



PERCONA
Performance Consulting Experts

Breaking the Boundaries

Percona Performance
Conference

April 22-23 2009

Santa Clara, CA

by Peter Zaitsev, Percona Inc

World is Different now

- Different Scale
- Different Economics
- Different Hardware
- Different Technology needs

Difference Scale

- Internet Applications often larger than Enterprise
 - Performing more transactions per second
 - Having larger data set
- Visa does 7000 transactions/sec at peak
 - Compare this to interactions with FaceBook
 - How many documents Google crawls a second ?
- Most internal Enterprise applications designed for thousands/tens thousands of users
 - Internet applications may have millions and tens of millions of users.

Different Economics

- Internet Applications have a lot of data and high transaction rate
 - But little money which comes from this activity
- Compare revenue Visa has per transaction or Airline per booking to Facebook per page view or Youtube per movie watched

Power Requirements

- More important on the high end
 - If you rent 1-2 servers you do not care how much power they take.
- Power/Power Density not the space is leading limiting factor for older centers
 - Many data centers are half empty due to power budget
- Power is significant contributor to TCO
- Internet applications need large scale systems requiring a lot of power.
- Performance per Watt/Transactions per Watt metrics

High Load with Little money

- Become Creative in your solutions
- Optimize Performance
- Use Open Source Software
- Use Commodity Architectures
- Sacrifice on requirements
- Look for simplicity
 - Development and operations cost a lot
- Wikipedia, YouTube, Craigslist
 - Small teams; great resources.

Scalability and Efficiency

- Scalable solution may not be efficient one
 - Efficiency aspect is often forgotten
- You can run complex tasks with desired response time
 - If you supply enough servers
- But how this matches to performance you could reach ? To performance of single node task
- You can find “scalable” solutions which are order of magnitude different in their efficiency.

Different Hardware

- The exponential performance growth of single core is no more.
 - Though now we're getting more and more “cores” and “threads” per chip
- How many OLTP applications “scale” to 256 threads
 - How many can effectively use such hardware to run a single job ?
- Cheap hardware allows using networks of hundreds and thousands of computers for processing

Different Hardware

- Memory continues its drop in prices
 - You can get “commodity” systems with 512GB these days
 - This allows to run many applications in single box memory.
 - Happily “internet population” grows slower than hardware improvements.
- SSD – breakthrough in cost per IOP
 - Feasible replacement for Hard drives
 - 64GB Intel X25-E SSD about \$800
 - 146GB 2.5” 15K RPM about \$400
 - Earlier in its technology S-Curve
 - More rapid improvements are expected
- SSD still very expensive for large storage.

Different Hardware

- **SSD Means**
 - You can allow larger “miss rate” and operate with smaller memory.
 - Random IO is not as bad any more
 - Nested loops join is cool again
- **Databases spent years optimizing for sequential IO**
 - And now need to make changes
- **The optimization of IO path becomes very important**
 - RAID cards, File Systems, Innodb are often not ready to handle tens of thousands of IO operations per device

Flash is not SSD

- “Hard Drive Replacement” is only one of the uses of Flash memory technology
- PCI-E cards by FusionIO and others
- Violin Memory “appliance” model
- Virident using Flash for DRAM chip replacements

Other hardware innovations

- **Fast Interconnects**
 - 10Gb Ethernet getting traction
 - Dolphin Interconnect
- **Data flow processing**
 - Kickfire doing for databases what happened to 3D graphics processing 10 years ago



Technology Needs

Data Consistency

- Low consistency requirement
 - Typically it is not money
 - Or not a lot of money at least
- Ready to pay consistency for performance
 - Loose durability settings
 - Limited use of Foreign Keys
 - “Dirty” synchronization algorithms
 - Non exact result algorithms
 - Such as sampling

System multi use

- We want to have the cake and eat it
- We want to use same system for everything
 - OLTP transactions
 - Information Retrieval/Full text search
 - Reporting Queries
- Additional systems, ELT process make development and operations more complicated

Global Audience

- Geo Distribution
 - High availability and response time
- Can't pay “classical” cost of distributed transactions
- Synchronous replication is too slow
- Asynchronous replication makes handling conflicts tricky
 - Or poses visibility challenges

Data Visibility

- Not every session/operation requires the same view of data
 - Helps use of async replication locally and globally
- Visibility options go well beyond traditional SQL isolation modes and MVCC
- Visibility often applies to user Web sessions
 - Which are not represented by DB transaction or session
- Example:
 - You post a forum message. You should see it at once
 - Different user may see it in several seconds

Dynamic Sizing

- Capacity requirements may be unforeseen
 - Successful application experience fast exponential growth
- Capacity requirements can be non uniform
 - Event specific resources
 - Advertising campaigns and unexpected promotions
- Cloud Computing as a response
- Few modern “database” technologies work very well with cloud.

ACID vs BASE

- Alternative to the “ACID” concept of standard databases
- **BASE**
 - **B**asically **A**vailable
 - **S**oft State
 - **E**ventually Consistent
- One of the interesting alternative modes
 - Published by ACM

What does it tell us ?

- Old Technologies do not work well as they could
- New technologies are not mature
- Great time to Innovate !
- Great time to learn new technologies
 - We bring some of them at Percona Performance Conference