Cloud Computing In Reality: Experience sharing in cloud solution developments and evaluations
Speaker Profile

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Cloud Computing In Reality: Experience sharing in cloud solution developments and evaluations

ABSTRACT:

- The talk presents recent experiences in evaluating cloud & other solutions and making decisions towards cloud services. The speaker will discuss requirements aspects of his medical applications and another R&D project as well as why his decision was made and based on technical and business facts.
Dilbert on cloud 😊

I migrated our northern data center to the cloud.

But the cloud stopped working and I can't find the phone number for our cloud guy.

So... whatever.

You lost our data center?

That's one way to look at it.
Outline

❖ Background & Motivation
❖ Cloud-based Medical Service Application
❖ Architecture decision & Amazon AWS
❖ Summary
BACKGROUND & MOTIVATION
Opportunities

- EKG Services – Medical Application for startup
- Technical Evaluations for Cost-based Disaster Recovery Solution R&D (next talk)
Decisions, Decisions??(1)

- Medical data is vital, especially in intensive care
- Data & System/Infrastructure are quite Critical
- Must be always available
- Cost
- Pay Per Usage
Decisions, Decisions?? (2)

- Time to Market
- Guaranteed Reliability, Availability & Performance
- Stick to your business
- Must be profitable

- Hosted Servers, Private or Public CLOUD
EKG SERVICES

Credit: picture from nih.gov
EKG - Electrocardiography

- A medical test that checks for problems with the electrical activity of your heart

Picture credit: dr. khanat
EKG Services- Smart Health

- **Requirements**
  - Mobility – wireless
  - Smarter – data warehouse & data analytics
  - As Reliable
  - Service-based or subscription-based
  - Cost Effective
EKG Services- possible technologies

- Embedded system – electronics
- Wireless Technologies – wifi, bluetooth
- Web/Client-Servers (SOA) – web services
- Service-based Separation of infrastructure – Virtualization/cloud computing
- Smart health – data analytic or hadoop
System Architecture

1. 12 Lead EKG
2. Computer หรือ Tablet หรือ Set top Box ทำการรวบรวมข้อมูล
3. ส่งข้อมูลผ่าน - WiFi หรือ Bluetooth ผ่านทาง HTTP

Sent data to cloud

Picture credit: dr. khanat
Client Device/App

Picture credit: dr. khanat
The View

Picture credit: dr. khanat
Smartness – server based decisions

1-Tier Architecture
- Client Computers
- File Server

2-Tier Architecture
- Client Tier
- Database Tier

3-Tier Architecture
- Client Tier
- Business Logic Tier
- Application Server
# Pros & Cons on the server architecture

<table>
<thead>
<tr>
<th></th>
<th>1-Tier</th>
<th>2-Tier</th>
<th>Multi-Tier</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefits</strong></td>
<td>Very simple</td>
<td>Good security</td>
<td>Exceptional security</td>
</tr>
<tr>
<td></td>
<td>Inexpensive</td>
<td>More scalable</td>
<td>Fastest security</td>
</tr>
<tr>
<td></td>
<td>No server needed</td>
<td>Faster execution</td>
<td>“Thin” client</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very scalable</td>
</tr>
<tr>
<td><strong>Issues</strong></td>
<td>Poor security</td>
<td>More costly</td>
<td>Very costly</td>
</tr>
<tr>
<td></td>
<td>Multi user issues</td>
<td>More complex</td>
<td>Very complex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Thick” client</td>
<td></td>
</tr>
<tr>
<td><strong>Users</strong></td>
<td>Usually 1 (or a few)</td>
<td>2-100</td>
<td>50-2000 (+)</td>
</tr>
</tbody>
</table>

Credit: simcrest.com
Architectue Decisions

- Multi-tier SOA architecture (3-tier)
- Anticipated fast growth, elasticity & guaranteed Reliability with Auto-scaling
- Smart health data analytic
- Cost Factor & Pay per usage
- Cloud-based compute (VM) & storage/DB
- **Public cloud - Amazon EC2 & RDS Solutions**
Amazon Cloud Services

- Elastic Compute Cloud – EC2 (IaaS)
- Amazon RDS (Database)
- Elastic Block Storage – EBS (IaaS)
- SimpleDB (SDB) (PaaS)
- Simple Queue Service – SQS (PaaS)
- Elastic Load Balancing (ELB)
- Consistent AWS Web Services API & AMI
Cloud-based EKG service

EKG app server
Web + app server
On EC2 instance
Cloud-based EKG service (alternative)
Is amazon cloud the right choice?

- When compared to host your own infrastructure.
- Cost is a major & obvious factor beside to focus on your business.
  - Server cost ($10-20K/server for HA)
  - Admin staffs (e.g. $100,000 – $150,000/ year FTE)
  - Data center ($300/ft², build or rent??)
  - Operational cost (electric/cooling, $23,000/kW)
  - Cost of downtime and lost data
Example Amazon EC2 Pricing

<table>
<thead>
<tr>
<th>(in $USD, price per hour)</th>
<th>US – N. Virginia Region</th>
<th>US – N. California Region</th>
<th>EU – Ireland Region</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard Instances</strong></td>
<td>Linux/Unix</td>
<td>Windows</td>
<td>Linux/Unix</td>
</tr>
<tr>
<td>Small (Default)</td>
<td>$0.085</td>
<td>$0.12</td>
<td>$0.095</td>
</tr>
<tr>
<td>Large</td>
<td>$0.34</td>
<td>$0.48</td>
<td>$0.38</td>
</tr>
<tr>
<td>Extra Large</td>
<td>$0.68</td>
<td>$0.96</td>
<td>$0.76</td>
</tr>
<tr>
<td><strong>High-Memory Instances</strong></td>
<td>Linux/Unix</td>
<td>Windows</td>
<td>Linux/Unix</td>
</tr>
<tr>
<td>Double Extra Large</td>
<td>$1.20</td>
<td>$1.44</td>
<td>$1.34</td>
</tr>
<tr>
<td>Quadruple Extra Large</td>
<td>$2.40</td>
<td>$2.88</td>
<td>$2.68</td>
</tr>
<tr>
<td><strong>High-CPU Instances</strong></td>
<td>Linux/Unix</td>
<td>Windows</td>
<td>Linux/Unix</td>
</tr>
<tr>
<td>Medium</td>
<td>$0.17</td>
<td>$0.29</td>
<td>$0.19</td>
</tr>
<tr>
<td>Large</td>
<td>$0.68</td>
<td>$1.16</td>
<td>$0.76</td>
</tr>
</tbody>
</table>

**Note:** Hours of Baseline Usage and Hours of Peak Usage are calculated in this section, above.

**Source:** http://aws.amazon.com/ec2
Example Amazon RDS Pricing

- We make the same assumption:(Micro, 10 hours pre day)
- One year cost will be: $23 + 0.016*12*365 = $93.08$
Scaling & Reliability

- Nothing is for free but possible
- Using AWS Elastic Load Balancing
- Auto-Scaling with CloudWatch
- Require the right design, configurations and developments
The Right Cloud App

- Design & build cloud app.. Don’t just build app in the cloud
- Design for failure anticipation
- Best Practices in design scalability
- Design for dynamism
- Use cloud standard API & cloud features
- Build Security into every component
Design & build cloud app

- Use self-discovery, be self-configurable, and network independent
- Use cloud standardized Messaging & DB when possible
- Leverage inherent EBS replication and snapshots for DBMS
Design with failure anticipation

- Avoid single point of failure
- Use multiple AWS zones (EC2 can fail, zone can be unavailable)
- Use Elastic IP addresses
- Create multiple DBMS slaves across Availability Zones
- Use Amazon CloudWatch for real-time monitoring
Design Scalability

- No central point of data storage contention
- Use Load Balancing such as ELB
- Use Auto-scaling
- Design cloud app servers that are loosely coupled with self-discovery
- Use Amazon CloudWatch for real-time monitoring
Conclusion

- Cloud architecture seems to be the right choice for startup (e.g. EKG smart health service)
- When no predetermined or guaranteed workload or customers, pay per usage is more logical and cost-effectives
- Nothing for free.. So design and build cloud application not just build your app on cloud
- Stick to your BUSINESS
Thank You

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