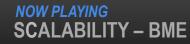




Hodicska Gergely Web Engineering Manager as Ustream email: <u>felho@ustream.tv</u> twitter: @felhobacsi



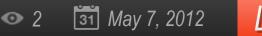




V DEFINING SCALABILITY

It is not:
 – Performance
 Easier to scale
 – HA

It is the ability to handle growing amount of work in a capable manner
Not just technology but people and process



SCALABILITY TYPES

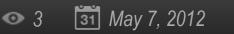
Vertical

- Bigger
- Typically more expensive
- Sometimes feasible (DB SSD)

Horizontal

- More
- Typically we need this







SCALABILITY RULES

KISS

Command and conquer
Approximate correctness
Shared nothing

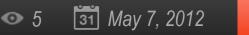




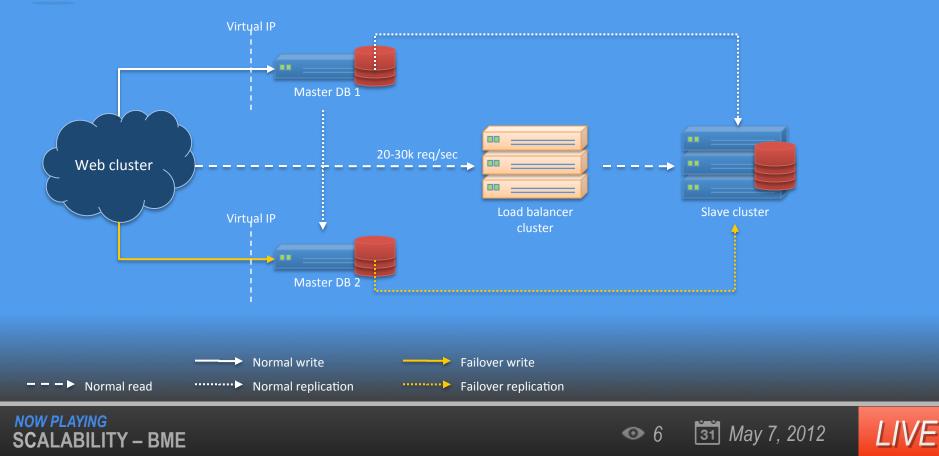


V DATABASE

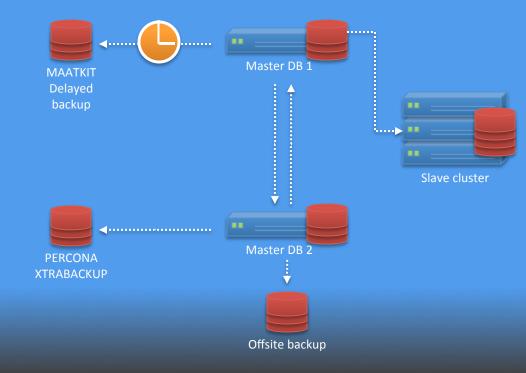
Most tough to scale Read -> Replication - Lag, cascading Write -> Sharding - App logic, vertical vs. horizontal, key server HA: Multi Master Replication – DRDB, MMM, MySQL cluster



NOTABASE – MULTI MASTER MYSQL



V DATABASE – BACKUP STRATEGY



- Continuous
 backup
- Encrypted off site backup
- Delayed replica

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NOSQL

- CAP theorem (availability, consistency, partition tolerance -> eventual consistency)
- Diverse world
- Automatic partitioning, sharding, elasticity
- Transparent for the application
- Extendable without downtime
- Fault tolerant
- Redis, Riak, Voldemort, Cassandra, CouchBase





Strategies - Write-through cache - Write-back cache - Implicit/explicit invalidation Consistent hashing Restart

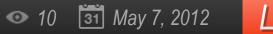
NOW PLAYING SCALABILITY – BME





Local vs. remote LRU Storing lists Versioning Race condition (cas) Object size

NOW PLAYING SCALABILITY – BME



♦ APP LEVEL CACHE

Code
Shared memory
APC, Ehcache
(Opcode cache)







♦ HTTP LEVEL CACHING

Cache-Control header

Local vs. proxy

Static versioning
Huge expire time

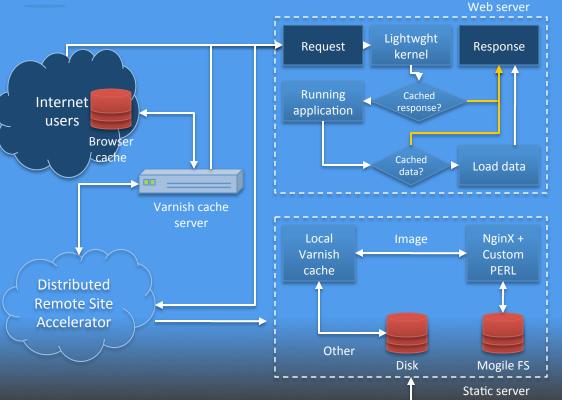




V CACHING

NOW PLAYING

SCALABILITY – BME



Highlights

- DRSA: globally distributed reverse proxy to serve the content to the users from a geographically close server
- Cache servers: we try to cache as much requests on these servers as possible to offload our web cluster
- Browser cache: all of our static assets are automatically versioned for optimal serving (using huge expire times)
- Application level: caching whole pages to avoid running all the code or the pieces of data to offload the database
- Our framework automatically package and compress the JS and CSS files to reduce the number of HTTP requests

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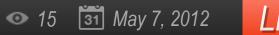
STATIC CONTENT

- NFS (mount problems)
- DB
- MogileFS
- Authentication, access control
 - Perlbal
- FS limitations
- Low hit ratio



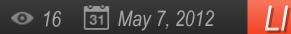
V LOAD BALANCING

- Dedicated hardware vs. software based
 Price
- HA proxy
- Nginx (HTTPS termination)
- LVS (direct routing)
- DNS loadbalance, Anycast (multi site)
- Layer 4 vs. 7





Sticky (shared) Centralized – DB / NoSQL - Memcached Cookie Sysop will like you



♦ ASYNCHRONOUS OPERATIONS

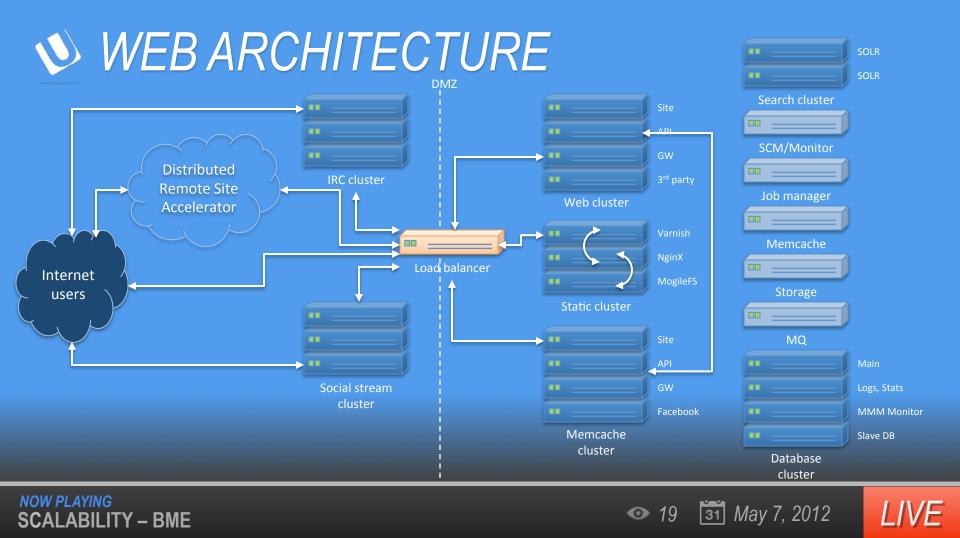
Decoupling Capacity handling Node.js Jobs - Gearman Message queue – Q4M, RabbitMQ, ZeroMQ



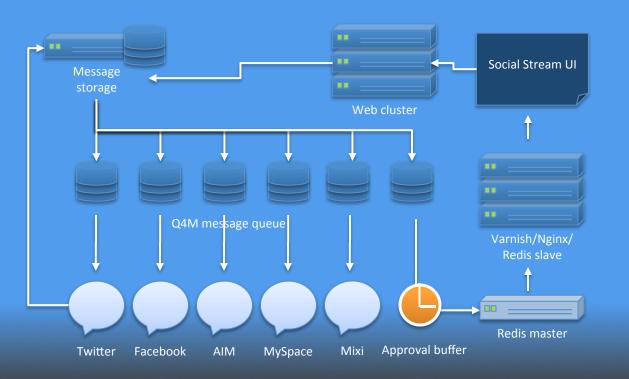
CHALLENGES OF THE WEB STACK

- Web requests:
 - 200 requests / sec / server (peak)
- Cache server requests:
 - 10,000 requests / sec / server (peak)
- Social stream requests:
 - 15,000 requests / sec / server (peak)
- Database requests:
 - 25,000 requests / sec / server (peak)





SOCIAL STREAM: UNDER THE HOOD



Highlights

- Generated 2.5M visits in the last 30 days (the 20% of this is new visitor)
- 0.8-1.1M messages per day
- Justin Bieber has ~230k messages per day
- Jonas Brothers concert: 10k messages per minute in peak
- Peak:

• 20

- 5k new connection / sec
- 15k requests / sec

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600 Mbit / sec



V DEVELOPMENT BEST PRACTICES

- Continuous integration
 - Automated builds
 - Unit tests
 - Acceptance test
- TDD, (ADD, FDD ;))
- Abstract branching (feature switch)
- Code review, pair programming, topic experts
- DevOps culture



V DEVOPS TOOLING

Provisioning

- Configuration management (cfengine, chef, puppet)
- Application deployment (capistrano, fabric)
- Orchestrator (mcollective)
- Monitoring (system/application level)
 Nagios, Munin, Cacti, Graphite etc.
- Supervisors (monit, god)
- Log management/analysis





V DEVELOPMENT BEST PRACTICES

Visualizing

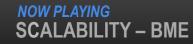
- Graphite (StatsD, logster)
- Custom dashboards with KPIs, alerting
- Runtime vs. build time
- Automated code deployment
- Load testing (automated better)
 MVC

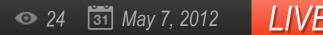


CONFIGURATION MANAGEMENT

- Automation
- Versioning
- Accountability
- Chef, Puppet

- Same local dev environment





CLOUD ENVIRONMENTS

- Amazon, Google App Engine etc.
- Early stage
- Cost savings
- Backup for peaks

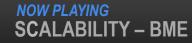






♦ ORGANIZATIONAL BEST PRACTICES

- Architect board
- Scrum of scrum
- Product board
- WESK (who else should know)
- Internal demos





SOURCE CODE MANAGEMENT

- Using git for most of the projects
- Code is deployed to more than 120 servers (parallel deployment)
- Custom SCM tool which automates
 the process
- Different environments: development, staging, releases, live
- Devops culture: developers, sysops and QA work closely together
- Release and rollback policy

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NOW PLAYING SCALABILITY – BME



MONITORING

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Highlights

- Proprietary dashboard to oversee key system performance charts in one location
- Real-time information about streaming related servers, web/ cache servers, database servers
- Summary of the Nagios checks
- Ability to roll back for historic charts
- Provides shortcut to system tools

Tools

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- Munin: Several custom plugins
- <u>Cacti</u>: Mainly for network devices
- <u>Nagios</u>: More than 1200 checks, Active checks
- <u>Monit</u>: Ensuring that a given process runs and it doesn't consume too much resources, Active checks
- <u>Query watchdog</u>: Automatically stops and reports excessive read queries

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WHERE TO IMPROVE

- English
- Enjoy programming
- Soft skills (communication, team working, presentation, cooperation, management, leadership, time management etc.)
- Agile development methods (Scrum, Kanban)
- Continuous learning (blogs, books, conferences, code)
- Craftsmanship
 - Clean Coder, Agile Software Development, Martin Fowler books / signature series, The Mythical Man-Month, Code Complete, The Pragmatic Programmer, Peopleware, The Passionate Programmer





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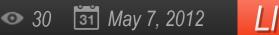
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WHERE TO IMPROVE

- Network programming, protocols
- Algorithms
- DHT
- Database
- Big Data (Hadoop, HBase, Hive/Pig, BI tools etc.)
- API design (REST, SOAP, oAuth etc.)
- Playing with open source tools of big companies (Twitter, FB, Linkedin)
- Blogging, taking part in open source projects
- Learning different type of programming (e.g. functional)

NOW PLAYING SCALABILITY – BME







Questions?









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