

**DSTC**

# Experience, Recommendation and Reputation

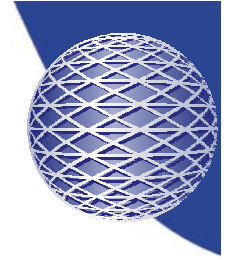
*iTrust Workshop, Imperial College London  
September 2003*

**Dr. Audun Jøsang**

Distributed Systems Technology Centre

Brisbane, Australia

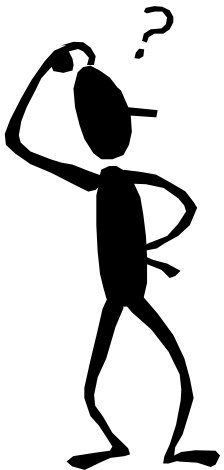
<http://security.dstc.edu.au>

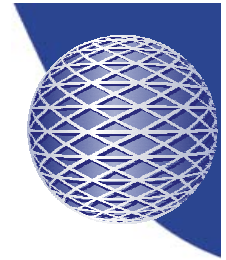


# What is Reputation?

*What is generally said or believed about a person's or thing's character or standing.*

*Oxford's Dictionary*

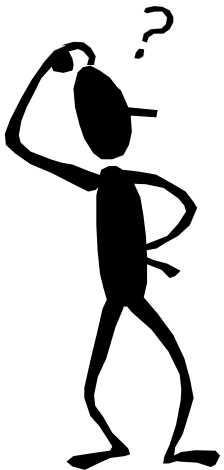




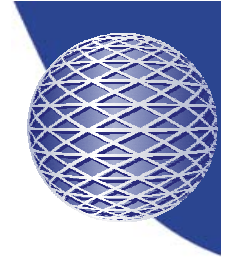
# What is Trust?

*Trust is the extent to which one party is willing to depend on something or somebody, even though negative consequences are possible.*

*McKnight and Chervany 1996*



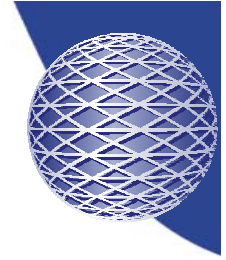
# Trust and Reputation, Not quite the same



*"I trust you because of your good reputation."*

*"I trust you despite your bad reputation."*

- Objective reputation (i.e. common opinion)
- Subjective trust (i.e. personal opinion)
- Reputation influences, but doesn't dictate trust.
- Reputation = sum of everyone's subjective trust.
- Trust and reputation can change quickly.



# Extrinsic and Intrinsic Trust

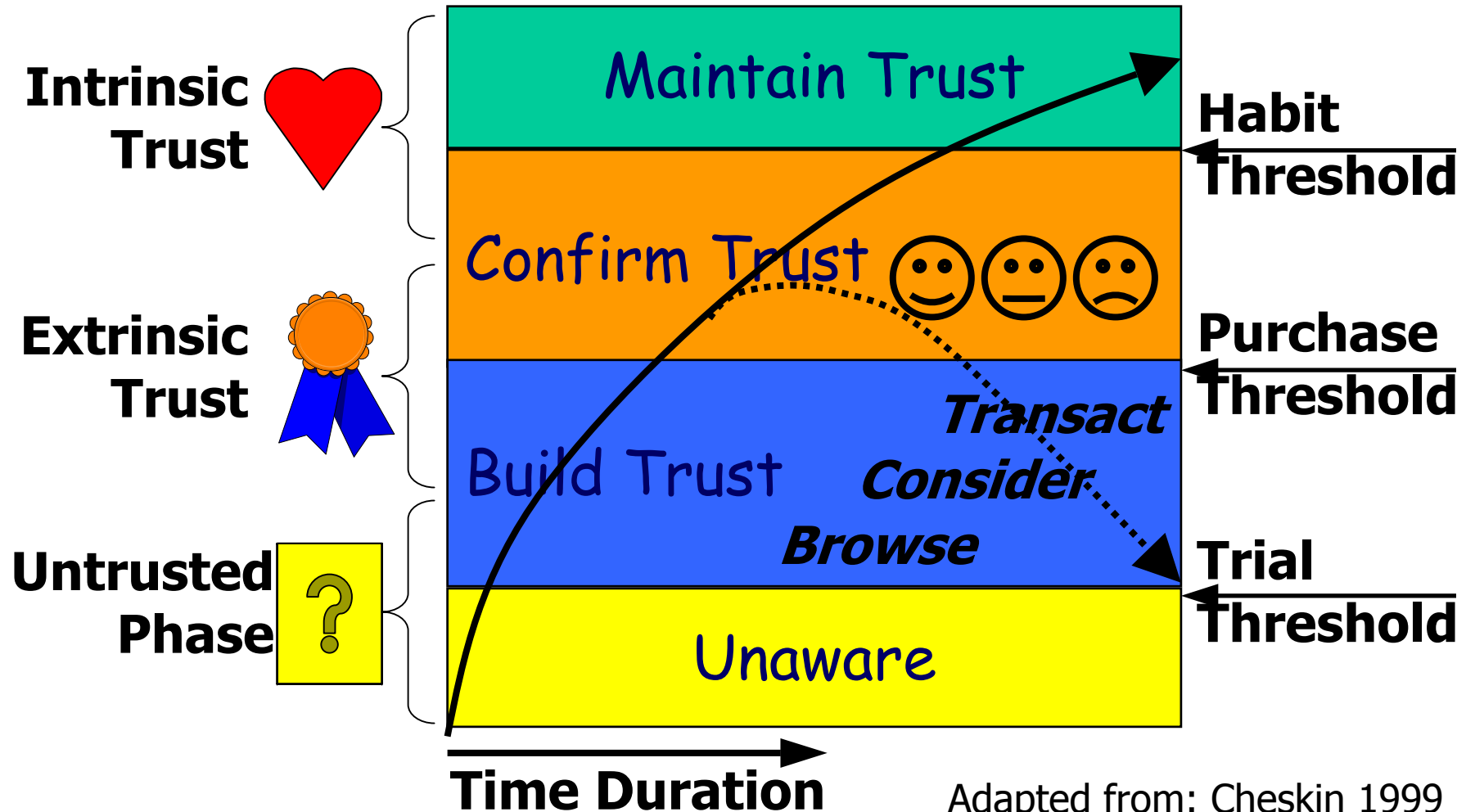
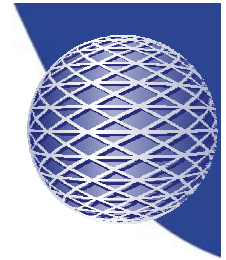
## Extrinsic Trust

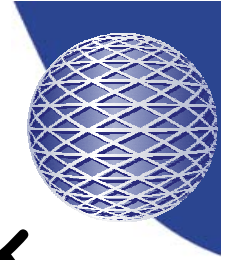
- Cognitive
- Observed
- Recommendation
- Reputation
- External evidence
- Easy to manufacture
- Initial trust

## Intrinsic Trust

- Affective
- Experienced
- Intimate relationship
- Internalised pattern
- Takes time to build
- Long term trust

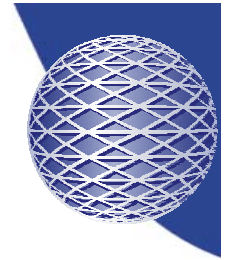
# A Model for E-Commerce Trust



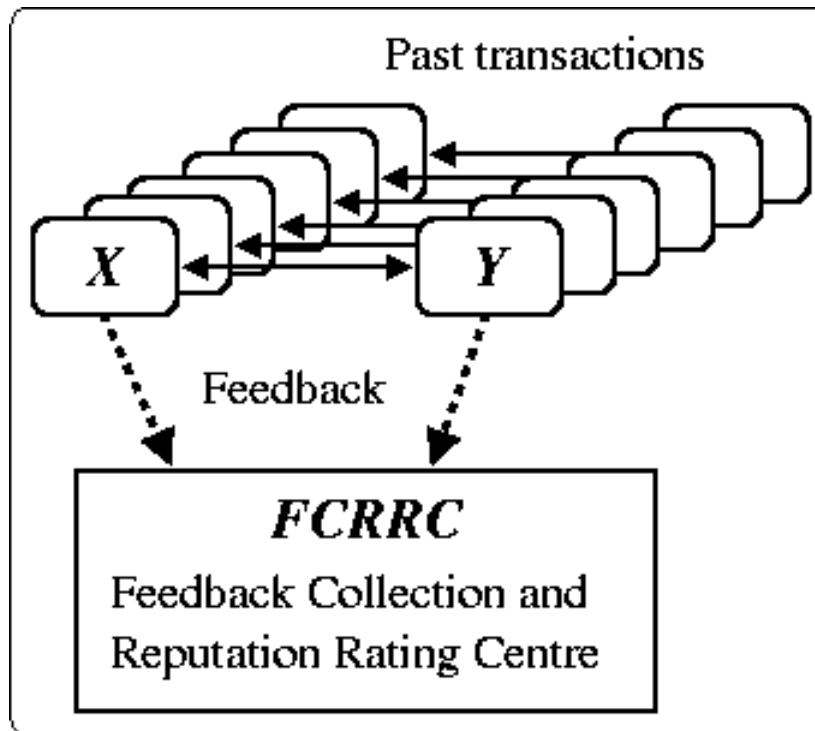


# How Reputation Systems Work

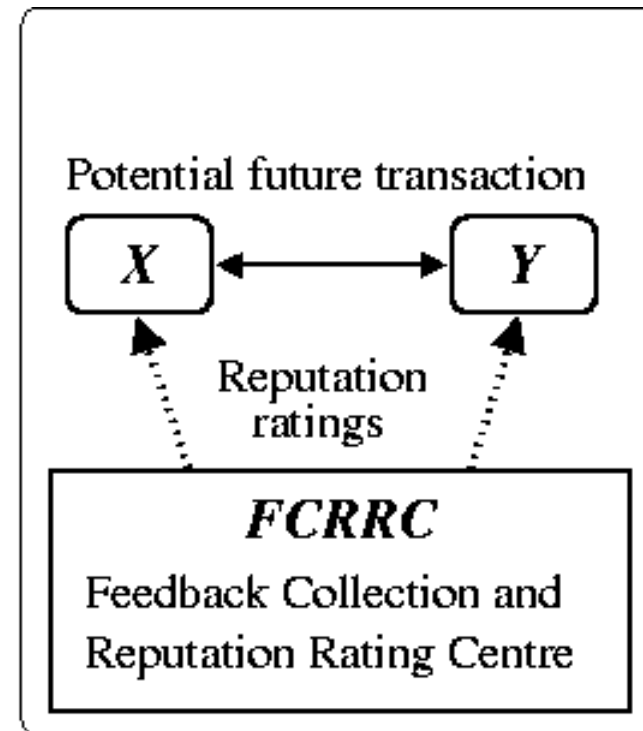
- Collect feedback about transactions.
- Compute reputation rating.
- Publish rating.
- Centralised or distributed systems.



# Centralised System

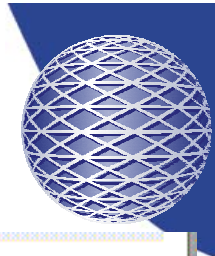


a) Past



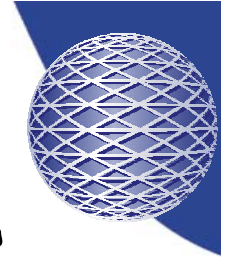
b) Future

# The eBay Reputation System



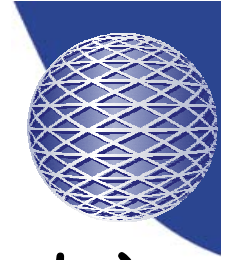
<a href="#">tjs_studio (68)</a> ★	Sep-02-02 16:06:00 PDT	<a href="#">2044255968S</a>
<b>Praise</b> : Great transaction. Thanx SO MUCH. A++++++		
<a href="#">wvbhunter03 (5)</a>	Sep-02-02 15:10:20 PDT	<a href="#">2045391206S</a>
<b>Praise</b> : thanks for a quick shipment. a+		
<a href="#">kirsys (20)</a> ★	Sep-02-02 14:10:51 PDT	<a href="#">1369947784S</a>
<b>Praise</b> : Works great- Super fast delivery. FYI, Sales tax IS applied towards purchase.		
<a href="#">dkronmal (5)</a>	Sep-02-02 11:22:39 PDT	<a href="#">2035480350S</a>
<b>Neutral</b> : Item arrived broken but was able to receive refund at the store.		
<a href="#">markandracyg (134)</a> ★	Sep-02-02 07:16:35 PDT	<a href="#">2042895535S</a>
<b>Praise</b> : Nice to deal with ... Hope to again		
<a href="#">slomovinsa (14)</a> ★	Sep-02-02 05:55:38 PDT	<a href="#">2035047638S</a>
<b>Praise</b> : g		
<a href="#">horn1954 (91)</a> ★	Sep-01-02 21:50:05 PDT	<a href="#">1760166400S</a>
<b>Praise</b> : A+++++		
<a href="#">horn1954 (91)</a> ★	Sep-01-02 21:50:05 PDT	<a href="#">2044984578S</a>
<b>Complaint</b> : Compaq tried two weeks to get going, I gave up...return to sears		
<a href="#">horn1954 (91)</a> ★	Sep-01-02 21:50:04 PDT	<a href="#">1369319201S</a>
<b>Neutral</b> : Shipping damage...everything else OK		
<a href="#">budsett (1)</a>	Sep-01-02 18:35:16 PDT	<a href="#">1374945559S</a>
<b>Praise</b> : Item in good shape...could have been cleaned up a bit		
<a href="#">eaglet1223 (13)</a> ★	Sep-01-02 18:35:00 PDT	<a href="#">1371699379S</a>
<b>Praise</b> : Sears is Awesome. Got my product well packed. Gotta love them. Buy from sears!		
<b>Left by</b>	<b>Date</b>	<b>Item# S/B</b>

[\(previous page\)](#) [1](#) [ [2](#) ] [3](#) [4](#) [5](#) [6](#) [7](#) ... [20](#) ... [40](#) ... [60](#) ... [80](#) ... [100](#) ... [120](#) ... [140](#) ... [160](#) [161](#) [\(next page\)](#)



# Reputation System Challenges

- Ad hoc computation
- Collusion
- Change of identity
- Multiple identities
- Hard to get negative feedback
- Discrimination
- Fraud is on the rise

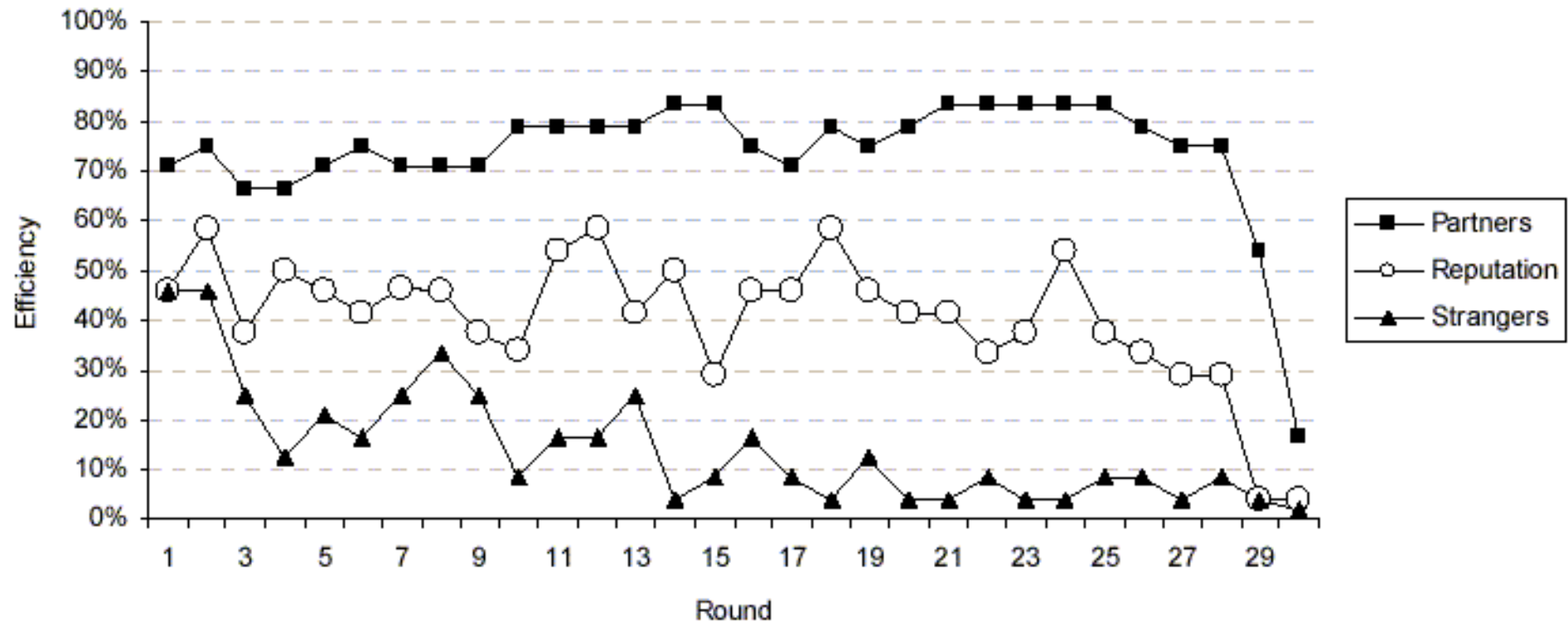
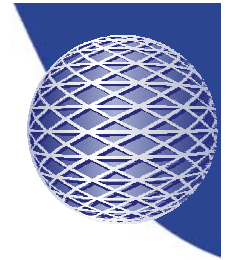


# Yhprum's Law

(systems that shouldn't work sometimes do)

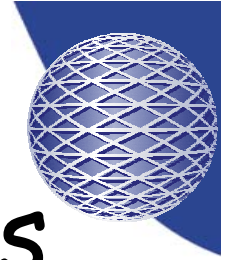
- Buyers provide feedback despite having no rational incentive to do so.
- Negative feedback is hard to elicit.
- Present reputation systems are easy to manipulate.

# Market Efficiency Experiment



Source: Bolton, Katok, Ockenfels, 2002

# Simulating the Effect of Reputation Systems on e-Markets

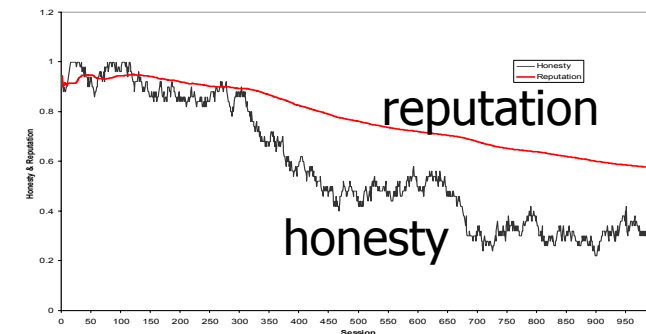


- Selling and buying software agents.
- Programmed to maximize profit by being dishonest.
- Honesty pays with reputation system

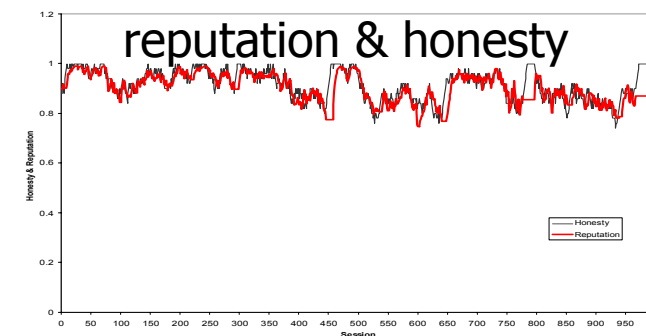
*No  
feedback*



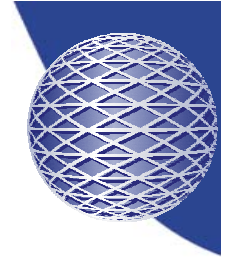
*Endless  
feedback*



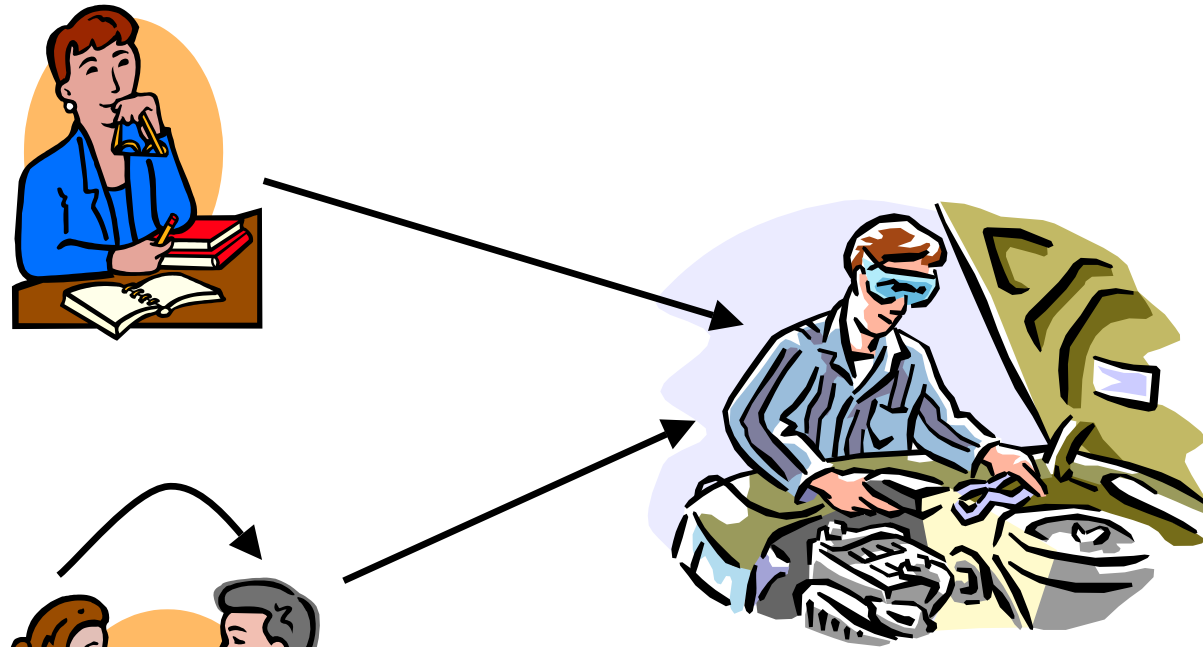
*Fading  
feedback*



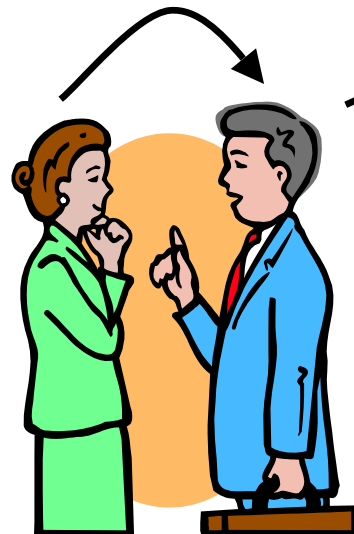
# Recommendations and Transitive Trust

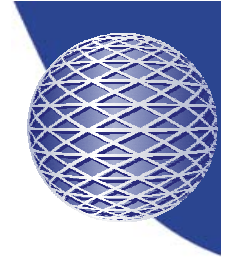


Direct trust:



Indirect trust:

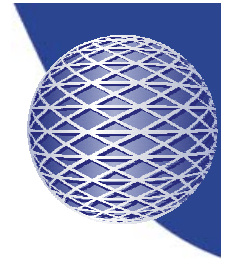




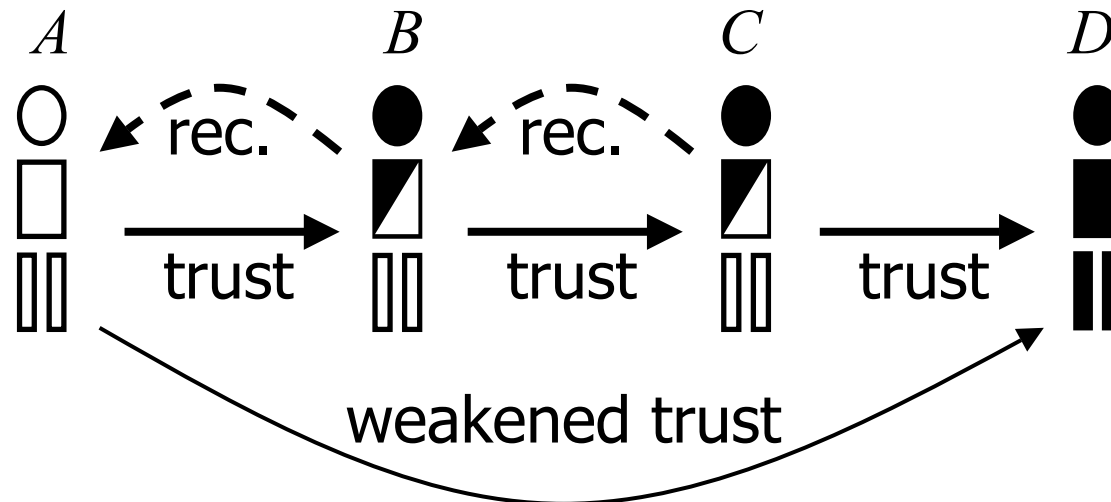
# Trust Types

- Direct trust = Trust for a specific purpose
- Indirect trust = Trust for recommending  
(for a specific purpose)
  
- Primary trust = Trust from own experience
- Secondary trust = Derived trust from  
recommendations

# Trust Transitivity

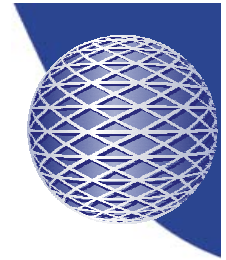


Trust gets weakened in a transitive chain.

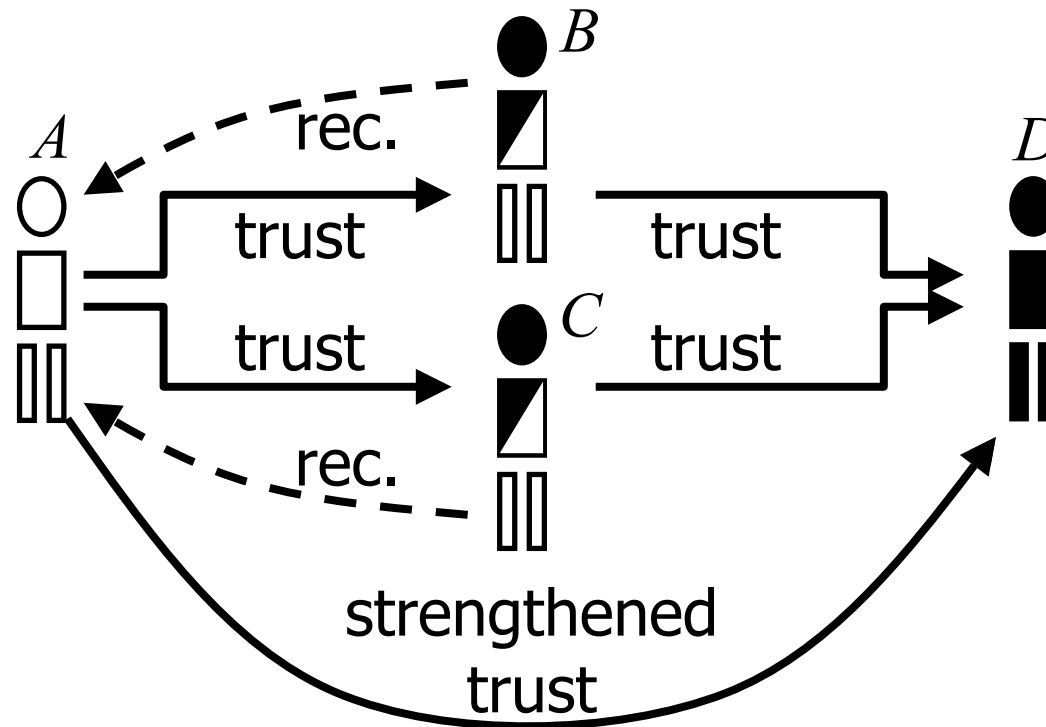


Notation:  $A \xrightarrow{\quad} D = A : B : C : D$

# Trust Combination

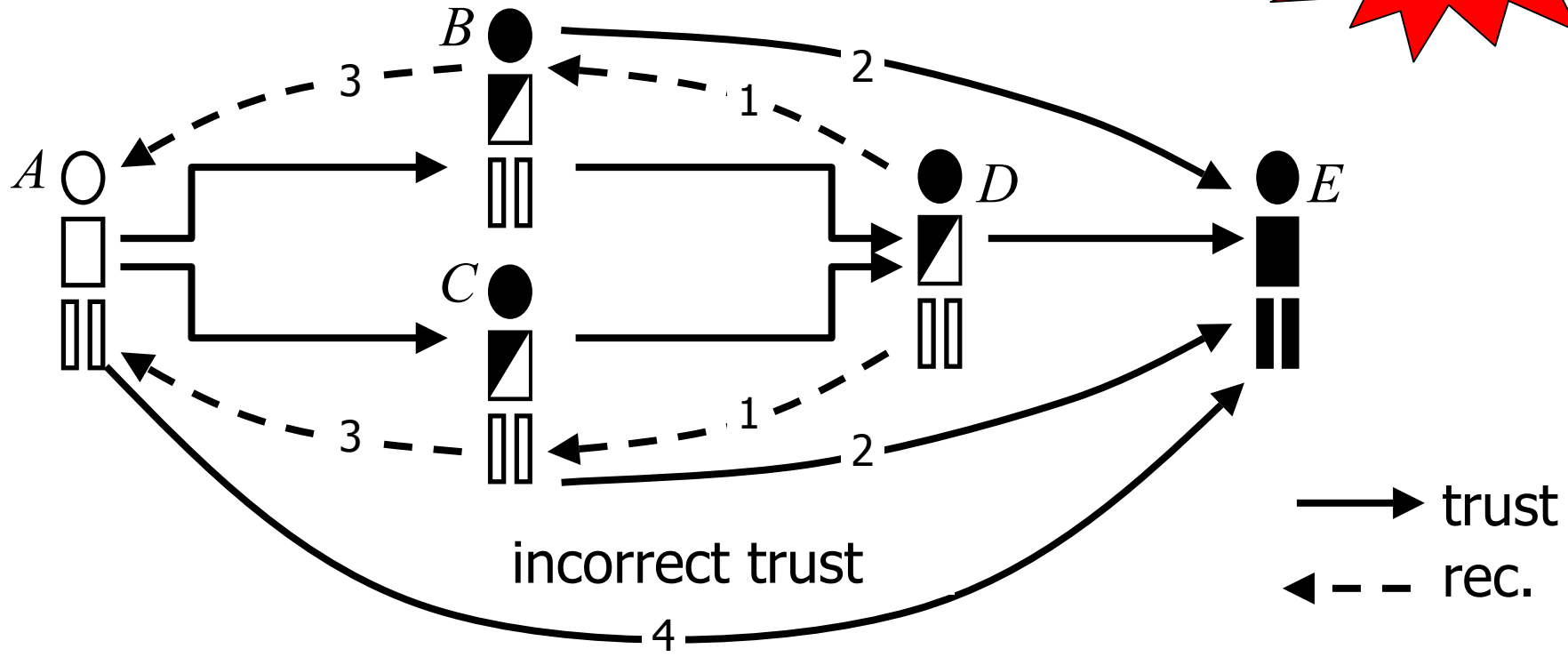
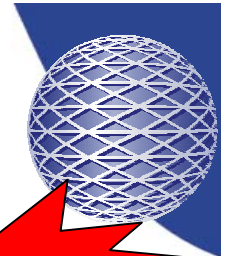


Parallel combination can strengthen trust



Notation:  $\vec{A : D} = (A : B : D), (A : C : D)$

# Recommending Secondary Trust



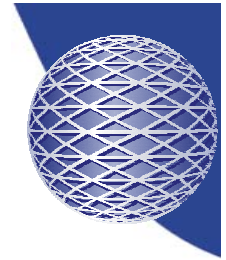
Perceived topology:

$(A : B : E), (A : C : E) \neq$

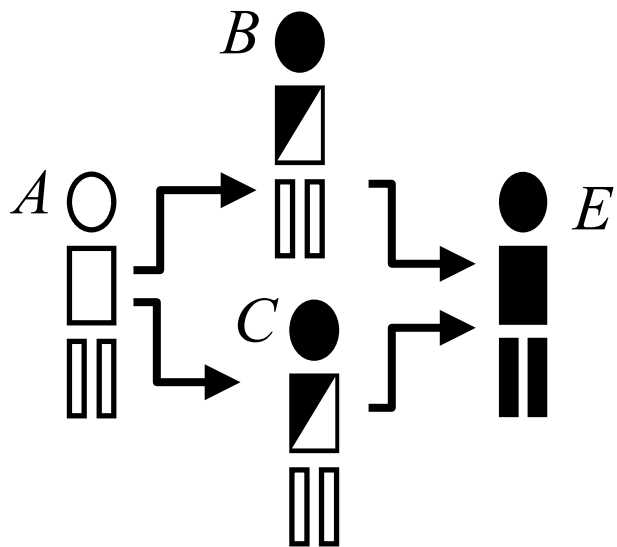
Hidden topology:

$(A : B : D : E), (A : C : D : E)$

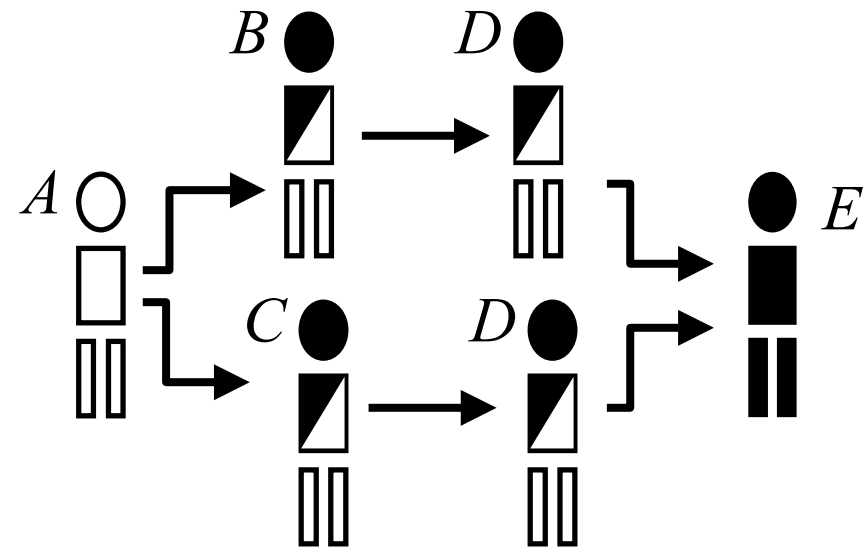
# Hidden and Perceived Topologies



Perceived topology:

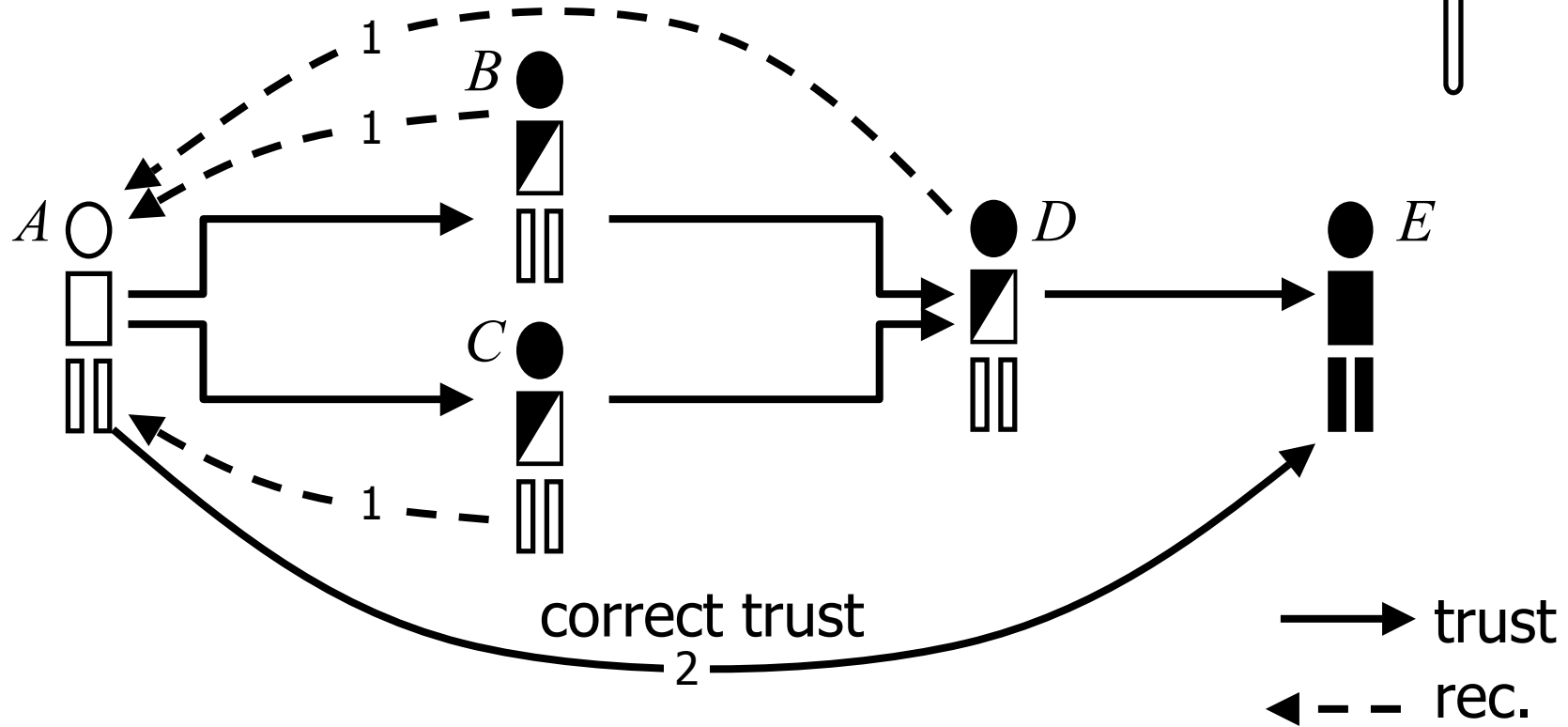


Hidden topology:

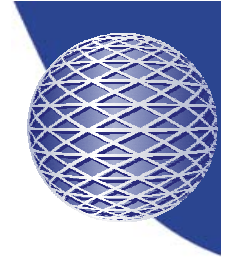


$$(A : B : E), (A : C : E) \neq (A : B : D : E), (A : C : D : E)$$

# Recommending Primary Trust



Perceived and real topology:  $((A : B : D), (A : C : D)) : E$



# Concluding Remarks

- Reputation and recommendations
  - Extrinsic trust factors
  - important for initial trust
- Experience
  - Intrinsic trust factor
  - Important for long term trust