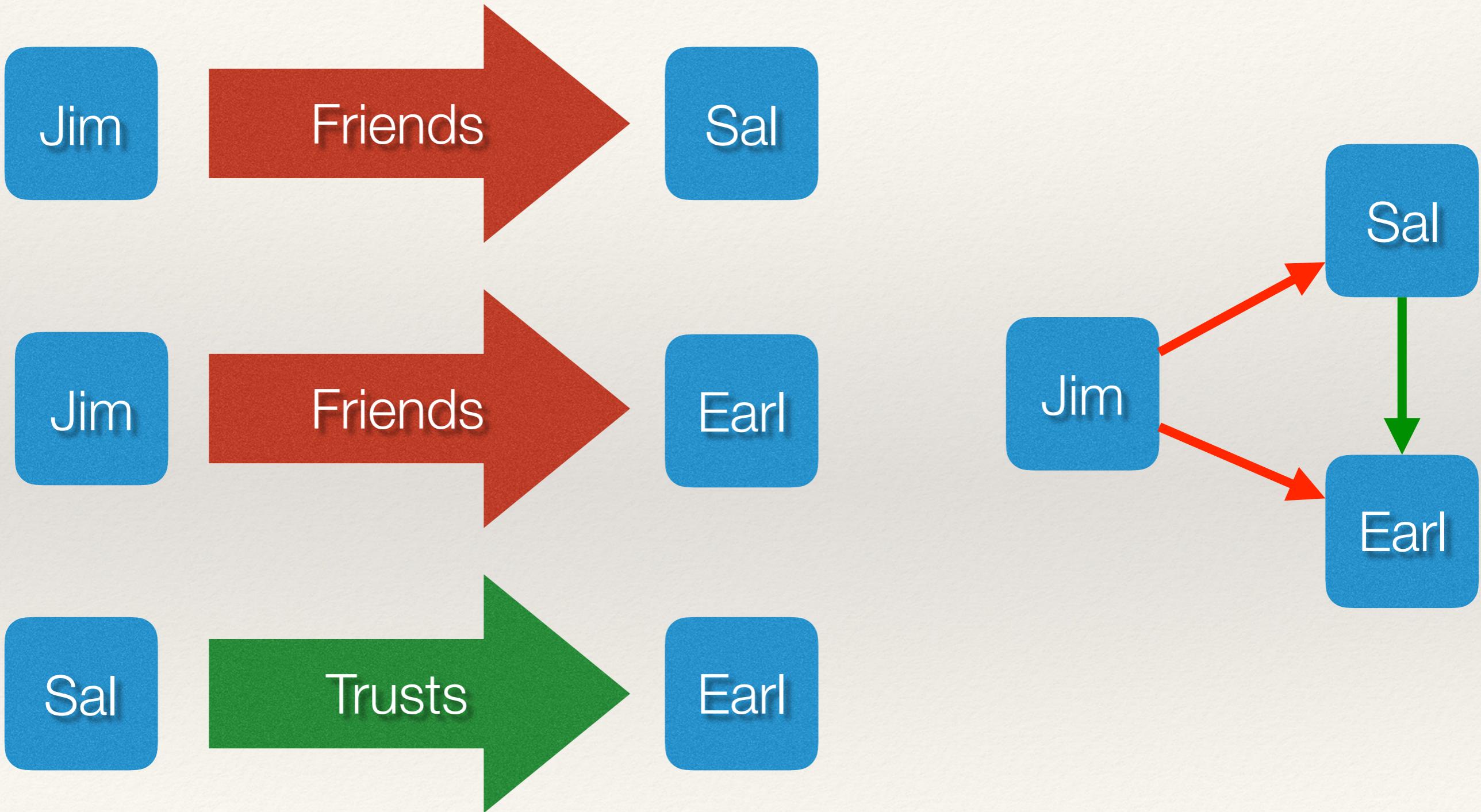
# Transitivity



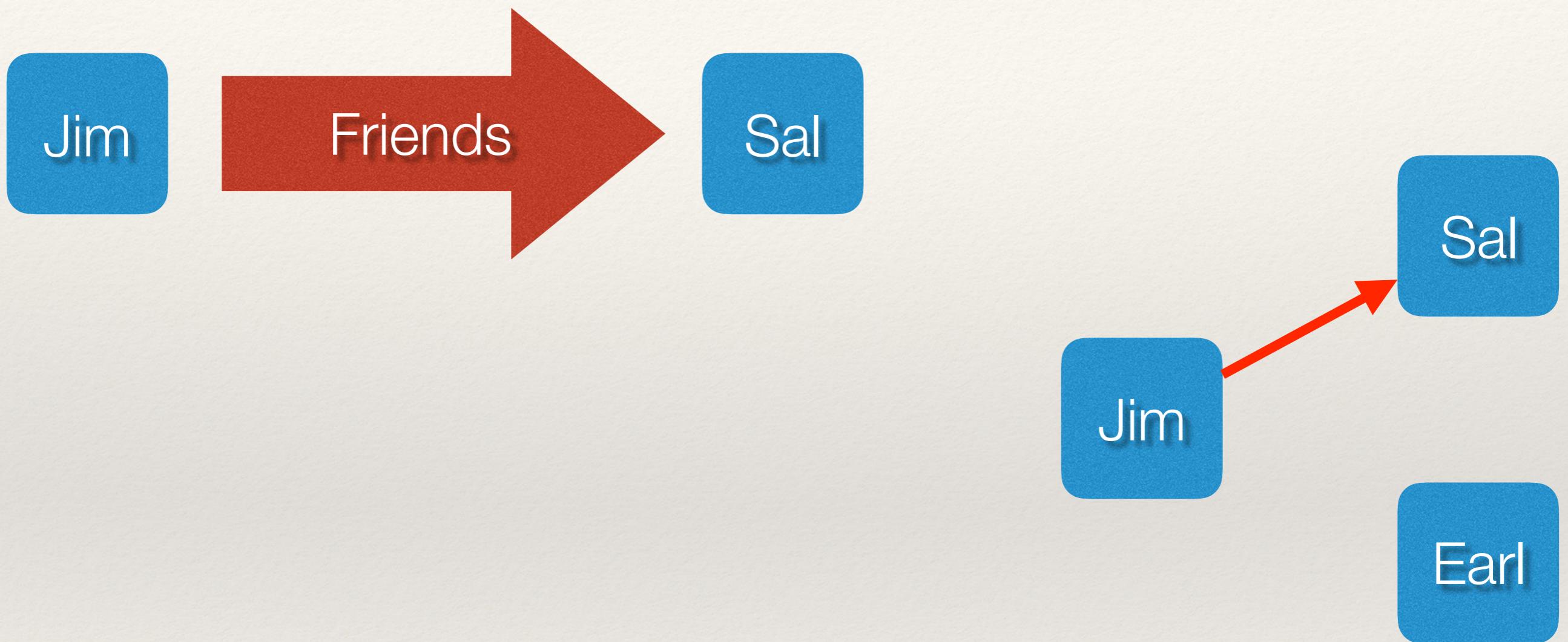
# Transitivity



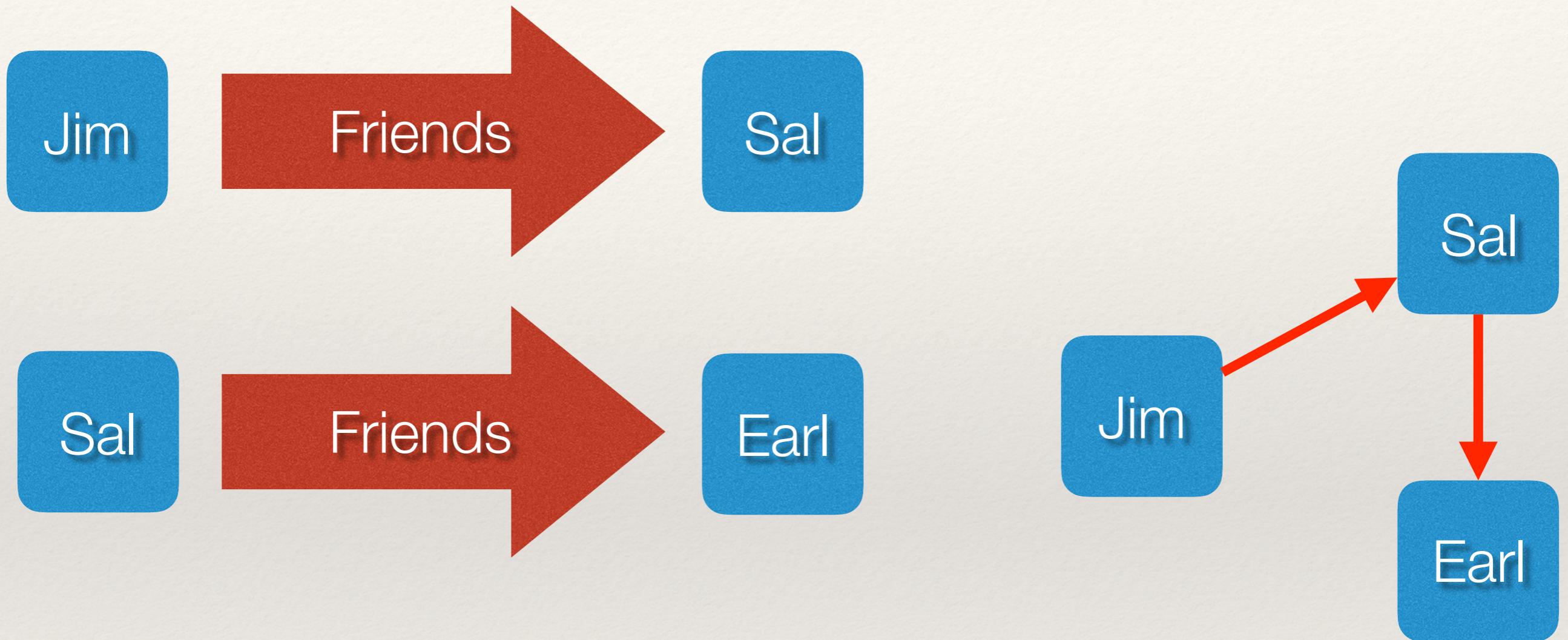
# Transitivity



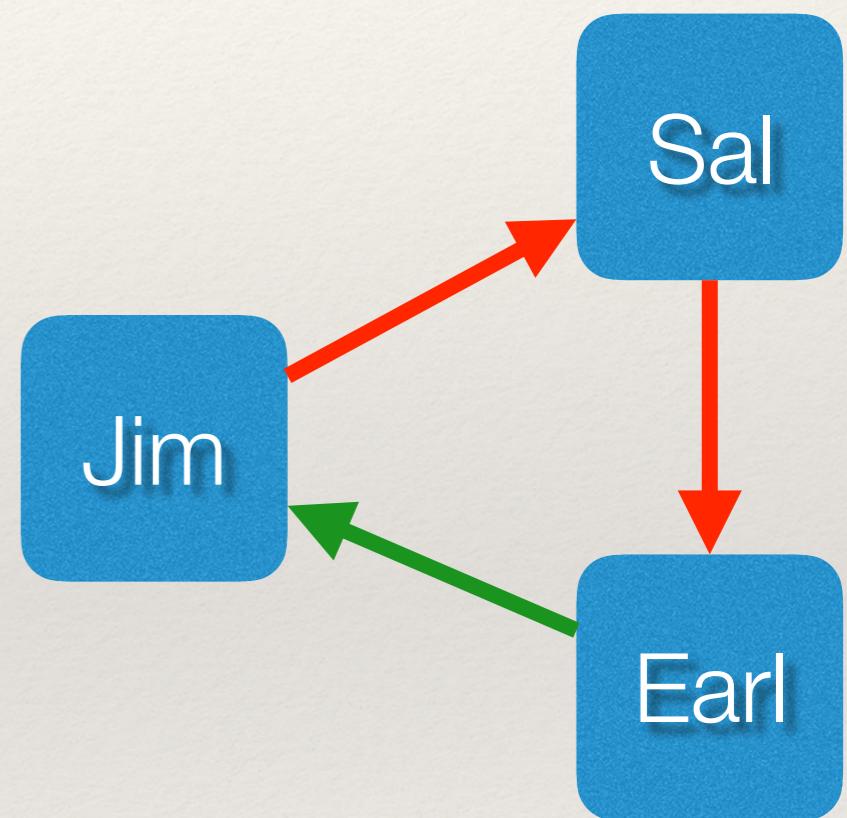
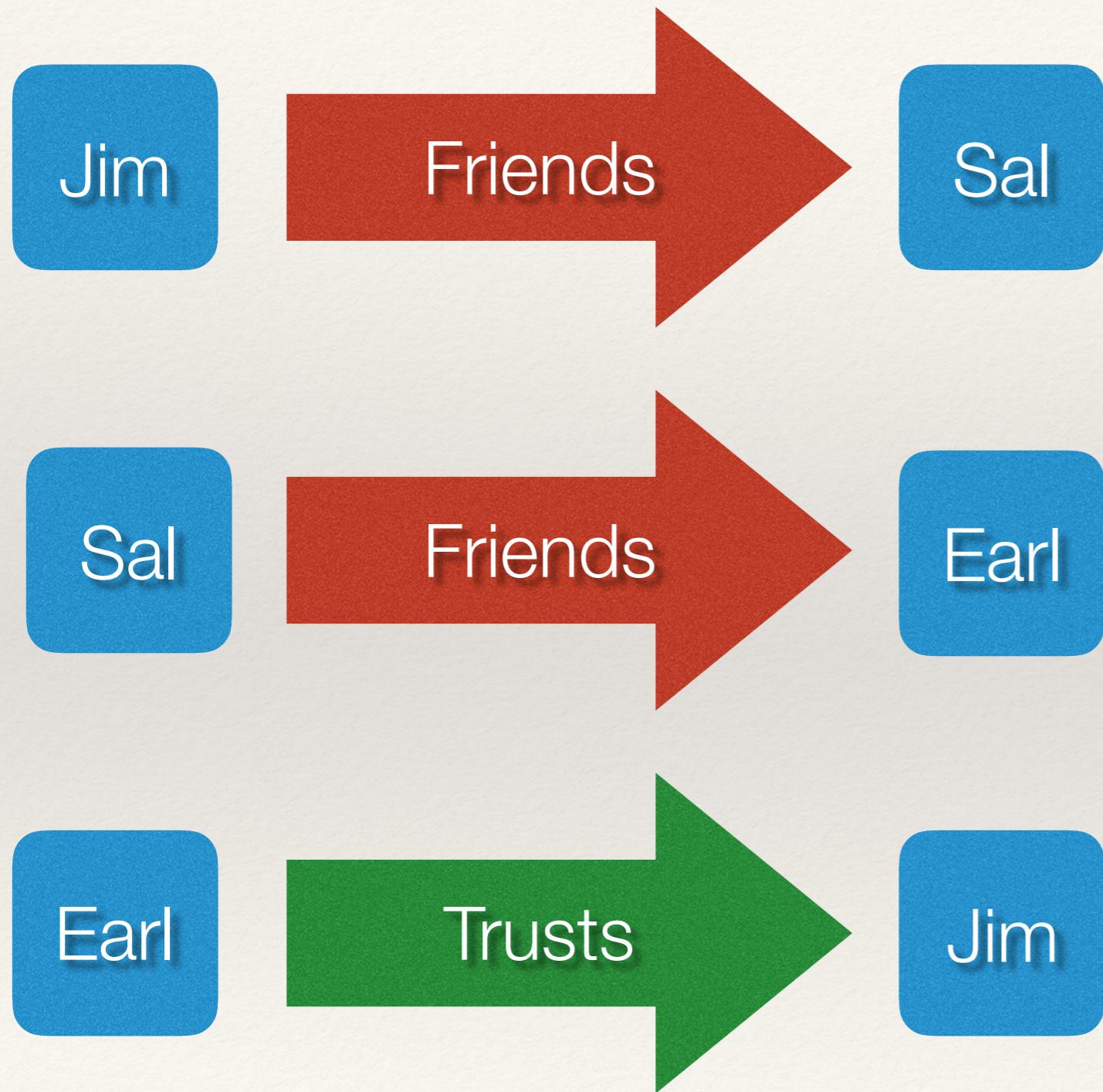
# Closure



# Closure

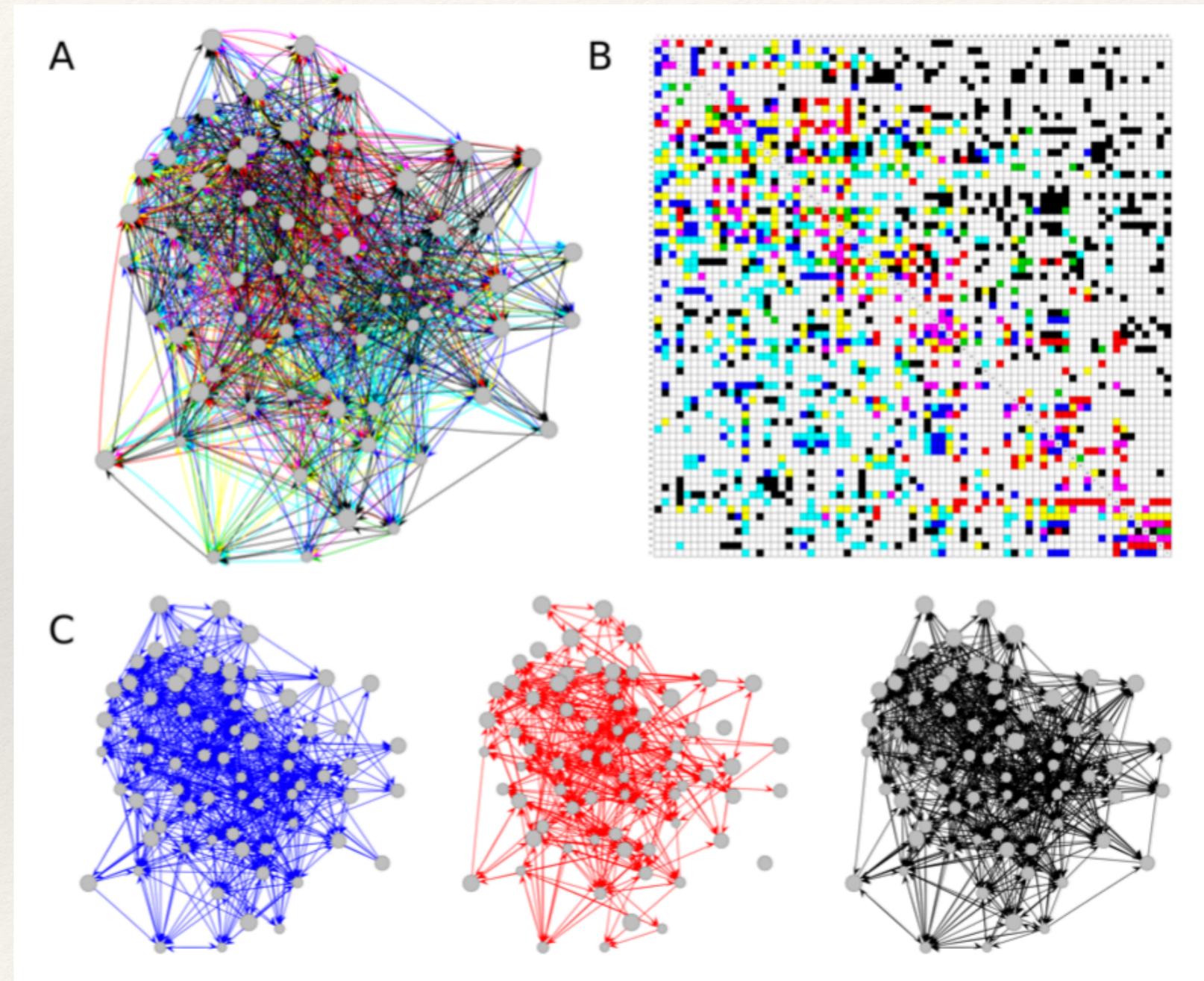


# Closure



# Multiplexity as an Outcome (DV)

- ❖ Complex multiplex structures can develop through fairly simple network configurations.
- ❖ Recent advances in the modeling of these configurations.



Exponential-Family Random Graph Models for  
Multi-Layer Networks

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# Multiplexity as an IV

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- ❖ “Network Theory” Questions:
  - ❖ Does network density influence some outcome? (simplex)
  - ❖ Does greater cross-network density influence some outcome? (multiplex)

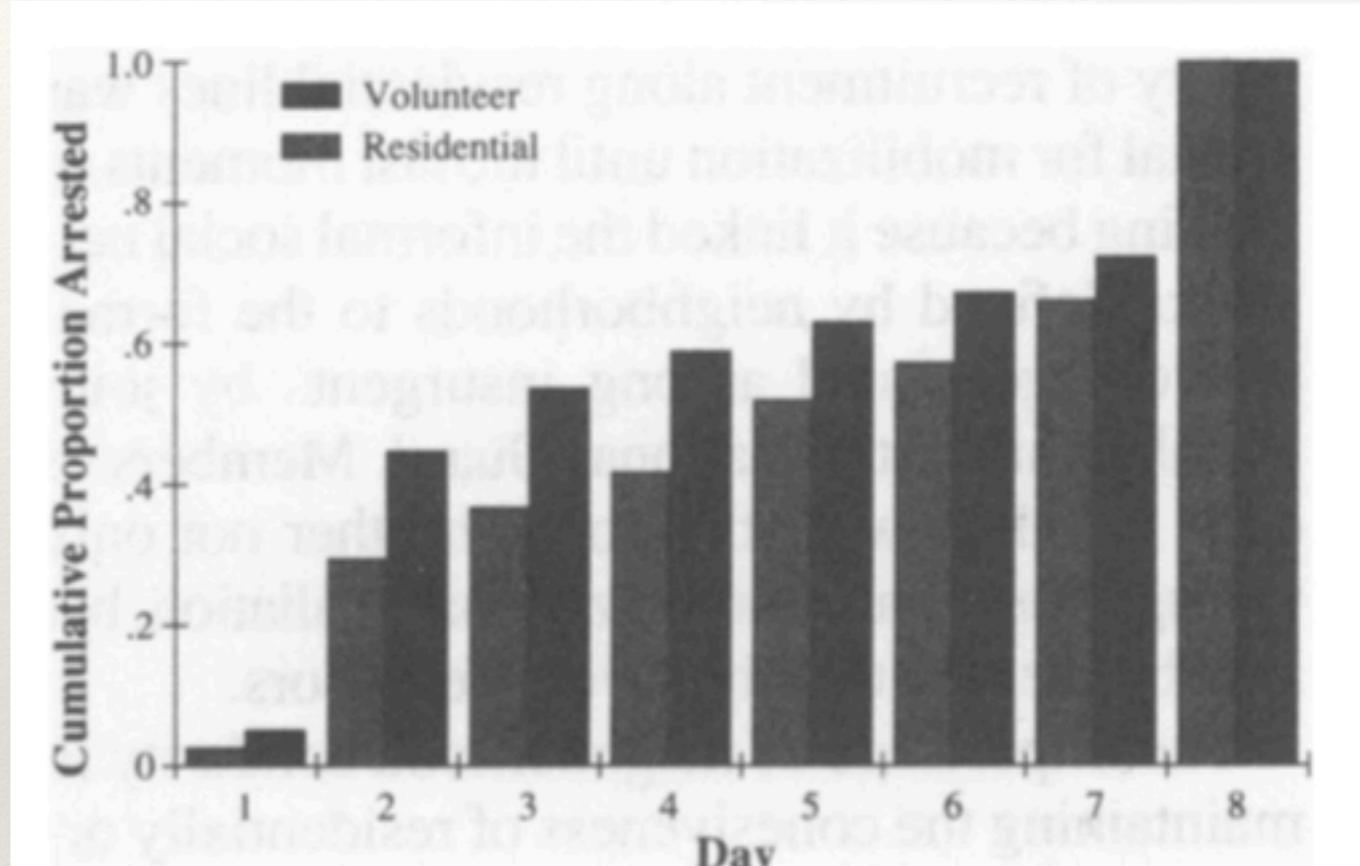
# Gould (1991)

- ❖ *What is Gould (1991) trying to understand?*
- ❖ Put differently:
  - ❖ What is the variation he is trying to explain?



# Gould (1991)

- ❖ *Why did some neighborhoods vary in the timing of their arrests rates?*



**Figure 1. Cumulative Distribution of Arrests of National Guardsmen by Day, for Volunteer Battalions and Residential Battalions: Paris Commune, May 21-28, 1871**

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# Gould (1991)

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- ❖ Answer:
- ❖ Organizational networks overlap with informal networks
- ❖ National Guard militia ties and neighborhood ties
  - ❖ Recruitment was based on neighborhood (*arrondissement*)

# Gould (1991)

National  
Guard

Neighborhood



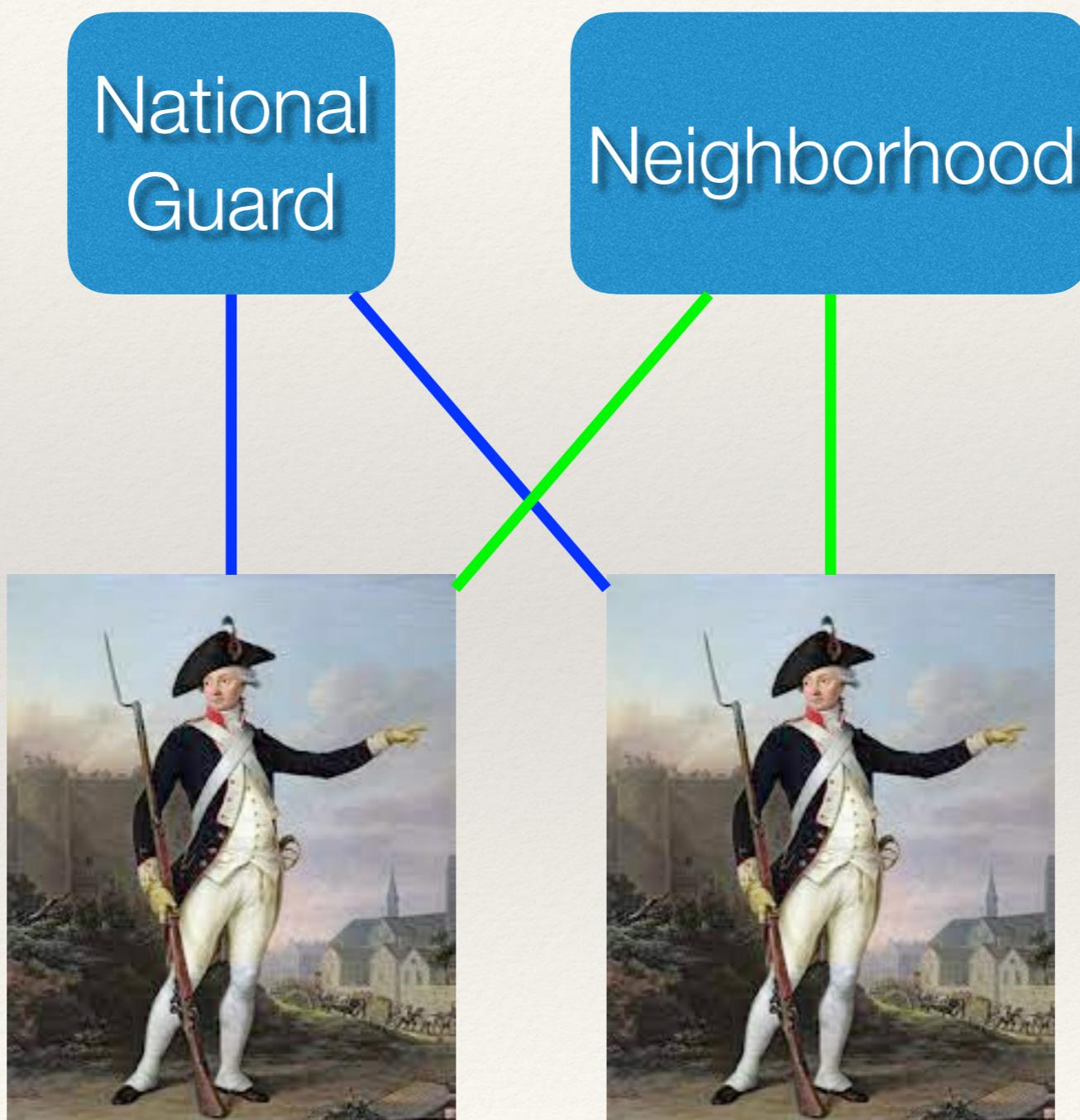
# Gould (1991)

National  
Guard

Neighborhood



# Gould (1991)



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# Gould (1991)

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- ❖ Answer:
- ❖ Organizational networks overlap with informal networks
  - ❖ This lead to greater solidarity, compared to volunteers

# Gould (1991)



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# Other Examples

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- ❖ Trust and friendship among incarcerated women (Haynie & Young 2020)
  - ❖ *We can add other available network data.*
- ❖ Victimization and offending among friends (Turanovic & Young 2016)
  - ❖ *This can be reworked to be a multiplex network...with some additional information.*
- ❖ The big picture: Network Configurations

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# Learning Goals

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- ❖ Multiplexity vs. Homophily
- ❖ How does it happen? (DV, “theory of networks”)
- ❖ Consequences of multiplexity (IV, “network theory”)

Questions?

Break

# Discussion

## Network Theories and Theories of Networks\*

NETWORK THEORIES ("networks as <i>cause</i> ")		THEORIES OF NETWORKS ("networks as <i>effects</i> ")	
		<i>Explanatory Goal</i>	
<i>Explanatory Model</i>	Social Capital/ Performance ("why are the benefits?")	Homogeneity ("why are nodes similar?")	Network Structure ("why is the network this way?")
<b>Network Flow</b> (ties as pipes)	<u>Capitalization</u>  <b>Definition:</b> Acquisition to resources through ties and this influences human capital which contributes to performance.  <b>Examples:</b> Access to unique information via bridging ties. Information control benefits of structural holes. Solving problems through access to diverse knowledge.	<u>Contagion</u>  <b>Definition:</b> Nodes become similar through a process of "infection" where various "bits" are passed from one node to the other.  <b>Examples:</b> Diffusion of innovations. Peer influence. Disease transmission.	<b>Examples:</b> Homophilous Selection ("why do people with the same attitudes cluster together? They sort into these groups")
<b>Network Coordination</b> (ties as bonds or "prisms")	<u>Cooperation</u>  <b>Definition:</b> Networks provide benefits that can coordinate multiple nodes in order to bring all their resources to bear on a problem.  <b>Examples:</b> Unionization. Collective efficacy in neighborhoods.	<u>Convergence</u>  <b>Definition:</b> Nodes adapt to their environments, and as a result nodes with similar structural environments will demonstrate similarities.  <b>Examples:</b> Administrative assistants have higher levels of communication in organizations.	<b>Examples:</b> Popularity ("why do some individuals receive more ties than others?")

\*Adapted From Borgatti and Halgin (2011) and adams (2020).