Hasso Plattner Institut

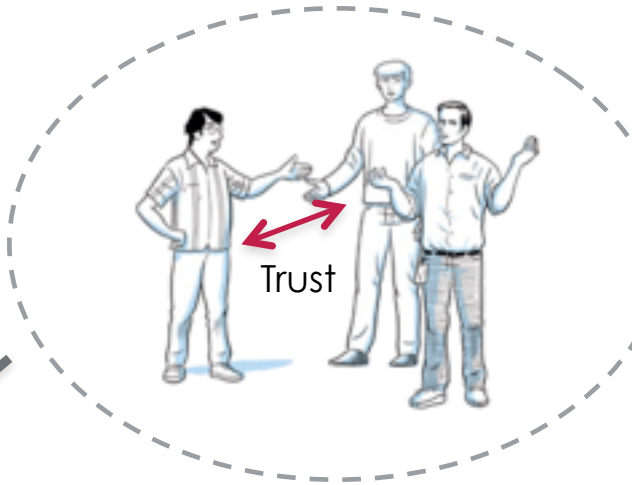
IT Systems Engineering | Universität Potsdam

More into Reputation Systems

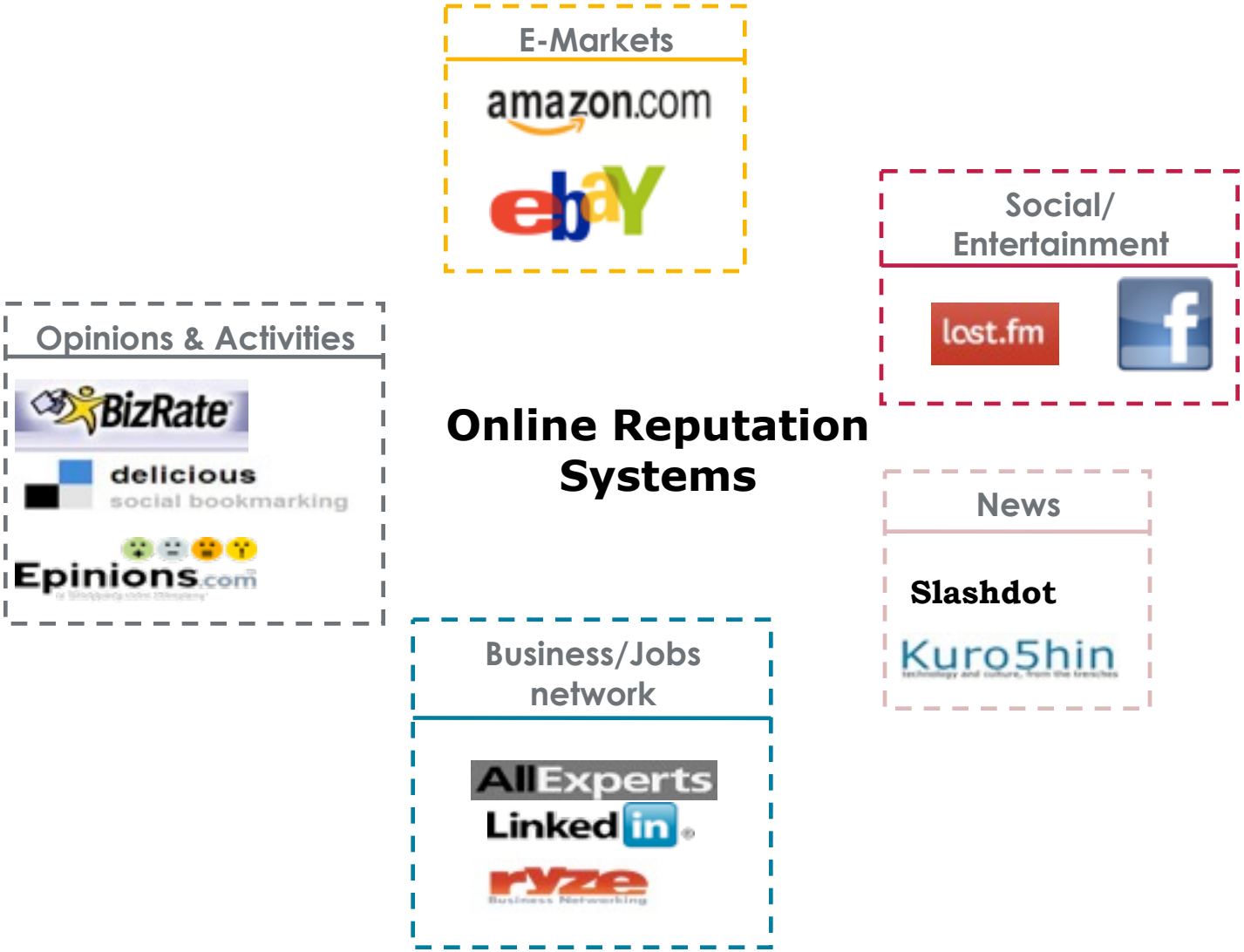
Dr. Rehab Alnemr
Prof. Dr. Christoph Meinel

Chair of Internet Technologies
Hasso Plattner Institute
Potsdam, Germany

Trust and Reputation

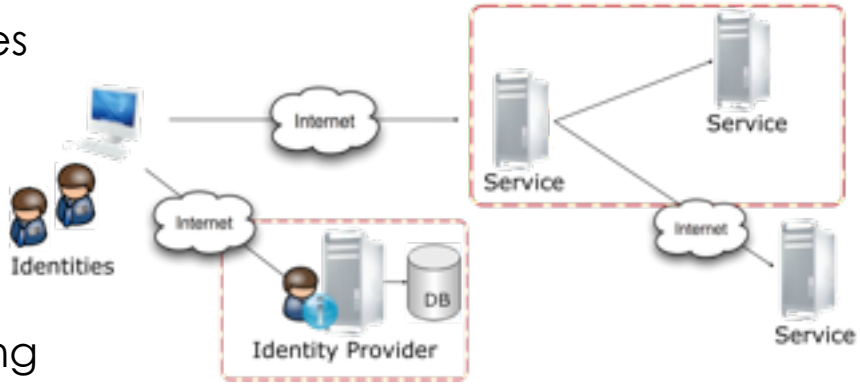


Where do we see it?



Other Reputation Systems

- **Peer-to-peer systems**
  - Sharing movies, music, ….
  - Rings any bell? Not judging here!
- **Web Services**
  - Service consumer rates services
  - Services rate services
  - Monitoring and analysis
  - Evaluating service providers
  - And naturally Cloud Computing



- **Indirect**
  - Graph Reputation Systems: PageRank

Reputation Concepts

- **Reputation Model**

  all of the reputation statements, events, and processes for a particular context

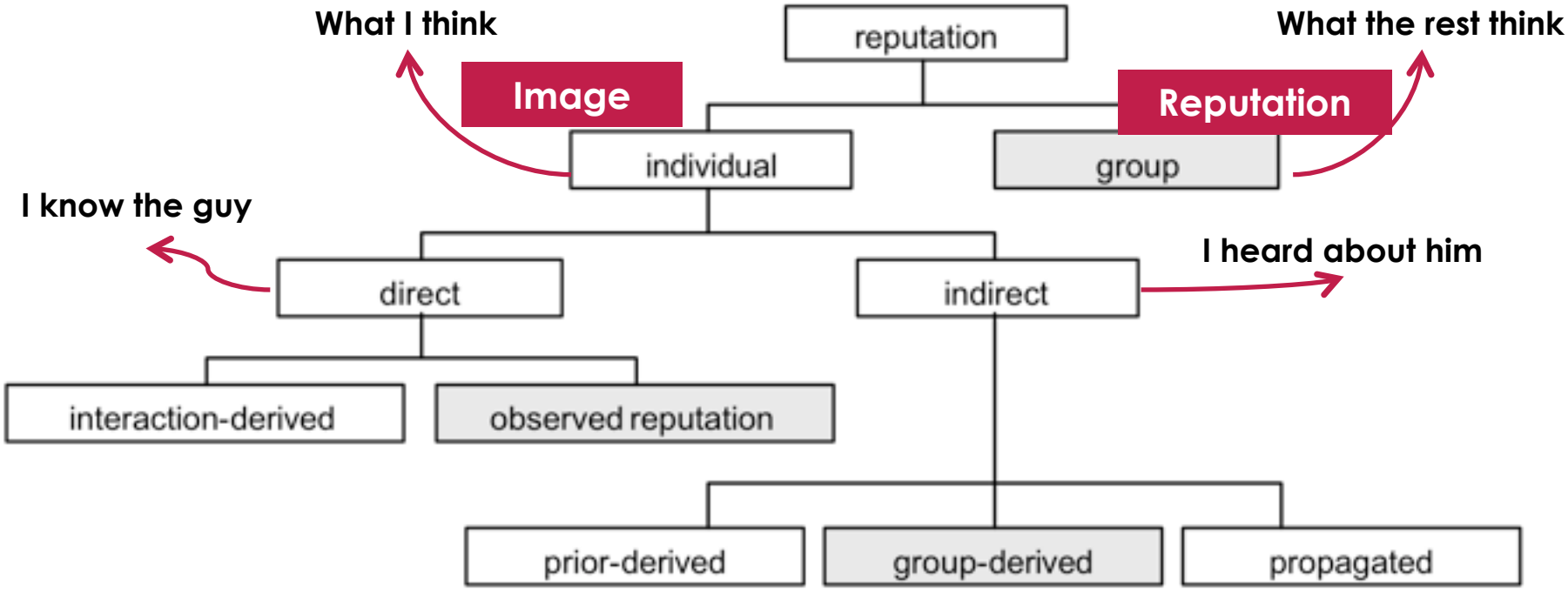
- **Reputation Context**

  the relevant category for a specific reputation

- **Reputation Target**

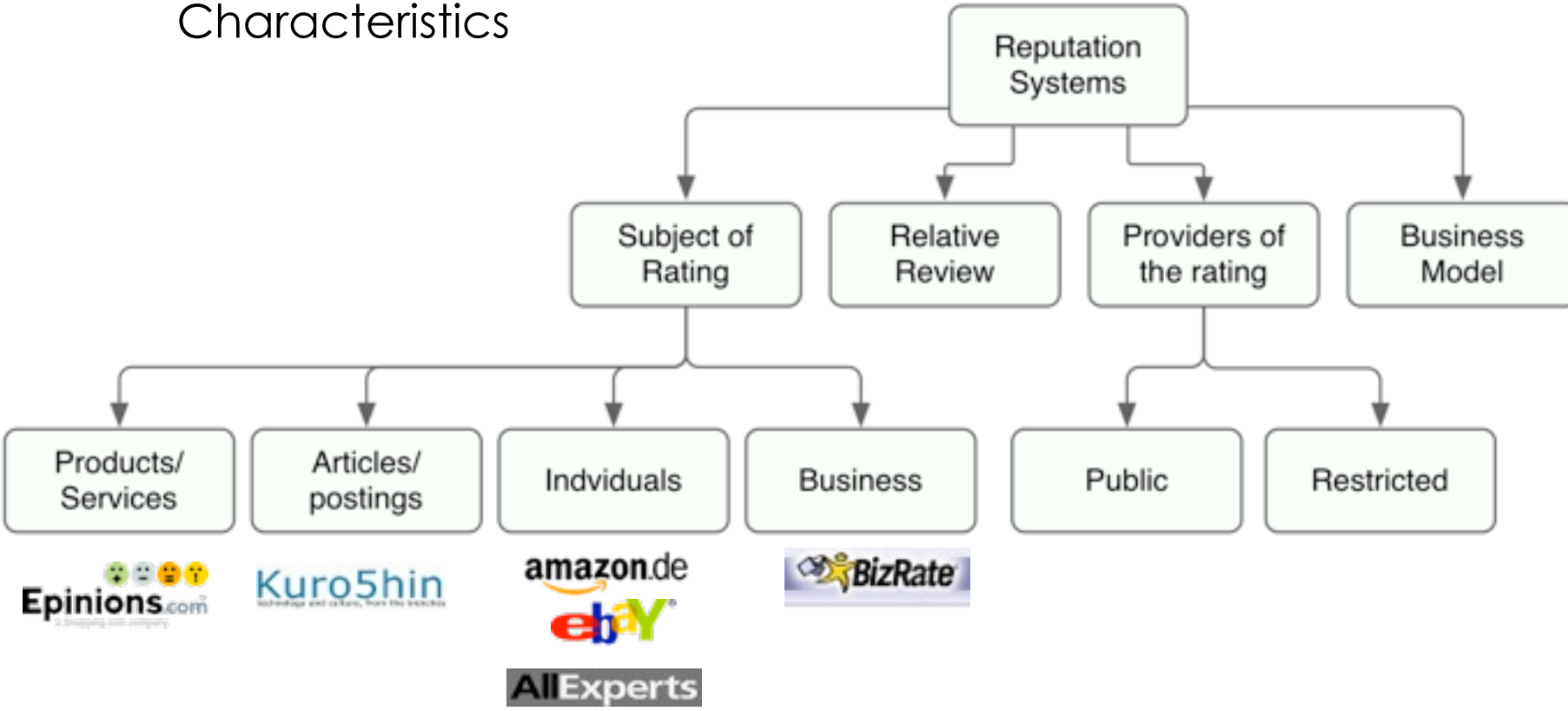
  users, movies, products, blog posts, videos, tags, companies, and IP addresses

Reputation Topology



Reputation Systems Categorized

Characteristics



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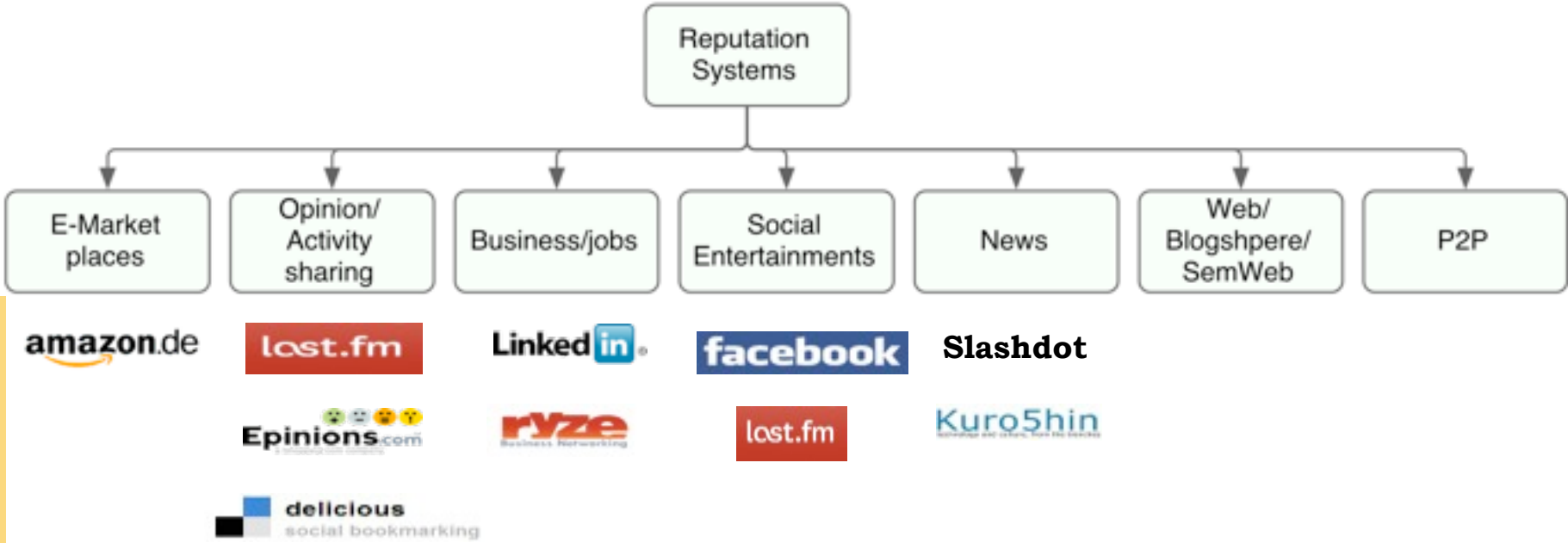
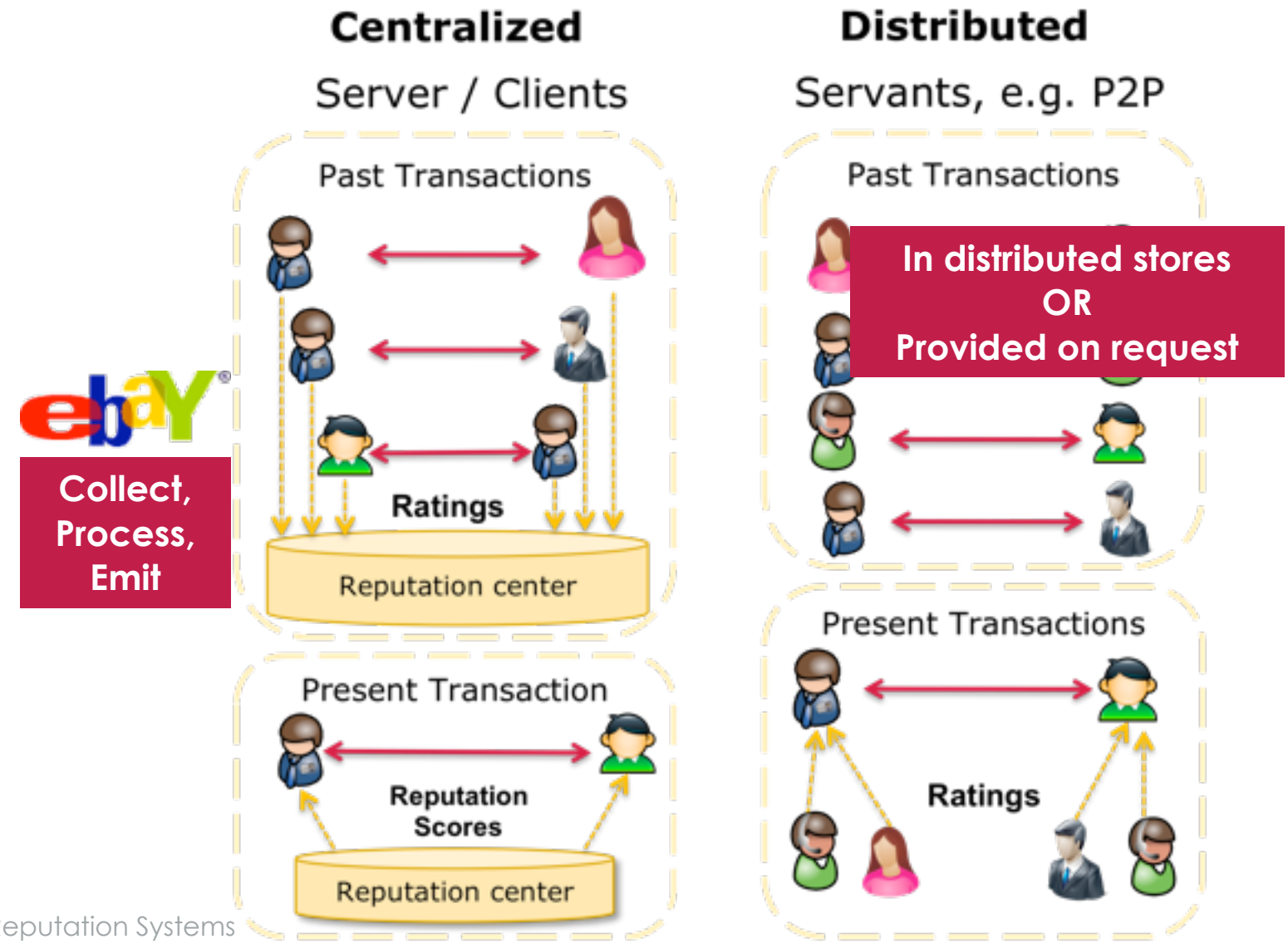


Features and properties

Reputation Systems Architecture



It is everywhere!

- E-Commerce
  - eBay
  - Amazon
  - Epinions
- Web 2.0
  - Qype
  - Slashdot
- Crowdsourcing
  - Yahoo! Answers
- Gaming
  - XBox

Ratings Methods/Models

It is not only rating…

- Ratings
- Favorites and Flags
  - Vote to Promote)
  - Favorites
  - Report Abuse
- This-or-That Voting
- Reviews
- Points
- Karma

It is not only STAR rating: Different Kinds

- Different Ratings
  (*explicit opinion about the quality of something: stars, bars,10-p scale, meters,..*)

It is not only STAR rating: Different Kinds

- Different Ratings
  (*explicit opinion about the quality of something: stars, bars,10-p scale, meters,..*)

	Series	Website audience / TV audience	Nielsen viewers (MM)
1	american idol	19.5%	30.4
2	deal or no deal	16.9%	12.2
3	dancing with the stars	9.8%	19.6
4	grey's anatomy	7.6%	19.5
5	lost	5.3%	14.6
6	heroes	5.3%	14.3
7	bachelor	5.0%	9.4
8	the office	4.4%	8.3
9	friday night lights	3.7%	6.1

It is not only STAR rating: Different Kinds

- Different Ratings
  (*explicit opinion about the quality of something: stars, bars,10-p scale, meters,..*)

Season	Program	Network	Rating
1950–1951	*Texaco Star Theater*	NBC	61.6
1951–1952	*Arthur Godfrey's Talent Scouts*	CBS	53.8
1952–1953	***I Love Lucy***		**67.3**
1953–1954			58.8

Series			
1 americ			
2 deal o			
3 dancir			
4 grey's			
5 lost		5.3%	14.6
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It is not only rating: Favorites and Flags

- Favorites and Flags
  - Vote to Promote (*Promoting in general: Digg, Reddit, and Yahoo! Buzz*)
  - Favorites (*counting how many times a user bookmark a content item*)
  - Report Abuse

It is not only rating: Favorites and Flags

- Favorites and Flags

Matt Seaton @mattseaton 1h

Time to take a historic stand against Big Energy's reckless despoliation of our planet, says @dhlovelife: guardian.co.uk/commentisfree/…

Reply Retweet Favorite

13 RETWEETS **3** FAVORITES

LIVE SCIENCE

Home | Space | Animals | Health | Environment | Technology | Culture | History | Strang

1h

ORITES

Article:

Why Some People See Sound

Charles Choi, LiveScience Contributor

Date: 23 October 2012 Time: 07:01 PM ET

Recommend 1.8k | Tweet 119 | +1 20 | Share 7

It is not only rating: This-or-That Voting

- This-or-That Voting
  (*vote on the usefulness, accuracy, or appeal of something*)

  Bounded set of options (not like vote-to-pormote)

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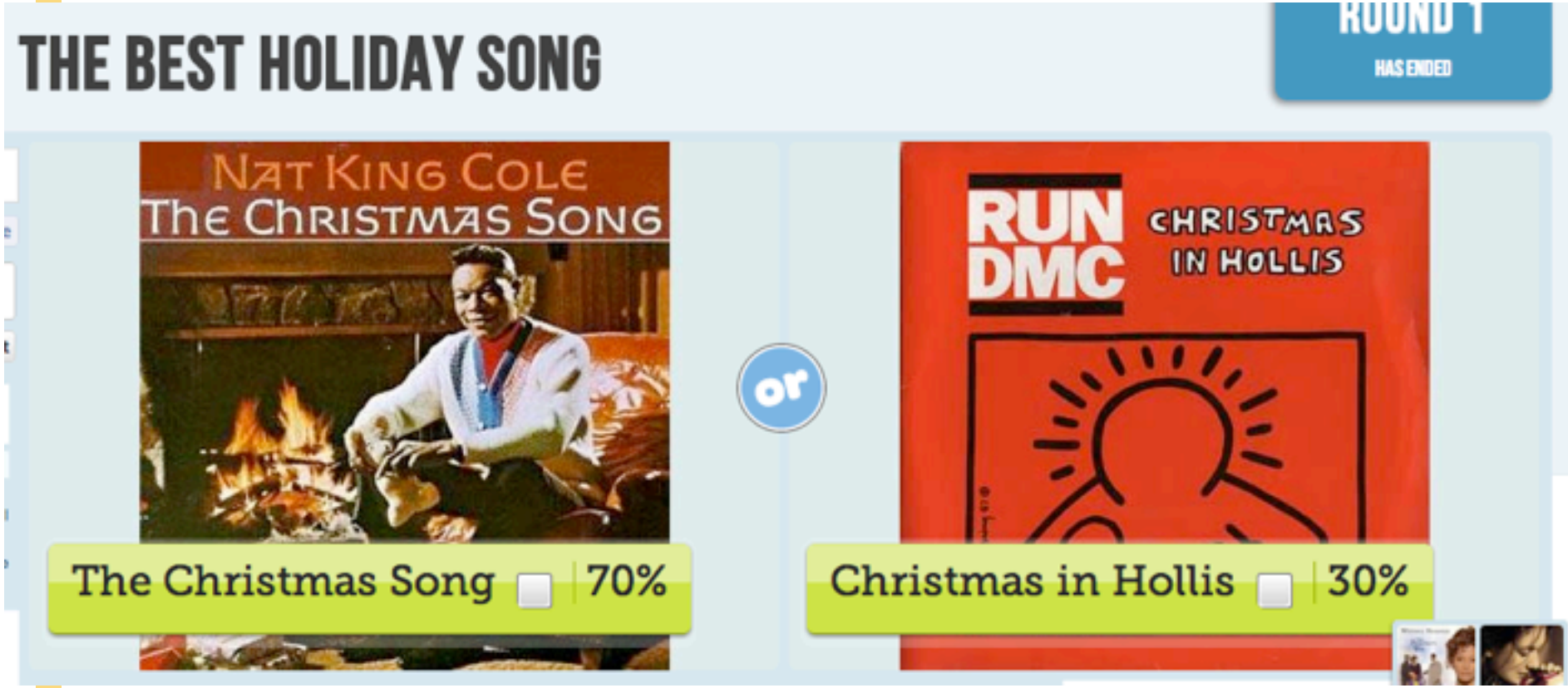
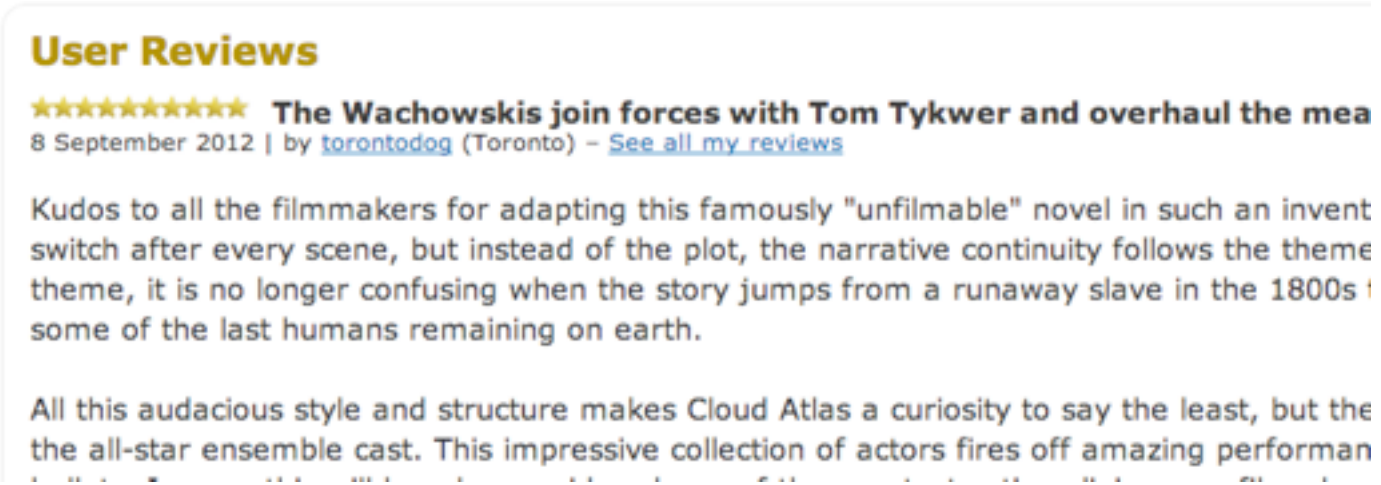


It is not only rating: This-or-That Voting

- This-or-That Voting
  (*vote on the usefulness, accuracy, or appeal of something*)

It is not only rating: Reviews and Points

- Reviews



- Points

  (hits, actions, and activities that users engage in)

It is not only rating: Reviews and Points

Points Table

Action	Points
Begin participating on Yahoo! Answers	One Time: 100
Ask a question	-5
Choose a best answer for your question	3
No Best Answer was selected by voters on your question	Points Returned: 5
Answer a question	2
Self-deleting an answer	-2
Log in to Yahoo! Answers	Once daily: 1
Vote for an answer	1
Vote for No best answer	0
Have your answer selected as the best answer	10
Receive a "thumbs-up" rating on a best answer that you wrote (up to 50 thumbs-up are counted)	1 per "thumbs-up"
Receive a violation	-10

It is not only rating: Karma

- Karma = Reputation for Users

  (*usually create incentives for user behavior: amount and quality of participation*)
  (usually combined with other rating models)

It is not only rating: Karma

- Karma = Reputation for Users

Feedback earned for transactions on eBay View your eBay My World page

Positive Feedback: 99.9%
Feedback score: 9423
[How is Feedback calculated?]

Detailed Seller Ratings (last 12 months)

Criteria	Average rating	Number of ratings
Item as described	★★★★★	1254
Communication	★★★★★	1248
Shipping time	★★★★★	1252
Shipping and handling charges	★★★★★	1246

Latest Feedback See all

Recommend to all. Oct-28-12 08:55
Buyer: jimijam (363 ★)

Thanks! As Described! Oct-28-12 08:28 Item #: 4003197366

Rating Methods in Online Societies

	Rating Levels	Entities Rated	Rating Semantics	Seller Feedback	Selling/ Financial transaction	Overall/ Detailed Rating	Rating Source
Amazon	5	Sellers Products	+ve : 5 or 4 Neutral: 3 -ve: 2 or 1	No	Yes	Yes	Customers Spotlight
		Reviews	Hated it: 1 Loved it: 5				
eBay	Starts at 3 Till 10	Members		Yes	Yes	Yes	Members
Epinions	5	Sellers Products	Excellent: 5 Poor: 1		No	Yes	Trusted Agents Customers
	4	Reviews Reviewers					
BizRate	5	Products Merchants		No	No	No	Customers Trusted Agents
	4	Reviews					
Yahoo	6	Sellers Products	Excellent: 5 Poor: 1	Yes	Yes	Yes	Members
	2	Reviews	Helpful Not Helpful				

Implicit vs. Explicit Ratings

Where are you going to do your graduate studies?

I'm going to Stanford. I just got accepted 2 days ago.

Why Stanford? You could go to Yale or Harvard.

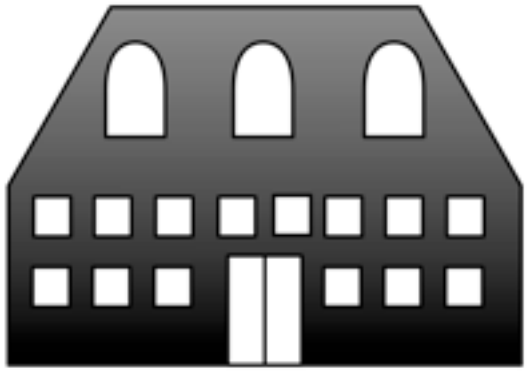
Explicit: the statement

Stanford has the best Design Thinking program. They were the 1st ones to start the discipline

Implicit vs. Explicit Ratings

Where are you your graduate studies?

Implicit: Actually going there



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Why Stanford? You could go to Yale or Harvard.

Reputation Models and Calculations

How to Quantify Reputation?

- How do we represent trust numerically? fractions, integers, percentages or some other representation?
- What is the range of possible values for a trust value? What meaning can we assign to a particular value?

Trustworthiness level	Trustworthiness value (user defined)	Visual representation (star rating system)
Level −1	$x = -1$	Not displayed
Level 0	$x = 0$	Not displayed
Level 1	$0 < x \leq 1$	From ★ to ⯪
Level 2	$1 < x \leq 2$	From ★⯪ to ★★
Level 3	$2 < x \leq 3$	From ★★⯪ to ★★★

Calculation Methods

provide a method for calculating the trustworthiness value for use in the current timeslot. Such as:

- Sum
- Average
- deterministic
- Bayesian
- fuzzy systems
- .....

Calculation Factors

(a) Deterministic approach

Credibility or trustworthiness of reputation opinion

$$T_{RA}(k,n) = \alpha_1 \sum_{i}^{I} TC_A(i,n,c) * R_A(i,k,n,c) * TF_A(i,n,c)$$

Reputation opinion given by recommending agent i

$$+ \alpha_2 \sum_{j}^{J} TC_A(j,n,c) * R_A(j,k,n,c) * TF_A(j,n,c)$$

Time Factor

$$+ \alpha_3 \sum_{l}^{L} TC_A(l,n,c) * R_A(l,k,n,c) * TF_A(l,n,c)$$

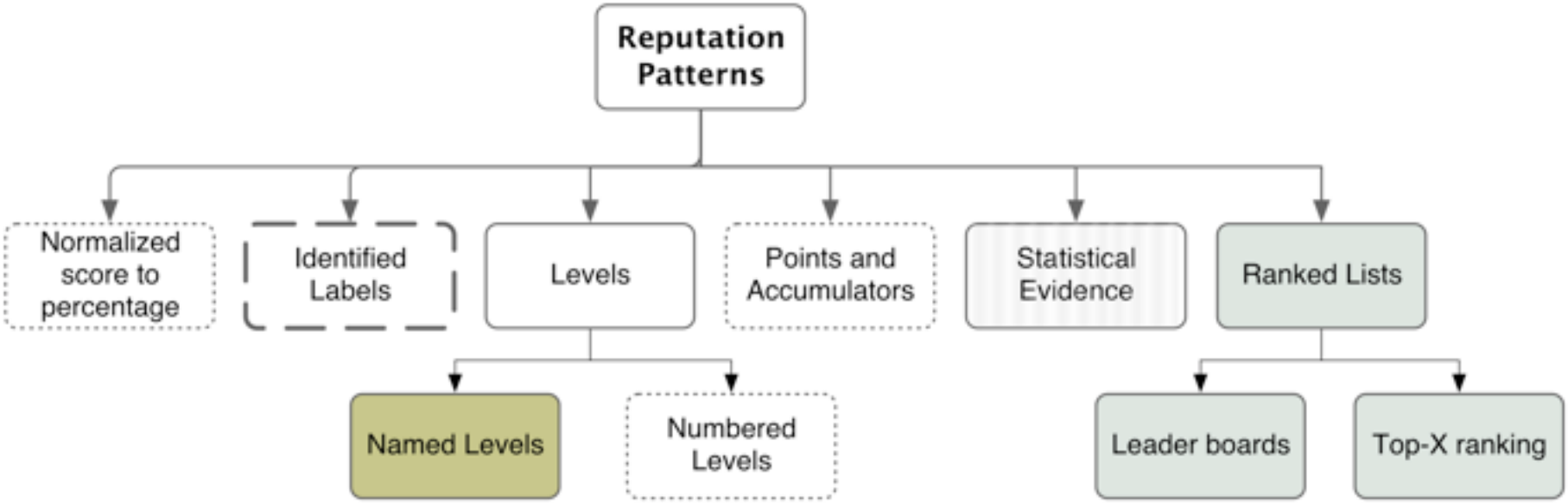
(b) Bayesian approach

Credibility **Reputation**

$$r_{ab} = \frac{\sum_{i=1}^{l} w_{ai} r_{ib}}{\sum_{i=1}^{l} w_{ai}}$$

Community Nature, Patterns and Content Control

Reputation Systems Patterns



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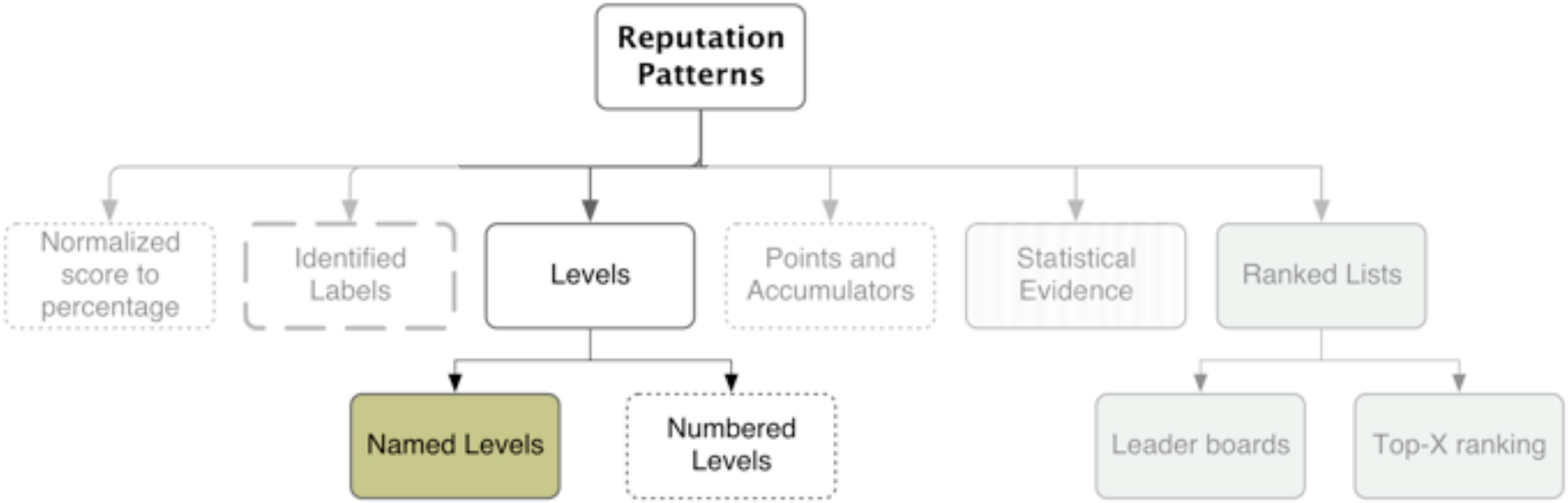

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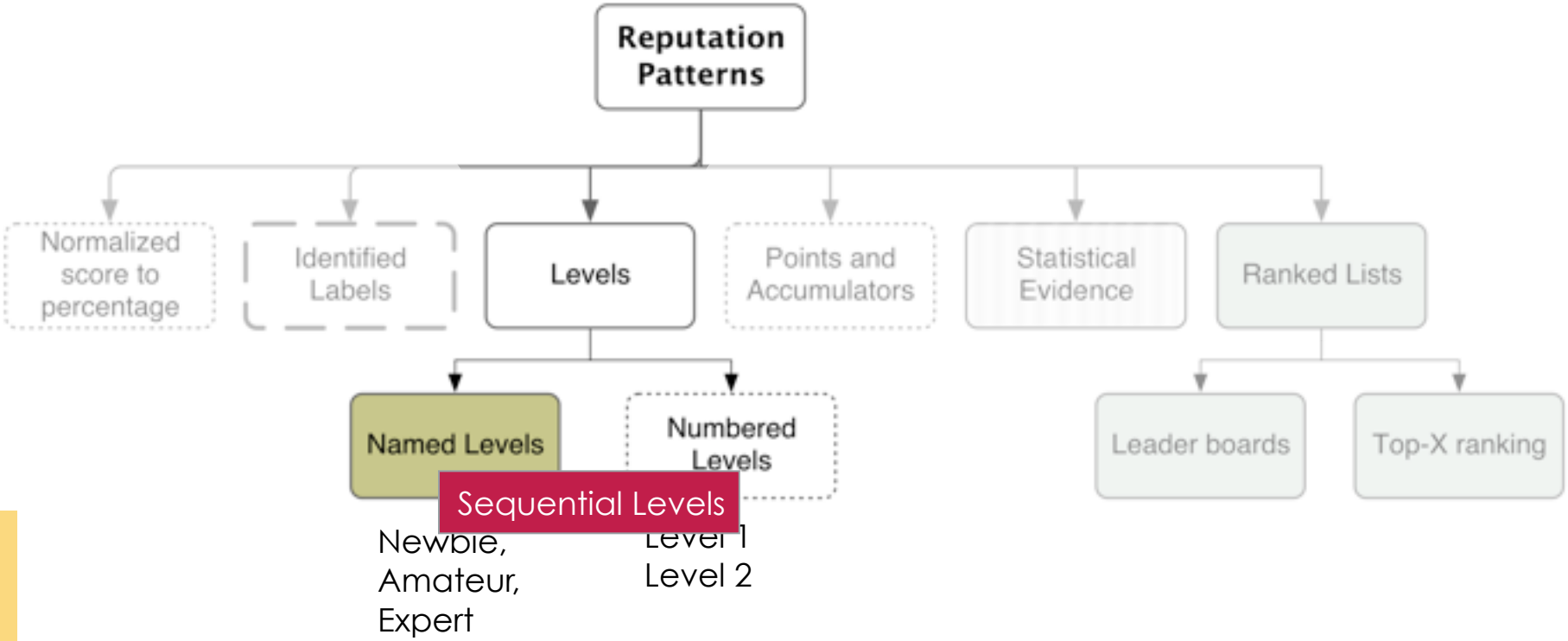
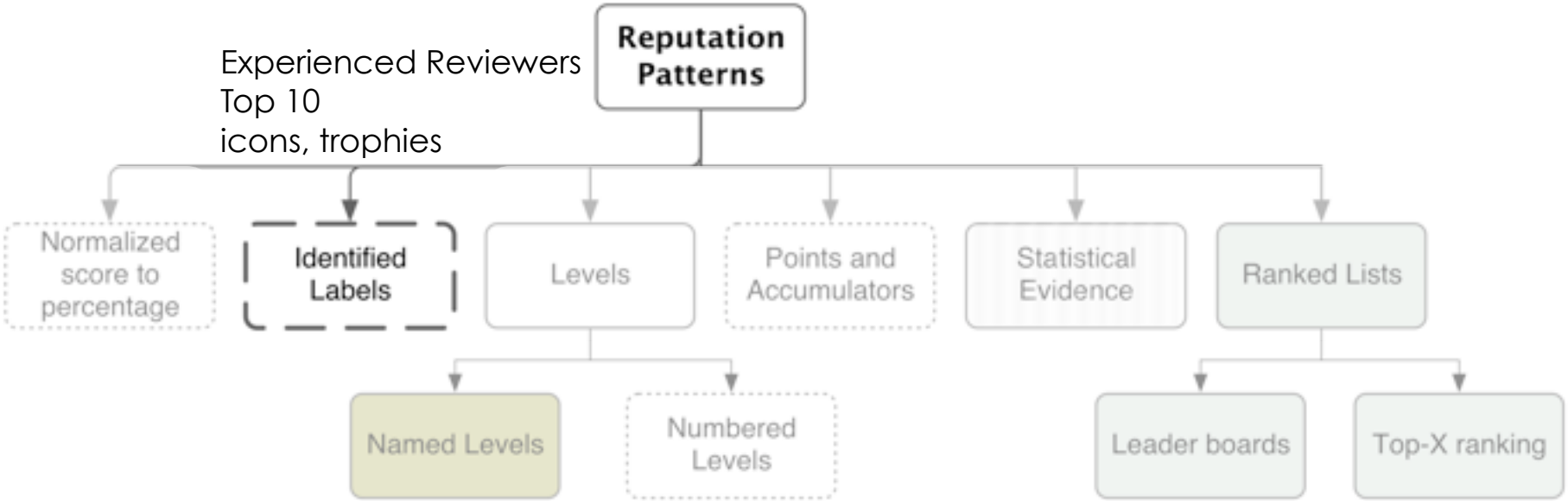


Reputation Systems Patterns

Experienced Reviewers
Top 10
icons, trophies



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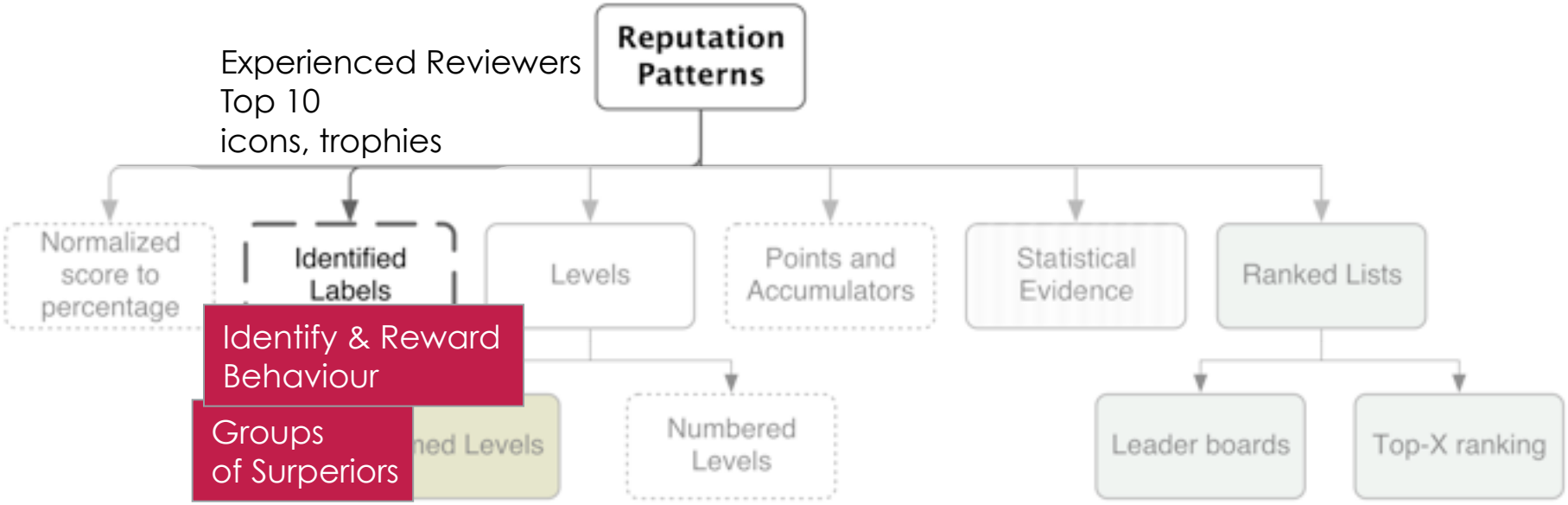

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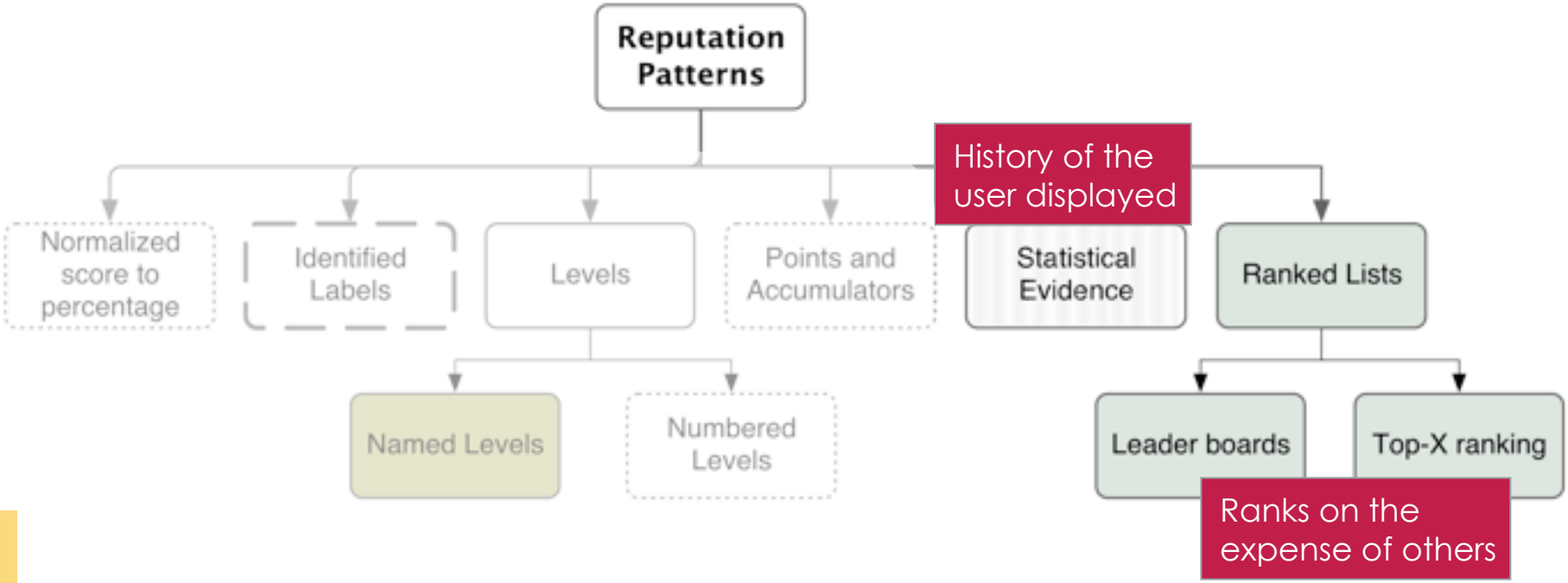

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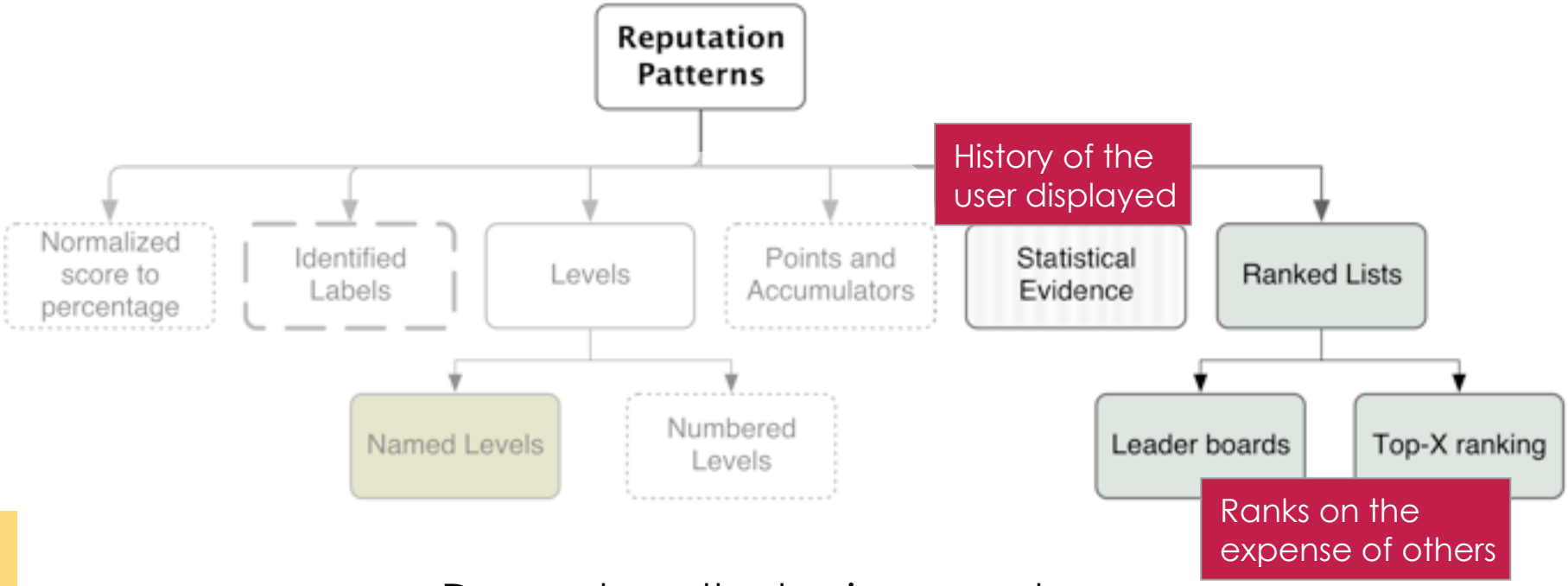
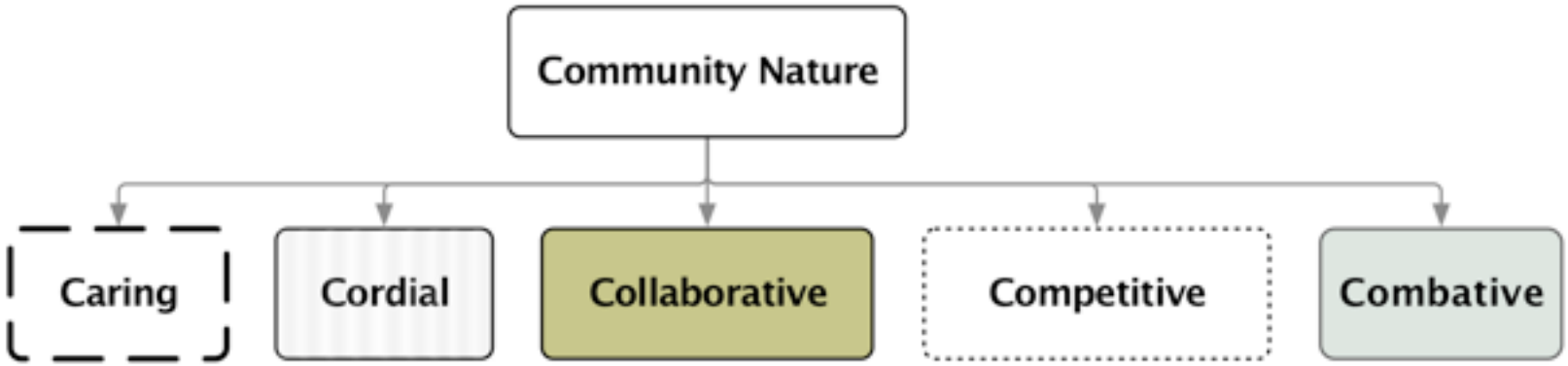


Depends on the business goals

- user engagement a primary goal?
- promoting a certain feature?
- user loyalty?

Community Nature



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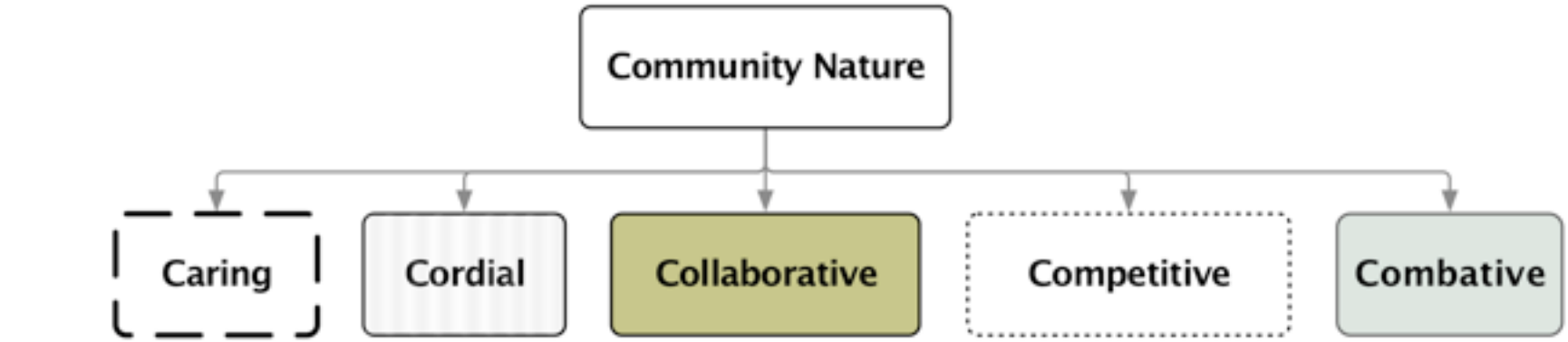


Help
Each others

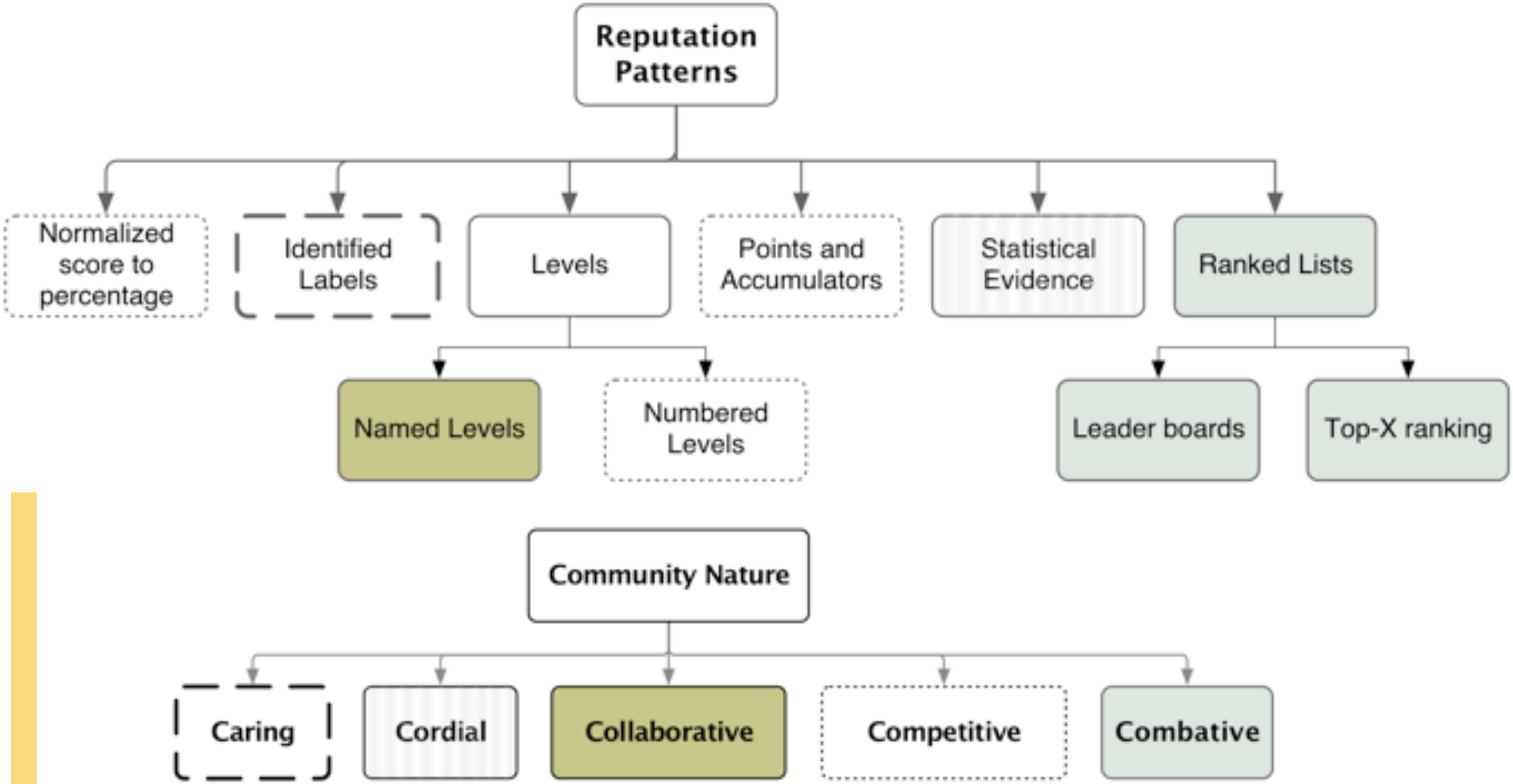
Goals aren't conflicting

Work Together

Same goal
Compete

Opposing goals
Must deny others of their goals

Reputation Systems Design Decision



Content control patterns

Create

Evaluate

Remove

Content control patterns

Create **Evaluate** **Remove**

- **Web 1.0:** Staff Creates, Evaluates, and Removes
- **Bug Report:** Staff Creates and Evaluates, Users Remove *(ex. Bugzilla)*
- **Reviews:** Staff Creates and Removes, Users Evaluate *(ex. Amazon.com)*
- **Surveys:** Staff Creates, Users Evaluate and Remove *(ex. American Idol)*
- **Submit-Publish:** Users Create, Staff Evaluates and Removes *(Citizen news sites)*
- **Agents:** Users Create and Remove, Staff Evaluates *(Agents calculate)*
- **Basic Social Media:** Users Create and Evaluate, Staff Removes *(removing when conflict occurs)*
- **Part of Web 2.0:** Users Create, Evaluate, and Remove *(Wikis)*

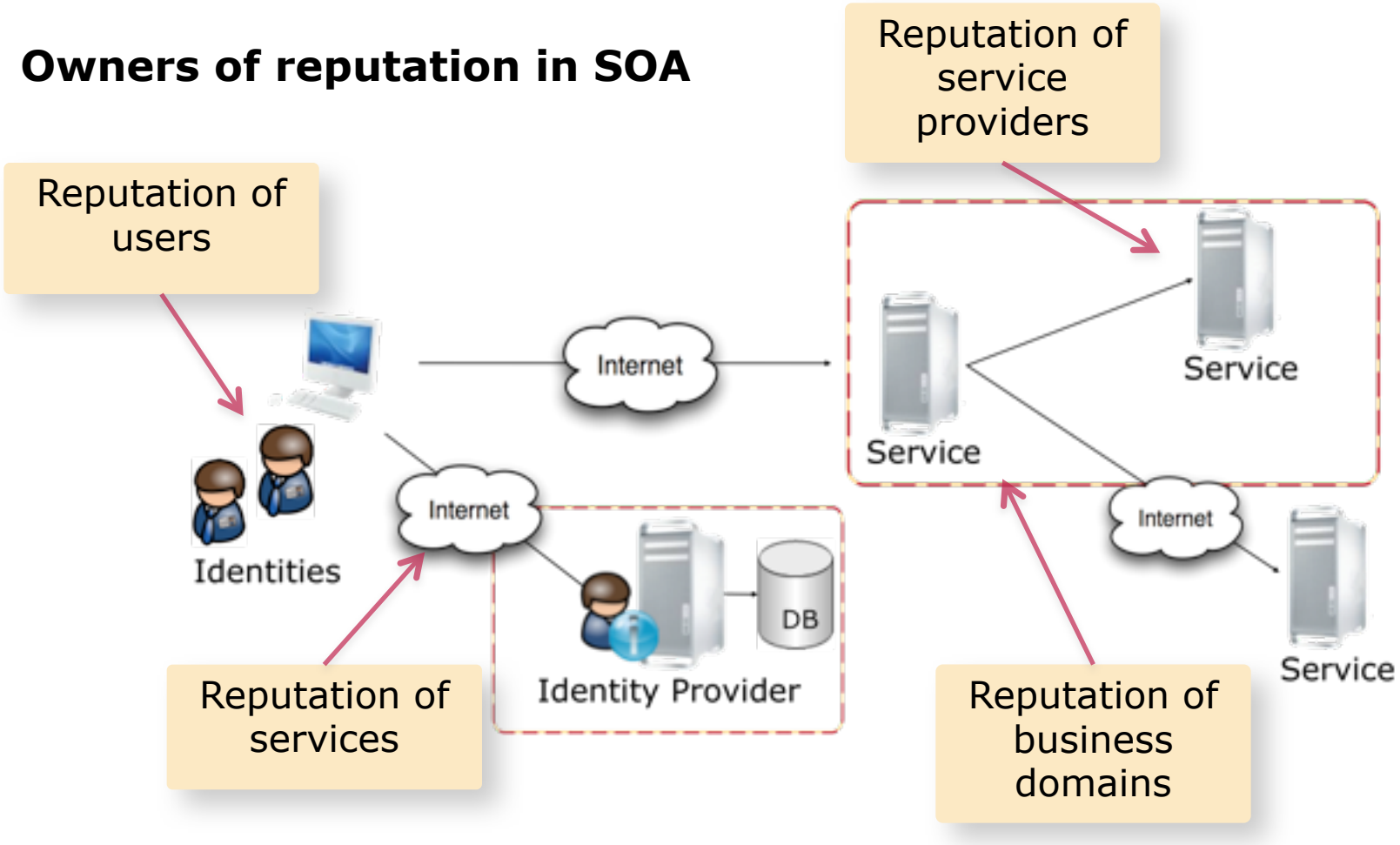
Why bother: Incentive to contribute

- **Altruistic motivation**: for the good of others
  - Tit-for-tat, community dynamics
- **Financial motivation**: to generate revenue
  - *Epinions* money for reviews, P2P networks,..
- **Egocentric motivation**: for self-gratification
  - user show their accomplishment in their profiles
  - I know it all
  - I am recognized in the community

Reputation in Service-oriented Architecture

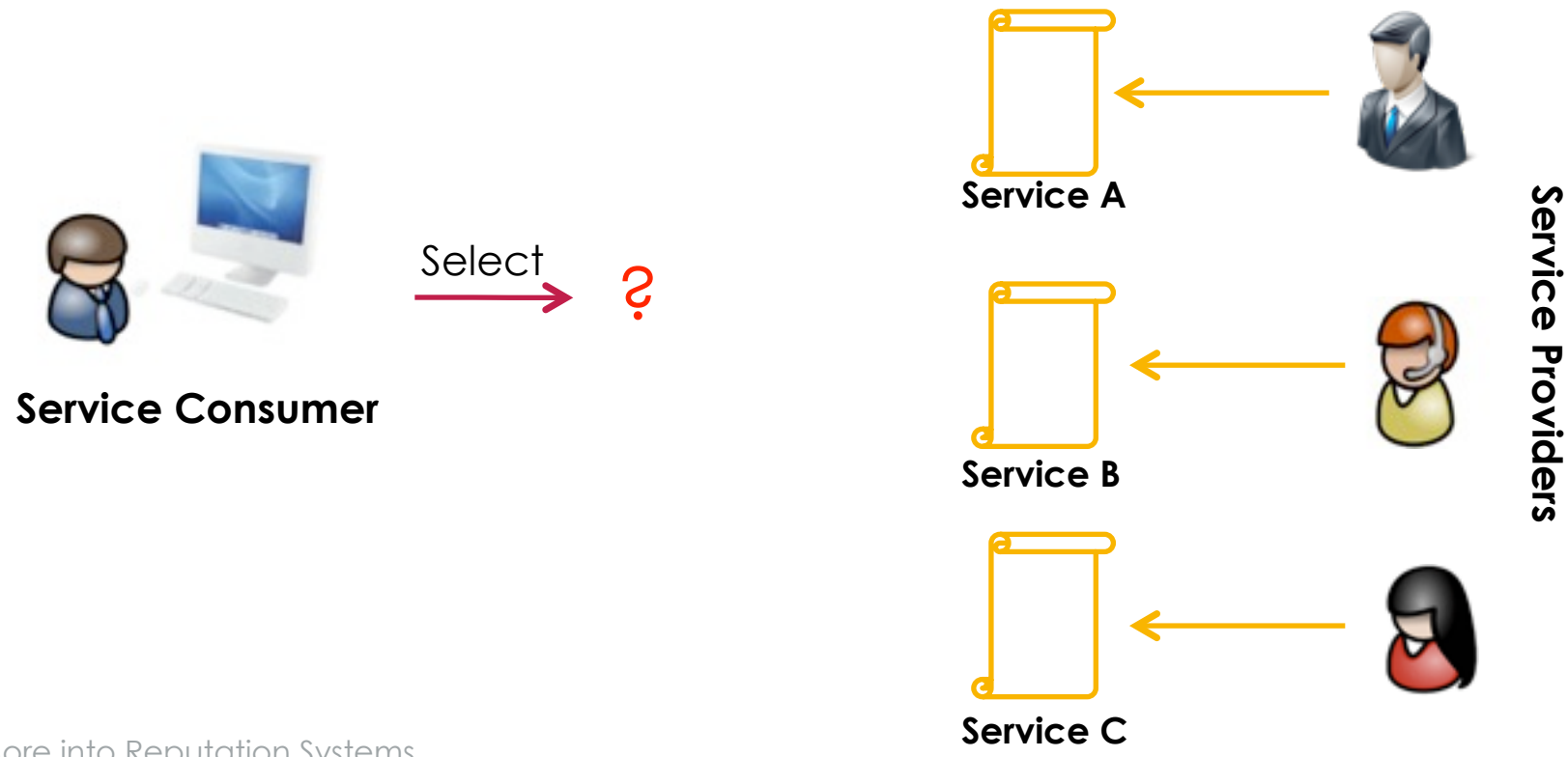
Reputation in SOA

Owners of reputation in SOA



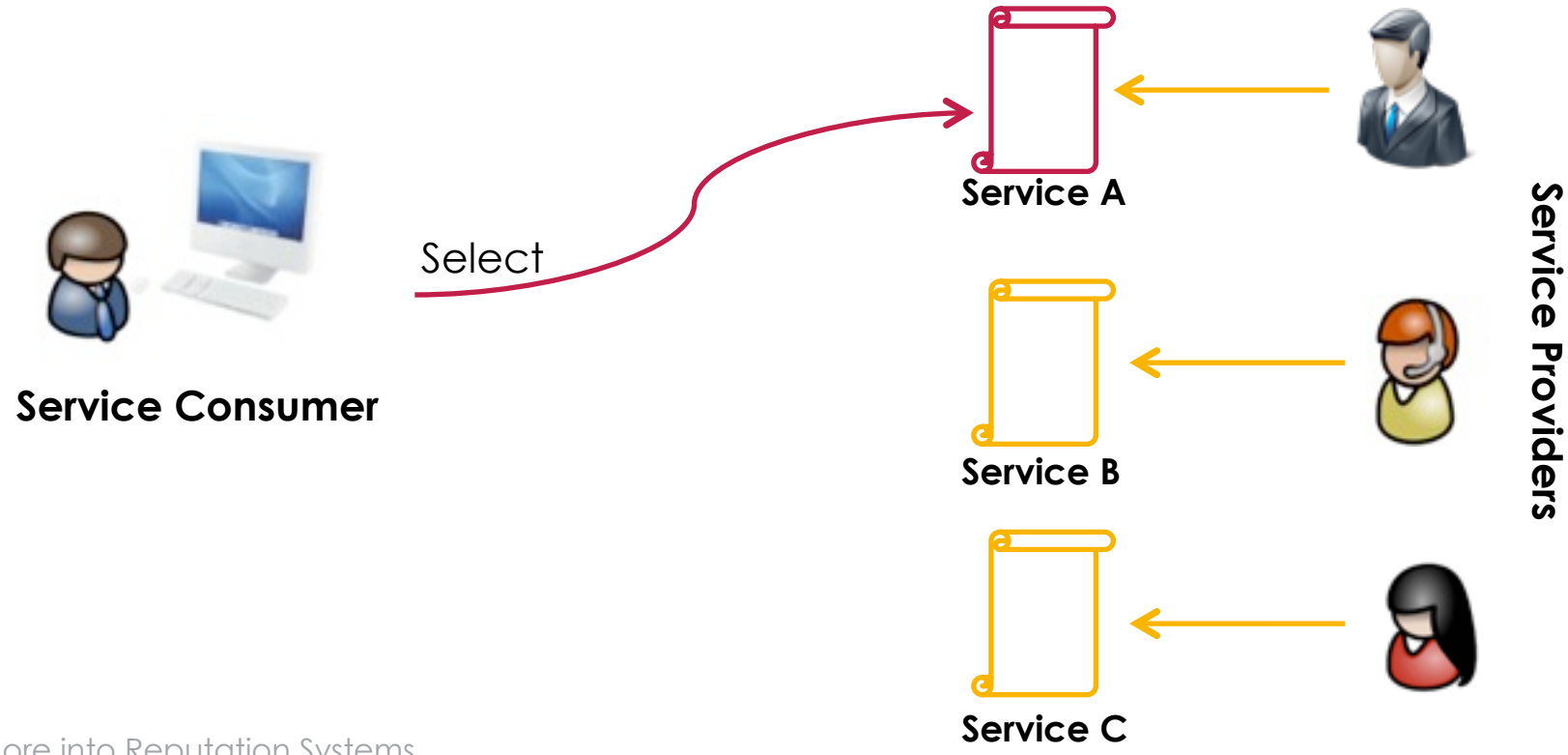
How it is used in SOA

- Service Providers: Publish the description of their services
- Service Consumers: Search for services with specific functionality



Service Matching in SOA

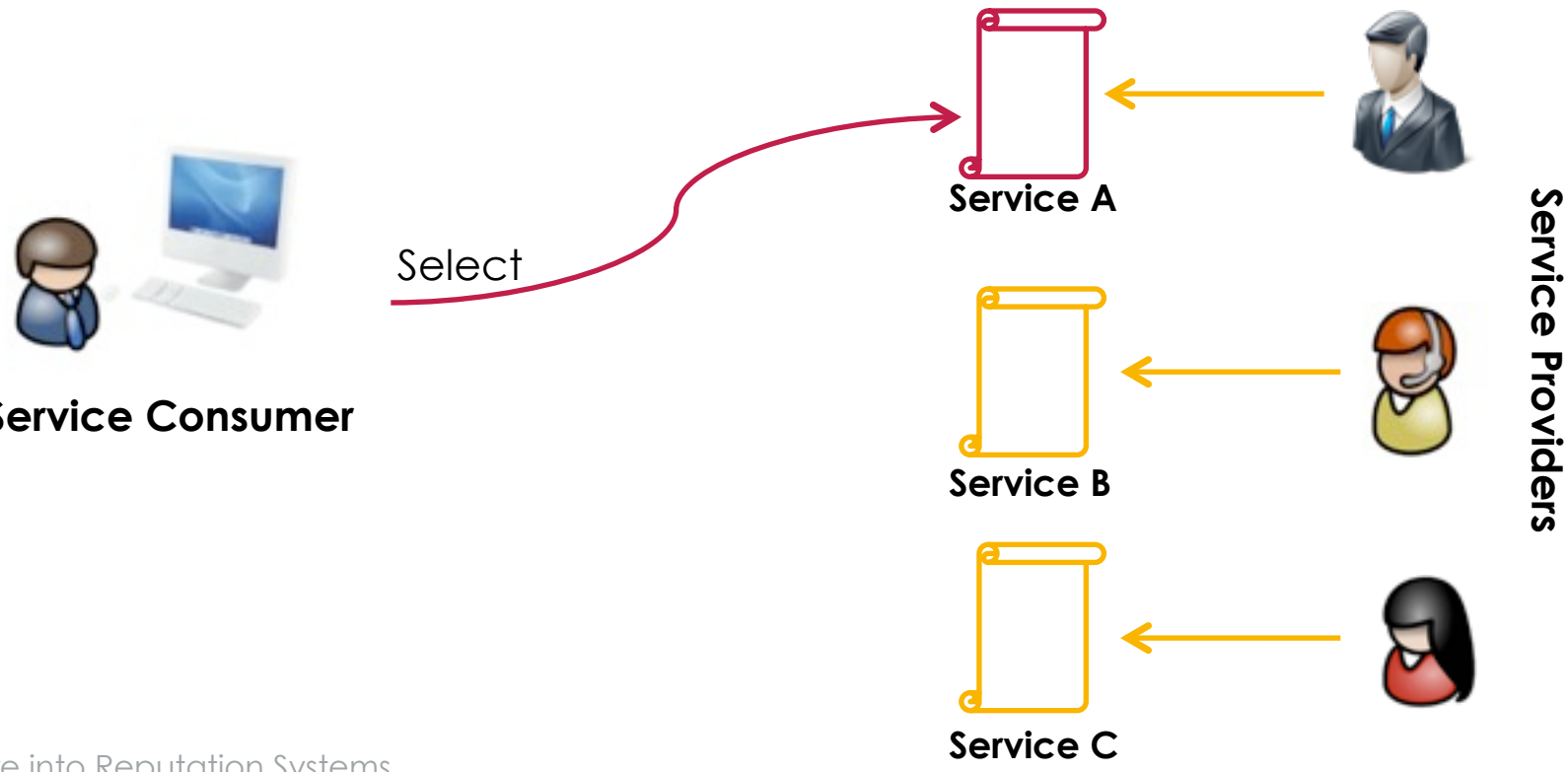
- Highest service rate
- Best availability of services
- High Bandwidth
- Reasonable Price



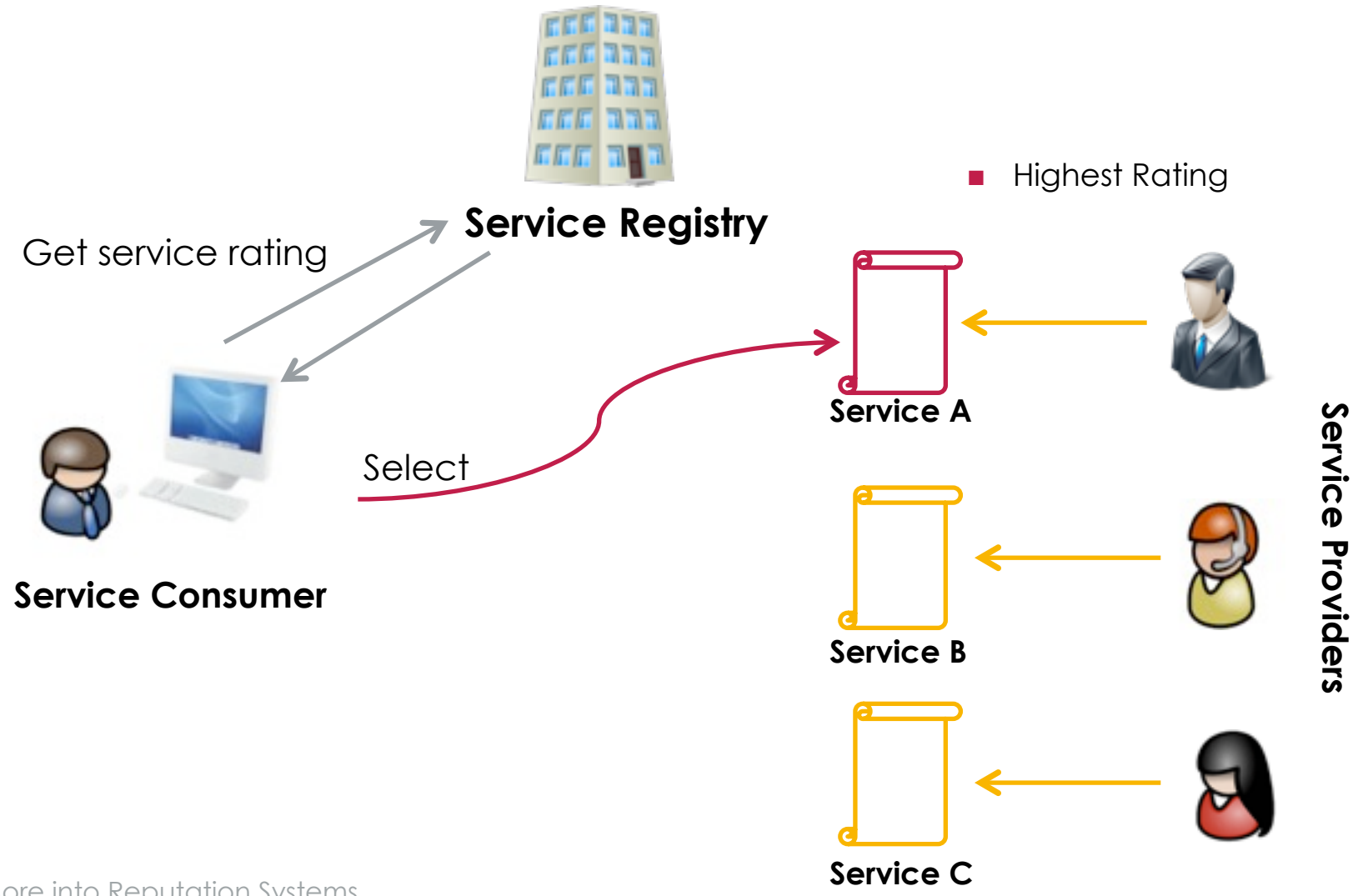
Service Matching in SOA

Quality of Service Metric = **Reputation Attributes**

- Highest service rate
- Best availability of services
- High Bandwidth
- Reasonable Price

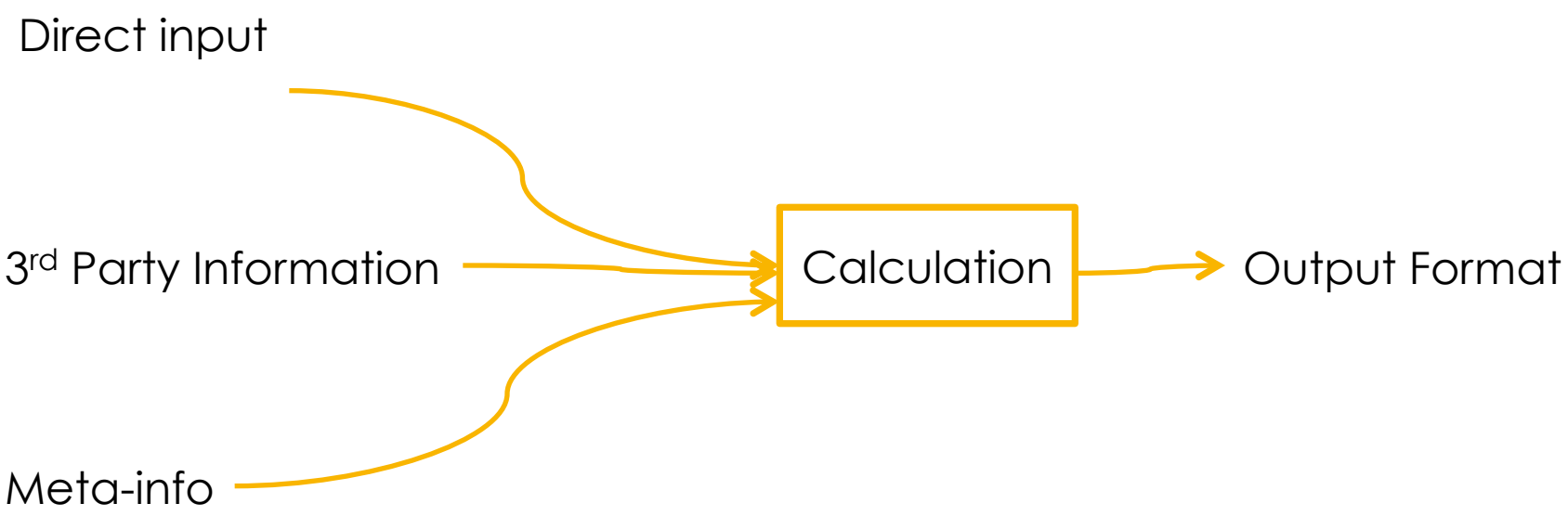


Service Matching in SOA



Reputation Systems Design

Design of Reputation Systems



Reputation Systems Properties

- **Reputation Model**
  - Capture feedback

    Why leave feedback?
  - Guide trust decisions
  - Persist over time

Reputation Systems Properties

- **Reputation Model**
  - Capture feedback
    - honest feedback?
    - Why leave ~~feedback?~~
  - Guide trust decisions
    - How to summarize feedback to lead to a decision?
    - Are all interactions equal? Weighed-Feedback
  - Persist over time

Design of Reputation Systems

A reputation system should describe

- **Computation functions**/mechanisms, i.e. how to calculate reputation?
- **Communication model**, i.e. how to collect and disseminate reputation?
- **Participants**, i.e. who uses and/or is affected by reputation?
- **Resources**, i.e. what is the information used to calculate reputation?
- **Representation model**, i.e. how to represent, view, or visualize reputation?
- **Storage**, i.e. where and how is reputation stored?
- **Functionalities and applications**, i.e. what are the benefits of using reputation in the domain of its creation?

Design of Reputation Systems

- In the system design, questions need to be answered
  - What inputs should be solicited ?
  - What outputs should be presented ?
  - How transparent should the rules be ?
  - How should reputation evolve over time ?

Design: Inputs

- What inputs should be solicited ?
  - Internal actions to be recorded
  - Feedback to record
  - Rating of things or rating of people (separately of what they own/create)
- How?
  - Audit your system
  - What are the actions users can do
  - Relations between actions
  - Actions to encourage vs discourage

Design: Outputs

- What outputs should be presented?
  - Statistics
  - Star Rating
  - Score/Ranks
  - Name Level
  - Badges
  - Leaderboards
  - …

Why do we need Reputation Systems?

- Trust
  - Leads to trust decisions
- Quality
  - Incentive to quality participation
  - Recognize the relatively best
- Matching and Filtering
  - Find what I am looking for
  - Reduce Information overload
- Participation
  - Reasons to stay in the community

Rehab Alnemr
(rehab.alnemr@hpi.uni-potsdam.de)