

Trust Management Survey

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Outline

1. Introduction
2. Trust as a concept
3. Trust management
4. Conclusions

Introduction

- Paper written in 2005
- Aims to provide an overview of trust management research
- Written as a part of state-of-the-art analysis of TuBE project (Trust Based on Evidence)
- Seems to be quite thorough survey

Concepts

- Trustor: Service provider
- Trustee: an entity using trustor's services
 - An independent agent in the network
 - Cannot be controlled by the service provider
- Trust:
 - *“the extent to which one party is willing to participate in a given action with a given partner considering the risks and the incentives involved”*
 - Means for people to deal with uncertainty of the future and their interaction partners

...Concepts...

- Trust decision: binary decision
 - To trust or not to trust?
- Actions: using services provided by the trustee
- Risks
 - Effects of trust
 - By authorizing someone to do something, some asset is exposed
 - Tied to assets
- Action importance
 - Business value

...Concepts

- Reputation
 - *“a perception a party creates through past actions about its intentions and norms”*
 - exists only in a community where entities observe each other
- Recommendation
 - *“an attempt at communicating a party's reputation from one community context to another”*
 - Used to transmit reputation

Trust Management Model

- Research has roots in authentication and authorization
- Certificates can be used to proof identity or membership of a group
- Policy languages are used to decide whether credentials are sufficient
- Credentials are sufficient when the system knows the trustee's identity or knows it to be a member of a trusted group
 - Static

...Trust Management Model...

- To make trust more dynamic, behavior of the trustee should be taken into account
 - Intrusion detection systems
 - Information on behavior can be collected
 - locally
 - third-party
- Newcomers are problematic for a system
 - What is the initial level of trust?
 - Problem if trust management is based only on behavior history

...Trust Management Model

- Identifying the factors
 - Which affect trust directly?
 - Which are used together with trust decision?
- Relation between risk and trust
 - Not entirely clear
 - Increased risk, increased need to trust
 - Risk is relative

Trust Information Model

- Reciprocity: mutual exchange of deeds
- Research of trust can be divided to three groups
 - Fundamental level: infrastructure
 - Service level
 - Electronic commerce
 - Highest level: the community

The trust life cycle

- Initialization
 - Choosing a partner
 - Determining suitable initial trust
- Observing and information gathering
 - Data on actions of peers
- Taking actions
 - Adjustment of trust estimate

Initializing Trust Relationship

- Discovery Service
 - out-of-band (“friend told”)
 - In more dynamic environment, automation is needed
- After locating multiple service providers, which one to trust?
- Gathering of feedback into a reputation system
 - Users give feedback which is stored
 - How to trust the entity that stores the information?

...Initializing truth relationship

- If we have a recommending party, what can we do with the information?
 - “A user is trustworthy by '3 on a scale from 1 to 5”
 - What does the value mean?
 - Is the entity trustworthy to sell a car, if the reputation is built by selling pocket lighters
 - The principals behind the values must be the same or comparable

Properties of a reputation system

- Resnick et al: Three properties of a successful reputation system:
 - The entities must be long lived and have use for reputation
 - Feedback must be gathered, distributed and made available
 - Feedback must be used to guide trust decisions
- A newcomer must gain reputation after finding trustworthy partner

Observation

- Observation can be performed independently or using an outsider
- Independent observation gives more depth
 - Personal context
- Principles of intrusion detection can be used
 - Traditionally system calls and network traffic

Methods

- Attempts to model normal behavior
 - Learn from experience
- Detect misuse
 - Construct models to match attacks
- Specification based
 - Specify normal behavior
 - For example source code

Problems

- Observation ties up resources
 - Hard to keep track on what everybody does all the time
- Is suspicious activity always bad?
 - Action taken by and actor in a different role
 - Simply unusual behavior

Evolving reputation and trust

- What are the information gathered used for?
- Mathematical models can be used to deal with experience
 - “cooperated” or “defected”
 - scalar values
- Information about user's reputation can be distributed using recommendations
 - Representation of user's identity in different communities
 - Not necessary the truth

Conclusions

- Quite new area of research
- Trust as a concept has different applications
- Separation of trust and reputation
 - Often not discussed how one affects the other
- Difficult to find a representation of trust for computer systems
- Increased level of automation is needed, but there is need for human intervention

Thank you!
Questions?