Roadmap for Enterprise System SSD Adoption

IBM

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Smart Data Placement

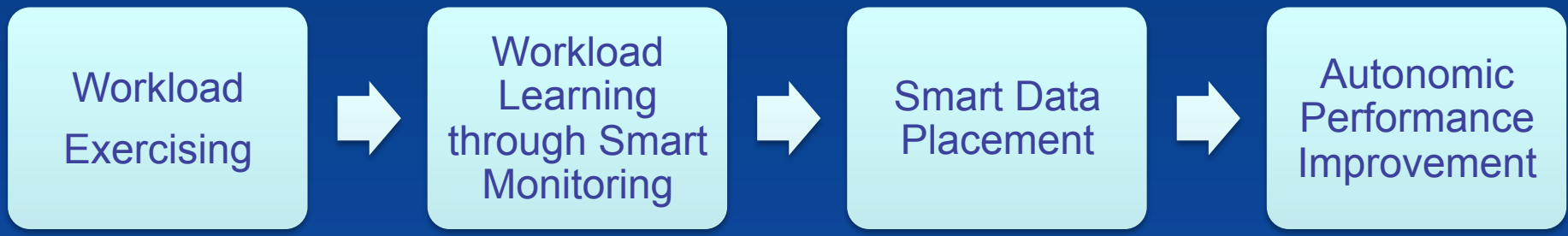
IBM is focusing on placing the right data on SSDs to maximize the performance/cost benefit.

Now:

- **DS8000+SSD/z tooling**
- **P+SSD/AIX/filemon**
- **i-Series workload analysis tools**
- **Storage system Fine-grain data performance monitoring and analysis tool**

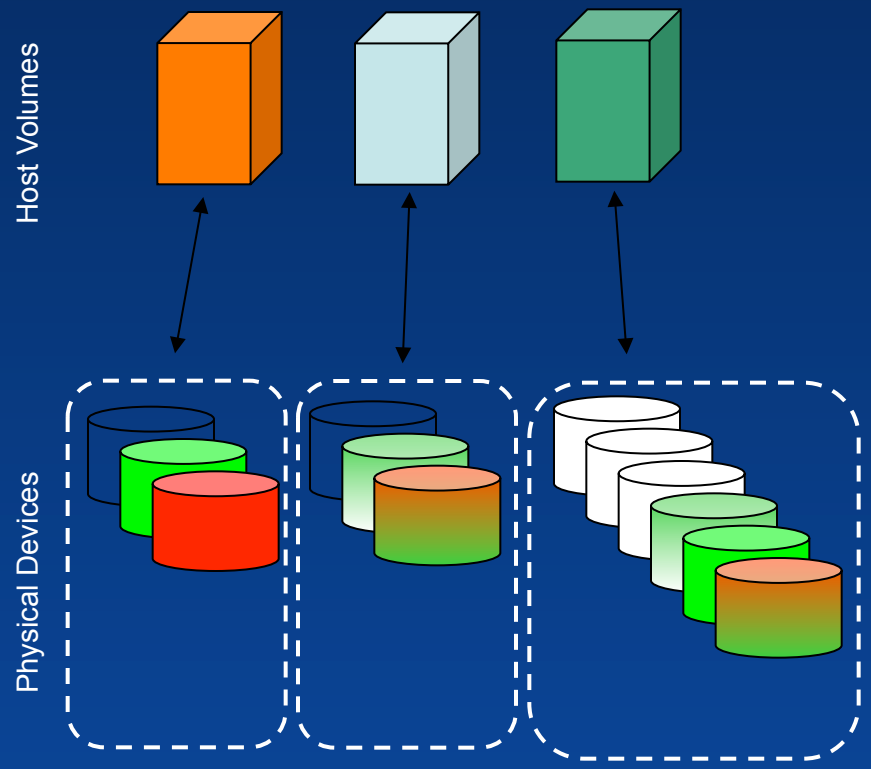
Coming:

- **Smart data migration to maximize the SSD benefit**



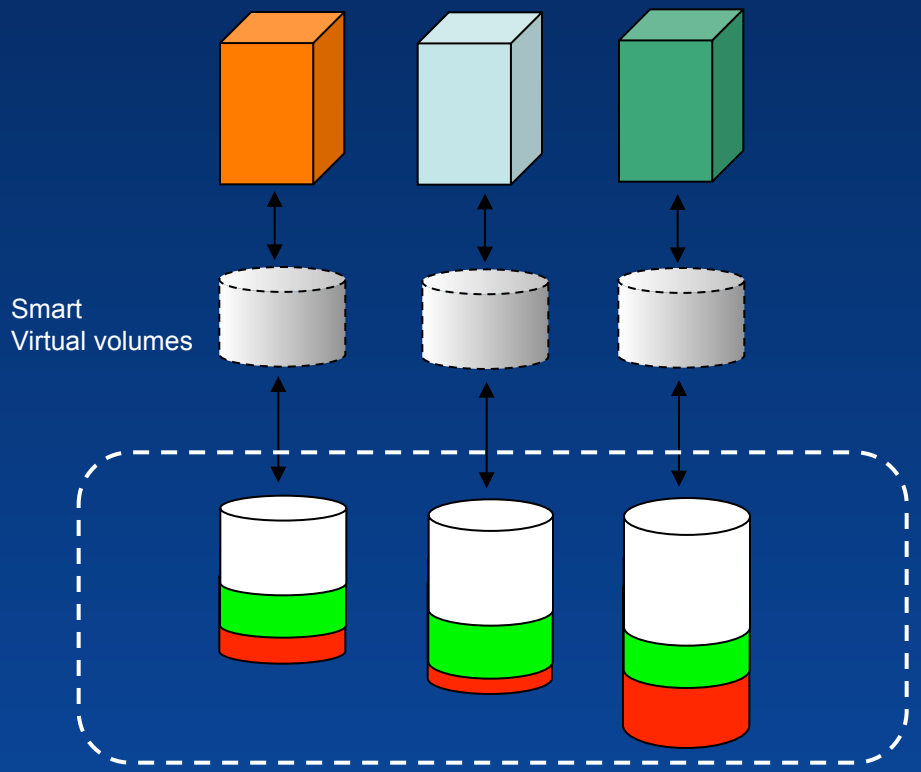
Traditional Disk Mapping vs. *Smart* Storage Mapping

Traditional disk mapping



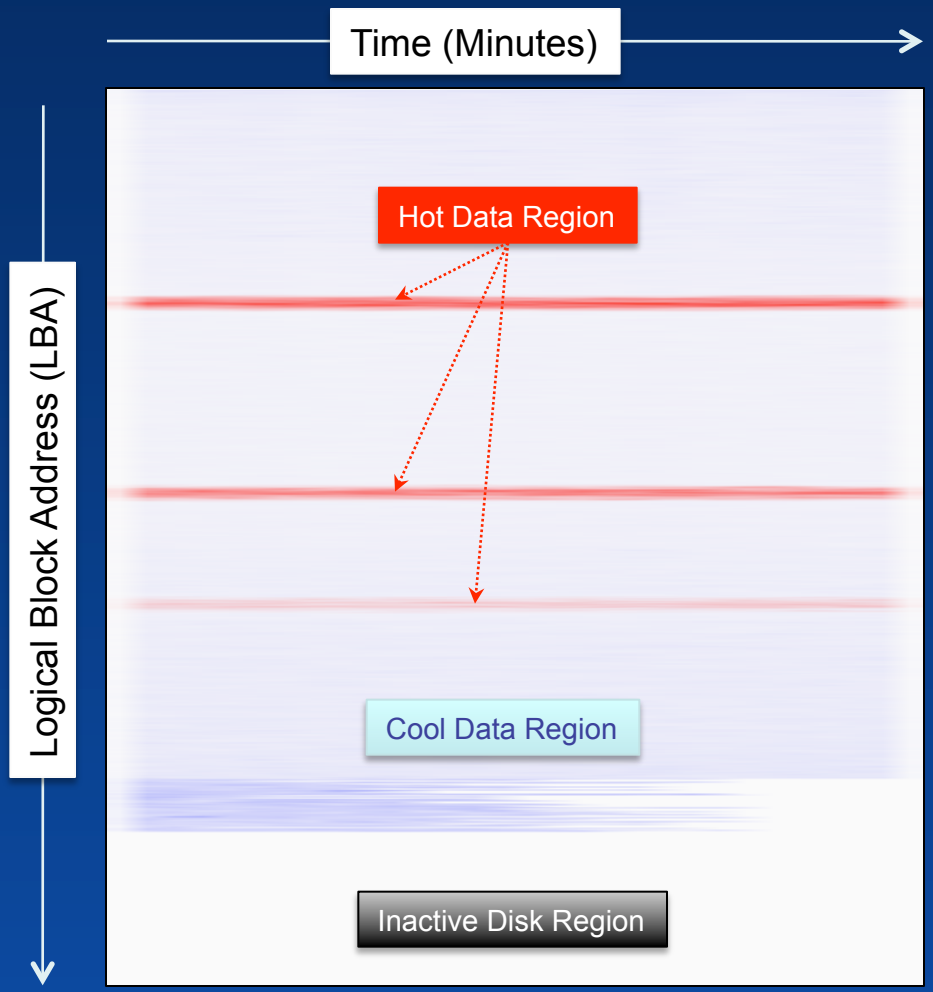
Volumes have different characteristics. Applications need to place them on correct tiers of storage based on usage.

Smart storage mapping



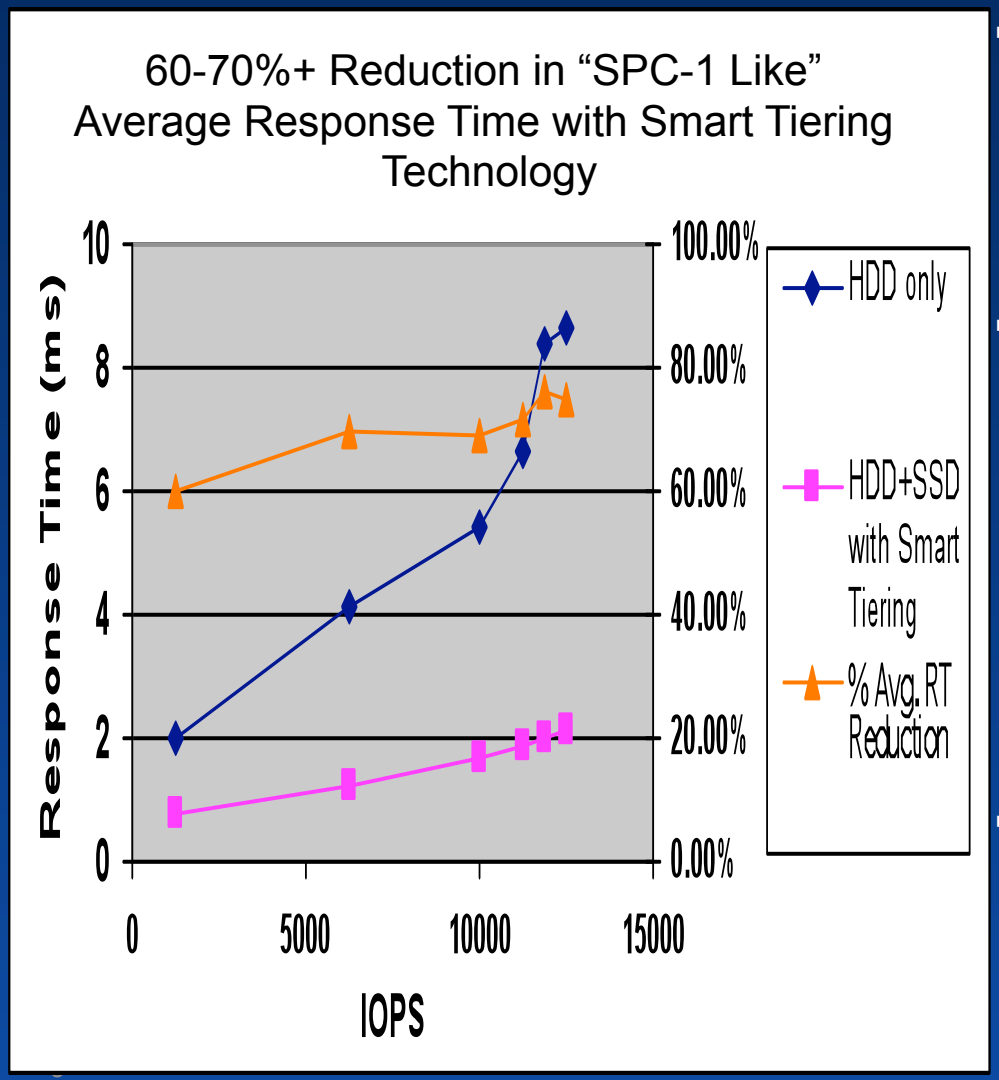
All volumes appear to be “logically” homogenous to apps. But data is placed at the right tier of storage based on its usage through smart data placement and migration.

Workload Learning through Smart Monitoring



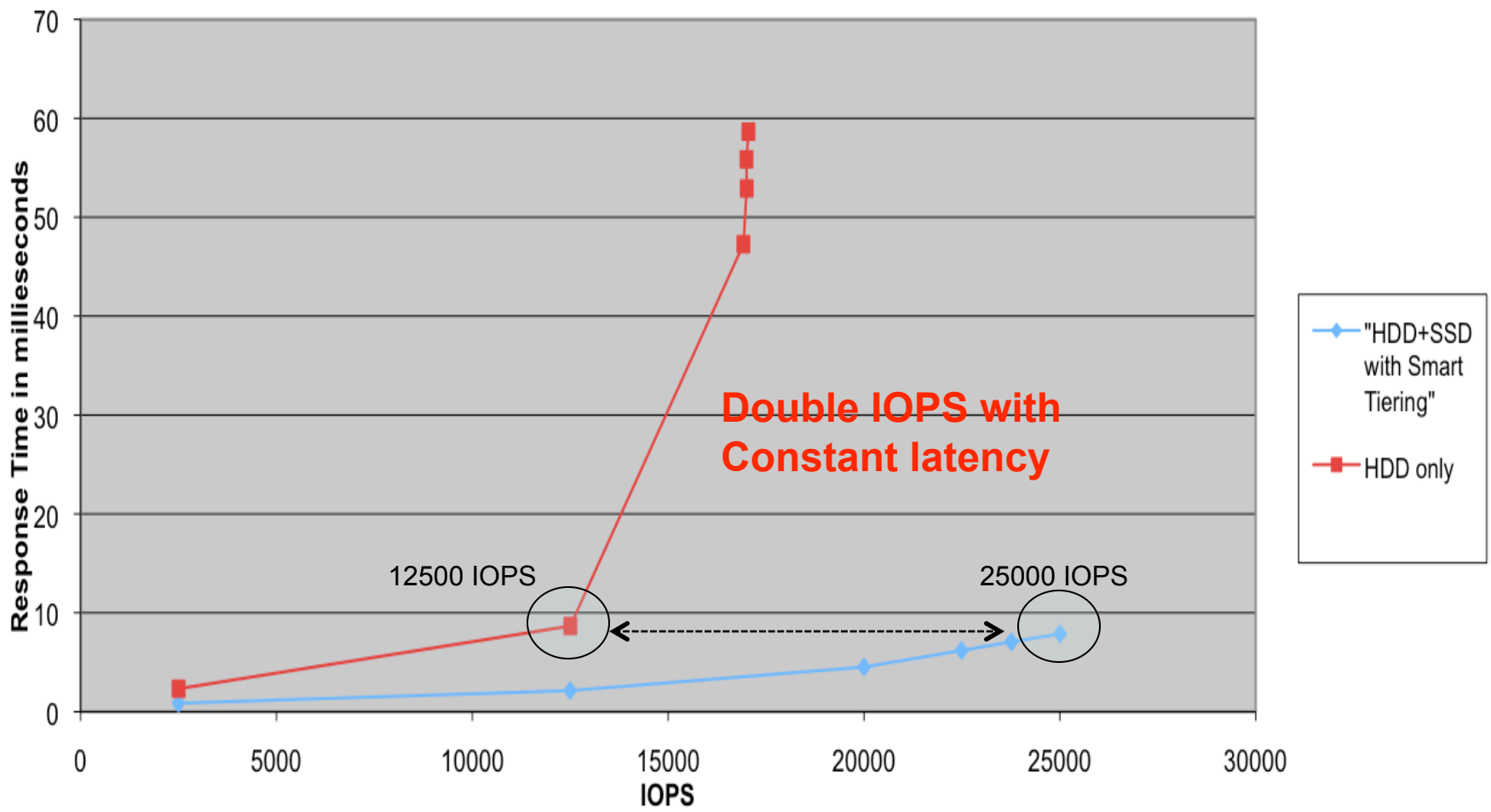
- Each workload has its unique IO access patterns and characteristics over time.
- Smart Monitoring and analysis tool allows customers to develop new insight to application optimization on storage infrastructure.
- Left diagram shows historical performance data for a LUN over 12 hours.
  - Y-axis (Top to bottom) LBA ranges
  - X-axis (Left to right) time in minutes.
- This workload shows performance skews in three LBA ranges.

Demonstration of Smart Tiering Technology on IBM Enterprise Storage System



- Setup:
  - Single Enterprise Storage System with both HDD and SSD ranks. About 5-6% capacity is in SSD ranks.
- Demonstration of Smart Tiering:
  - Compare "SPC-1 like" workload on HDD versus "smart tiering of HDD and SSD"
  - Smart Tiering Technology identifies and non-disruptively migrates "hot data" from HDD to SSD. About 4% of data is migrated from HDD to SSD.
- Result:
  - Response time reduction of 60-70+ % at peak load
    - **Sustainability test, 76%**
    - **Ramp test, 77%**

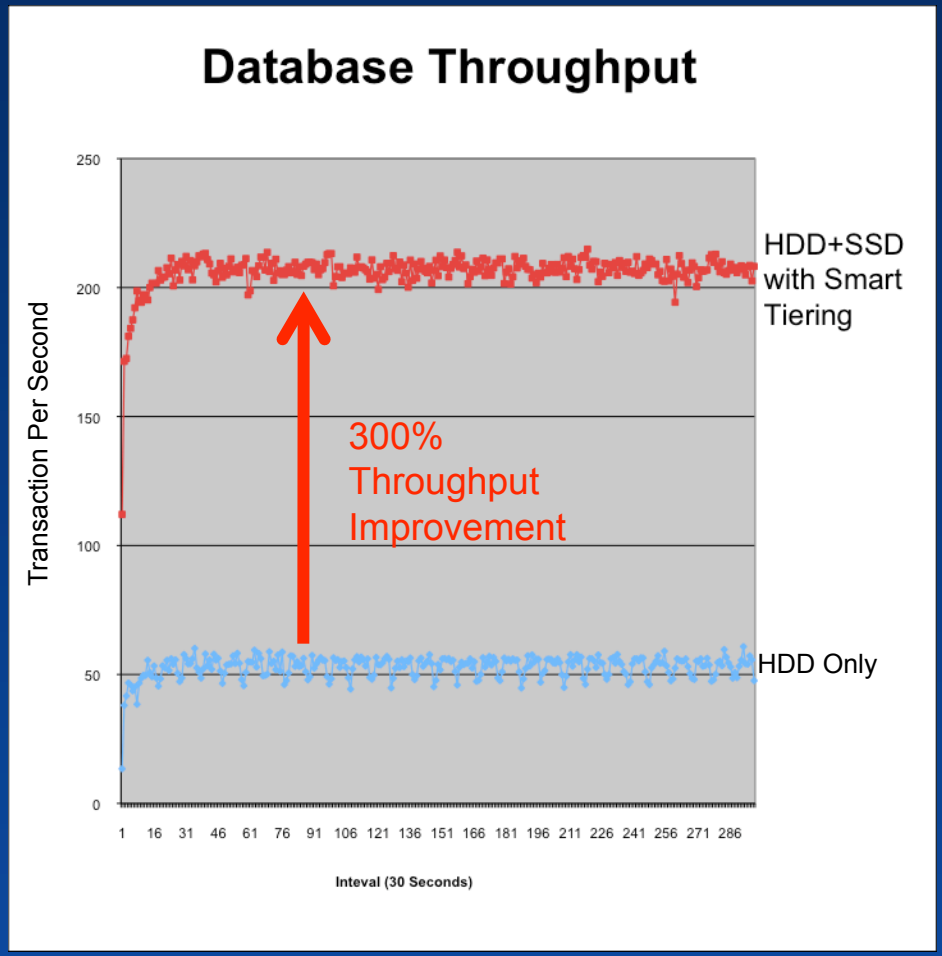
Workload Performance IOPS Doubled with Smart Tiering



"SPC-1 Like" Workload

Brokerage Workload using DB2 and Smart Tiering

- Identify hot "database objects" and smartly placed in the right tier.
- Scalable Throughput
  - 300% throughput improvement.
- Substantial IO Bound Transaction Response time Improvement
  - 45%-75% response time improvement.



Customer Value Proposition

- Automatically optimize storage performance within enterprise storage system to improve dynamic application demand or dynamic system configuration.
- Maximize performance / cost benefit.
- With a small percentage of data re-organization from tier 1, 2 to tier 0, a significant latency reduction or throughput improvement can be achieved to the total workload.
  - Fine grain reorganization of 4-5% of data to SSD to gain 70+% reduction in average response time or doubling (200% increase) of throughput.
- Enable customers to develop new insights of application workload on their storage infrastructure and develop new optimization strategies.

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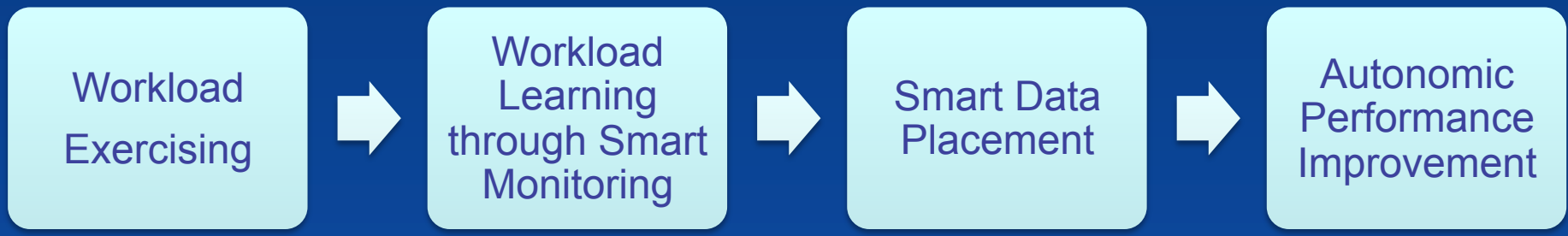
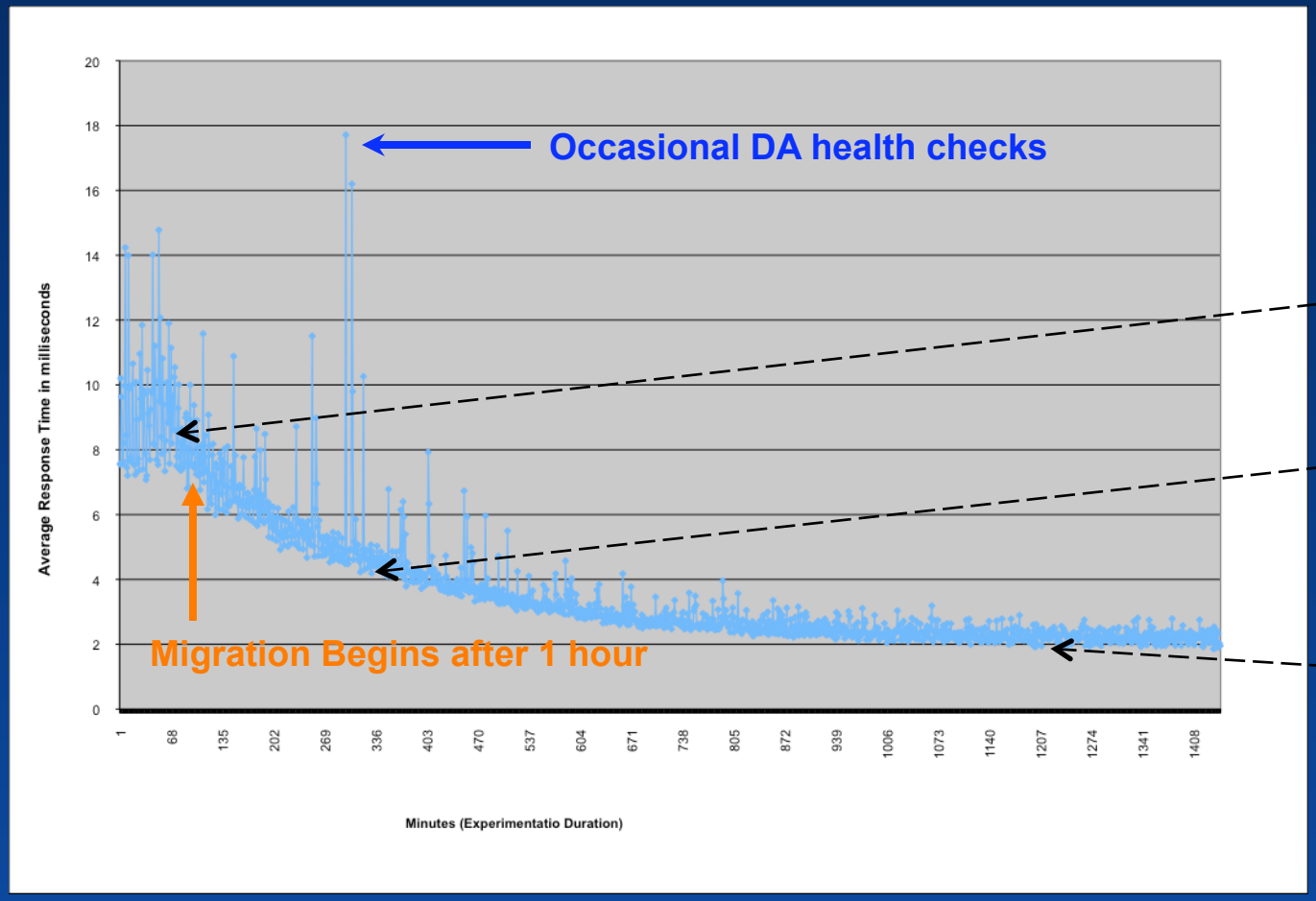


THE END

Average Response Time Shows Significant Improvement with Smart Data Placement and Migration



Before Migration:
Avg RT 9.13msec

After 5 hours Migration:
Avg RT 4 msec

Maximum Improvement
Of Average RT to 2 msec