Lessons from Industry Standard Benchmarking

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Agenda

• Industry Standard Benchmarks
• A closer look the TPC
• Changing technology landscape
• Key considerations for Big Data benchmarks
Benchmarks

• Demands for them have existed since buyers were first confronted with the choice between purchasing one system over another.

Historically we have seen that industry standard benchmarks enable healthy competition that results in product improvements and the evolution of brand new technologies.
Categories

• Industry standard benchmarks
  • Consortia driven development (Democratic process in decision making), Verifiable, Audit process, Product agnostic, Enables cross technology comparison

• Application benchmarks
  • Vendor driven, vertical focused
  • Examples: VMMark, SAP Standard Application Benchmarks, Oracle Applications Benchmarks

• Synthetic Workloads
  • Open source based tools, widely adapted by engineering community
  • Examples: IOMeter, Netperf, Terasort
Viewpoints

• Vendor point of view
  Define the level playing field for competitive analysis
  Monitor release to release progress
  Product developments and enhancements

• Customer point of view
  Cross-vendor comparisons (performance, cost, power)
  Evaluate new technologies

• Researcher point of view
  Known, measurable and repeatable workloads
  Optimizations can impact products
Benchmarks and Technology Landscape

Driven by technology and industry demands

1985: Debit Credit Benchmark
1988: TPC and SPEC formed

1990s (Client server, Internet)
- Processor
- Transaction Processing
- File server, Web server
- Data Warehouse

2000s (Web 2.0, Virtualization)
- Energy Efficiency
- Virtualization
- Complex Systems
- Cloud

2010s (Connected world, Analytics)
- Big Data
- Internet of things
- Software defined “everything”

Did you know the number of virtual machine shipments now exceeds the number of physical server shipments?
# TPC Membership

## Full Members
- AMD
- Bull
- Cisco
- Dell
- Fujitsu
- HP
- Hitachi
- Huawei
- IBM
- Intel
- Microsoft
- NEC
- Oracle
- Red Hat
- Sybase
- Teradata
- Unisys
- VMware

## Associate Members
- IDEAS International
- ITOM International Co.
- SDSC San Diego Supercomputer Center
- TTA Telecommunications Technology Association

Database centric
Represented by major systems and database companies
Independent audit process prior to publication
Mandatory performance, price-performance metric
Optional energy efficiency and virtualization metrics
## TPC Timeline

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| Common Specifications |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Pricing              |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Energy               |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |

| Developments in Progress |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| TPC-DI                |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| TPC-VMC              |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| TPC-V                |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |

- **Obsolete**
- **Active**
- **Common Specifications**
- **In Progress**
TPC-C Performance vs. Moore’s Law

TPC-C Price-Performance vs. Moore’s Law

System centric
Broad representation from industry and research
Peer audit process prior to publication
Primary metric is: performance
Separate benchmark for energy efficiency and virtualization
Technology Landscape is Changing

the winner of Time’s man of the year award for 1982 …

the winner of Time’s man of the year award for 2006 …

Source: time.com
Internet Users in the World Distribution by World Regions - 2012 Q2

Source: Internet World Stats - www.internetworldstats.com/stats.htm
Basis: 2,405,518,376 Internet users on June 30, 2012
Copyright © 2012, Miniwatts Marketing Group

2,405,518,376/7,017,846,922 =34.3 %
it took …

53 years to sell 100 million radios
14 years to sell 100 million TVs
but .. in 15 years …
there are 15 billion devices connected to the Internet

device-image

that’s 2.2 devices for every man, woman, and child on the planet earth
if

facebook

were a country ...
1. China (1.339 billion)
2. India (1.218 billion)
3. Facebook (900 million)
4. United States (311 million)
5. Indonesia (237 million)
6. Brazil (190 billion)
7. Pakistan (175 million)
8. Nigeria (158 million)
9. Bangladesh (150 million)
10. Russia (142 million)
Processing Movie AVATAR

4352 servers
34,816 processor-cores
102 terabytes of RAM
3 Petabytes of storage
Comprehensive statistics on more than 250 countries and entities

Unknown number of classified information
How Big is the Digital Universe?

2008 0.5 Zettabyte

2011 2.5 Zettabytes

2020 35 Zettabytes

1 Zettabyte = 1,099,511,627,776 Gigabytes
= 1 Billion 1TB Disk Drives

How many disk drives were sold in 2011?
Global IP Traffic

Global IP Traffic

Per Capita Internet Traffic

In 2016, equivalent of all movies ever made will cross global IP networks every 3 minutes

Source: Cisco
Benchmark Acceleration Initiatives

• TPC
  Technology conference initiative on performance evaluation and benchmarking
  2009 (Lyon), 2010 (Singapore), 2011 (Seattle), 2012 (Istanbul)
  2013 (Trento) – planned

• SPEC
  • SPEC Research
  • ICPE

• WBDB
  • First important step towards the development of a set of benchmarks for providing objective measures of the effectiveness of hardware and software systems dealing with big data applications.
What is Important?

- Performance
- Cost of ownership
- Energy efficiency
- Floor space efficiency
- Manageability
- User experience
Successful Benchmark Requirements

- Relevant
- Repeatable
- Understandable
- Fair
- Verifiable
- Economical

WBDB

• WBDB 2012
  
  http://clds.ucsd.edu/wbdb2012


• WBDB 2012.in
  

• WBDB 2013
  
  http://clds.ucsd.edu/wbdb2013.cn

• Bigdata 100 List
Thank you.