PaaS Cloud mit Java

Eberhard Wolff, Principal Technologist, SpringSource – A division of VMware

Agenda

- A Few Words About Cloud
- PaaS – Platform as a Service
- Google App Engine
- VMforce

A Few Words About Cloud

Three types of Clouds

Infrastructure as a Service

- Virtual Servers
- Virtual Storage
- Similar to Virtualization
- Custom Solutions
- Manage Everything Yourself

Platform as a Service

- Virtual Application Server
- Handles Scale-Out
- Everything is Services and APIs
- Usually Larger Buy-In
- Mostly Managed by Provider

Software as a Service

- Software or Service that you use
- Components that you add/integrate into your app

Cloud might be...

- **Private /internal "on premise"**
  - In your data center
  - Useful in particular for larger organizations
- **Public "off premise"**
  - Hosted and Operated by a third Party
  - Ideal for Startups etc

- **Even smaller enterprises can create private clouds**
- **Based on virtualization**

Cloud at the Core is a Business Model

- **Customer pays only for what he uses**
  - Per CPU hour or cycles, per GB of storage, per MB of network bandwidth
  - Per user and year
  - Not for having stand-by capacity

- **Flexibility: More capacity is available on demand**
  - Instantly available
  - Customer uses GUI or API to expand capacity
  - Cloud provider is responsible for having capacity ready

- **Makes IT just another service**

Why Cloud?

- **Compelling Economics**
  - Lower CapEx
  - Cheaper handling of peak loads
  - Better resource utilization
  - Simple to achieve benefits – direct ROI

- **Flexibility and better productivity for development**
  - Much easier to set up environments
  - Feasible to have production-like environments quickly and cheaply available
  - Indirect: Better productivity leads to cost saving / better time to market

OK, so let me get started

So, let me get started

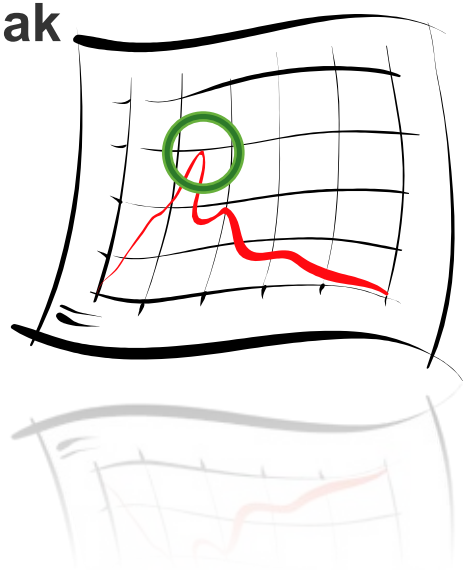
- Get an account at an IaaS provider
- …or virtualize your data center and create a self service portal

- Install your (Java EE) environment
- Install your (Java) application
- Done

- Wow, that was easy!

That is not enough

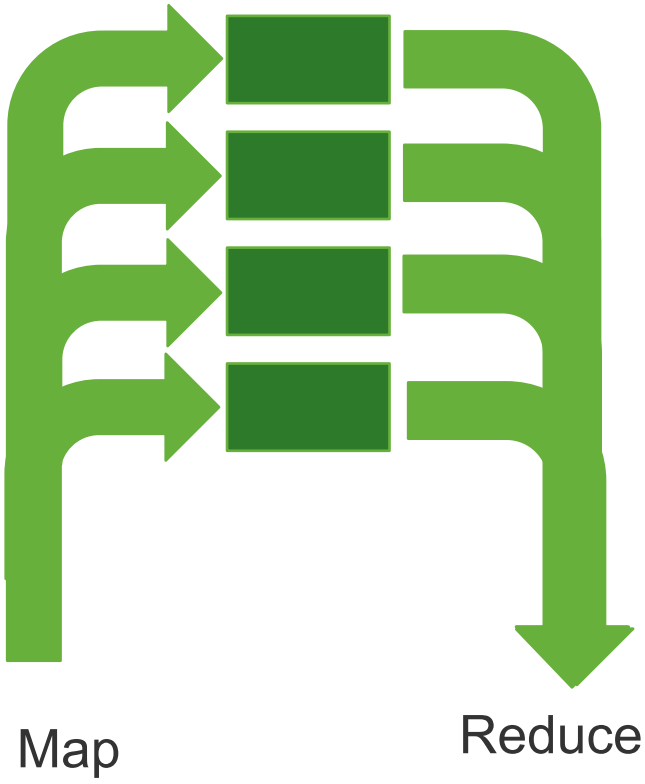
- How do you deal with peaks? Need more app server instances
- The server instances must be shut down after the peak
- …otherwise you would pay for them
- Traditional middleware does not allow for that
- Elastic scaling



- RBMS prefer scale up (larger server)
- In the cloud it is easier to scale out (more server)
- That is why Amazon and Google use NoSQL / key-value stores

That is not enough: Handling Lot of Date

- **Traditional approach: Batch on a few nodes**
- **Alternative approach: Map / Reduce on many nodes**
- **Map each value using some function**
  - Runs on many nodes in parallel
  - E.g. given a text file emit a word count each time a word is found
- **Reduce takes the result of the map step and reduces it**
  - E.g. add up all word counts
- **Distributed algorithm running on potentially many nodes**
- **Cloud: Can easily use a lot of nodes to run**



That is not enough: More Than Just a Virtualized Computer

- **Additional services**
  - Amazon Simple Queue Service (SQS)
  - Amazon Simple Notification Service (SNS)
  - Amazon Simple Storage Service (S3)
  - Amazon Elastic Block Store (EBS)

Cloud Influences the Programming Model

- **Some Jave EE technologies are not a good fit**
  - Non-JMS messaging technologies
    - AMQP / RabbitMQ
    - Amazon Simple Queue Service (SQS)
    - Amazon Simple Notification Service (SNS)
  - Two Phase Commit / JTA leads to long locking / strong coupling
  - What do you do about Map / Reduce?
  - What do you do about NoSQL?

- **You might be better off with a different programming model**
  - Spring can handle non-Java-EE environments (e.g. Tomcat)
  - Projects for NoSQL, AMQP …

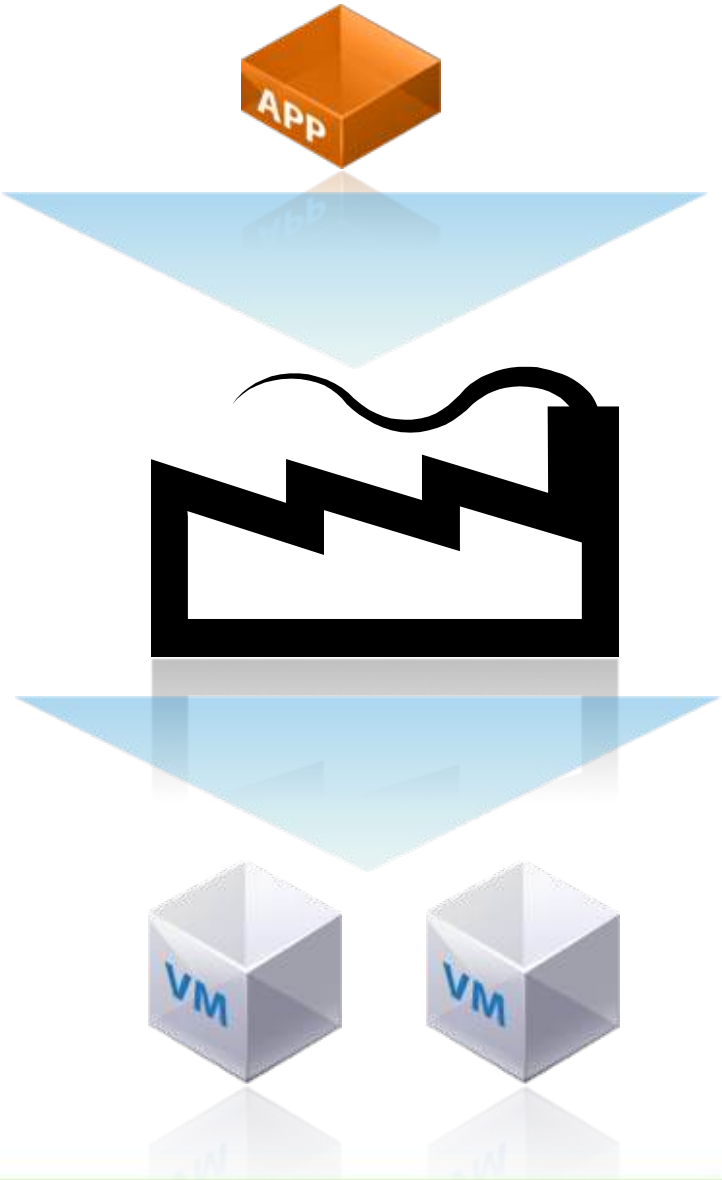
More Flexibility Needed

- And remember: You pay the resources you consume
- You need to use more or less resources based on load

- You need to be able to shut down servers if load is low
- You need to be able to start new servers if load is high

What you will eventually come up with

- **A tool to take an Application**
- **…and create a VM with all needed infrastructure etc**
- **Need tools to**
  - Install software
  - Manage infrastructure
  - Configure infrastructure
  - Set up user etc
  - Puppet, Chef etc.
- **Like a factory for VMs**



So…

- Can we automate this?
- Developers just want a platform to run applications on

- Also: Developers need other non-Java-EE services

Introducing…

The PaaS!

Platform as a service (PaaS) the delivery of a computing platform and solution stack as a service.

Not just automated…

Invisible

PaaS

PaaS: Advantages and Disadvantages

- **Advantages**
  - More useful than IaaS: You would need to install a server anyway
  - Automatic scaling
    - Resources automatically added
  - Can offer additional service
    - Tuned for Cloud
    - Technical e.g. data store, messaging, GUI elements
    - Domain e.g. predefined data model
- **Disadvantages**
  - Less flexible
    - Pre-defined programming model
    - Defines environment
  - Programming model might be different
    - Hard to port existing code
    - Need to learn

Google App Engine

Google App Engine

- **Infrastructure offered by Google**
- **Supports Java and Python**

- **Infrastructure completely hidden**

- **GAE sandbox more restrictive than normal JVM sandbox**
- **So GAE can handle your application better**
- **Java classes white list**
  - i.e. some Java classes must not be used
  - no Thread
  - no file system
  - parts of System class (e.g. gc(), exit()…)
  - Reflection and ClassLoader work

Google App Engine: Storage

- **No relational database**
- **Based on BigTable**
  - Google's storage technology
  - Key/value i.e. objects stored under some key
  - No joins
  - Simple / simplistic (?)
  - Scalable
  - Example of NoSQL
  - Principles will be discussed further in NoSQL
- **Max. 1 MB per entity (and other limitations)**

Google App Engine: Storage APIs

- **API: Low level com.google.appengine.api.datastore**
  - Not compatible to JDBC or the like
  - Queries, transactions, entities etc.
  - Should only be used by framework
- **API: JDO (Java Data Objects)**
  - Standard for O/R Mapper and OODBMS
  - Unsupported: Joins, JDOQL grouping and aggregates, polymorphic queries
- **API: JPA (Java Persistence API)**
  - Well established standard for O/R Mappers
  - Unsupported: Many-to-many relationships; join, aggregate and polymorphic queries, some inheritance mappings
- **Problem: JPA / JDO based on RDBMS, but this is key/value**
  - So maybe use the low level API instead?
- **JPA and JDO actually implemented by Data Nucleus library**
  - Byte code must be enhanced in an additional compile step

Google App Engine: Additional services

- **Memcache**
  - Implements JCache (JSR 107)
  - Fast access to data in memory
- **URL Fetch based on java.net.URL to read data via HTTP**
- **EMail support using JavaMail**
- **XMPP instant messages (proprietary API)**
- **Image Manipulation (proprietary API)**
- **Authentication / Authorization based on Google accounts (proprietary API)**
- **Task queuing (proprietary API, experimental)**
- **Blob store (proprietary API, experimental) for data >1MB**
- **Numerous other services available (not tied to App Engine)**
  - Google Predict, Google BigQuery …

Google App Engine for Business

- **Centralized administration.**
- **99.9% uptime SLA**
- **Premium developer support available.**
- **Sign on for users from your Google Apps domain**
- **Announced**
  - Hosted SQL databases
  - SSL on your company's domain for secure communications
  - Access to advanced Google services.

Google App Engine

- Documentation + SDK + Eclipse Plug In available
- SDK contains environment for local tests

- Spring / Spring Roo is the preferred programming model
- …as it is popular and works with the limited model of the Google App Engine

- http://code.google.com/appengine/

Google App Engine Demo

springsource
A division of vmware


vmforce

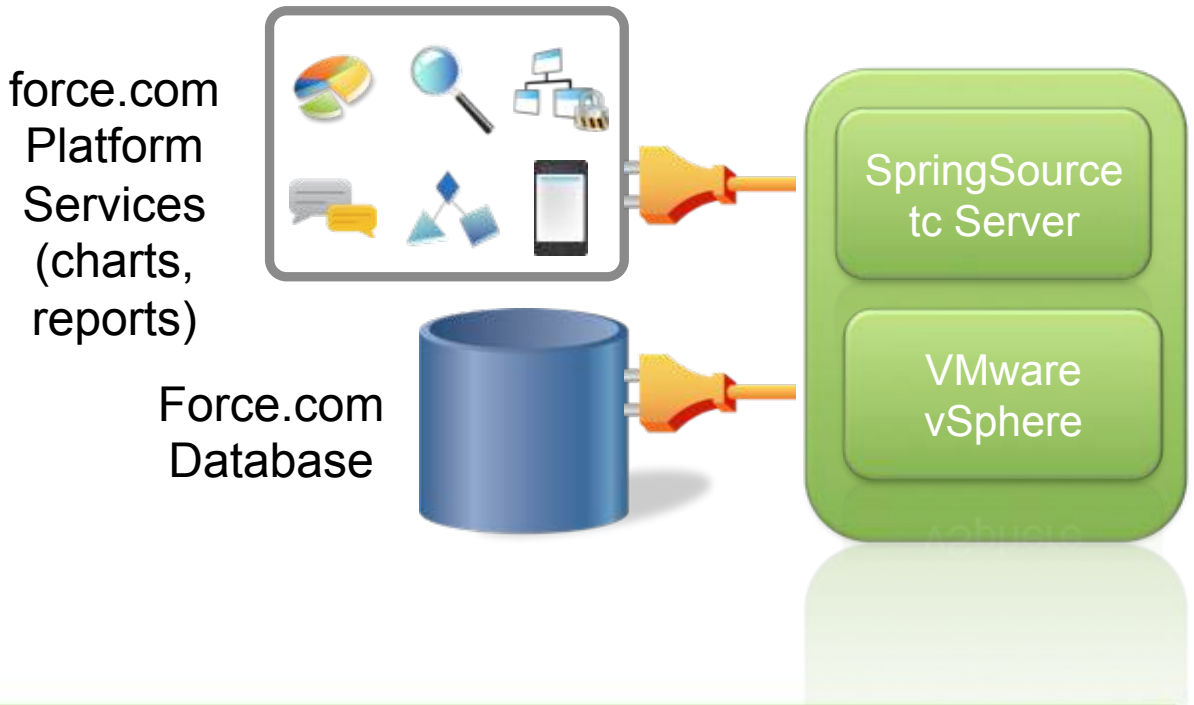
VMforce

- **Joined offerings by Salesforce and VMware**
- **Salesforce**
  - Leading provider for SaaS / CRM
- **Salesforce offers force.com environment**
  - Scalable PaaS
  - Database + data model
  - Charting
  - Reporting
  - Chat etc
- **VMforce = force.com + VMware virtualization + SpringSource programming model**

VMforce

- **VMforce = force.com**
- **+ VMware virtualization**
  - Offers IaaS foundation
- **+ SpringSource tc Server / Hyperic**
- **+ Spring programming model**

- **i.e. run your standard Spring Apps**
- **Use force.com data model / database**
- **…and charts / reports**



PaaS: Conclusion

- **PaaS offer a runtime environment in the cloud**
- **Usually based on IaaS**
- **Makes Cloud easier usable for a developer**
- **…but less customizable and less choice**

- **Technical challenges (scalability) solved by platform**
- **Spring can be used as a universal model**

- **Each PaaS differentiate themselves with their added services**
  - VMforce: database model, charts, reports, GUI elements (functional components)
  - GAE: Big Table, caching, security, image processing, blob storage (technical platform)
- **Choose the right tool for the job!**