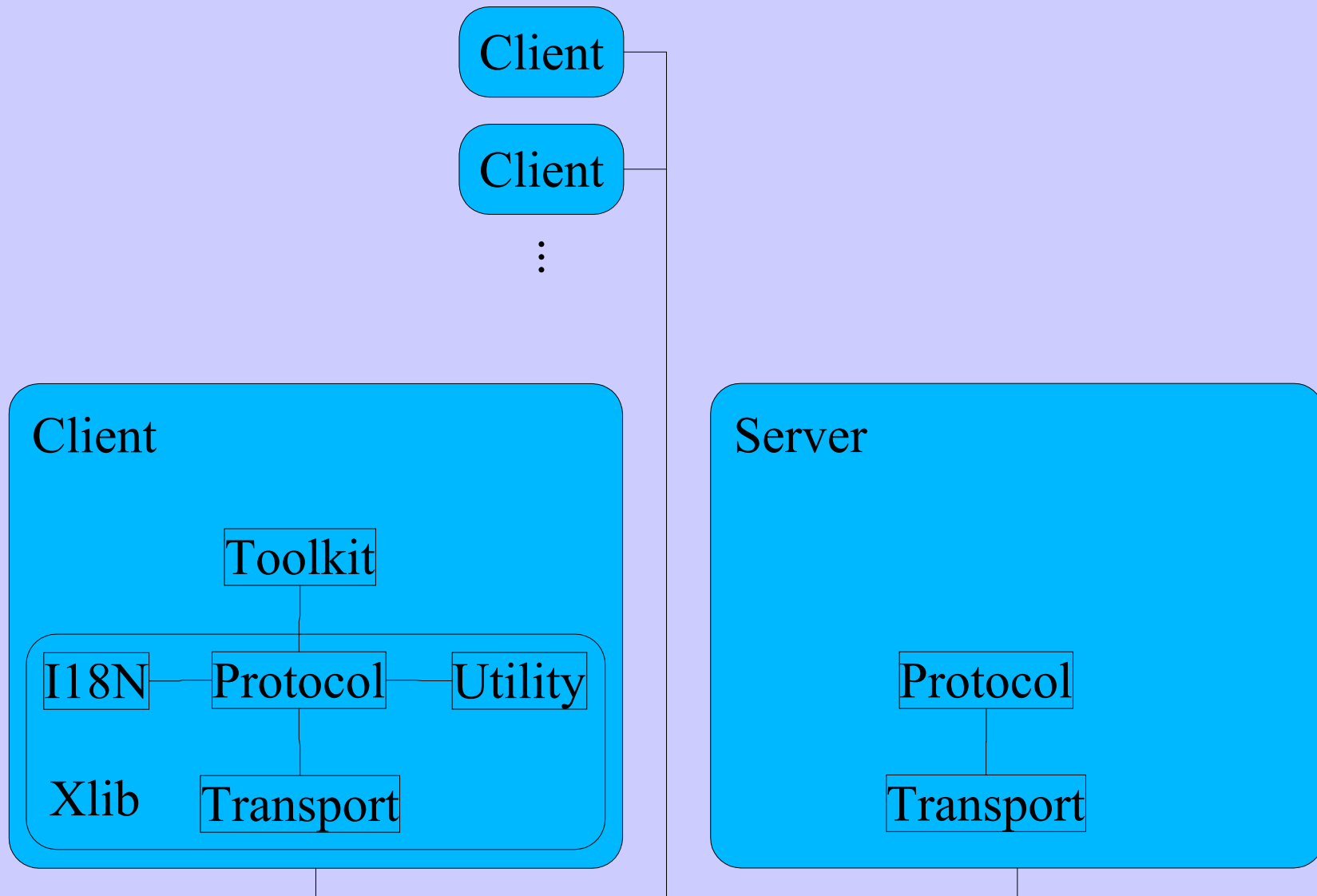


# *How Xlib Is Implemented (And What We're Doing About It)*

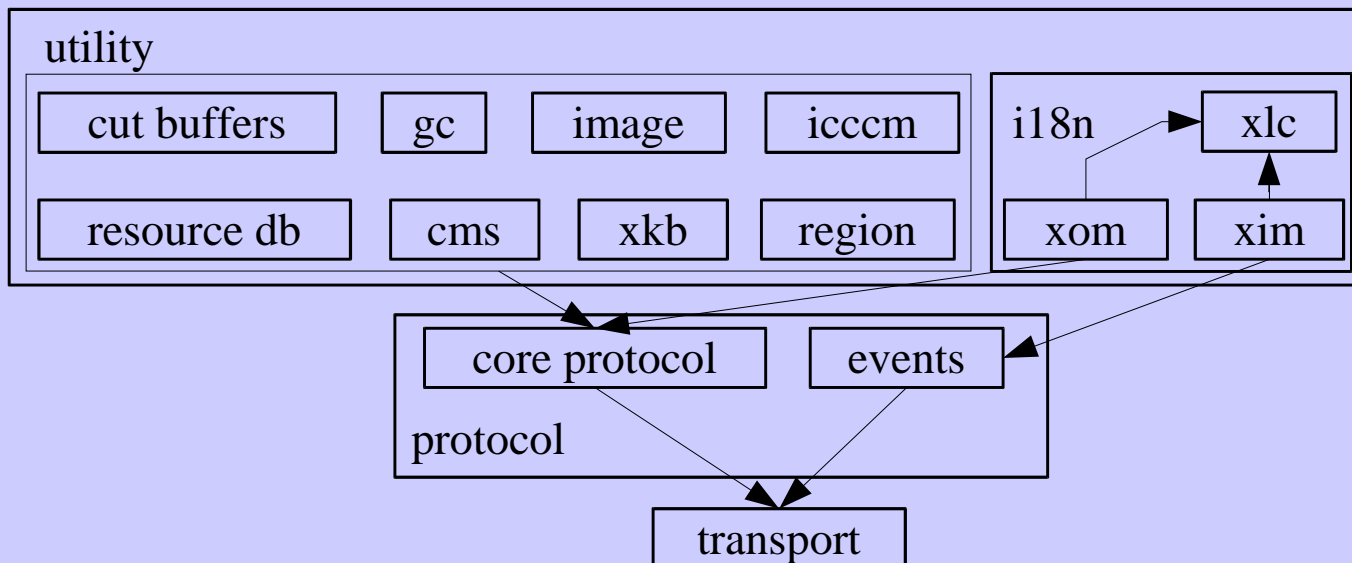
Jamey Sharp  
Computer Science Department  
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[jamey@cs.pdx.edu](mailto:jamey@cs.pdx.edu)  
<http://xcb.freedesktop.org>

# *X Window System Architecture*



# *Xlib Architecture*

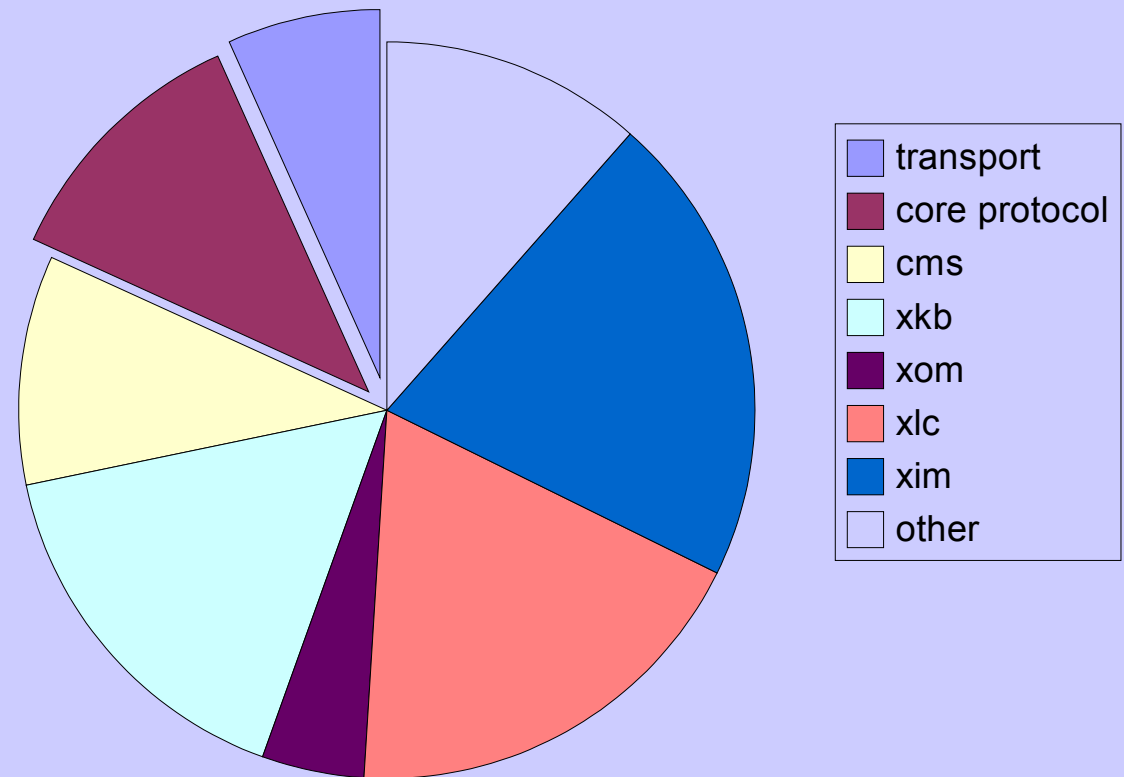
- ◆ Transport layer: conveys requests and responses between client and server
- ◆ Protocol layer: constructs requests and unpacks replies
- ◆ Utilities layer: does everything else



# *Some Xlib Issues*

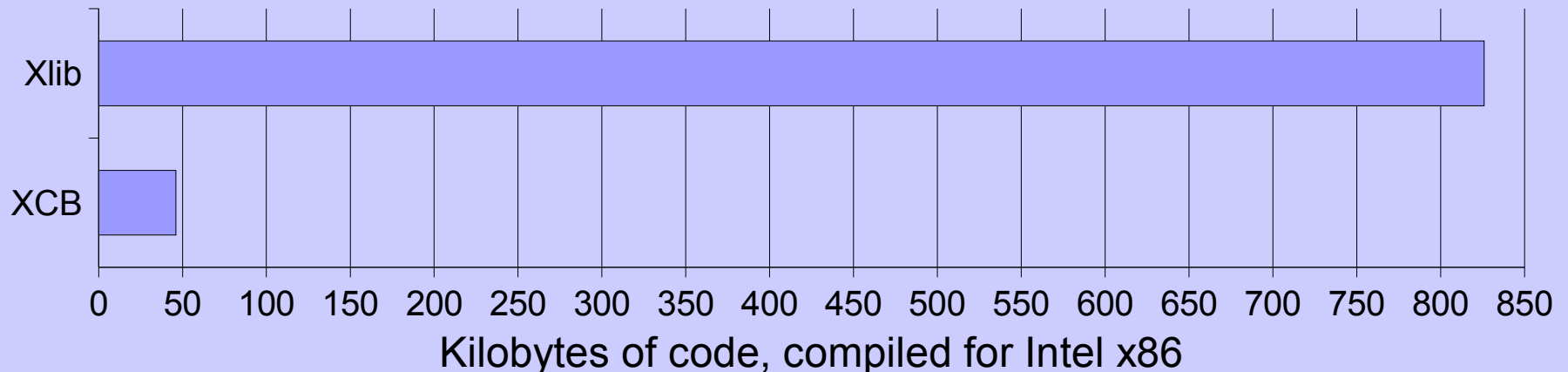
- ◆ Large size
- ◆ Inflexible code
- ◆ Unpredictable behavior
- ◆ Excessive latency
- ◆ Confusing thread support

## Xlib Component Sizes



# *Starting Over: XCB*

- ◆ Simpler, smaller implementation
- ◆ Focus on transport, protocol
- ◆ New domain-specific language for X protocol description provides
  - ◆ flexibility
  - ◆ maintainability

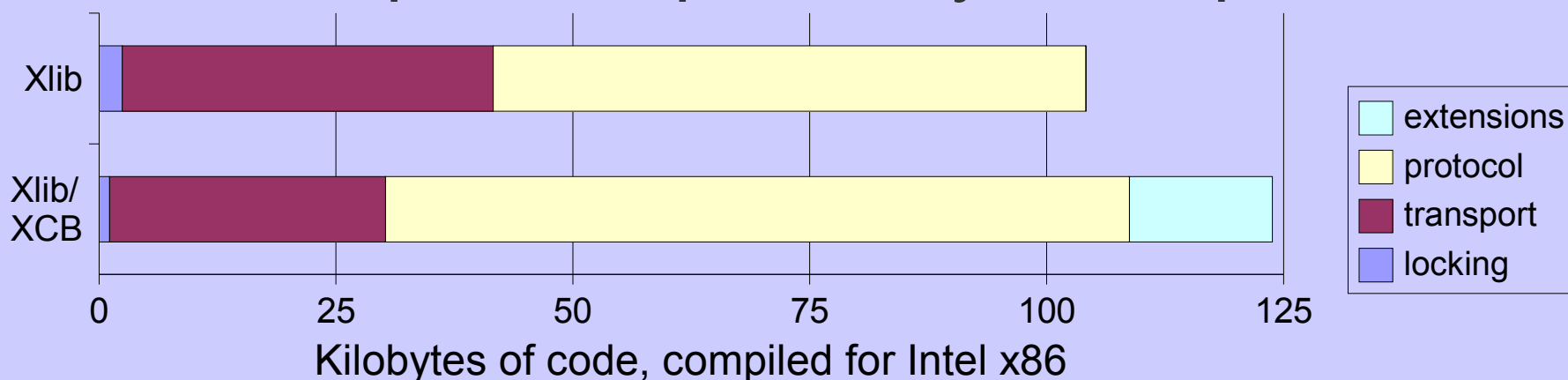


# *Porting Xlib to XCB*

- ◆ Goal: provide a migration path for Xlib-based applications and libraries
- ◆ First try: XCL
  - ◆ Idea: re-implement Xlib's API from scratch using XCB
  - ◆ Problem: Xlib's API is huge
- ◆ Current approach: start migration at bottom
  - ◆ Replace transport and locking with XCB
    - ◆ Prototype implemented in a few days!
  - ◆ Slowly migrate protocol layer to XCB

# Results

- ◆ X Test Suite and real workloads confirm substantial correctness; some bugs remain
- ◆ Locking and transport are simpler and smaller; protocol port not yet complete



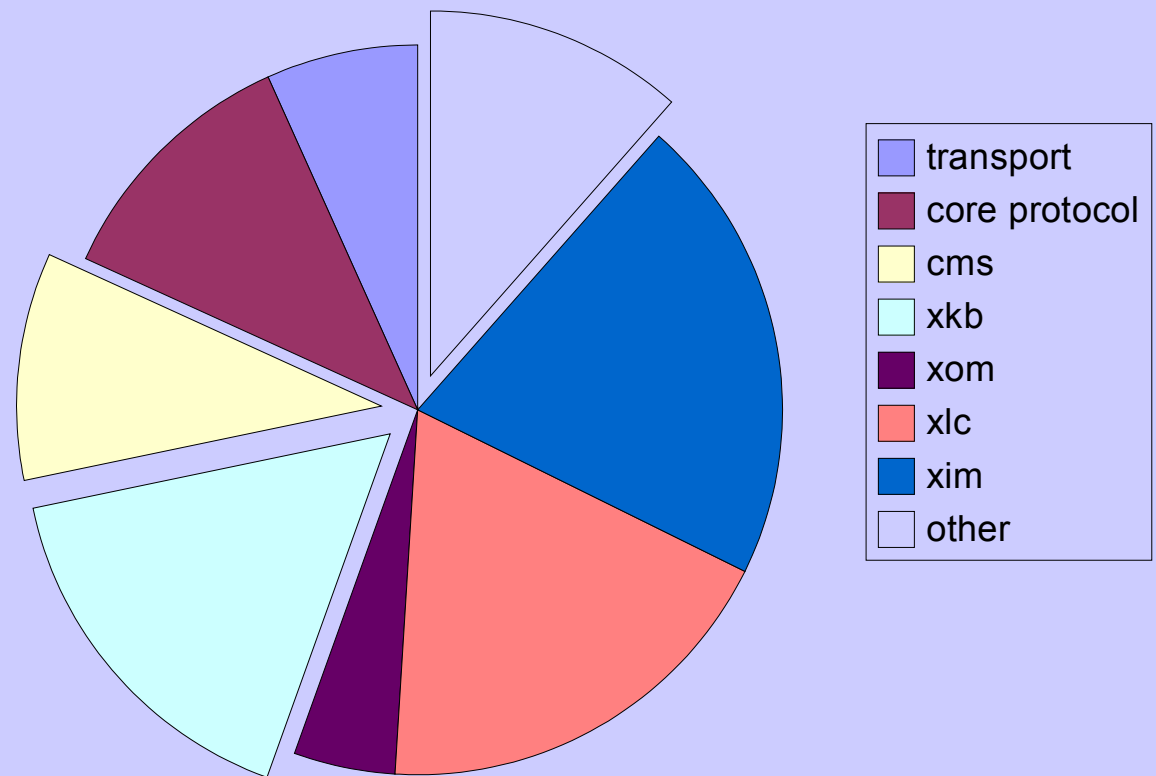
- ◆ Any changes in performance are imperceptible

# *Other Xlib Projects*

## Xlib Component Sizes

Redesigning other Xlib components

- ◆ cms
- ◆ xkb
- ◆ xom/xlc/xim





# *Conclusion*

- ◆ Installed size of X client libraries are reduced significantly
- ◆ Clarity, maintainability, and extensibility are improved as well

# *Acknowledgements*

- ◆ Keith Packard helped us comprehend Xlib and the X Window System.
- ◆ Prof. Bart Massey guides the design and implementation of XCB.
- ◆ Jim Gettys' continued support of this effort is greatly appreciated.
- ◆ Portland State University students Sheridan Mahoney and Mick Thomure provided valuable feedback on the current paper.
- ◆ USENIX

# *Availability*

XCB: <http://xcb.freedesktop.org/>

Xlib: <http://freedesktop.org/Software/X11>