Memory Access Visualization
Memory Geography: An add-on tool for a DRAM simulator
• Java based GUI application
  • Cross platform
  • Uses well-known, standard Swing/AWT libraries
• Uses data produced by our DRAM simulator
• Data input file may be specified
• Presents color coded “memory geography”
• Each memory element displayed separately
  • Channels at top level
  • Ranks below channels
  • Banks below ranks
  • Rows below banks
  • No Columns?
What is it? (more specifically)

- Top level displays memory’s channel(s)
- Clickable dialog allows you to browse through the memory hierarchy
- LOTS of rows to display, they are displayed in grid form…but still one box is a single row of memory
- At each level, coloration quickly gives you a relative idea of “what’s hot”
- At Channel, Rank and Bank level, number of accesses is readily visible
- At Row level, click on a “row” in the grid to display information on row number and number of accesses
Why?

- Visual representation of what's going on at the address level
- What rows are getting hit hard?
- Is the simulation giving a reasonable data set? (Sanity checking)
- Is the address mapping appropriate for what I am doing?
- Looks cool. Fun to work on. Never programmed a non-web GUI 😊
Let’s See It!  (Demo Time!)
Observations

- Pick a file. Format is important.
- Colors and ratio formulas seem ok, but can easily be tweaked and further graduated.
- First see the channels, click to explore further.
- Data collected on open and closed page data sets using Dave’s bus traces, also on randomly generated address in mem-test.c
- Seems as if all data is concentrated in certain rows for the bus traces, but more “noisy” for randomized mem-test data.
Issues/Future Ideas

- Memory! Eight channels is too much to handle.
  - $8 \times 8 \times 8 \times 16384$ vs. $1 \times 8 \times 8 \times 16384$
  - Limitations for extensive FBD-DIMM exploration
    - Row scaling factor can be adjusted, for this demo, it’s a one-to-one ratio
    - Range of channels can be processed and shown
- Better implementation of row presentation, repainting takes a while.
- More of a top level overview? Is anything interesting below, but not readily visible at the channel level?