CSE 451: Operating Systems
Winter 2026

Module 20
Review

Gary Kimura

Today's Agenda

- One last hard lesson learned
- Quick recap of topics covered
- Open discussion on any topic
- Finally, some last words

But first, I’m being watched

“Are those kibbles in your pocket”?

CSE 451: Operating Systems
Hard Lessons Learned

Windows
Generic Table Package using
Splay Tree

Gary Kimura

A simple package to look up keyed data

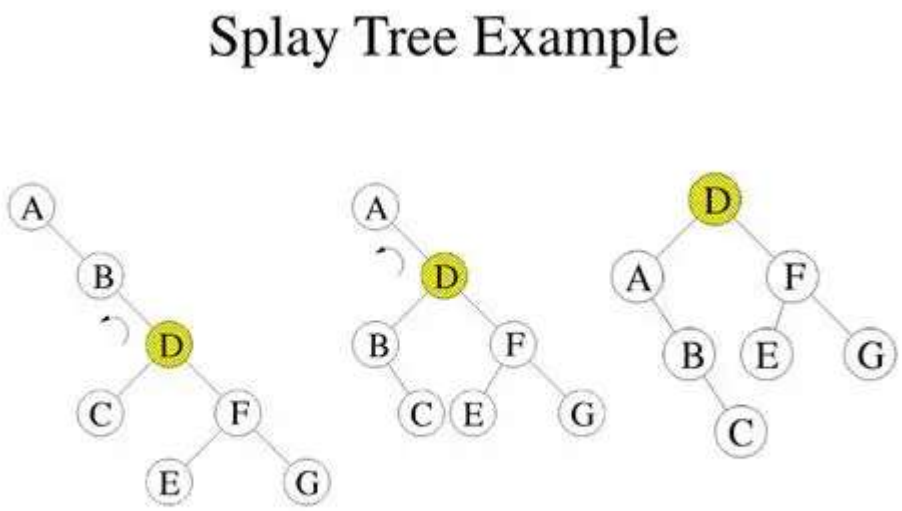
- Create() a table, specify a generic ordering (i.e., sorting) function
- Add() an entry to the table
- Lookup() an entry based on a key
- Remove() an entry

- Great for things like symbol tables in a complier or tracking opened files

- Added a way to enumerate a table from beginning to end, really as a debug tool

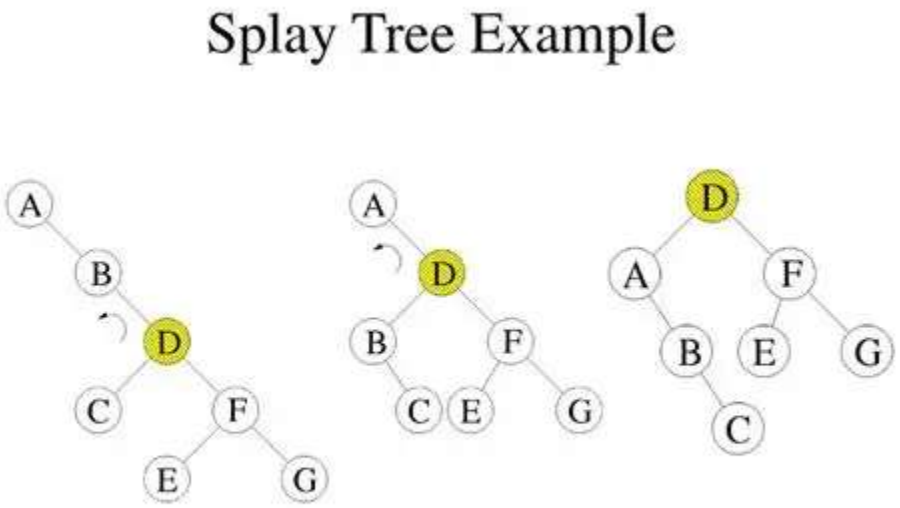
Splay trees: the perfect solution

- Just a binary search tree
- Self adjusting based on lookup



Performance gains

- Locality of lookups (temporal locality)



What could possibly go wrong?

- My simple solution for enumerating a table linearized the tree. It was a quick hack.
- What was originally meant for simply debugging the package became widely used. Augh!
- Used in the Windows Kernel Timer queue.

Back to the drawing board.

- Another developer replaced Splay trees with Red Black trees

Today's Agenda

- ~~One last hard lesson learned~~
- Quick recap of topics covered
- Open discussion on any topic
- Finally, some last words

Major Topics

- Hardware Modes
- General Structure, Architecture, and Processes
- Interrupt, Exception, and Syscall
- Locks, Deadlock, and Starvation
- CPU Scheduling
- Memory
- Virtual Memory
- Storage and File Systems

Obsolescence in design

- Ponder the implications of all the changes that have taken place in last 50+ years regarding computers.

- Word size: 8bit, 12bit, 16bit, 32bit, 36bit, 60bit, 64bit.
- Many things have become bigger and keep getting bigger
- Some things have shrunk
- A lot of things have becoming faster, but some speeds haven't changed
- And a lot more things…

Pet Peeves

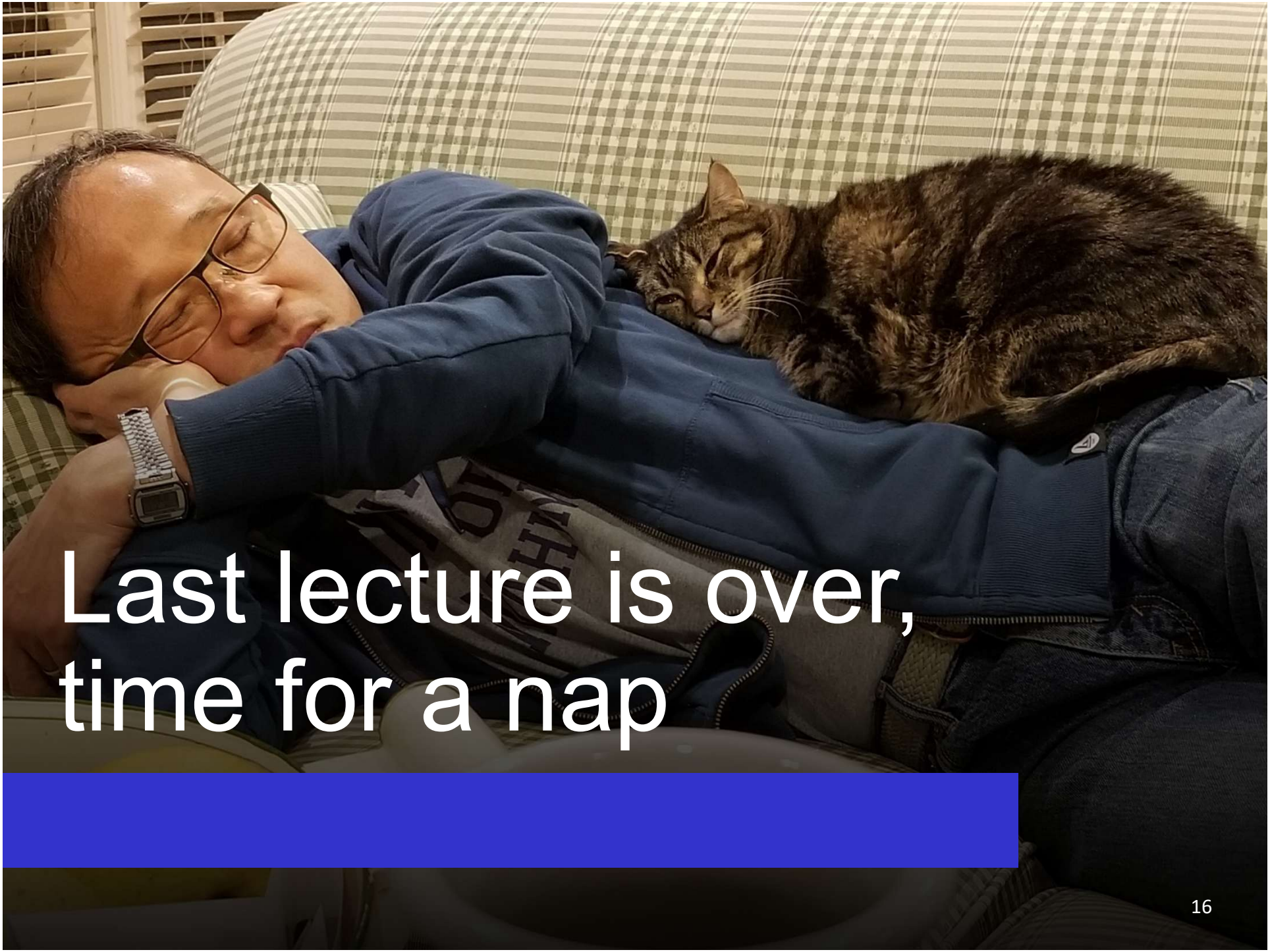
- Overly complex design (Keep It Simple)
- Poorly commented code
- Undocumented Tribal knowledge
- Picking a solution because it works well on some contrived data sets. Sorting is an example
- The job interview and selection process in the tech industry
- And the list goes on…

Wrap up

- OS design is not magic
- But the OS is a whole lot of stuff all tied together in sometimes unobvious, convoluted, and messy ways
- Hot OS topics? Research versus Industry
- What I hope you got out of this class
  - A more complete understanding of the OS environment that will make you better programmers and computer users
  - And when you stumble upon a bug in Windows you'll know who to blame

Penultimate slide

- ~~One last hard lesson learned~~
- ~~Quick recap of topics covered~~
- Open discussion on any topic
- Finally, some last words


Last lecture is over,
time for a nap