Challenges for the future storage

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(מיום שחרב בית המקדש) ניטלה נבואה מן הנביאים וניתנה לשוטים ולתינוקות לשוטים

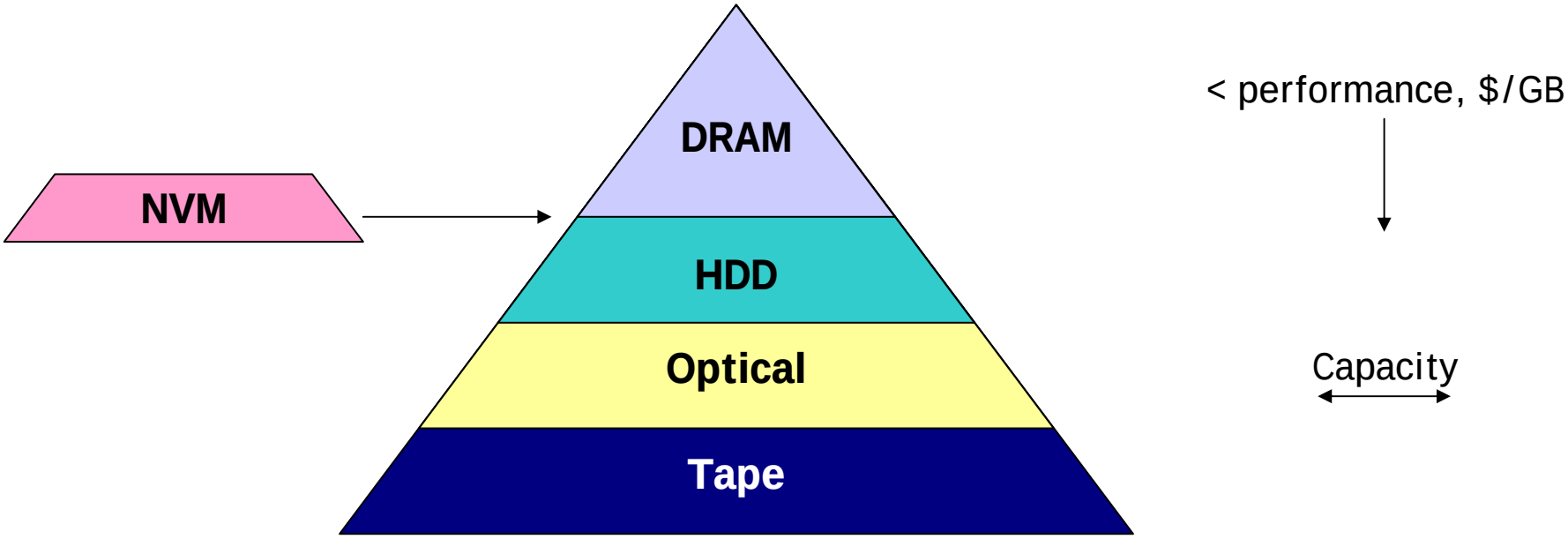
- Translation from Hebrew – “(Since the destruction of the temple) the gift of prophecy was taken from prophets and given to toddlers and fools”
  (The Law of Damages – see: http://kodesh.snunit.k12.il/b/l/l4301_012b.htm)

- Let’s talk about challenges ☺
  - Basic Storage Technology
  - Storage structures as they relate to various application areas
  - Commodity component trend

Basic Storage Technology

- Devices
  - Devices in use today DRAM/SRAM, Flash, HDD, Optical and Tape
  - All depend on lithography!
  - Need for capacity is increasing exponentially
  - Capacity is increasing very fast (no clear law and some slow down in sight) but performance is not keeping up
  - We risk ending up with disk farms where no disk will be filed before it fails
- Storage structure
  - Is caching an universal panacea? Is it cost effective?
  - Current cache hierarchy has DRAM, HDD, Optical, and Tape
  - Compute servers are becoming fast a “minority” in a market dominated by consumer devices that have a far shallower hierarchy
  - See “Hetzler model”

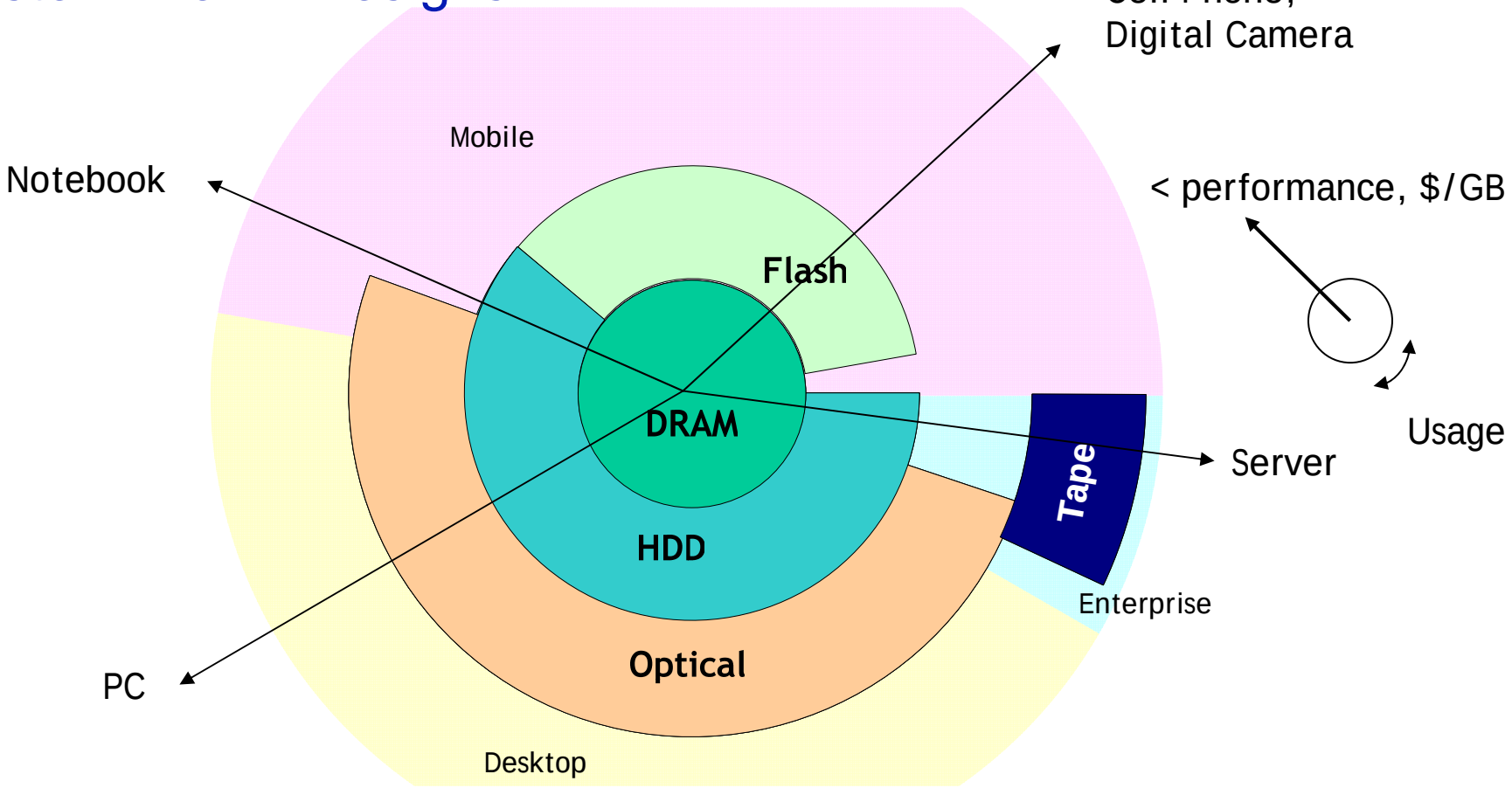
Classical Memory Hierarchy



"Classical Hierarchy"

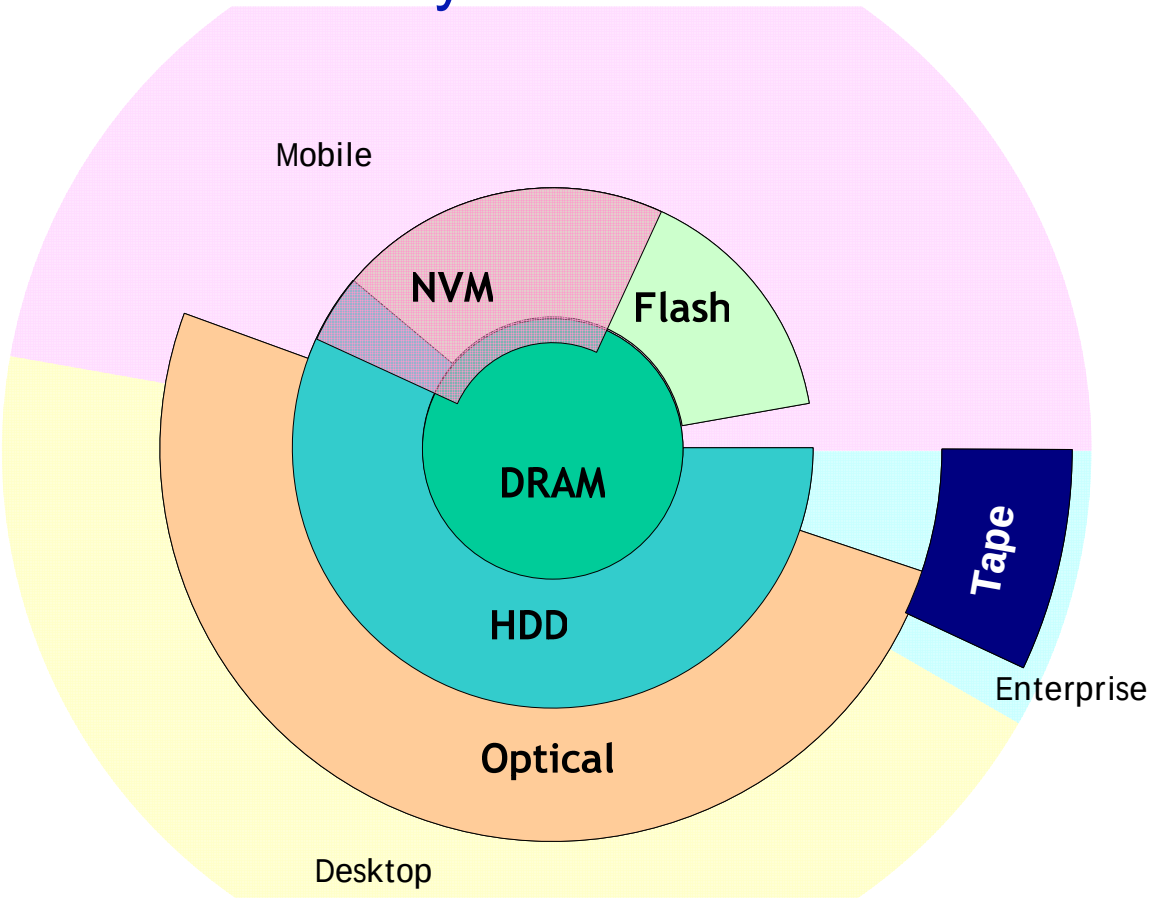
- Common assumption for non-volatile memories (NVM)
  - Fit between DRAM and HDD

System View - Designs



- Radial line is a system design

System View – NV Memory



HPC and commodity components

- HPC has enjoyed an enormous increase in performance and decrease in price based on the commoditization of components for the last 20+ years
- Components where mainly built for computers
- Used the designs and knowledge from previous computer generations (before they became commoditized) - no new architecture elements for a long time
- The target market is changing and the accumulated IP (intellectual Property) is wearing thin.
- Storage is also becoming highly important as the main repository of human knowledge and, that brings a plethora of new requirements which are not always aligned with High Performance Data Intensive computing

Question 1

- For the next several years, assuming an increasing demand for storage capacity and speed, but no change in the storage device availability and structure, what should be the areas for system research ? Assuming that the "preservation" trend continues and its challenges can be met by new function in storage then how could the HPC community benefit from it?

Question 2

- Object Storage has for a long time been the "love-kid" of this community. As time passes and the component economics change, how should Object Storage evolve?
  To a completely programmable device?
  Or partly programmable device?
  And, then what? Can it satisfy other markets?

Question 3

- Programming models have a very basic support for storage: the best example is, that with all the widespread usage of search programming, ingest of data is still completely tied to precisely defined data set. Is this good enough? How can we bridge the gap between search and data usage by programs?

Question 4

- As the storage usage volume moves away from computing, do we need to look again beyond commodity, to some forms of storage that are "specialized for HPC”? Should this be an industry effort? (Is there enough market?) Or should this be a government(s) sponsored effort?

Panel answers

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