OPUS

A lightweight system for observational provenance in user-space

Thomas Bytheway, Nikilesh Balakrishnan,
Ripduman Sohan, Andy Hopper

University of Cambridge
Computer Laboratory
Motivations

- Usability
Motivations

- Usability
- Discreet
Motivations

- Usability
- Discreet
- Always-on
Motivations

- Usability
- Discreet
- Always-on
- Complete Capture
The PVM Model

In three unusual cases
Versioning Schemes

- Version on Write
- Open to Close
- Explicit Versioning
Unusual Operations

- Unlink
- Rename
Unusual Operations

- Unlink
- Rename
- Abstraction
Unusual Operations

- Unlink
- Rename
- Abstraction
- Open -> Gain Reference
- Close -> Lose Reference
POSIX Problems

P1
POSIX Problems

P1 → F
POSIX Problems

P1 → F ← P2
POSIX Problems

P1 → ?
POSIX Problems
Aliases
Aliases

HARD

SOFT
Aliases

HARD

SOFT

A

Z
Aliases

HARD

SOFT

A

B

Z
Aliases

HARD

A
B
Z

SOFT

K
Y
Aliases

HARD

A
B
Z

SOFT

K
L
Y
The OPUS System
System Structure
Conclusions

- OPUS
- Usable system
- Complete Capture
Conclusions

- OPUS
- Usable system
- Complete Capture
- PVM
- Unusual Operations
- Process View
Thank You

For more info visit:

http://www.cl.cam.ac.uk/research/dtg/www/research/