27 – Access control and policy configuration

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Usable Privacy and Security

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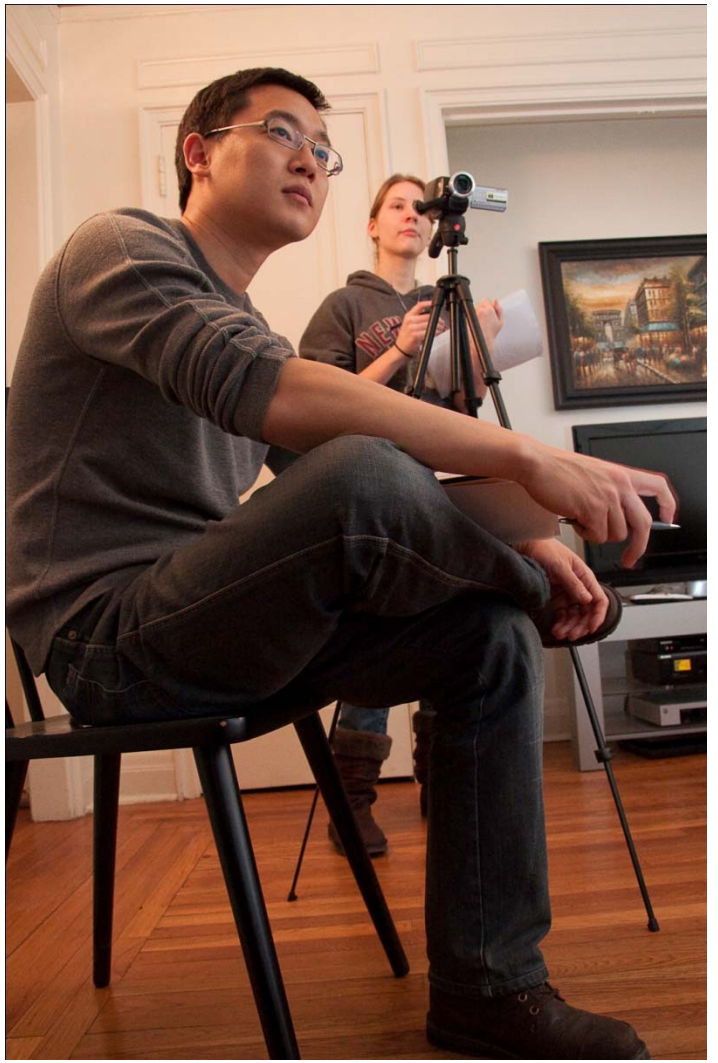
Home access control

- Plethora of networked consumer electronics
  - Who handles security and access control in the digital home?
- Home security will only work if it works for home users
  - "Normal people" who don't do technology 24/7/365
- Seek to understand attitudes, needs, and current practices
  - Current access-control practices: digital, paper

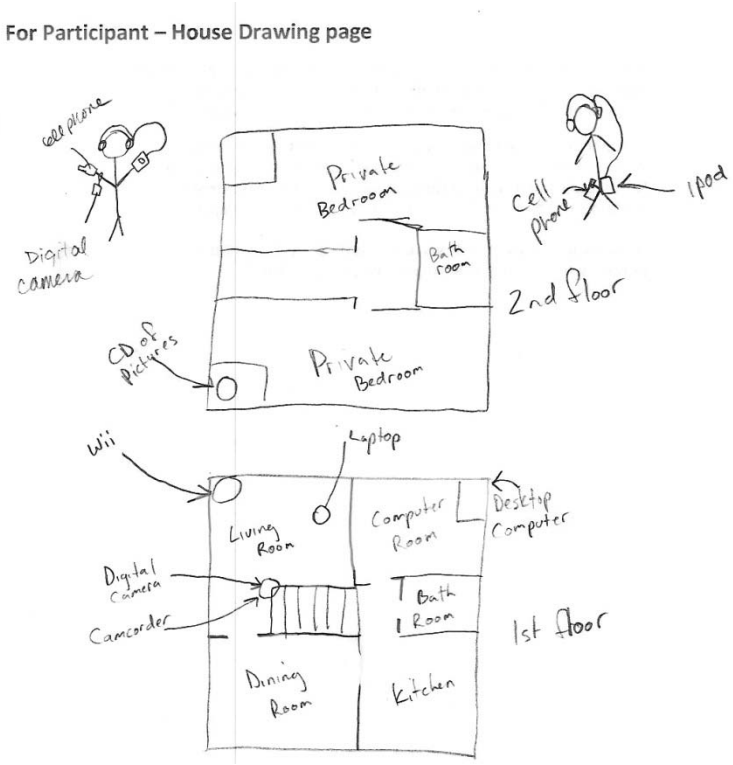
Access Control for Home Data Sharing: Attitudes, Needs and Practices [Mazurek, Arsenault, Bresee, Gupta, Ion, Johns, Lee, Liang, Olsen, Salmon, Shay, Vaniea, Bauer, Cranor, Ganger, and Reiter, CHI 2010]

Interview study

- In-situ, semi-structured interviews
  - Recruitment via Craigslist, fliers
  - Limited to non-programmer households
- Interviewed 33 users in 15 households
  - Families, couples, roommates
  - Ages 8 to 59
- Recorded and transcribed over 30 hours of interviews



House Maps Guided Interviews



Interview protocol

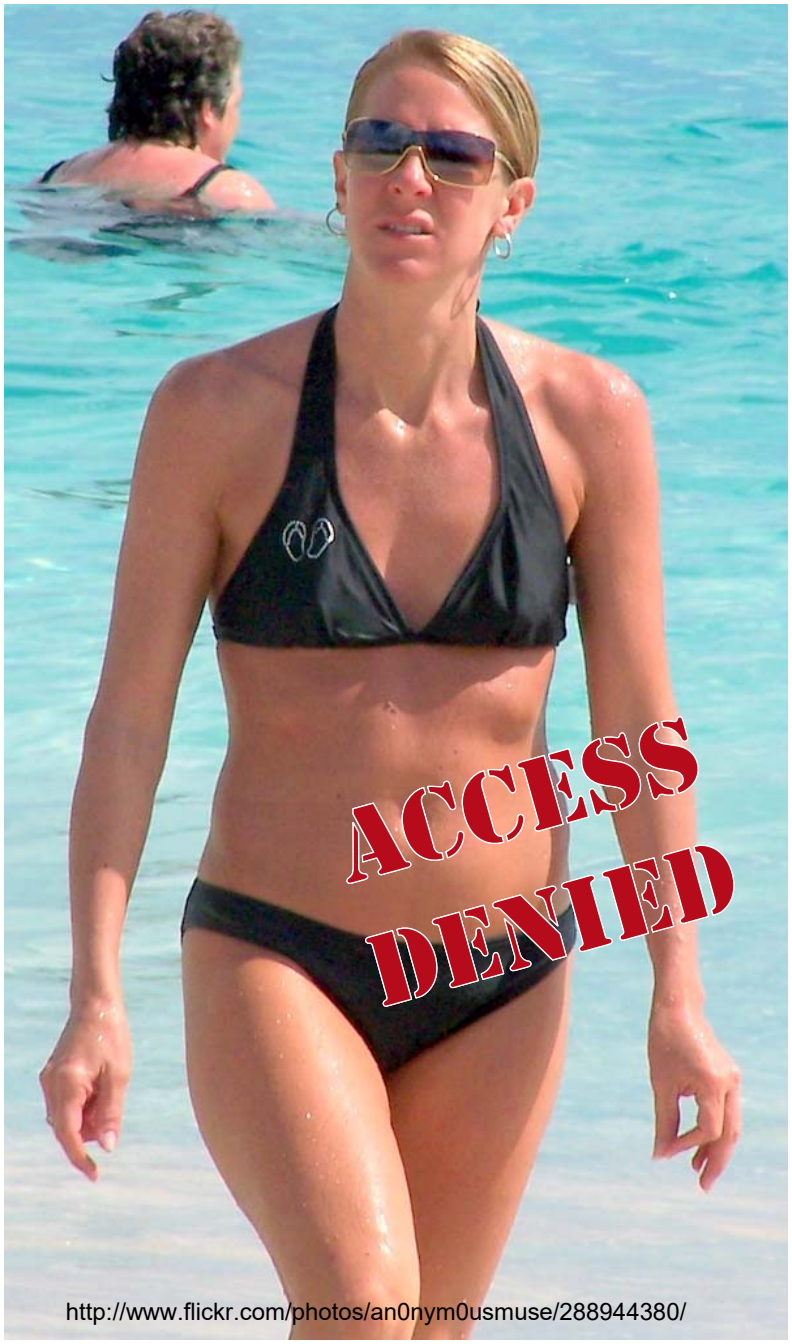
- For each dimension, start with a specific scenario
- Example: Imagine that a friend is in your house when you are not. What kinds of files would you want them to be able to view?
  - Would it be different if you were also in the house?
- Extend to discuss that dimension in general
- Likert scale to rate concern over policy violations:
  - From 1 = don't care, to 5 = devastating

Current methods aren't working

- People do worry about sensitive data
  - Many potential breaches rated as "devastating"
  - Almost all worry about file security sometimes
  - Several have suffered actual breaches
- Access-control mechanisms varied and ad hoc
  - Encryption, user accounts (some people)
  - Hide sensitive files in the file system
    "If you name something '8F2R349,' who's going to look at that?"
  - Delete sensitive data so no one can see it
    "If I didn't want everyone to see them, I just had them for a little while and then I just deleted them."

Policy needs are complex

- Fine-grained divisions of people and files
  - Public/private not enough
  - More than friends, family, colleagues, strangers
- Presence of file owner matters
  - "If you have your mother in the room, you are not going to do anything bad. But if your mom is outside the room you can sneak."
  - Also gives a chance to explain
- Location sometimes matters
  - People in my home are trusted
- Some people tend to share, some tend to restrict



http://www.flickr.com/photos/an0nym0usmuse/288944380/

Twenty-something middle school Spanish teacher:

"Wouldn't want my boss to see me in my swimsuit…. I just wouldn't like him to see it."

Twenty-something paralegal and law student would let her boss see photo of her drunk, dancing on a table: “he’s seen me do it in person before.”

A-priori policy not good enough

- People don't feel as much in control when they set policy up front
- People like to be asked permission

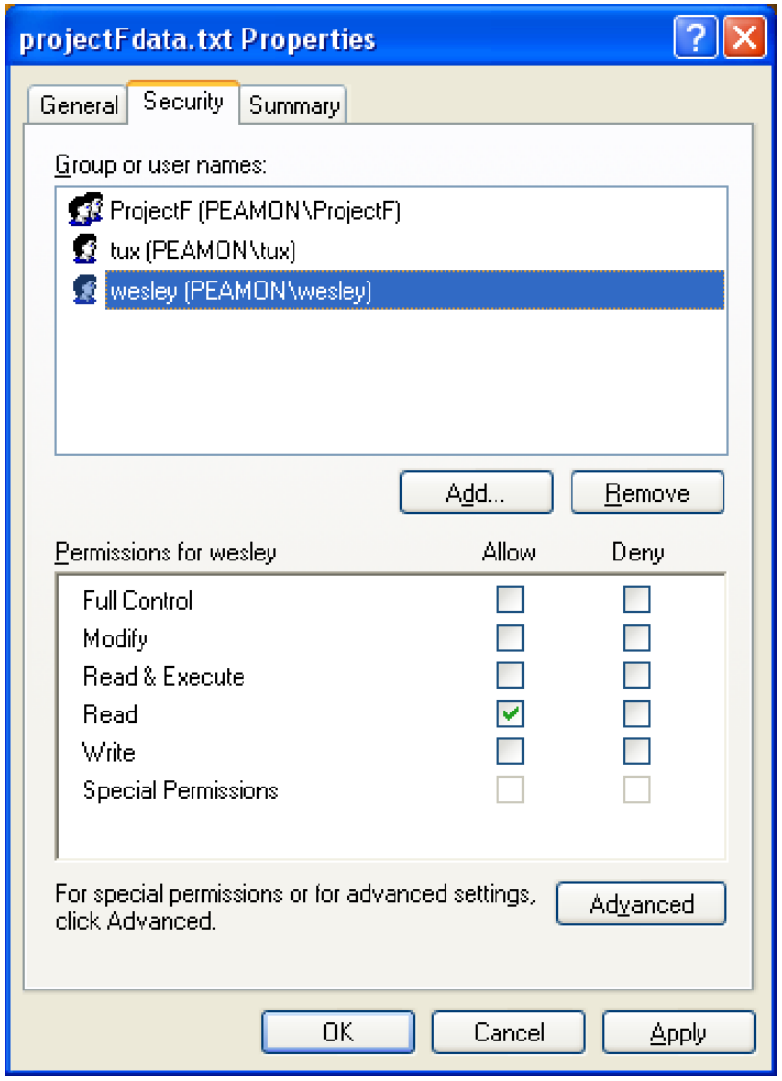
  "I'm very willing to be open with people, I think I'd just like the courtesy of someone asking me."
- People want to know both who is accessing files and why
- People want to review accesses, revise policy
- This finding led us to conduct a follow-up study on **reactive access** control

Exploring reactive access control
[Mazurek, Klemperer, Shay, Takabi, Bauer, and Cranor, CHI 2011]

File system access control

- Access control on Windows file systems often incorrect
- Mistakenly misconfigured server used by both Republican and Democrat staffers led to 2003 “Memogate” scandal
- Windows access control is difficult because it has no holistic view of effective file permissions, and conflict resolution is complicated

Problem: Rule-centered interfaces



What makes policy authoring difficult?

- Default rules
  - What happens when no rule applies?
- Composite values (groups, folders, etc.)
  - What are the component values?
- Rule conflicts & precedence rules
  - What if more than one rules applies?
- Scale
  - Large policies can get tricky

Example task: Jana

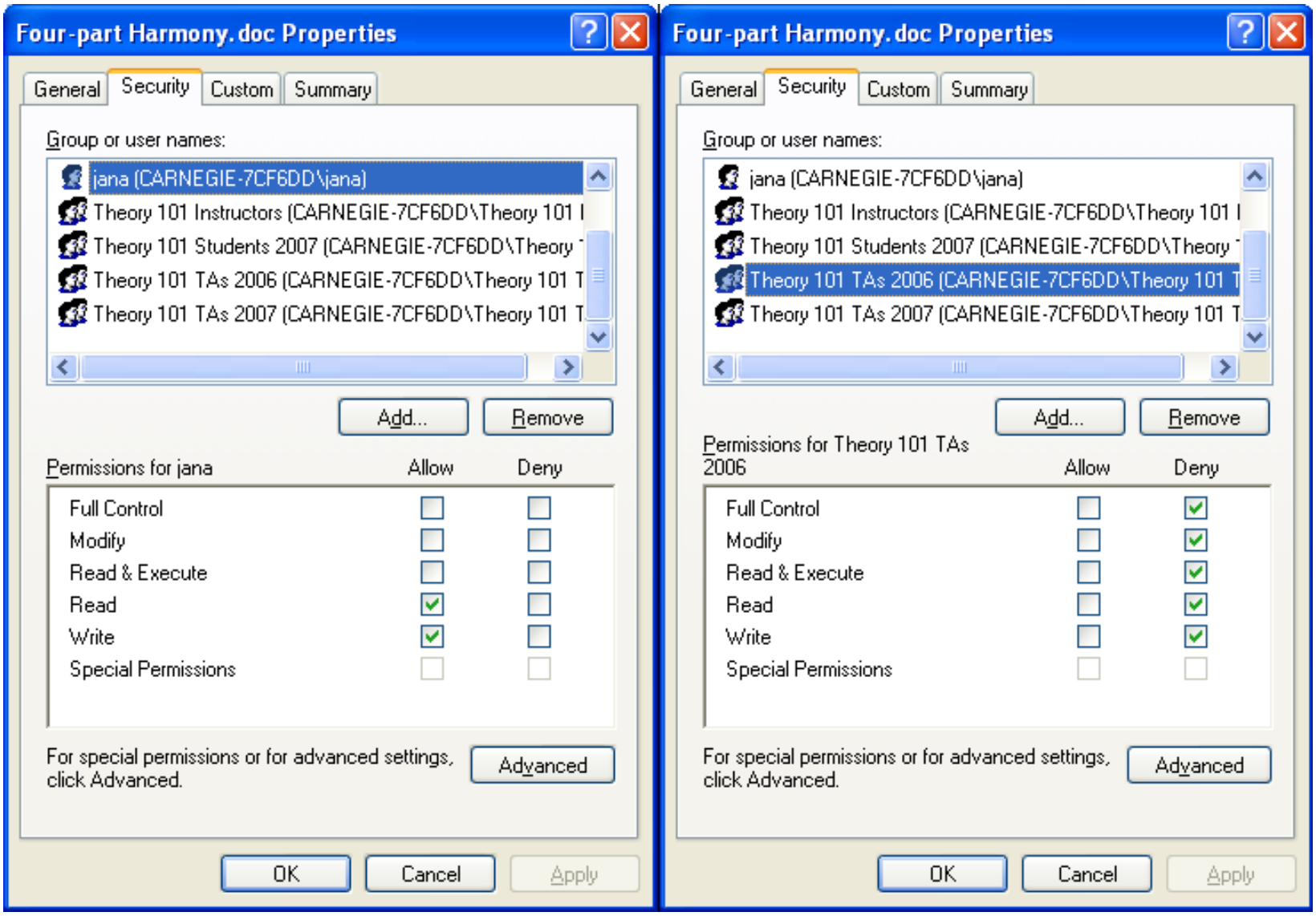
Jana, a Theory 101 TA, complained that when she tried to change the Four-part Harmony handout to update the assignment, she was denied access.

Set permissions so that *Jana* can *read and write* the *Four-part Harmony.doc* file in the *Theory 101\Handouts* folder.

Jana setup

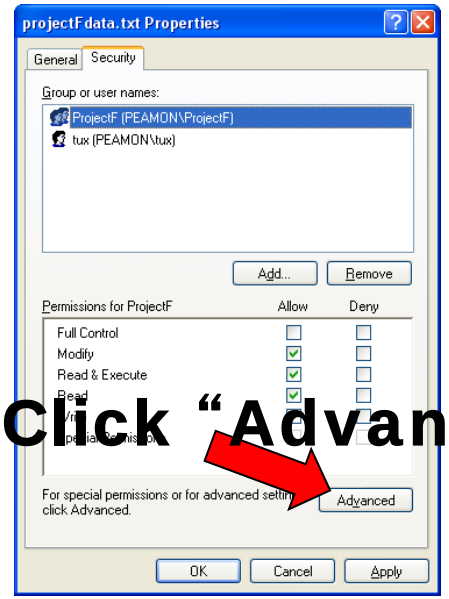
- Jana is a TA this year
  - Is in the group *Theory 101 TAs 2007*
- Jana was a TA last year
  - Is in the group *Theory 101 TAs 2006*
- 2007 TAs are allowed READ & WRITE
- 2006 TAs are denied READ & WRITE
- Since Jana is in both groups, she is denied access

Jana task – common error



Learning Jana's effective permissions

1



Click "Advanced"

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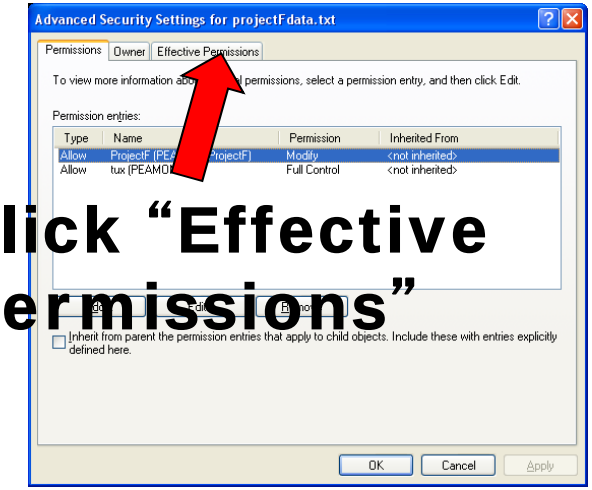

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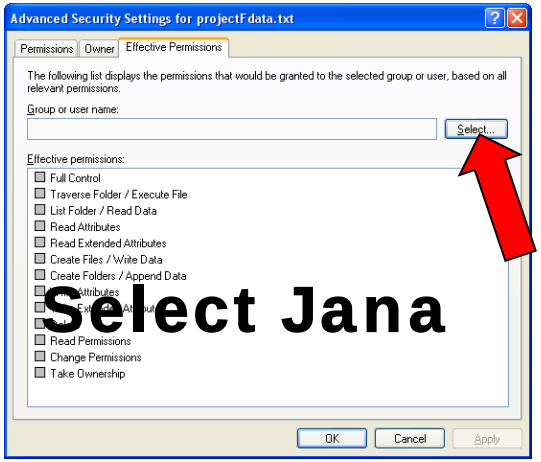

Select Jana

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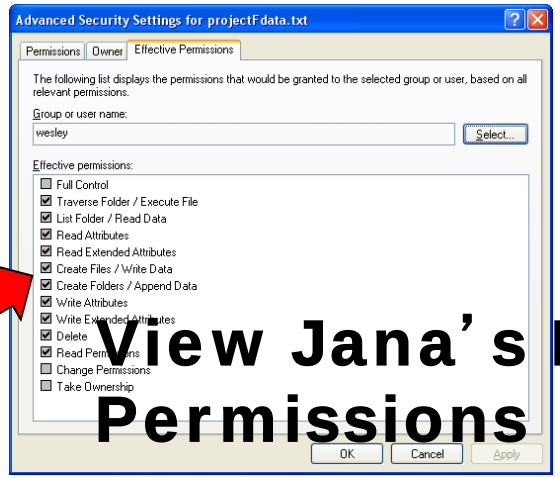

View Jana's Effective Permissions

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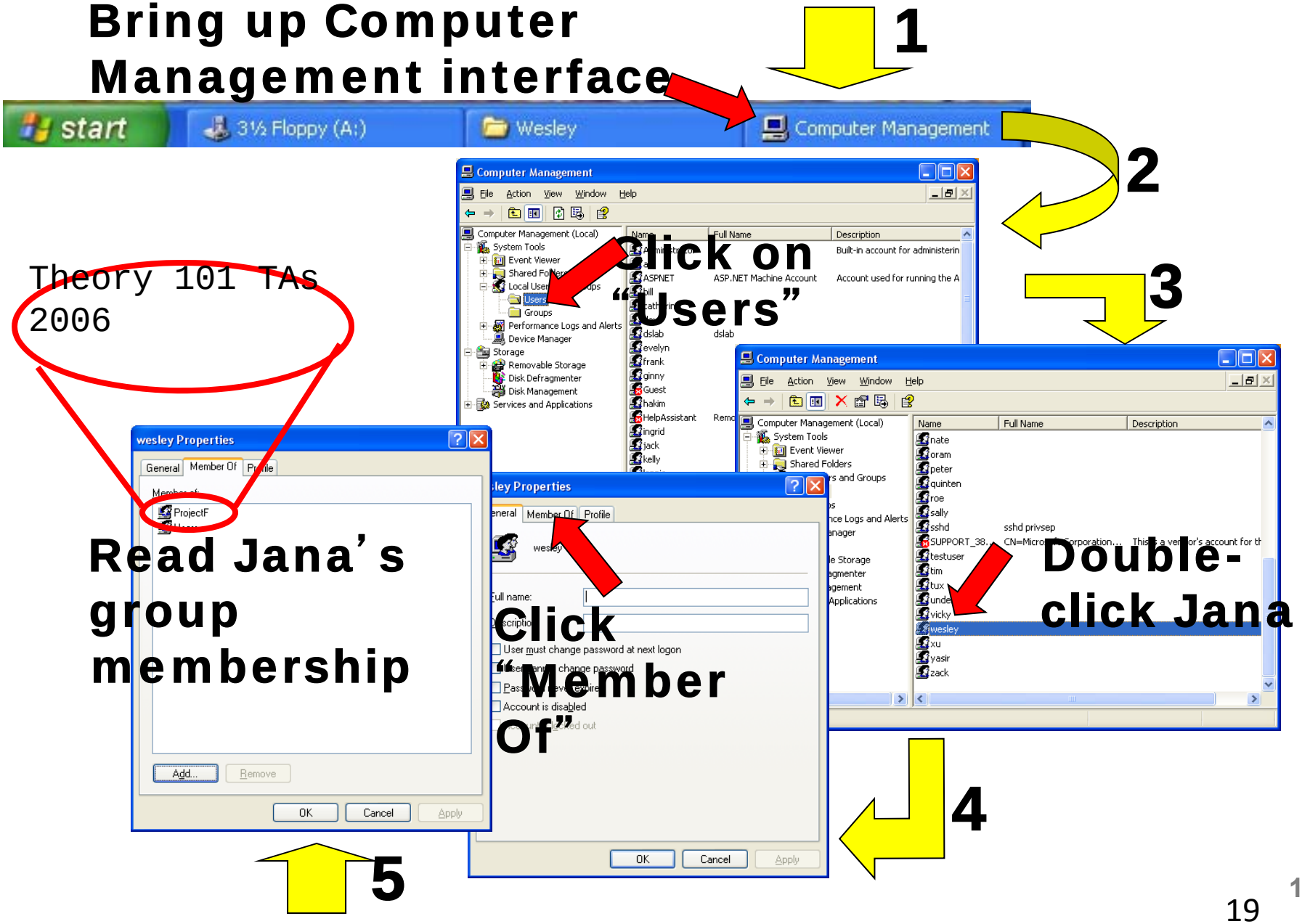
Learning Jana's group membership



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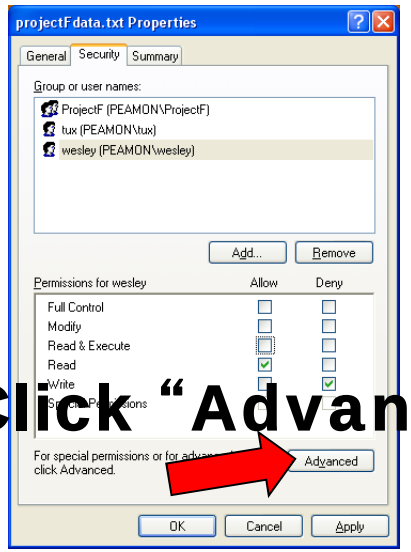
Checking work

1



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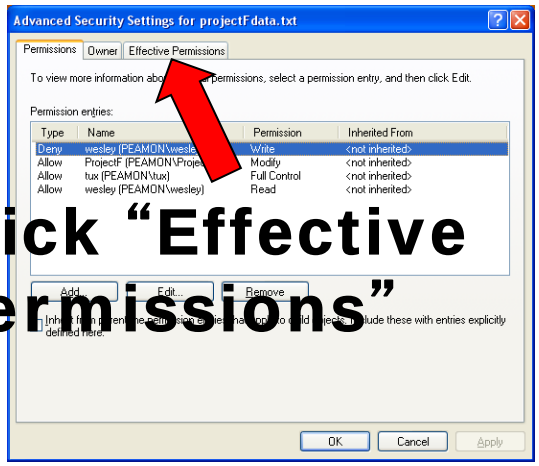

Click "Effective Permissions"

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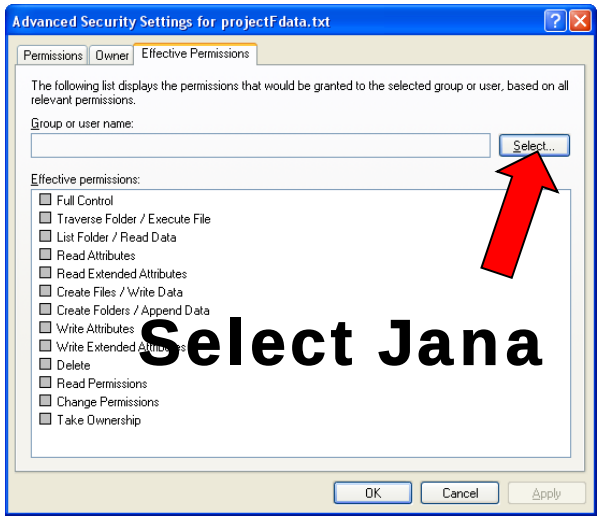

Select Jana

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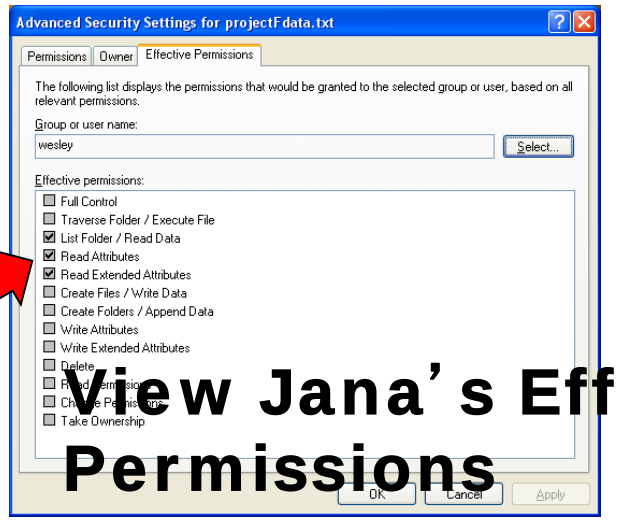

View Jana's Effective Permissions

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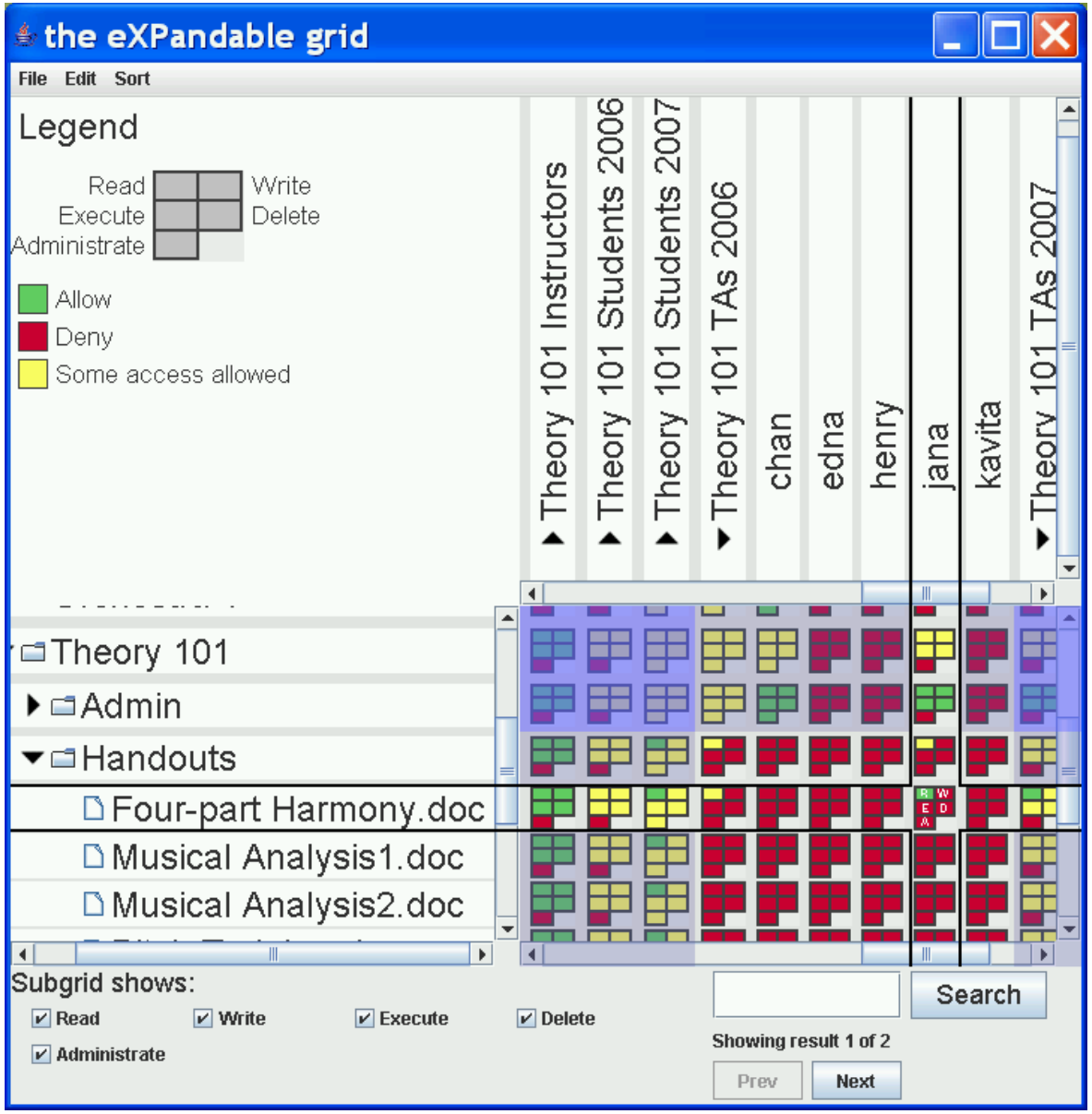
Four fundamental policy-authoring operations to support

1. Viewing policy decisions
2. Changing policy decisions
3. Viewing composite value memberships
4. Detecting and resolving conflicts

Key insight

Key insight: Center policy-authoring user interfaces around a display of the *whole effective policy, not a list of rules*

Solution: Expandable Grids



User study of Expandable Grids for XP

- Laboratory study
- 2 conditions:
  - (1) Expandable Grids
  - (2) native Windows file permissions interface
- 36 participants, 18 per condition
- 20 tasks per participant
- Training:
  - 3.5 minutes for Grid
  - 5.5 minutes for Windows

Tasks in user study

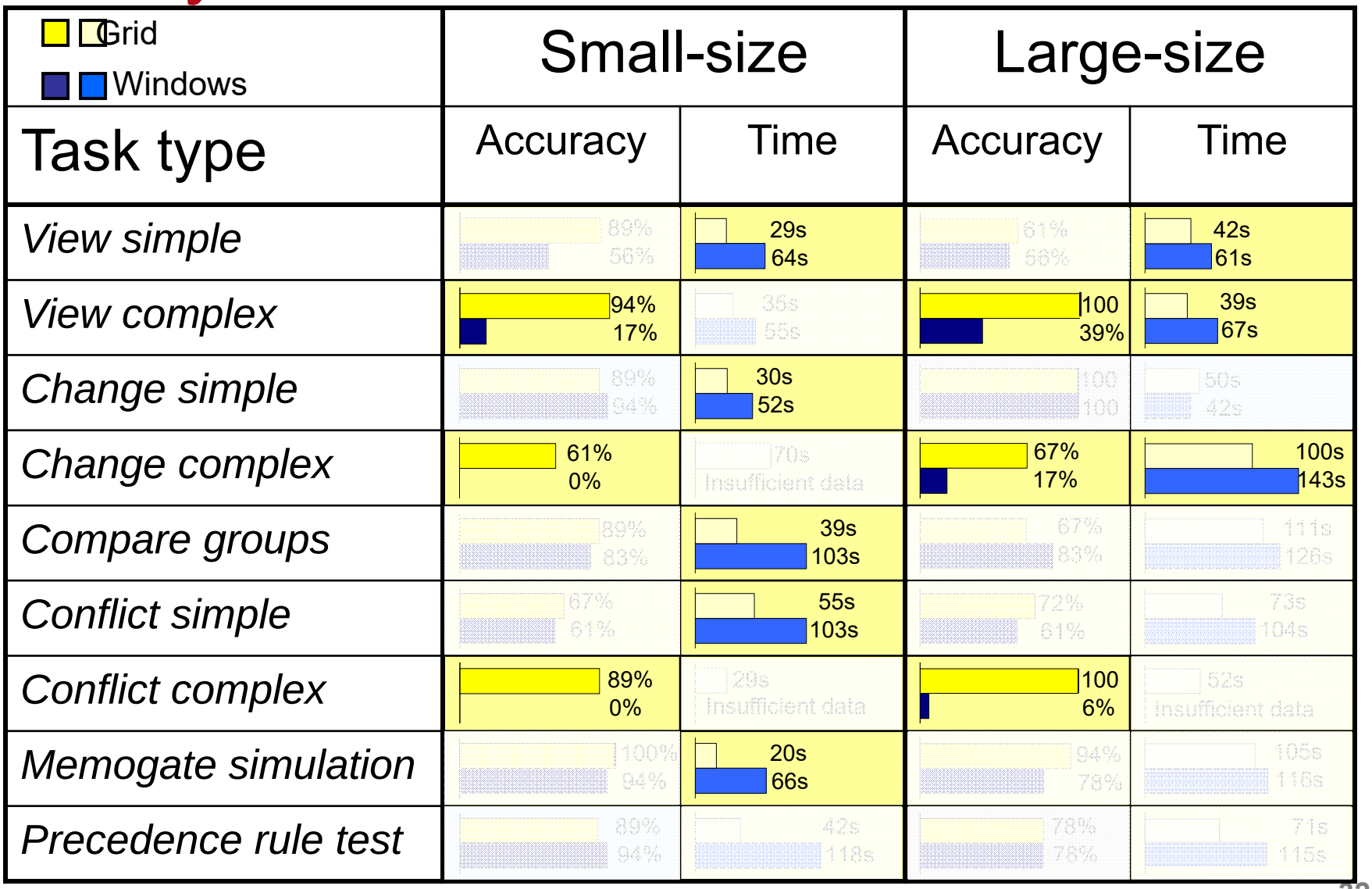
- Used Teaching Assistant scenario
- 20 total tasks varied by:
  - Size of pre-existing policy
  - Pre-configuration of policy
  - What they asked participant to do
- 2 policy sizes: small and large
  - Small: ~50 principals and ~50 resources
  - Large: ~500 principals and ~500 resources
- 10 different tasks per policy size
- Task order: small size first, then large, but counterbalanced within each size

Tasks in user study

- 10 configurations
  - each used twice, for small and large policies

Training	Make simple policy change
View simple	Does user X have write access to file Y?
View complex	Same, with rule conflict present
Change simple	Allow user X to have write access to file Y
Change complex	Make 3 different changes to policy
Compare groups	Who is in both group A and group B?
Conflict simple	Make exception for user X in group A
Conflict complex	Resolve conflict for user X in groups A and B
Memogate simulation	Does group A have access it shouldn't?
Precedence rule test	Give group A, except user X, access to folder Z

Study Results: Grid vs Windows



But… Conflict Resolution

- Alice is a member of a group denied access to SECRET.TXT. What happens if I later set a policy rule that Alice should have access to SECRET.TXT?
- Windows: Deny-precedence, deny access
- Expandable Grids: Recency-precedence, allow access
  - Change in conflict-resolution was needed for direct manipulation interface to work
  - One drawback is that it is easy to accidently override exceptions
  - Later version of Expandable Grids used specificity-precedence
- Were the effects of our study due to the grid visualization, the new conflict-resolution method, or both?

Semantics Study

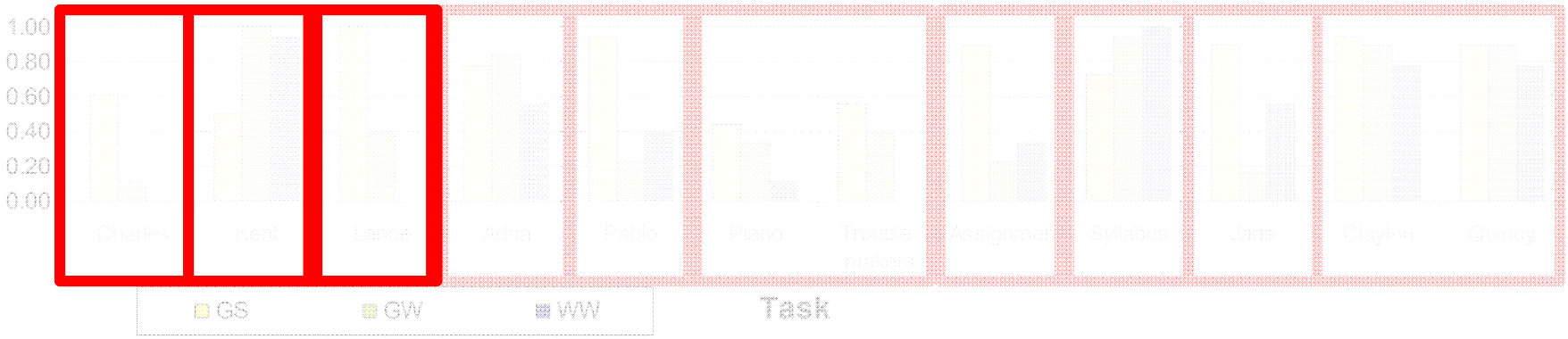
- Laboratory study
- 3 conditions:
  - Expandable Grid with specificity semantics
  - Expandable Grid with Windows semantics
  - Native Windows file permissions interface
- 54 participants, 18 per condition, novice policy authors
- 10 minutes training for all conditions
- 12 tasks, measured speed and accuracy of task completion

More than skin deep: Measuring effects of the underlying model on access-control system usability
[Reeder, Bauer, Cranor, Reiter, and Vaniea, CHI 2011]

Charles Task

- *Charles has just graduated, but is going to come back to sing in the choir with his friends*
- *Add Charles to the Alumni group, but make sure he can still read the same files in the Choir 1\Lyrics folder that his good friend Carl can read*

Semantics Study: Results



1. **Does semantics make a difference?** **YES**
2. **Does specificity help resolve rule conflicts?** **YES**
3. **Is specificity semantics always better than Windows?** **NO**

Why usability can't be just skin deep

- Early system design decisions can impact usability
- Sometimes early UI prototypes and user studies may be needed to understand implications of these decisions on usability
- User studies before designing system can reveal unexpected system requirements
- Usability should be a prime consideration during the formative stages of security system design