Storage Performance Analysis for Big Data Processing

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Storage Performance Model

End to end big data benchmarking has become an extreme attention of ICT industry, the related techniques are being investigated by numerous hardware and software vendors.

Storages, as one of the core components of a data center system, need specially designed approaches to measure, evaluate and analyze their performance.

This talk introduces our methods to create the storage performance model based on workload characterization, algorithm level behavior tracing and capture, and software platform management.
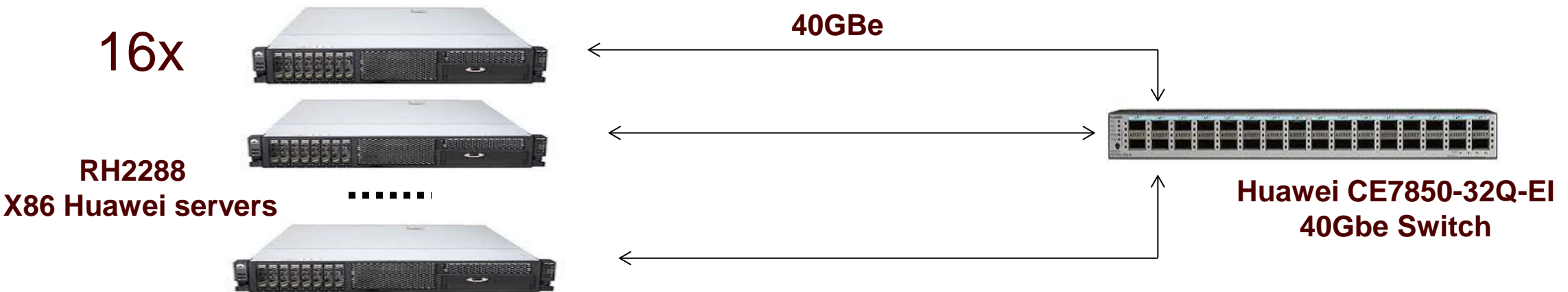
The functionality and capability of our methodology for quantitative analysis of big data storage have been validated through benchmarks and measurements performed on real data center system.

A FusionInsight System for Big Data

Hadoop Cluster HW Configuration

16x

RH2288
X86 Huawei servers

40GBe

Huawei CE7850-32Q-EI
40Gbe Switch

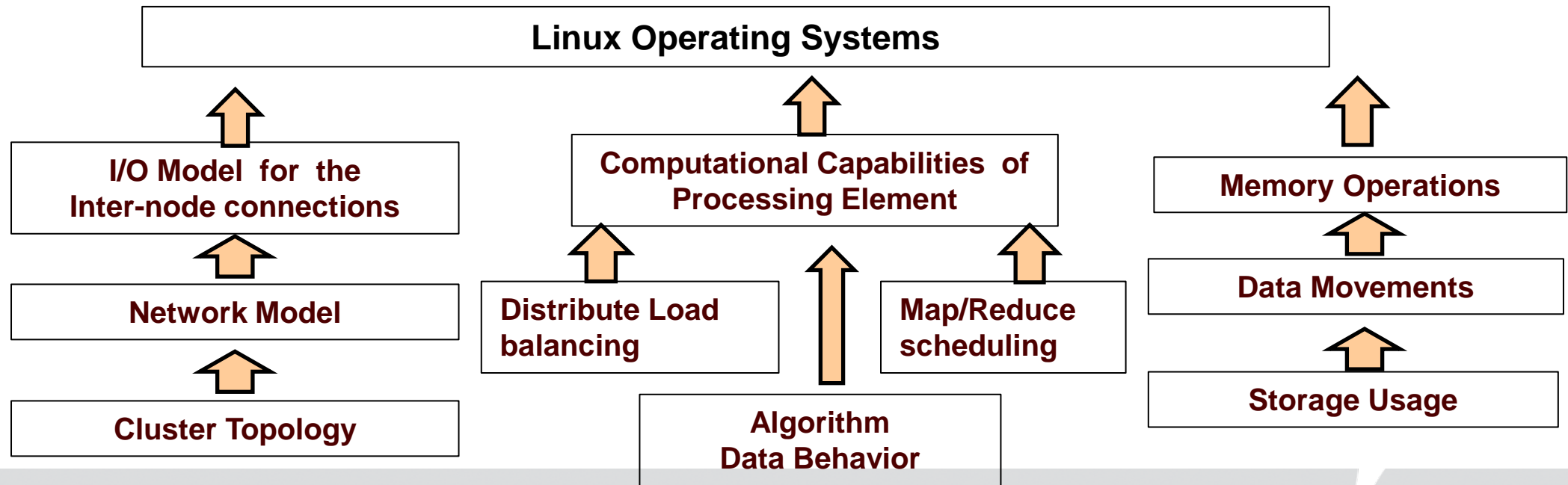|	
Servers:	16 x Huawei Tecal RH2288 v2 Server
Total Processors/Cores/Threads	32/256/512
Processor	2 x Intel® Xeon® Processor E5-2680 v2, 2.70 GHz, 20M L3
Memory	256GB
Storage Controller	1 x Symbios Logic MegaRAID SAS 2208
Storage Device	1 x 600GB 10K SAS HDD, 1 x 2.4TB Huawei ES3000 PCIe SSD Card
Network	1 x Mellanox ConnectX-3 Pro EN 40GbE SFP+CNA
Connectivity:	1 x Huawei CE7850-32Q-EI 40GigE

Storage Performance Modeling and Analysis

Software Stack

Performance Analysis

Applications

API   REST/SNMP/Syslog

Hue	Loader	Flume	FTP-Server
Hive	Impala	Elk
MapReduce	Spark	Solr
Oozie	Kafka	YARN
HDFS	SmallFS	DBService	HBase	ZooKeeper

FusionInsight Manager

Plugin API

Management

Security

Linux Operating Systems

I/O Model for the Inter-node connections

Network Model

Cluster Topology

Computational Capabilities of Processing Element

Distribute Load balancing

Map/Reduce scheduling

Algorithm Data Behavior

Memory Operations

Data Movements

Storage Usage

Program Behavior Model from Measurement

- One view that correlates data from all the experiments based on the common sampling rate and common time line;

- Analyze parameter for the application's (TPCx-HS) behavior

- Identified program charactors and create leading markers;

- Identified program segments and perform detailed analysis on each segment;

- Developed a Model that can use data captured from the systems stimuli and explore bottlenecks and dependencies.

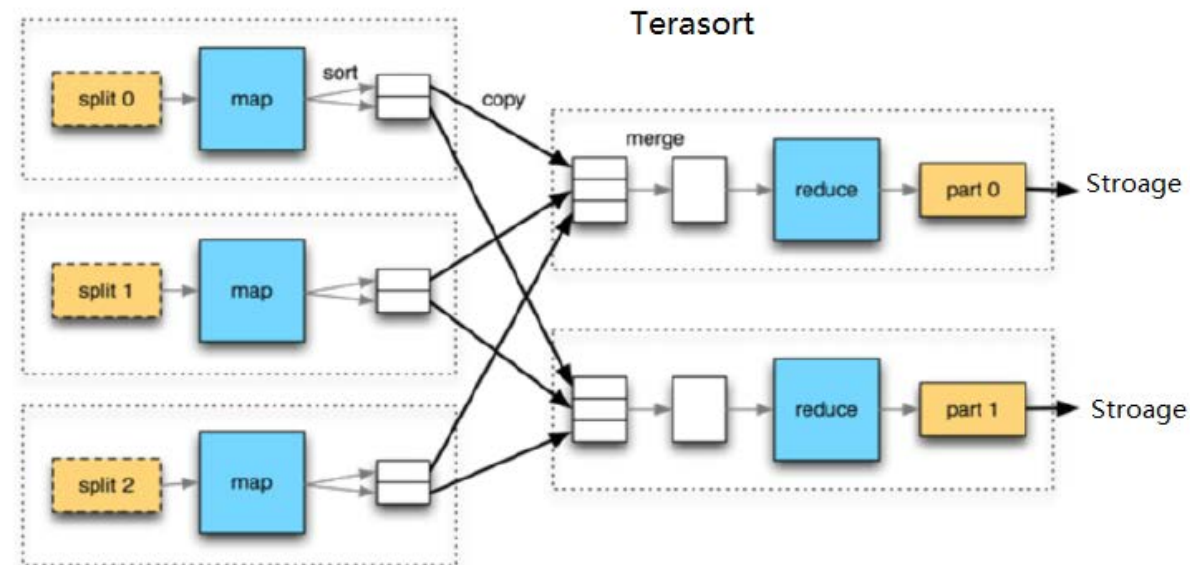# Performance Issues in Each Layer of Big Data Computing

FIG. 3

$$\sum_{i=1}^{steps} t_i$$

$$\sum_{j=1}^{steps} t_j$$

Data Processing
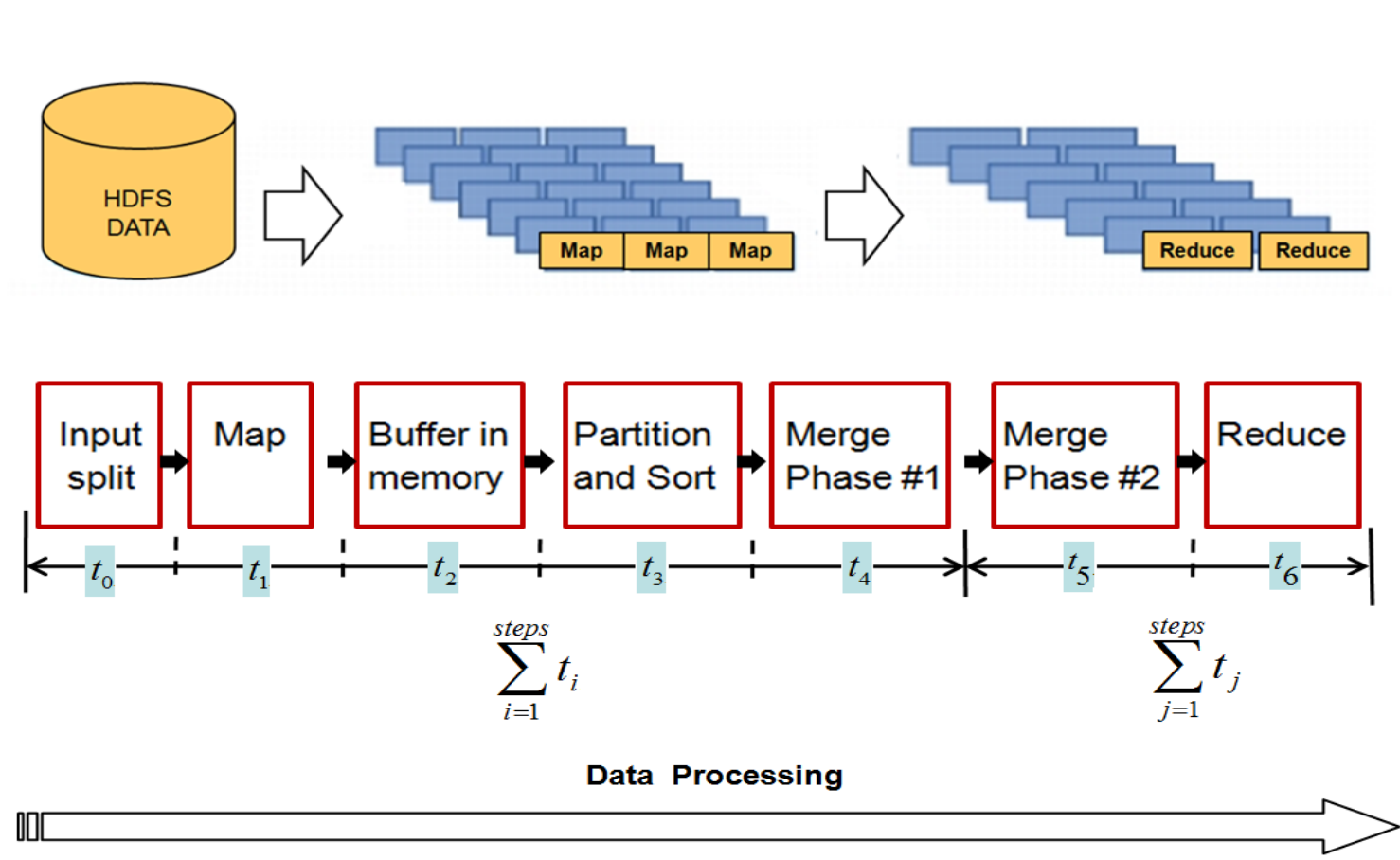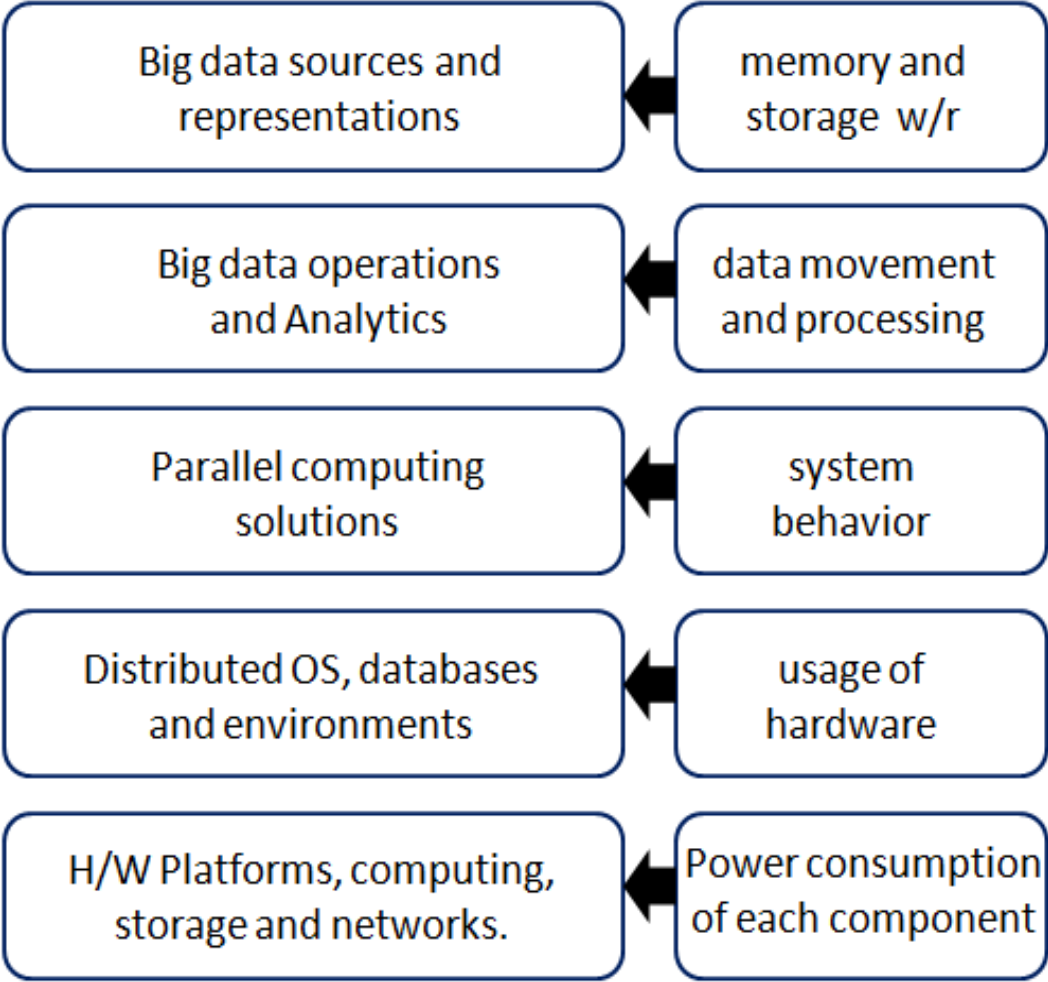
Algorithm Behaviors in Terasort
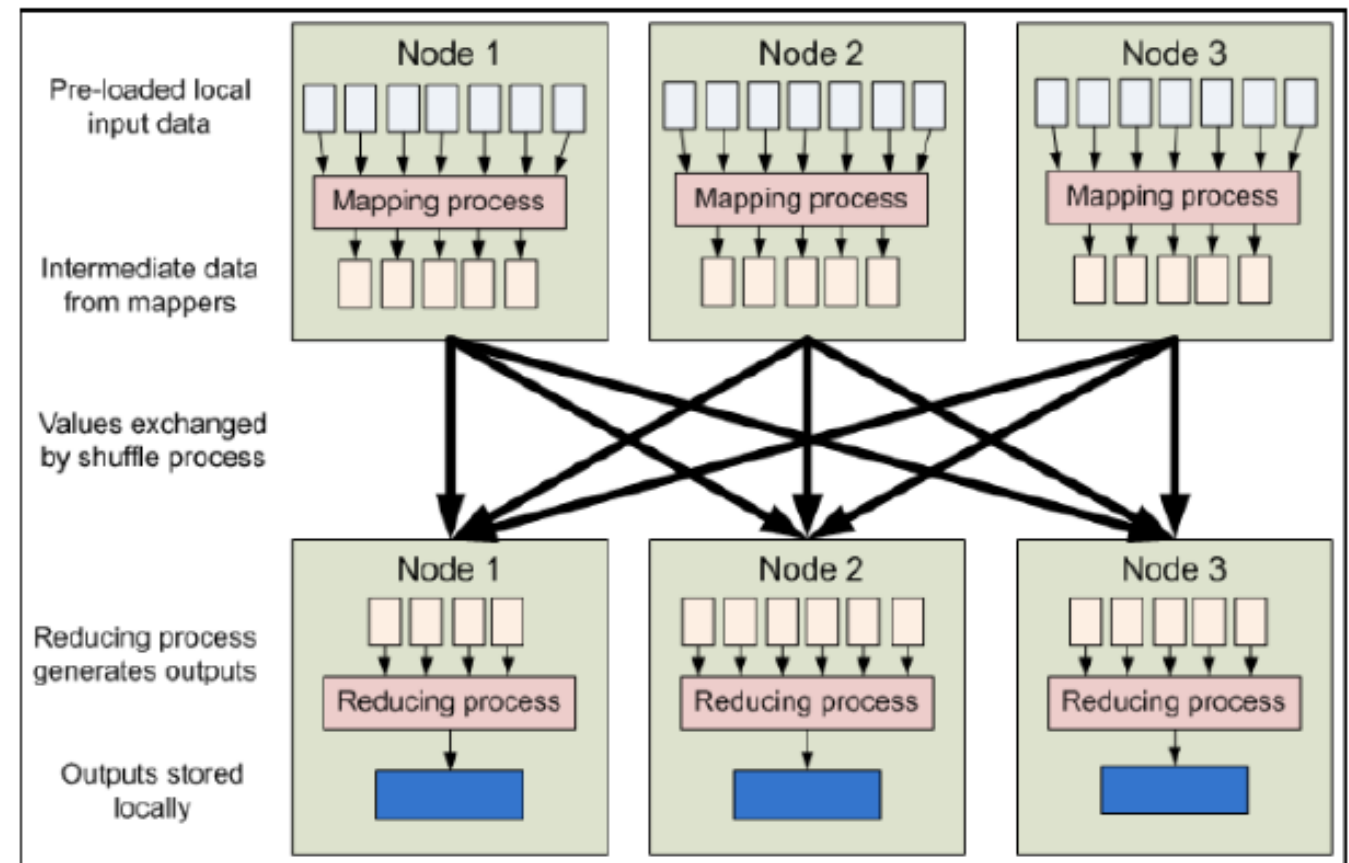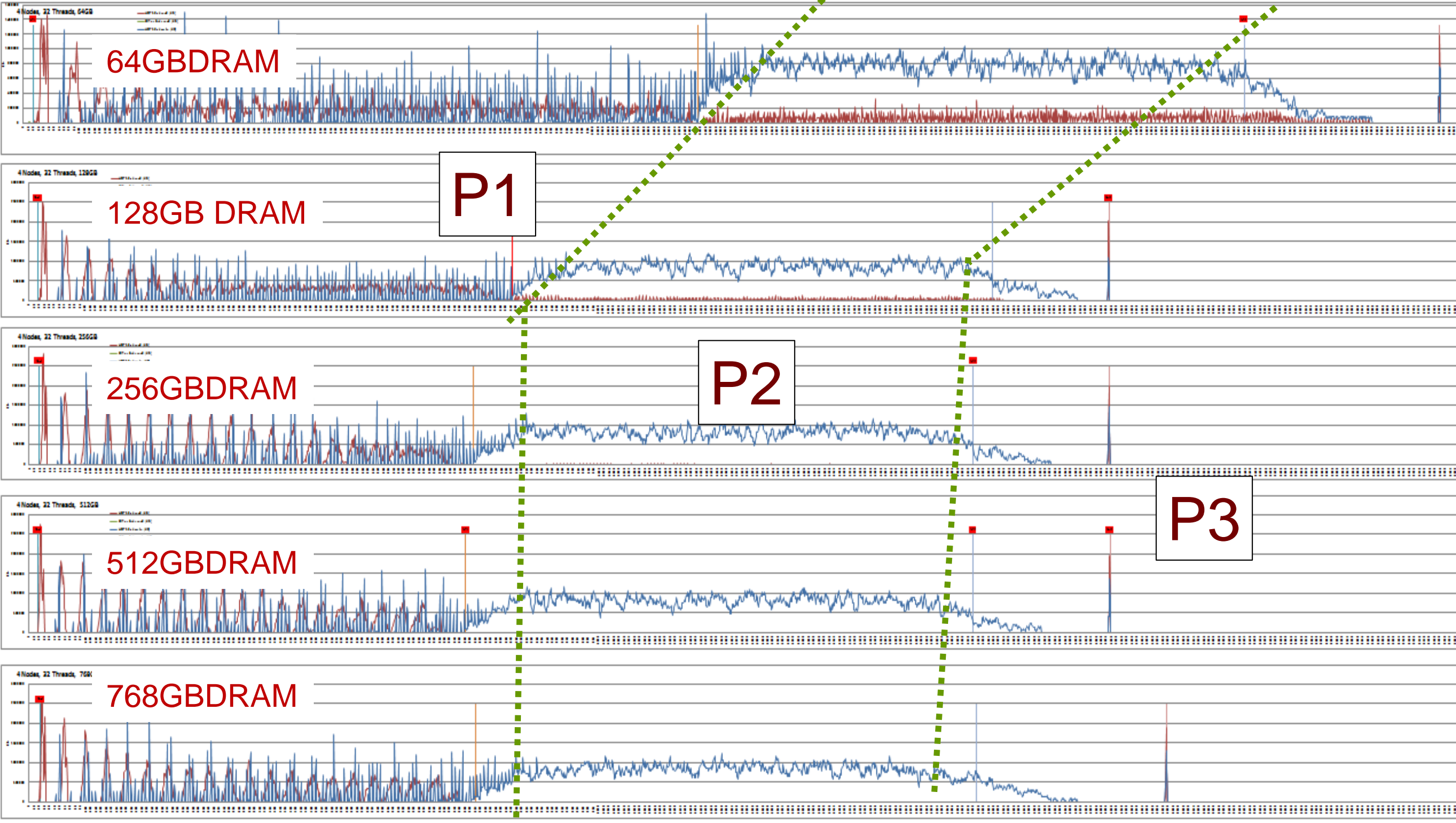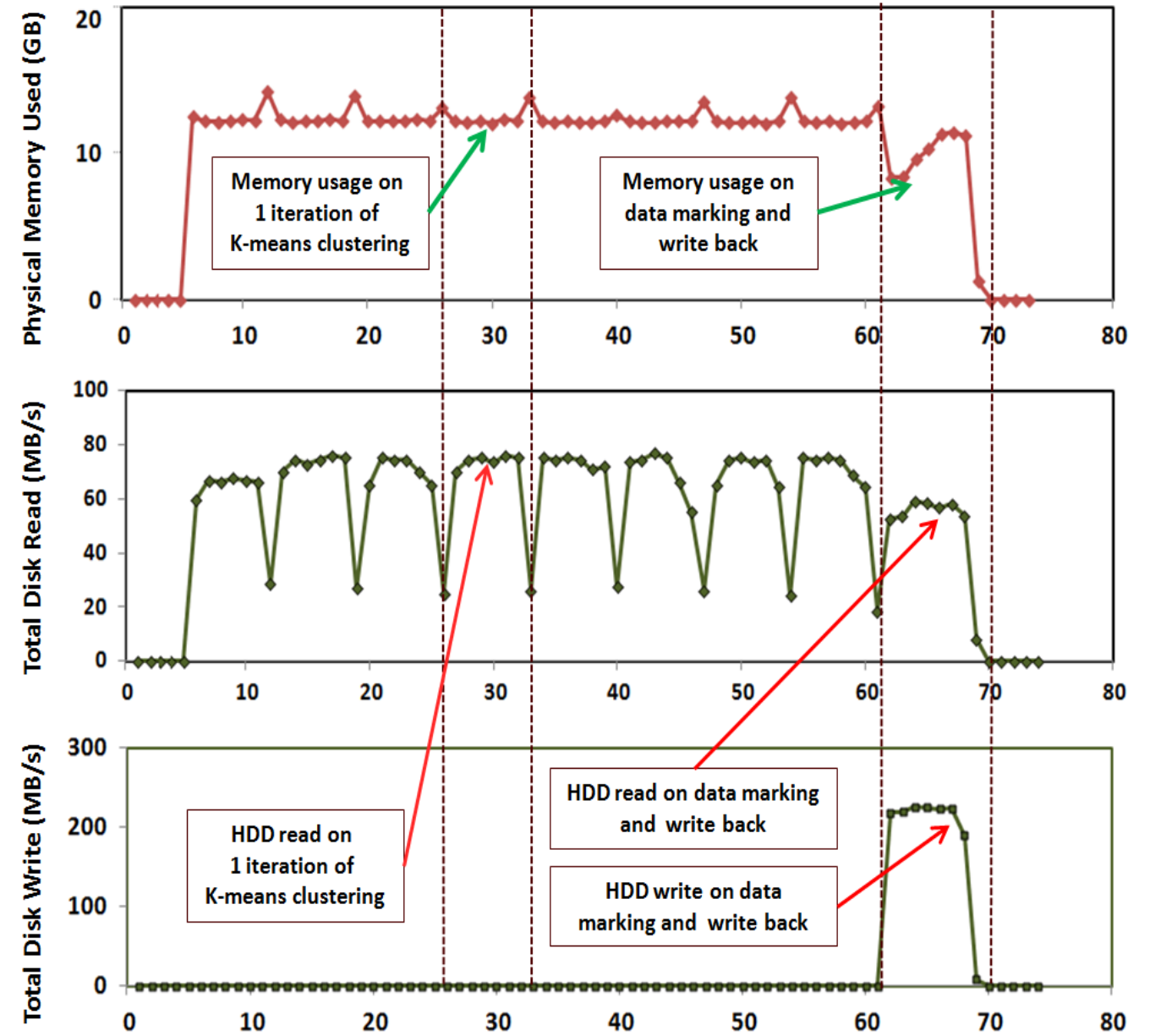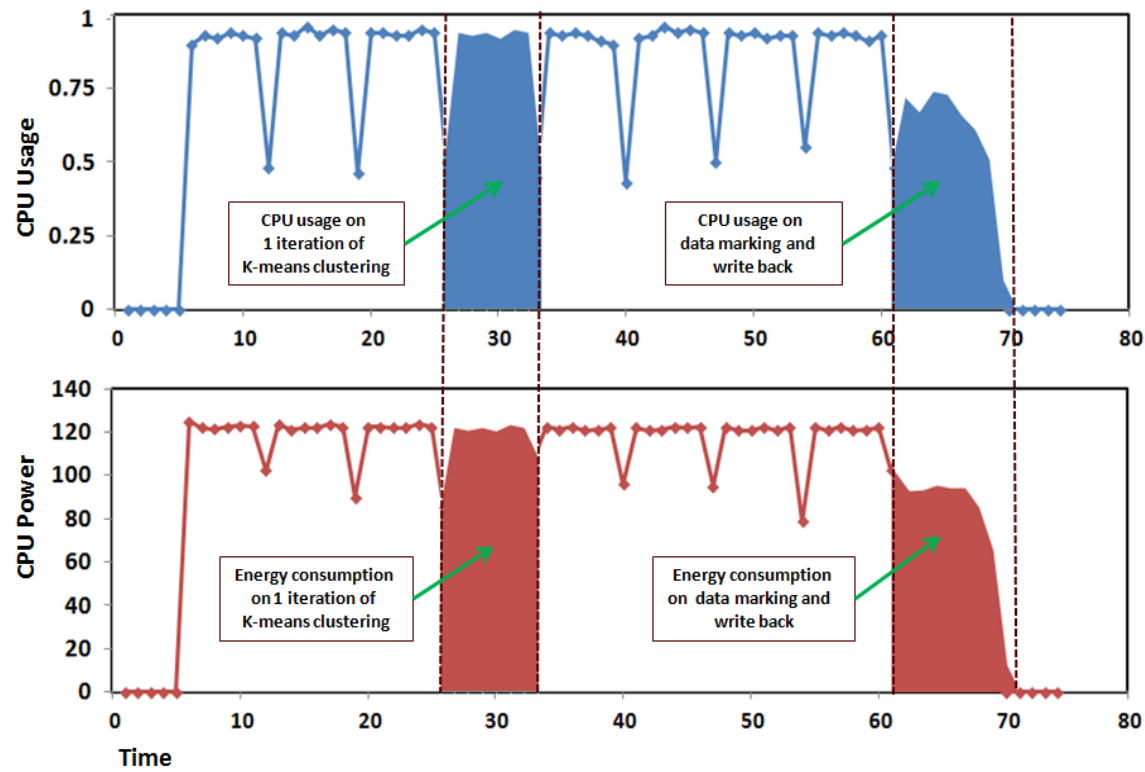
Terasort Measurement and Analysis

From analyzing the algorithm behaviors, 3 distinct phases are identified

- Phase#1 : Data Generation

- Phase#2: Data Sort / Validation.

- Phase#3: Data Write back.
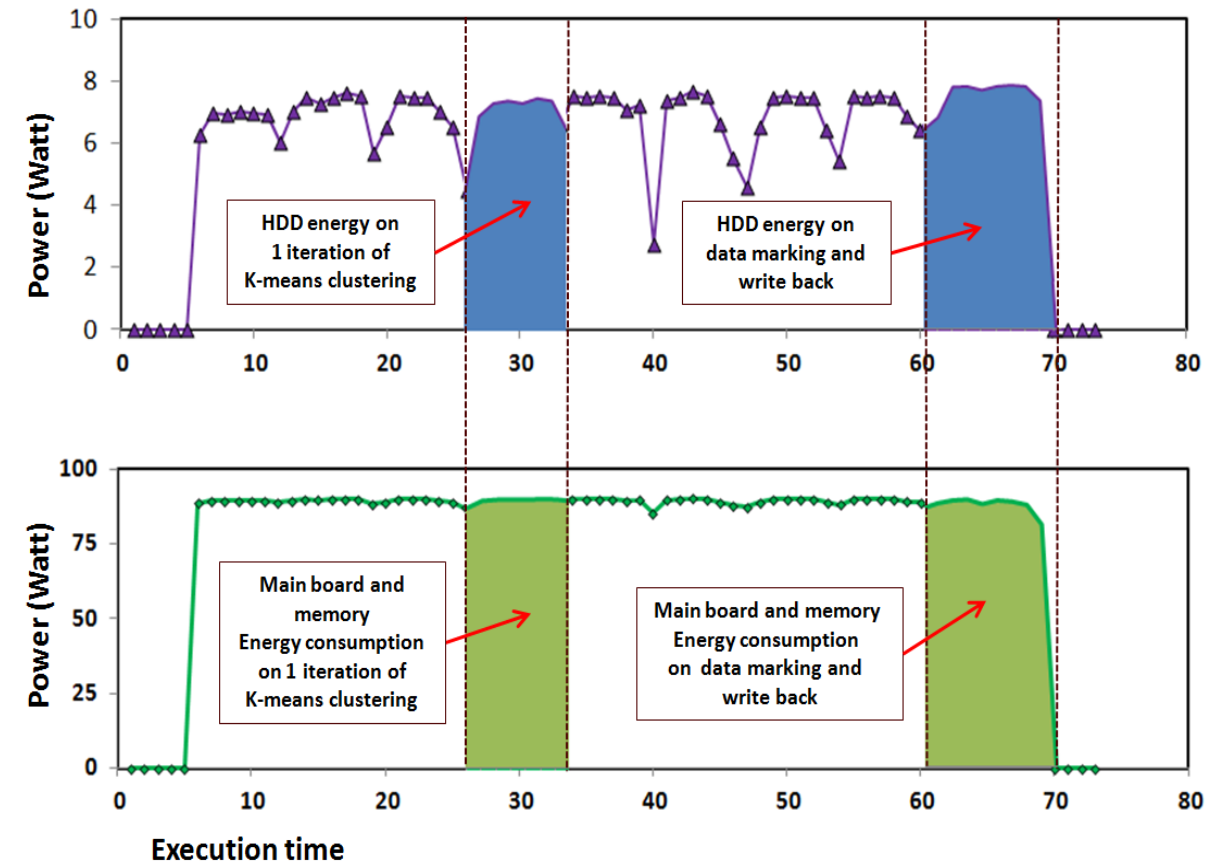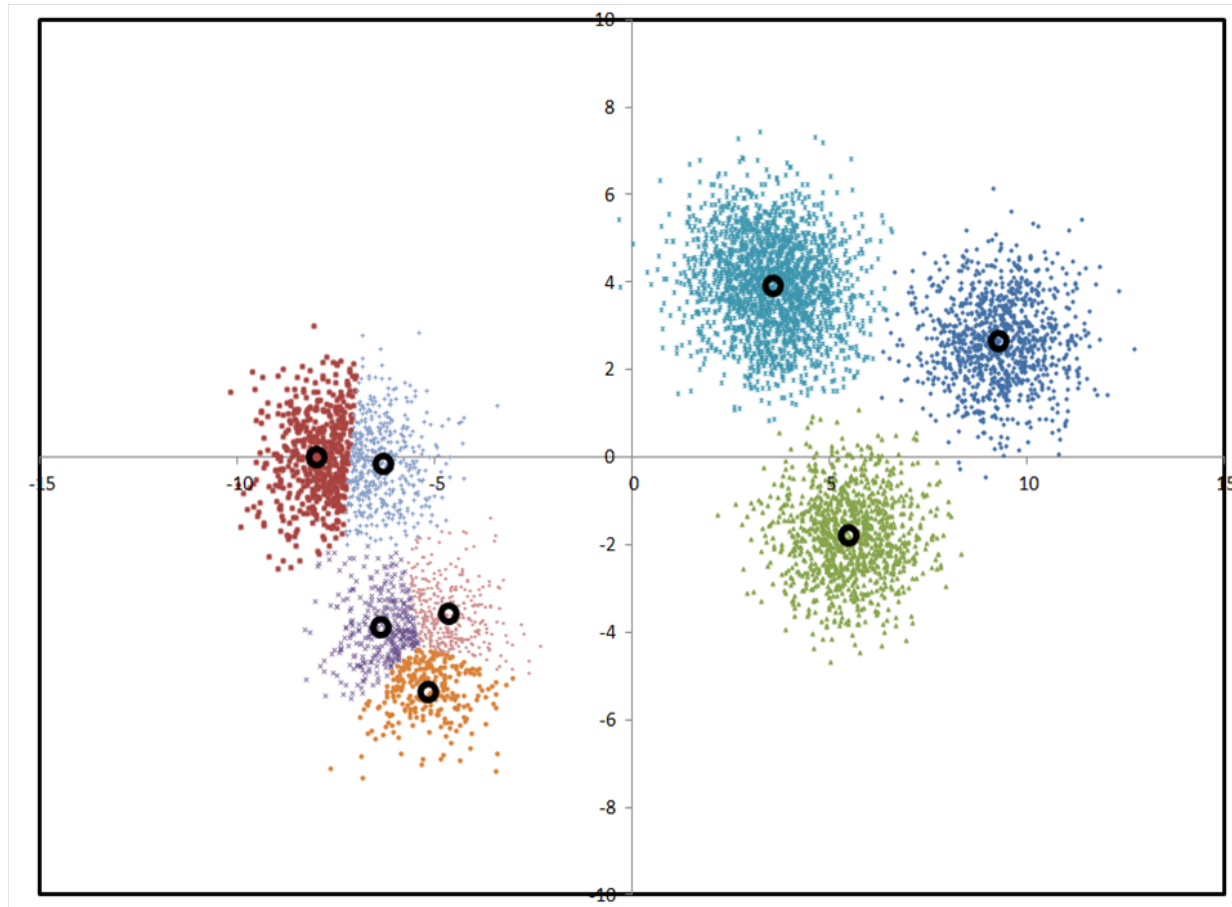
- P1, P2, P3 markets where set on all graphs for all test

Memory Capacity Scalability

Algorithm Behaviors in K-Means Clustering

Algorithm Behaviors in K-Means Clustering

MORE INTERESTING RESULTS & ANALYSIS WILL BE AVAILABLE

Thank you

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