Scalable Applications Design - Refactor - Host

Emanuele Rocca

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Why scaling?

30 thousand hits on the web application in one day!



30 thousand potential new users!

Photo by anirudhkoul, http://www.flickr.com/photos/anirudhkoul/3786725982/, CC Attribution-NonCommercial

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Three different scenarios

- scale from your garage (again)
- escale an existing application
- I host applications in a scalable way

Garage Innovators PaaS providers

Outline





2 Keep the relational model



Who is this Garage Innovator, again?

- good idea
- no money

Utility Computing

"If computers of the kind I have advocated become the computers of the future, then computing may someday be organized as a public utility just as the telephone system is a public utility. The computer utility could become the basis of a new and important industry."

- John McCarthy, MIT Centennial, 1961

Utility computing makes it feasable

The application should:

- scale up within seconds
- scale down when the crowd leaves (remember: no money)

Toolbox

- Storage Delivery Networks
- HTTP redirection
- Load balancers (network vs. application level)
- Round robin DNS

Houston, we have a problem

The database

But YOU can handle a flash crowd

10k new users in one day with 150\$

Outline





3 PaaS providers

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Give me my RDBMS back!

- My data is relational
- I want strong consistency
- The application needs transactions
- Resistance to change

Access patterns?

Turns out that different access patterns allow for different optimizations.

- replication if you have lots of reads
- partitioning if you have writes that do not span partitions

Service-oriented modeling

Go for a Service Oriented Design.

- separation of concerns
- independent data services
- each data service has exclusive access to its private data store

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- each data service has exclusive access to its private data store
- simplification of each database workload
- more efficient use of classic scaling techniques

Service Oriented Data Denormalization



Scalability of individual services



Putting It All Together

- You have to know what you are doing
- Any update to the code may require to restructure your data
- Denormalization allows efficient use of scalability techniques
- Strong consistency and transactional properties

Outline







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We want to host applications in a scalable way



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Scalable Applications

We want to host applications in a scalable way



ConPaaS is an open-source Platform-as-a-Service environment for easy application hosting in federated Clouds.

Simple

ConPaaS does not require much to run your Web application. Click a few buttons, upload your application code, and it is running!

Scalable

ConPaaS uses the most advanced techniques to scale your application. Expand or reduce the capacity of your application in one click! In the future, ConPaaS will even do this automatically.

Extensible

ConPaaS is open-source software. It is designed to be easy to extend to suit the particular needs of any modern Web application. (29 Aug 2011) Press release: Hundreds of web servers online with a single click - Platform as a Service developed by Contrail. Imagine your brilliant idea turns out to be so successful that you need to

successful that you need to go from one web server to a thousand in a couple of hours. The Cloud is the answer. But it would demand experts packaging your application and writing scripts to manage the Cloud. Well, this was before Conhas. With ConPaas. bringing hundreds of web servers on-line is done with no more than a single mouse click. Read more.

8 Sept 2011: Try ConPaaS using our public testbed!

Today conPasS has reached an important milestone: we are ready to go public! Everyone interested in ConPasS is welcome to visit our **public testbed** and get a free account. The platform lets deploy Web applications in the Cloud in one click, and control the amount of resources used by your application in another click.

Are you interested in ConPaaS? If so, then why not give it a try?

30 Aug 2011: ConDaaS is almost ready for a first alpha release

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Scalable Applications

ConPaaS is developed by Vrije Universiteit

PaaS providers have their amount of fun too

- cope with dynamic, changing workloads
- choose between different VM adaptations
 - capacity control
 - 2 migration
 - replication
- provide isolation
- fulfill SLAs

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Changing the application is out of the question

Impact of VM adaptations

- VM adaptations can be beneficial
- there ain't no such thing as a free lunch (TM)
- evaluate benefits taking costs into account

Cost-Sensitive Adaptation Engine



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Cost-Sensitive Adaptation Engine: LQN Solver



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Cost-Sensitive Adaptation Engine: Cost Mapping



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Cost-Sensitive Adaptation Engine: Off-line model parametrization



Cost-Sensitive Adaptation Engine: maximize utility



Concerns

- Needs per-application offline experiments
- Tested on 4 machines, does it scale?
- World Cup request rates scaled from 1200 to 80 req/sec...

Conclusions

- Scalability can be seen from very different angles
- There is no "scale up" magic button
- We have seen how to design or refactor an application to improve its scalability
- How to provide a scalable hosting service fulfilling SLAs and without wasting money?