TrustNeighborhoods

3D Trust
Visualization

TrustNeighborhoods: Visualizing Trust in Distributed File Sharing Systems

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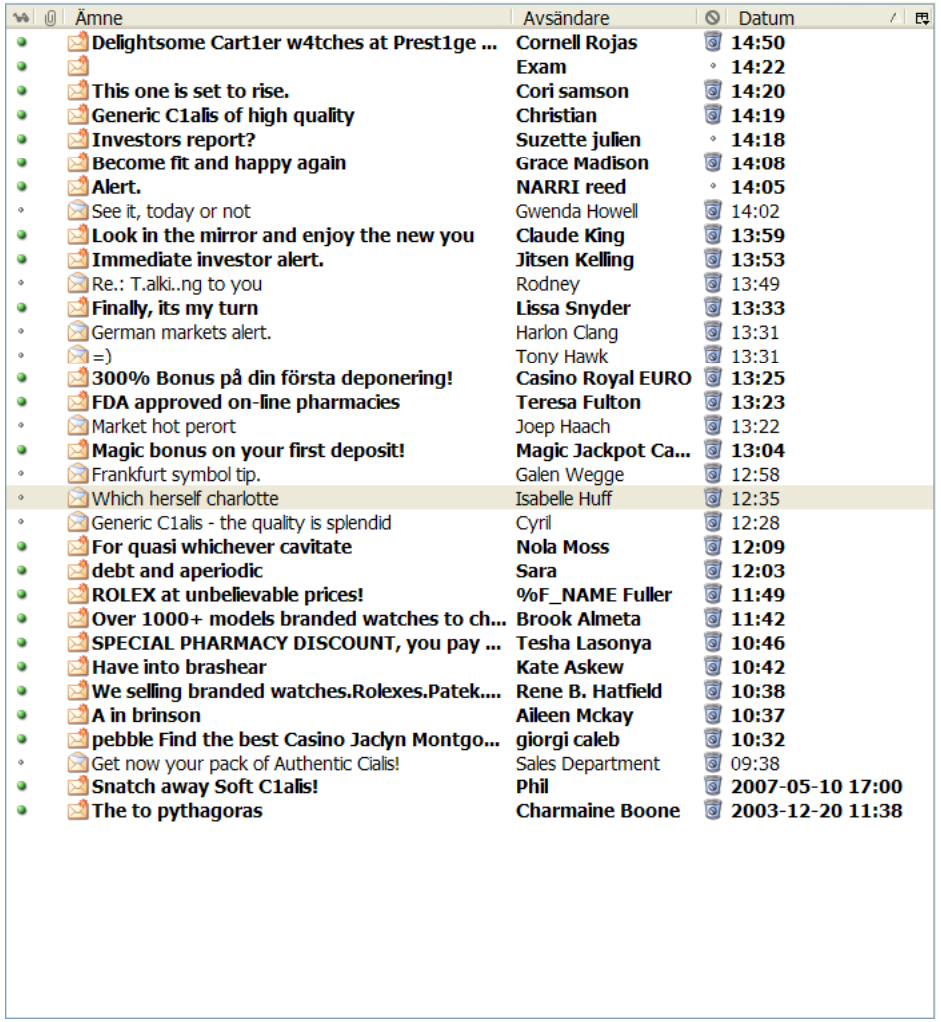
Security through Obscurity? (user side)

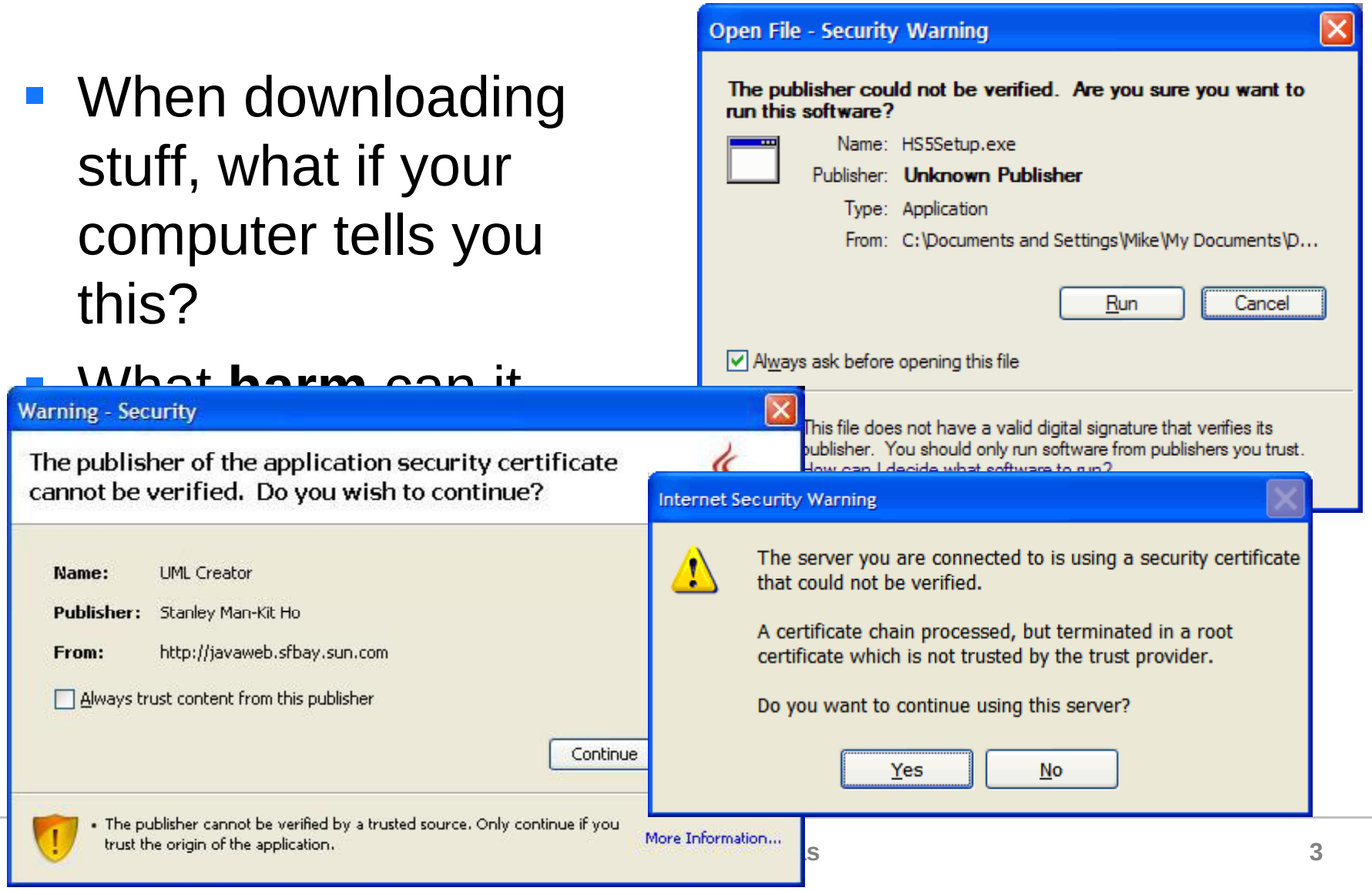
- If you’re a novice user and you get e-mail like this, what do you do?
- Getting new e-mail is **nice**, is it not?



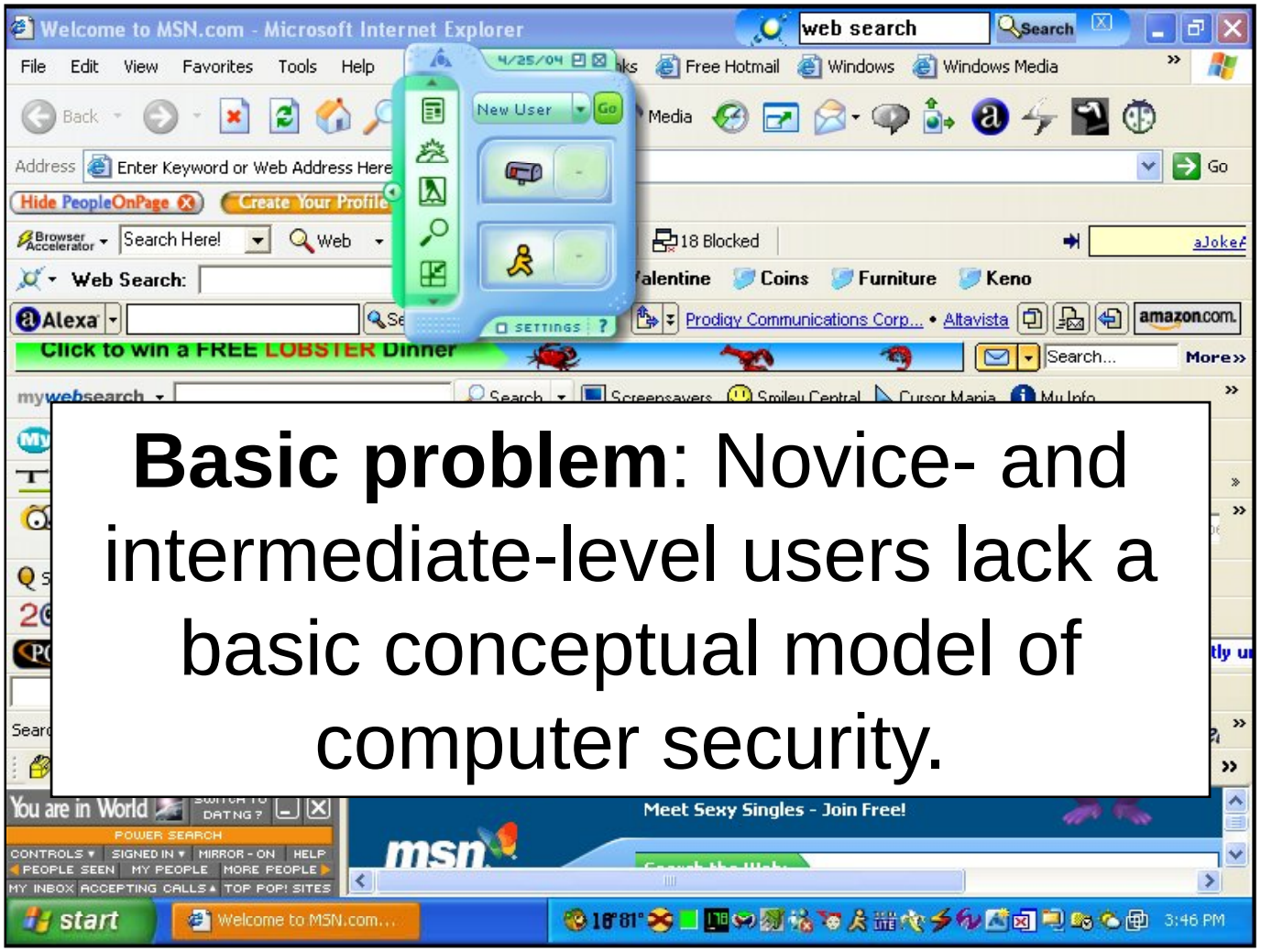
Ämne	Avsändare	Datum
Delightsome Cart1er w4tches at Prest1ge ...	**Cornell Rojas**	**14:50**
	Exam	**14:22**
This one is set to rise.	**Cori samson**	**14:20**
Generic C1alis of high quality	**Christian**	**14:19**
Investors report?	**Suzette julien**	**14:18**
Become fit and happy again	**Grace Madison**	**14:08**
Alert.	**NARRI reed**	**14:05**
See it, today or not	Gwenda Howell	14:02
Look in the mirror and enjoy the new you	**Claude King**	**13:59**
Immediate investor alert.	**Jitsen Kelling**	**13:53**
Re.: T.alki..ng to you	Rodney	13:49
Finally, its my turn	**Lissa Snyder**	**13:33**
German markets alert.	Harlon Clang	13:31
=)	Tony Hawk	13:31
300% Bonus på din första deponering!	**Casino Royal EURO**	**13:25**
FDA approved on-line pharmacies	**Teresa Fulton**	**13:23**
Market hot perort	Joep Haach	13:22
Magic bonus on your first deposit!	**Magic Jackpot Ca...**	**13:04**
Frankfurt symbol tip.	Galen Wegge	12:58
Which herself charlotte	Isabelle Huff	12:35
Generic C1alis - the quality is splendid	Cyril	12:28
For quasi whichever cavitate	**Nola Moss**	**12:09**
debt and aperiodic	**Sara**	**12:03**
ROLEX at unbelievable prices!	**%F_NAME Fuller**	**11:49**
Over 1000+ models branded watches to ch...	**Brook Almeta**	**11:42**
SPECIAL PHARMACY DISCOUNT, you pay ...	**Tesha Lasonya**	**10:46**
Have into brashear	**Kate Askew**	**10:42**
We selling branded watches.Rolexes.Patek....	**Rene B. Hatfield**	**10:38**
A in brinson	**Aileen Mckay**	**10:37**
pebble Find the best Casino Jaclyn Montgo...	**giorgi caleb**	**10:32**
Get now your pack of Authentic Cialis!	Sales Department	09:38
Snatch away Soft C1alis!	**Phil**	**2007-05-10 17:00**
The to pythagoras	**Charmaine Boone**	**2003-12-20 11:38**

Security through Obscurity? (cont'd)

- When downloading stuff, what if your computer tells you this?
- What **harm** can it



The Results of Obscure Security



Basic problem: Novice- and intermediate-level users lack a basic conceptual model of computer security.

Security: an HCI problem?

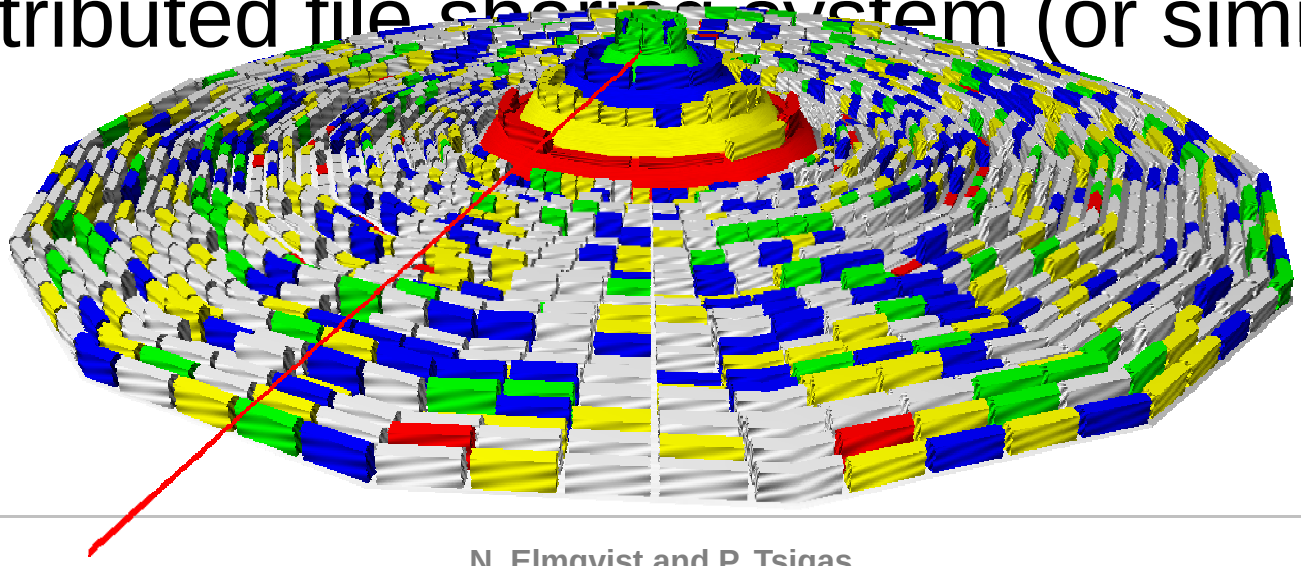
- **Problem**: Novice and intermediate users lack a *conceptual model* of security and networks
- [Bishop 1986]: **90+%** of all security failures due to configuration errors (HCI error!)
- [Yee 2002]: security and usability are not at odds—they should work together!
- [Good & Krekelberg 2003]: users are often unaware of which files they are sharing

Security: what is it?

- [Garfinkel & Spafford 1996]
  - "*A computer is **secure** if you can depend on it and its software to behave as you expect.*"
  - Keyword: "**you**"
  - User perspective critical
- **Besides**: How do novice users know what is expected behavior?

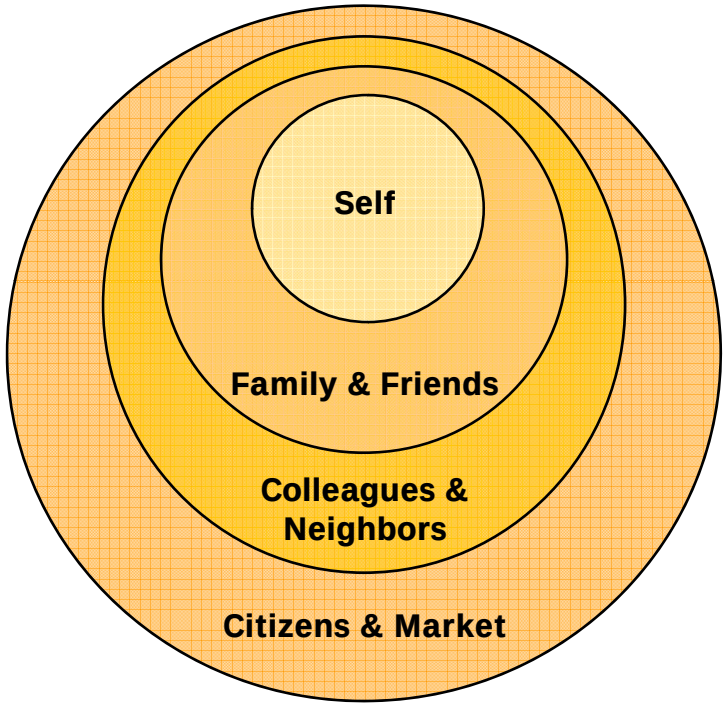
TrustNeighborhoods

- TrustNeighborhoods is a method to provide a **tangible mental model** of network security
- Designed for visualizing **trust** in a distributed file sharing system (or similar)



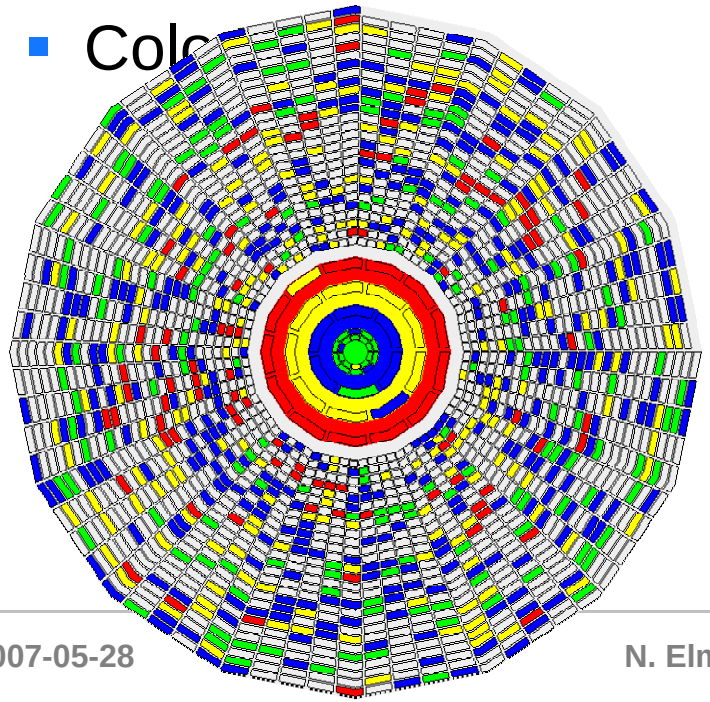
Circles of Relationship

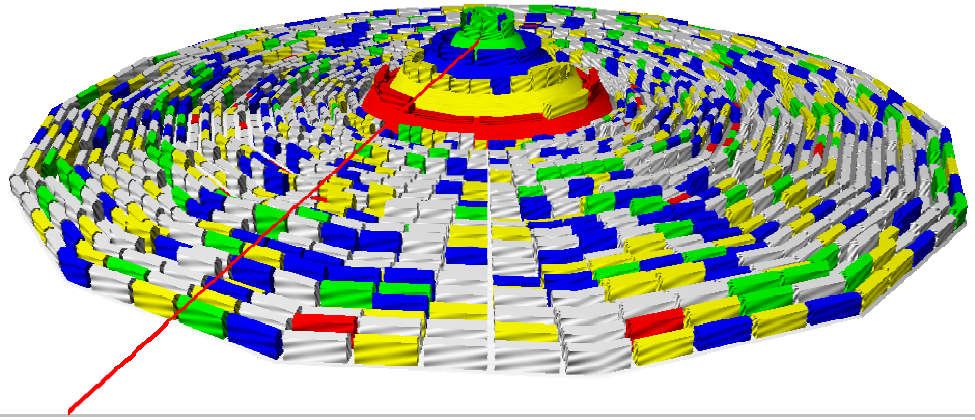
- **Basic idea**: use a city or fortress metaphor
- Inspiration from **Ben Shneiderman**'s "circles of relationship"
- Each circle represents a specific class of relationship
- We transform this to the geographic connotations of a city:
  - House, street, neighborhood, city part, etc



Visualization

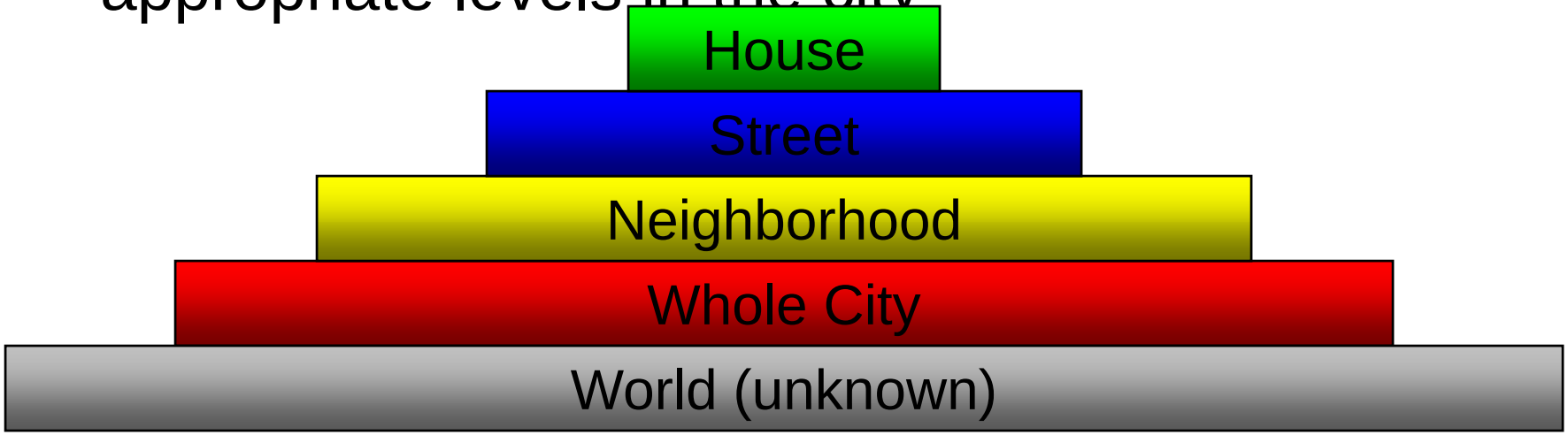
- 2D trust management
  - Purpose: assigning and revoking trust, etc
  - Continuous zoom and pan
  - Colo
- 3D overview and navigation
  - Purpose: inform and alert user of security and trust
  - Tangible mental model
  - Rendered in ambient visual channel (background)





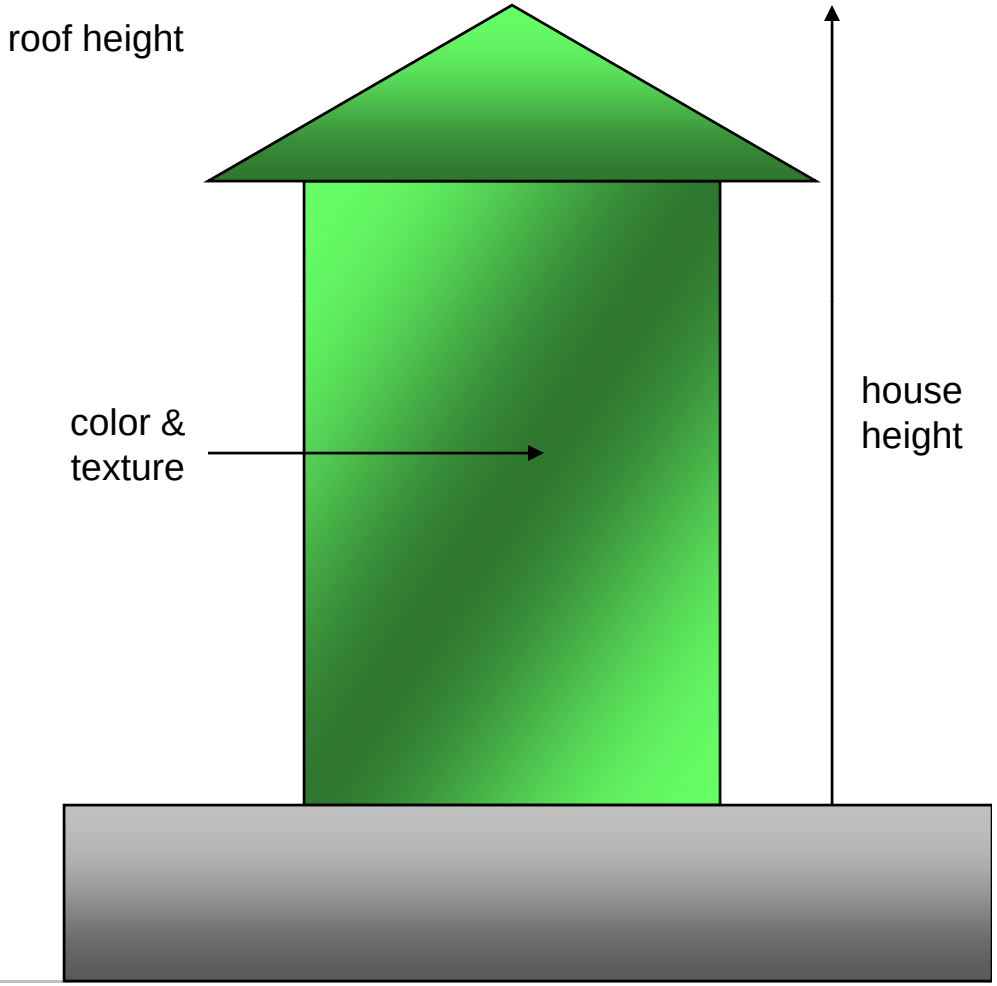
City Metaphor

- **Metaphor**: Fortress city of concentric walls built around your computer (**house**)
- Each security sector is called a **society**
- Individual **buildings** represent entities on network
- Users assign trust by placing them on appropriate levels in the city



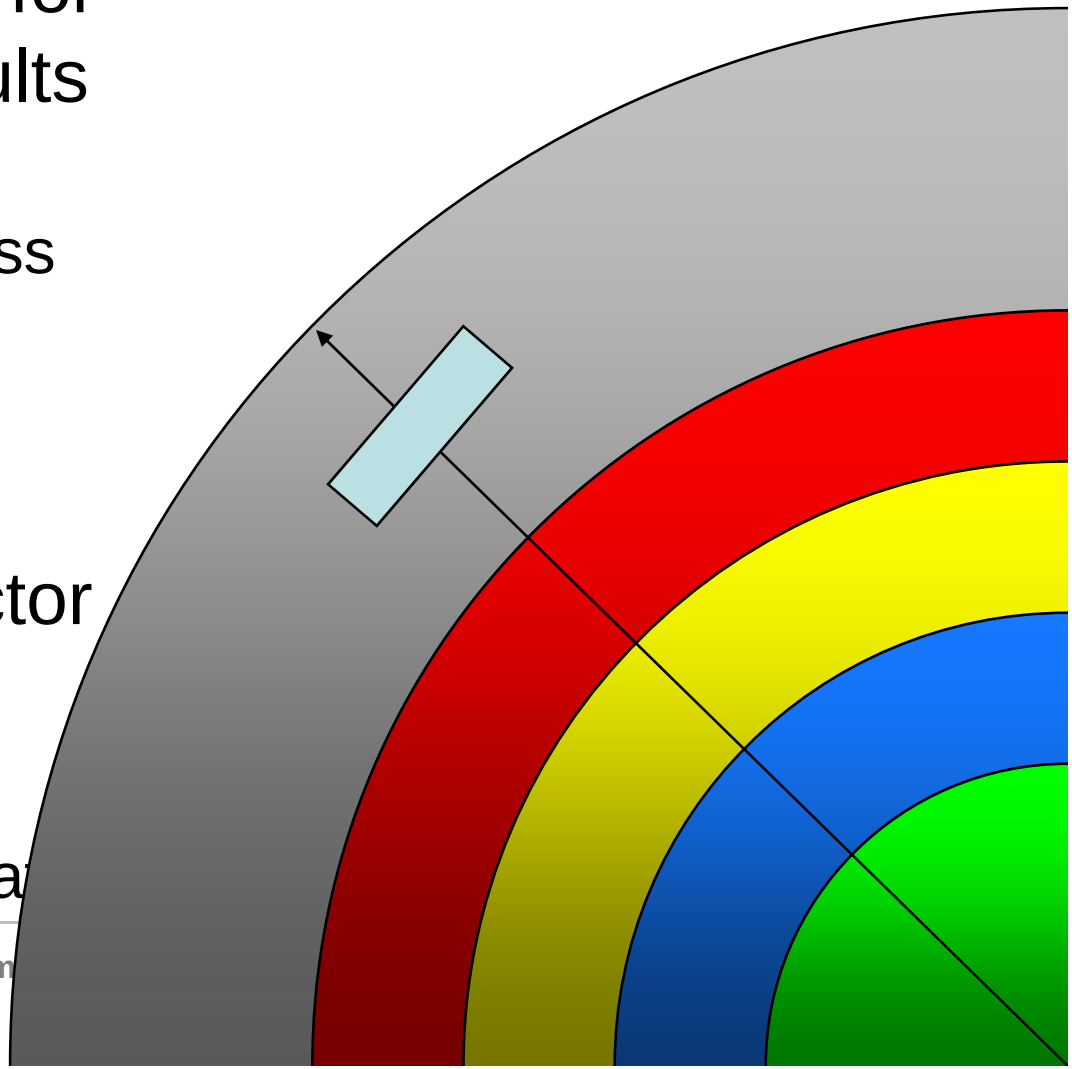
Building Metaphor

- Buildings are network entities
  - Users or documents
- Position in city levels indicates user trust!
- Geometrical properties visualize **data**
  - **Properties**: Size, height, color, texture, etc
  - **Data**: user trust, average trust, weighted average trust, file size, etc



City and Building Layout

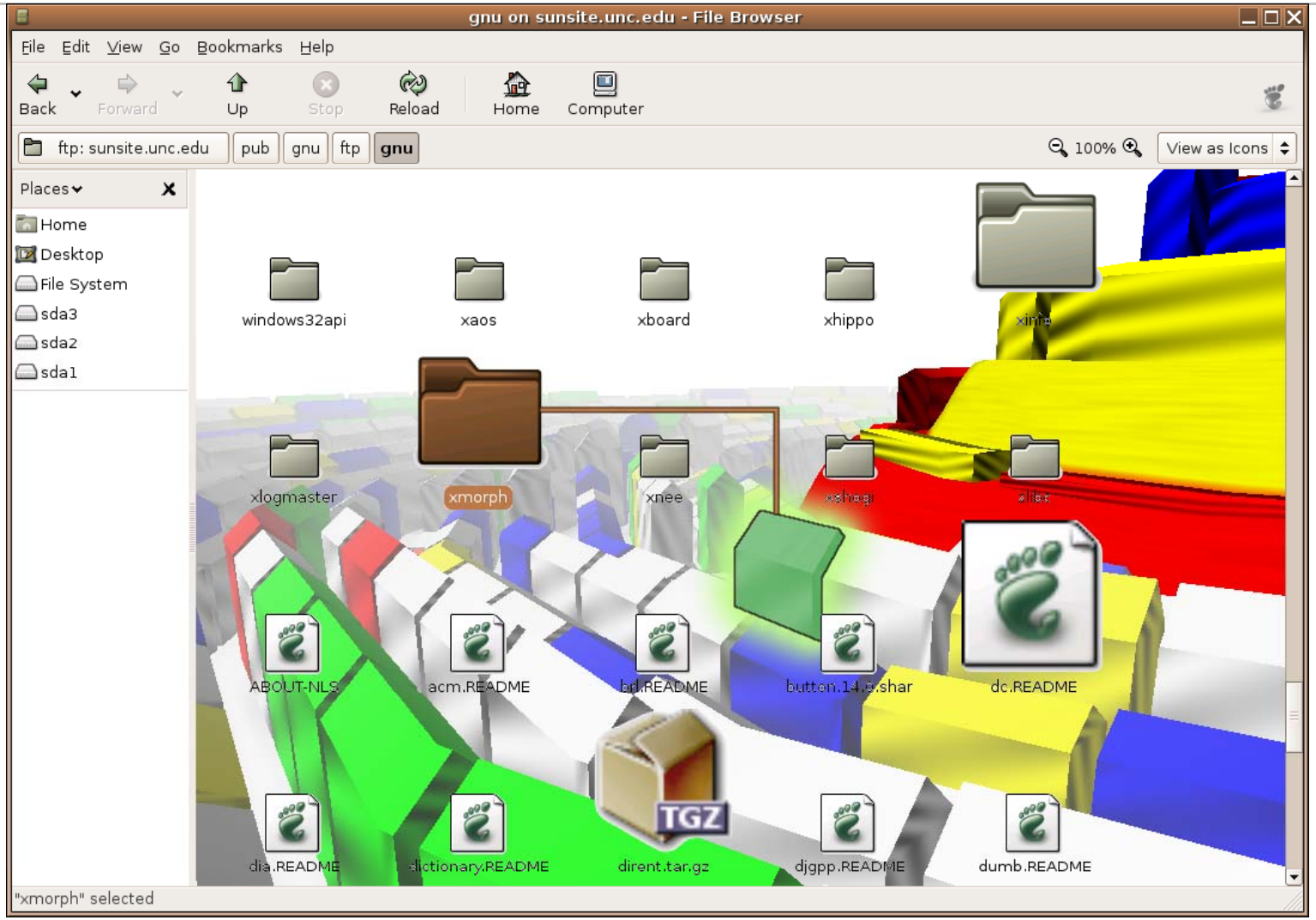
- Grey (“world”) sector for unknown search results
  - Derived trust can still indicate trustworthiness
  - Volumetric fog to decrease visual complexity
- Placement within sector only has meaning to user
  - Grouping to utilize spa memory



Interaction

- Primary use: ambient visualization
  - **Example**: background of desktop or file manager
- 2D mode for trust management
- 3D mode for unobtrusively showing trust
- **Fly-to** interaction: zoom in on a specific entity
  - Rotate around center point to appropriate angle
  - Zoom in to fit size of entity as well as context

Example: TrustNeighborhoods



Demonstration!

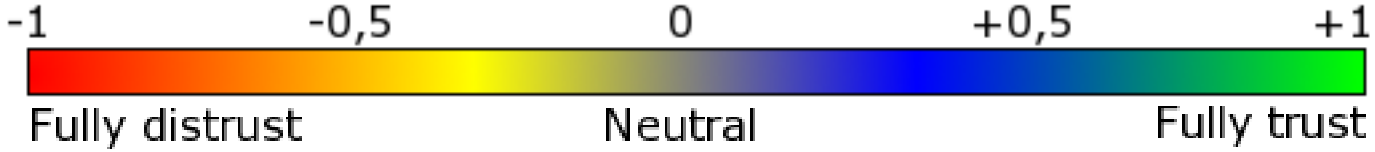
TrustNeighborhoods in action!

User Study

- **Questions** to answer
  - How efficient is it?
  - How accurate is it?
- **Subjects**: 20 engineering undergraduates
  - (Ecological validity?)
- **Design**:
  - Independent vars: **UseVis** (“true”, “false”)
  - Dependent vars: **time** and **error**
- **Task**: 2 x 100 trust assignments

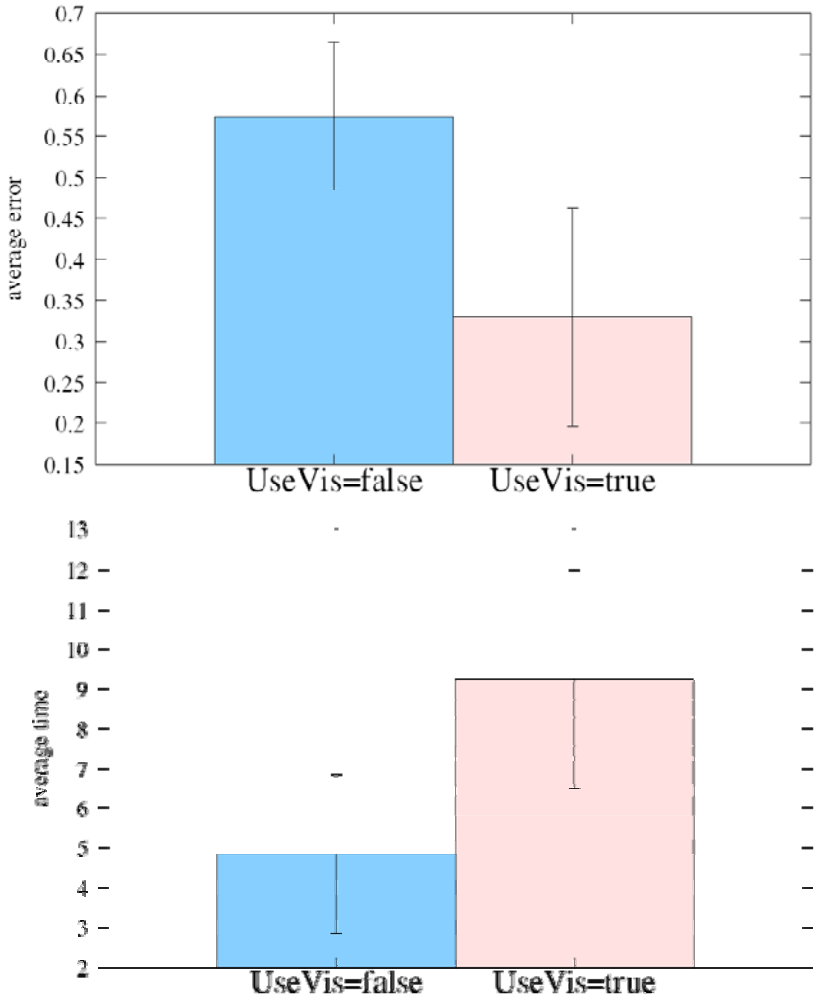
Data Set and Tasks

- Data set of hostnames
  - Constructed from black hole lists (DNSBLs)
  - 20% malicious hosts (Internet Storm Center)
    - Ad sites, spammers, spy/malware, virus sites
- **Task**: Assign trust [-1, +1) to a hostname
  - Visualization available or not
- Seeded with 10 fully trusted hosts



Results (Quantitative)

- Correctness: 45 % erro
  - Manual assignment: 57% (s.d. 9%)
  - Visualization assignment: 33% (s.d. 13%)
- Completion times: 6.92 s
  - Manual assignment: 4.84 s (s.d. 2.00)
  - Visualization assignment: 9.24 s (s.d. 2.76)



Results (Qualitative)

- **Subjective ratings**: visualization most preferred down to $p < .05$ except for **speed**
- Interviews and observations:
  - Metaphor felt natural
  - No user had problem understanding
  - 3D navigation difficult and unwieldy
    - More constraints necessary
  - More experienced: less trusting (opposite effect)
  - In general, positive feelings about the

Conclusions

- TrustNeighborhoods visualization provides novice users with a **tangible** conceptual model
- User evaluation to measure utility
- **Classic trade-off**: speed vs. accuracy
  - Emphasis depends on domain
  - For security, better to err on the safe side…
- Observation:
  - Experienced users very skeptical of the new visualization
    - Dislike being told what to think and do
  - Important to give room for reasoning
  - Interesting problem to tackle for the future

Questions?

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