Quantifying Temporal and Spatial Localities
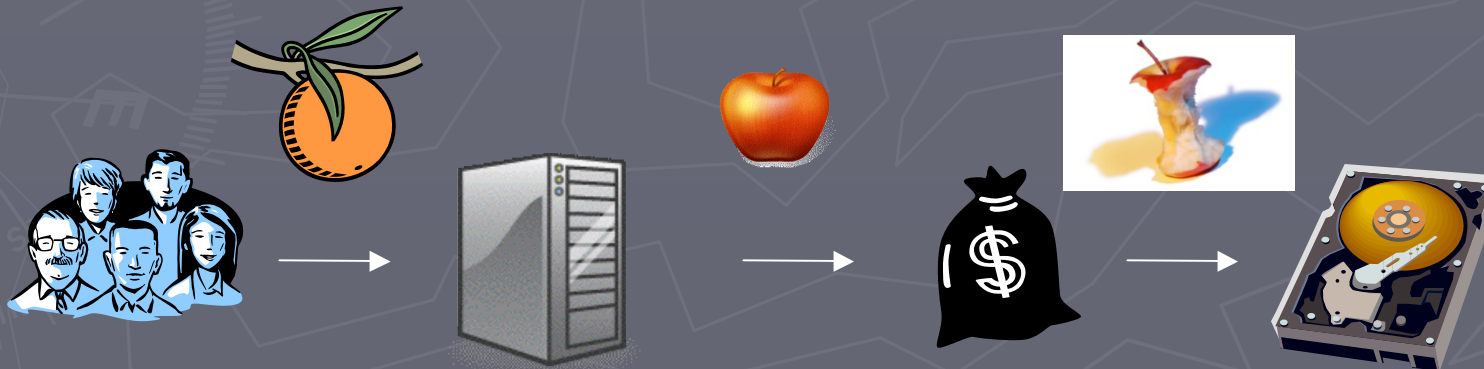
Florida State University

fox, lojpur, awang@cs.fsu.edu

Quantifying Localitites

- **Describe workloads**
  - Compare different workloads
  - Create accurate synthetic workloads
- **Understand locality transformations**
  - How are workloads transformed by caching?
  - Do workloads properly stress data path components?
  - What opportunities remain for further data path optimizations?

Current Metrics

- ## Cache hit ratios
  - Measures the effectiveness of caching
  - Does not cleanly separate temporal and spatial locality
  - Does not show transformations
  - Only applies to cache

- ## Reference distance
  - Reference distance is the number of unique blocks referenced before accessing the same block

- ## Block distance
  - Block Distance is the difference between block locations on disk
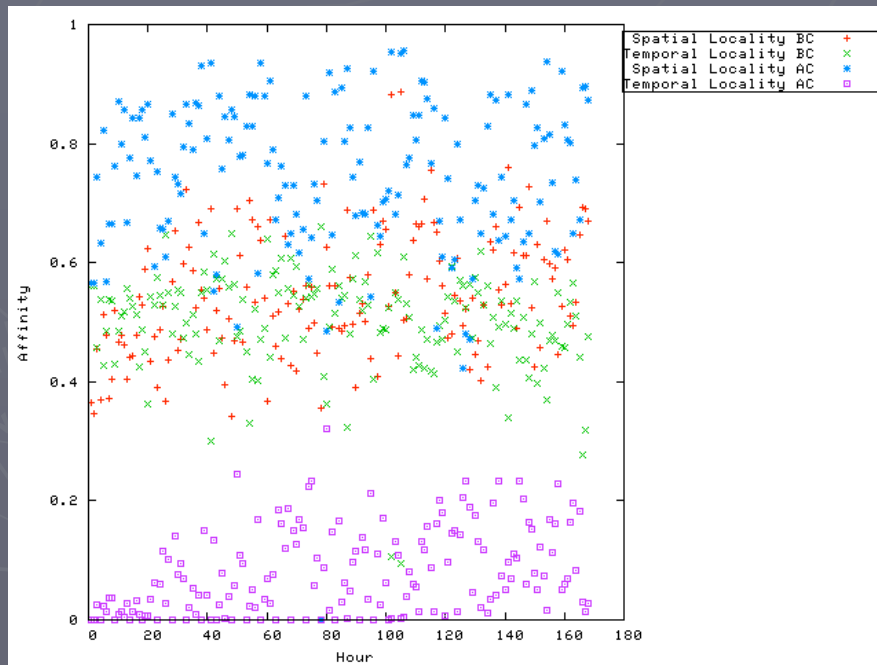
New Metrics

- Affinity
  - Builds on block and reference distance
  - 0%-100% easy to understand
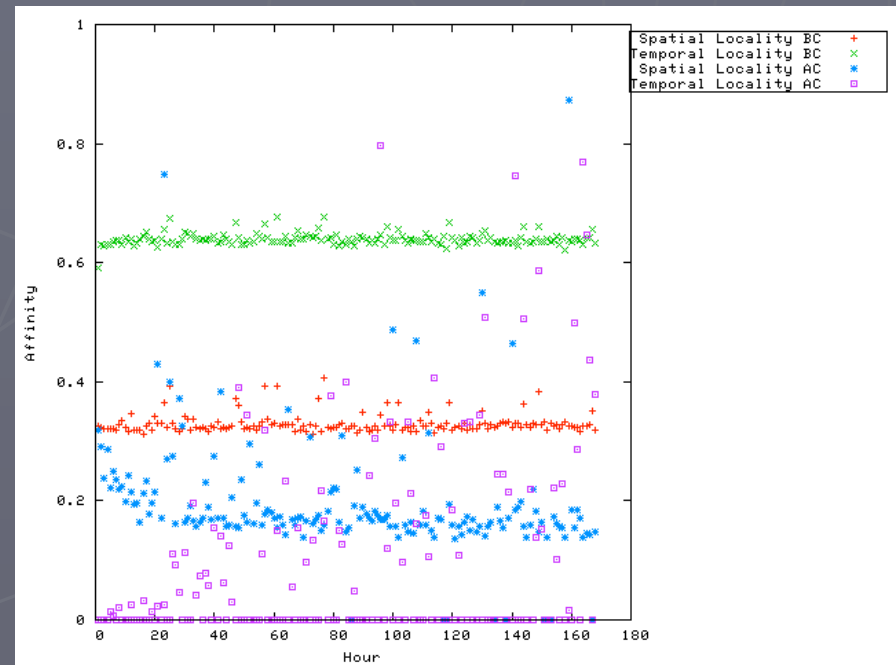 - Less sensitive to generations of hardware

Example use

Web-trace

Synthetic

Shuffled references, same inter-arrival rate, reference distribution

Future Work

- Study how each storage component transforms locality characteristics
- Verify fidelity of various benchmarks
- Improve storage components and benchmarks