

TechEd

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How Architecture and Design influence Cost Savings on Cloud

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Before we Start

Remember the Professor and Jar Story of Life



http://www.dailymotion.com/video/xdzo8a_philosophy-professor-inspiring-stor_school

Key Take Aways

Point of View : Cloud and Saving Costs

Architecture Myths on Cloud

Cloud Architecture Principles

Cost Saving Patterns

Application Architecture Patterns

Data Design Patterns

Communication Patterns

Storage Patterns

Compute Patterns

Paths to Save Costs

Point of View : Cloud and Saving Costs

1. Cloud apps are the minority of total apps, but by 2014 they are expected to be a much larger percentage (as much as half)
2. Companies are embracing cloud apps **not just to cut IT costs**
3. Cloud apps have already **generated significant benefits**
4. Customer-facing functions get the **largest share of the cloud app budget**
5. Global industries that are biggest users of cloud apps are computer hardware, financial services, industrial manufacturing and telecom
6. In Latin American and Asia-Pacific, cloud apps are more prevalent and are generating greater benefits than in US and European companies
7. Yet many remain conservative about the cloud: few will put core apps in public clouds but most would put them in private clouds
8. Keys to capitalizing on the cloud: overcoming the fear of security breaches, and **quantifying and demonstrating returns early**
9. What companies look for in cloud vendors: **security at the top of the list; price at the bottom**



Architecture Myths on Cloud

- **Data Security:** A Cloud Provider cannot guarantee Security
- **Data Control:** My Organization will be locked into one vendor and lose control of its data, if it moves to the cloud
- **Cost Savings: My company must move all its applications to a cloud service to be able to benefit fully from cloud computing**
- **Private Cloud:** My company can get all the benefits of cloud computing with a 'Private cloud running on your own hardware
- **Job Security:** If my organization deploys Microsoft Online services my role as an Exchange Administrator goes away
- **IT Role Changes:** If my organization uses a public cloud service like Windows Azure my role becomes less technical.
- **Virtual Machine Cloud:** If I'm running applications or network services on Virtual machines, I'm already doing cloud computing
- **Cloud Types:** There is only one kind of "Cloud"
- **Integration:** Integration issues go away when applications are outsourced to the cloud
- **Benefactors of the Cloud:** Only a small business can gain any cost savings benefit out of cloud computing

Fundamental Principles



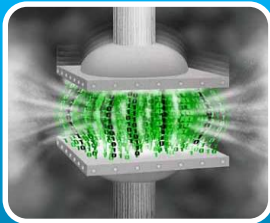
Measure everything, measure everything!

- Windows Azure Diagnostics
- Transparent ROI



Better Performance = Lower TCO

- Lower ongoing infrastructure costs
- Scalability of capacity
- Rapid deployment



Whenever possible:

- Cache
- Compress
- Batch

Principles leads to better user experience and application performance

Instrumentation is key to optimizing costs



Monitoring

Where is CPU time spent?

What % of CPU is used?



Diagnostics

What URLs are getting served?

What are the characteristics (caching, compression, etc)



Storage

What parts of your code are calling storage?

What partitions are they hitting?

Route all storage access through common code.

Verify storage patterns.

Cost Savings

Remember to account for monitoring and diagnostic usage

Cloud Architecture and Design Principles

- Design for failure and nothing fails
- Think Parallel
- Loose Coupling sets you free
- Design Applications for Elasticity and to leverage Load Balance capabilities
- Design for real-time
- Store it right and leave it there
- Build Security in every layer
- Clean up After yourself
- **Above all - Don't fear constraints**

The "IT System Design" (1)

The screenshot shows the homepage of the Indian Income Tax e-filing website. At the top left is the logo of the Income Tax Department, India, with the text 'आयकर भारत' and 'INCOMETAX INDIA'. To the right is a 'Quick Links' dropdown menu and three icons: a home icon, an email icon, and a social media icon. Below this is a navigation bar with links for 'Home', 'About US', 'Downloads', 'Help', 'Services', and 'Login'. The main banner features the text 'Income Tax e-filing' and a background image of a hand typing on a laptop keyboard. Below the banner is a yellow notification bar: '< AY 2009-10 has been enabled for all ITR forms. Please furnish the Form ITR-V to the Income-tax Department >'. The left sidebar contains a 'DOWNLOAD' section with links for 'NEW: Schema Download', 'e-Filing A.Y. 2009-10', 'e-Filing A.Y. 2008-09', and 'Previous Years', and a 'SUBMIT RETURN' section with a 'Select Assessment Year' link. The center area features the slogan 'ANYTIME. FILE ANYWHERE.' and a 'WELCOME TO INCOMETAX INDIA' banner. The right sidebar shows the date 'Sat Jun 20 2009 22:12:43 GMT+0530', the Indian national flag, and a 'Login' section with 'Existing User' and 'Login' links.

How will you design the Infrastructure for Indian Income Tax website ?

- UTI
- NSDL
- IRS officers online
- e-Payment of Taxes
- www.incometaxindia.gov.in
- OTHER INFORMATION
- Feedback/Assistance
- How to be Secure

21st May, 2009 req. TDS/TCS payment

NEW: Click here to download [Circular No. 03 / 2009 dated 21st May, 2009 req. ITR forms and form ITR V](#)

e-Filing for AY 08-09: Quick Statistics (as on 31st March 2009)

e-Filing Process - At a glance

- 1 Select [appropriate type of Return Form](#)
- 2 Download [Return Preparation Software](#) for selected Return Form.

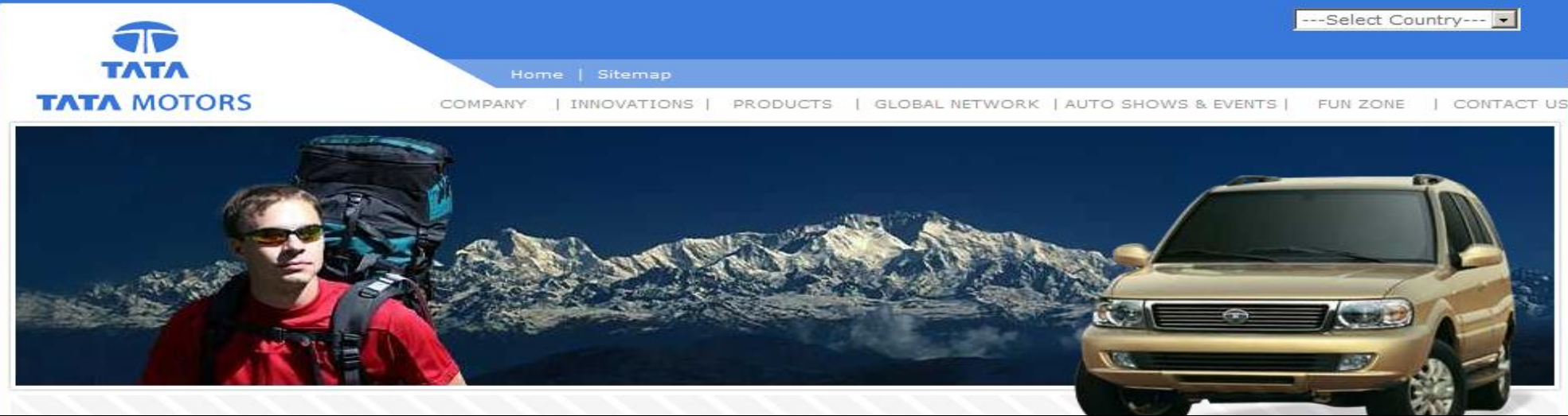
e-Filing News

E-Filing for AY 2009-10 has been enabled for all ITR forms. Please furnish the Form ITR-V to the Income-tax Department by mailing it to **Income Tax Department , CPC, Post Box No - 1, Electronic City Post Office, Bangalore - 560100,**

NEW: Advanced users / Software developers [Click here](#) to download Schema for AY 2009-10.

For feedback or any

The "IT System Design" (2)



How will you design web infrastructure for a product launch?



The "IT System Design" (3)



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The "IT System Design" (4)

The image shows the MIT OpenCourseWare website homepage. At the top, the MIT logo and 'MITOPENCOURSEWARE MASSACHUSETTS INSTITUTE OF TECHNOLOGY' are displayed. Navigation links include Home, Courses, Donate, About OCW, Help, and Contact Us. A search bar is present with the text 'Enter search keyword' and a 'GO' button. Language options for 简体中文, 繁體字, Español, and Português are available, along with a link to 'View translated courses'. An 'Advanced Search' link is also present. A 'Home' breadcrumb is shown. The main banner features a woman's portrait with the text 'Unlocking Knowledge, Empowering Minds.' and a quote from Maria Karamitsou, a student from Greece. Below this, there is a 'FEATURED COURSE' section for 'Ocean Worlds' and a 'SUPPORT OCW' section with a 'DONATE NOW' button. A black banner at the bottom of the page contains the text: 'What is the most cost effective solution for Virtual Classrooms or Web2.0 enabled education?'. The footer includes the MIT logo, copyright information (© 2002-2009 MIT), RSS feeds, privacy and terms of use, site map, and OCW content citation information. The Creative Commons BY-NC-SA license logo and the OCW Consortium logo are also present.

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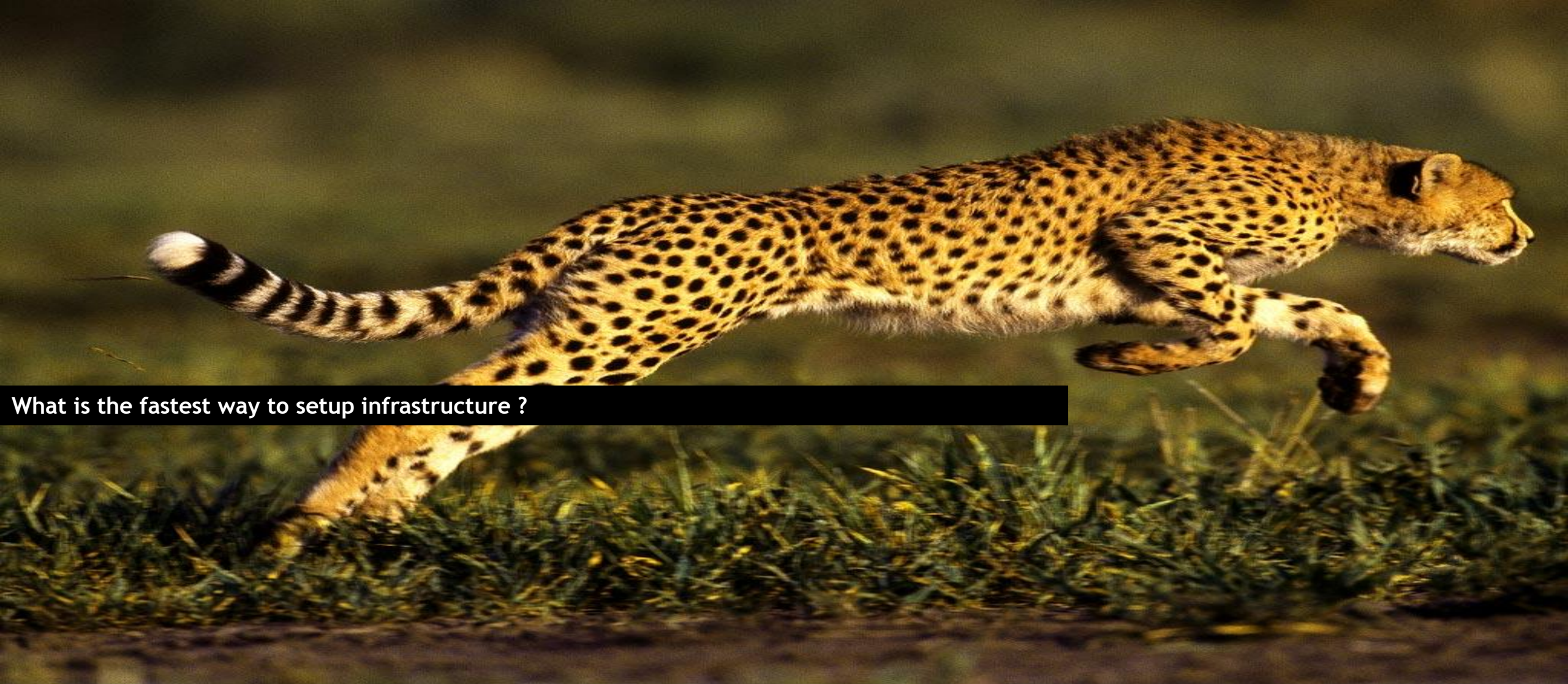
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OCW CONSORTIUM

The "IT System Design" (5)



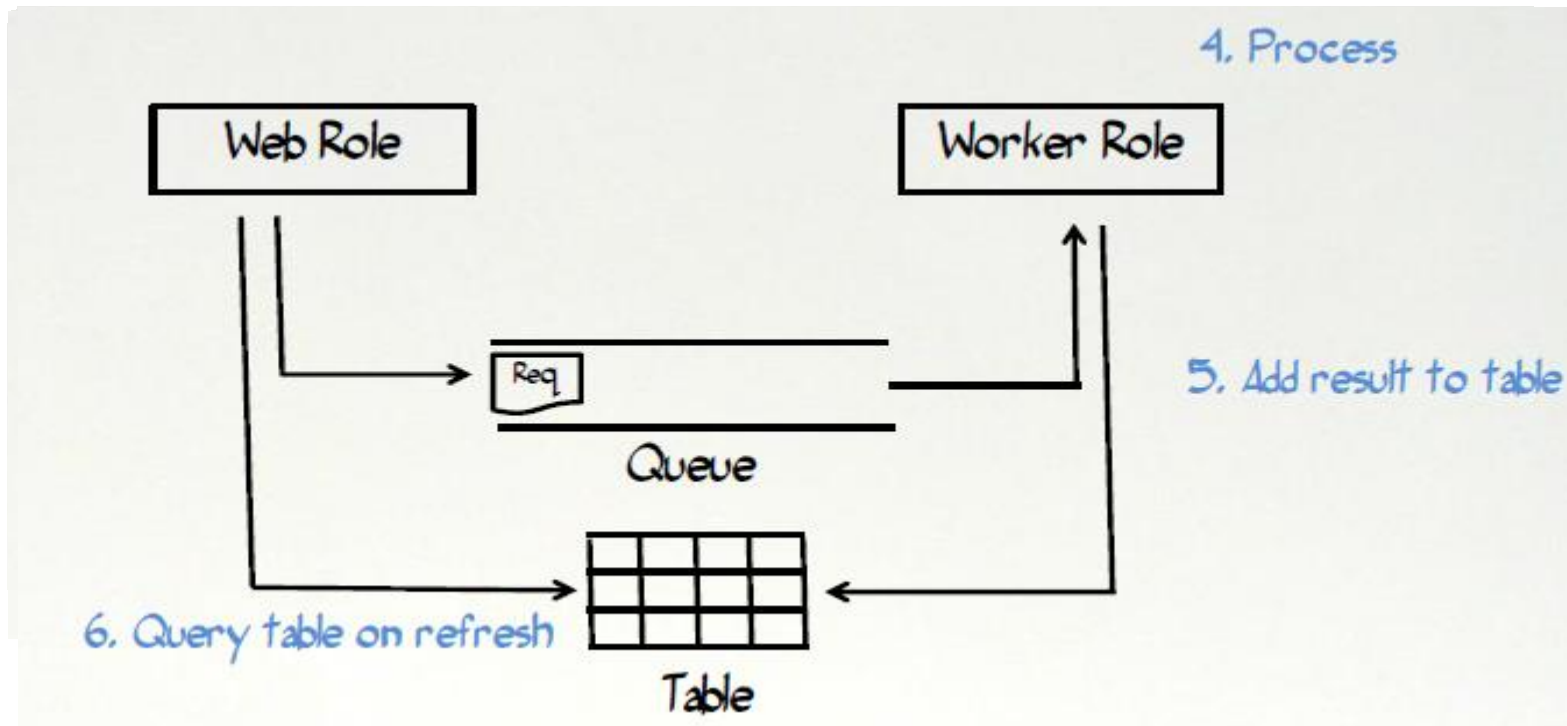
What is the fastest way to setup infrastructure ?

Scenario: Real Time Tracking as a Service

- Global Logistics Company started with a vision “Google of Tracking Data”
- USP – “Aggregation of Position data from Various Providers and devices. Flexible to export to 3rd party systems
- Complexity: Integration of 3rd party systems (Billing, Fleet, GPS, Tracking) and Distributed Continental network
- Architecture Patterns
 - Scalability
 - Queue-Centric Workflow
 - Multi-site Deployment
 - Multi-tenancy
 - Auto-scaling
- Costs Reduced by 40% in 3months after deployment from 10K /month to 6K /month

Cost Saving Patterns

Queue-Centric Workflow Pattern – Using Cloud for Scale



Key Take Aways

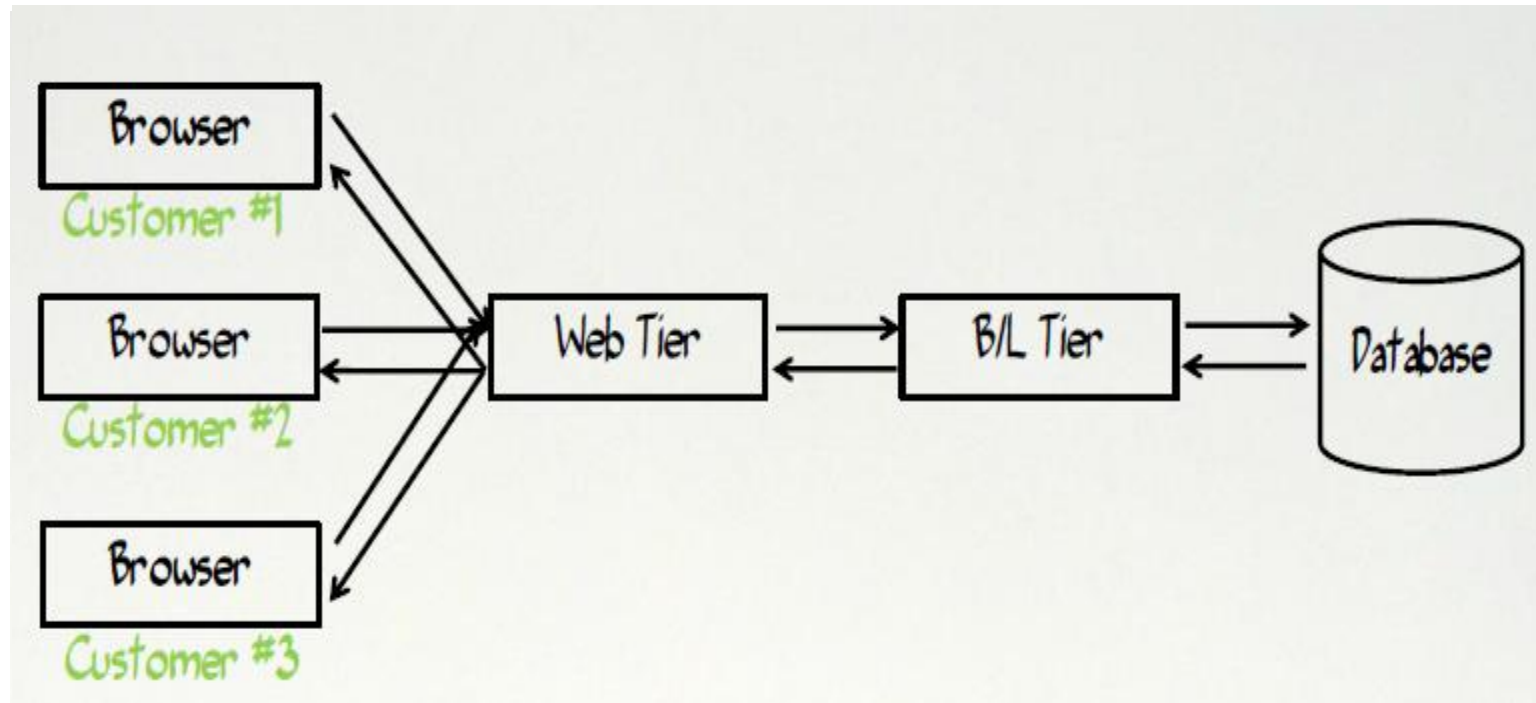
- Use Configuration to Scale
- Define strategy when to scale up/down in production
- Understand how to communicate between Web and worker role.

Scenario: Field Survey Application

- Oil and Gas Company
- Application to calculate the Oil fields viability before exploration.
- USP – “Flexible installation and configurable models for different field survey needs
- Complexity: Design demanded to have simple licensing models with time based subscriptions
- Architecture Patterns
 - Eventual Consistency Pattern
 - Map Reduce Pattern
 - Database Sharding Pattern
 - Auto-Scaling Pattern
- Costs Reduced by 27% in 4 months after deployment from 12K /month to 9.24K /month

Cost Saving Patterns

Multi-tenancy Pattern : Using Database Design for Scale

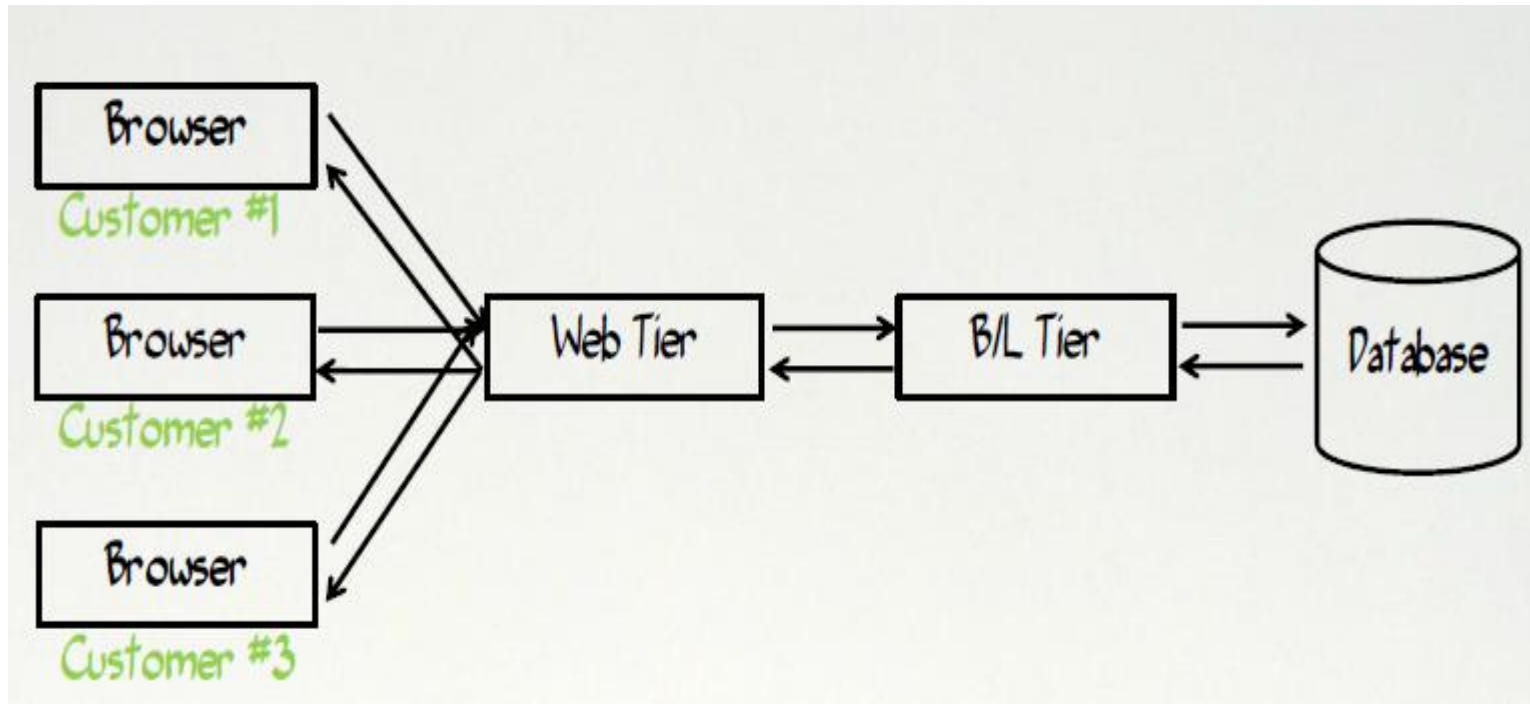


Key Take Aways

- Consider Multi-tenancy first, even if it is for one customer.
- Design should focus both data and UI
- Consider for identity management

Cost Saving Patterns

Multi-tenancy Pattern : Using Database Design for Scale

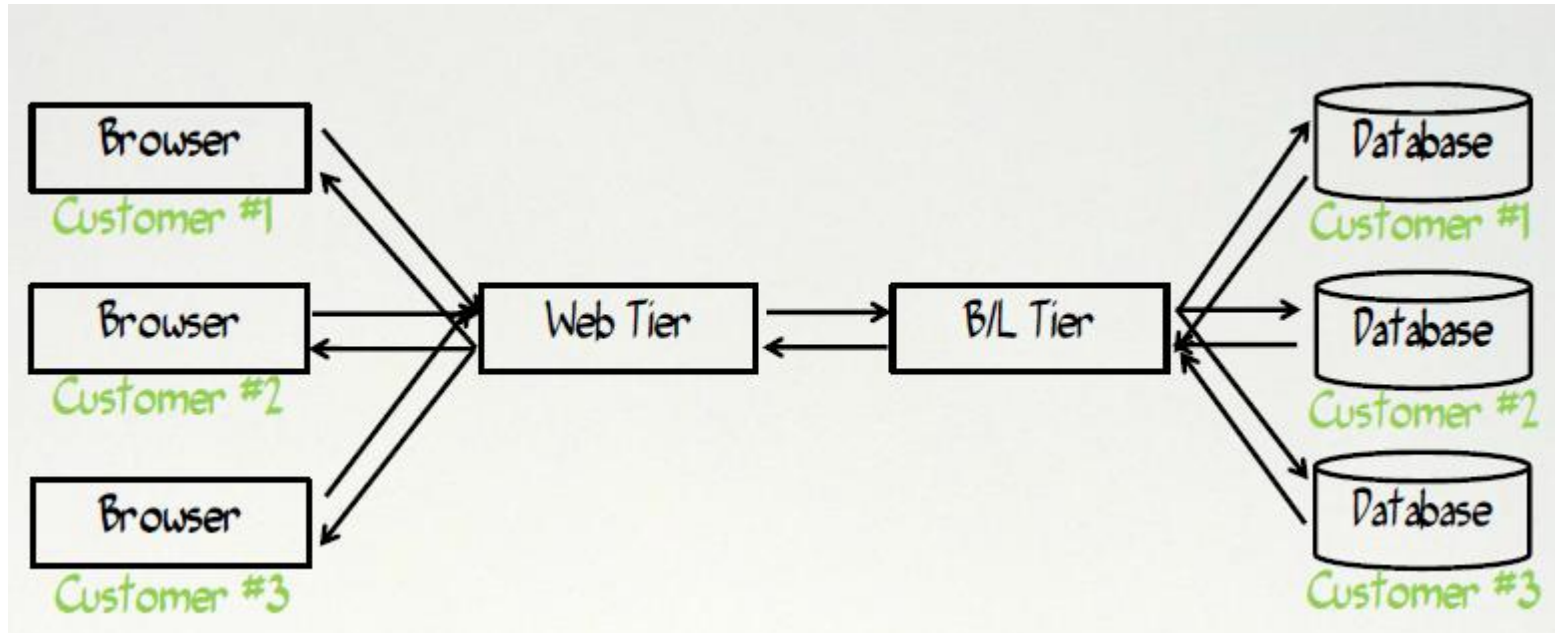


Fixed Schema

- Simple to define, easy to approach / upgrade
- No Customizations, restoring of tenant data.

Cost Saving Patterns

Multi-tenancy Pattern : Using Database Design for Scale

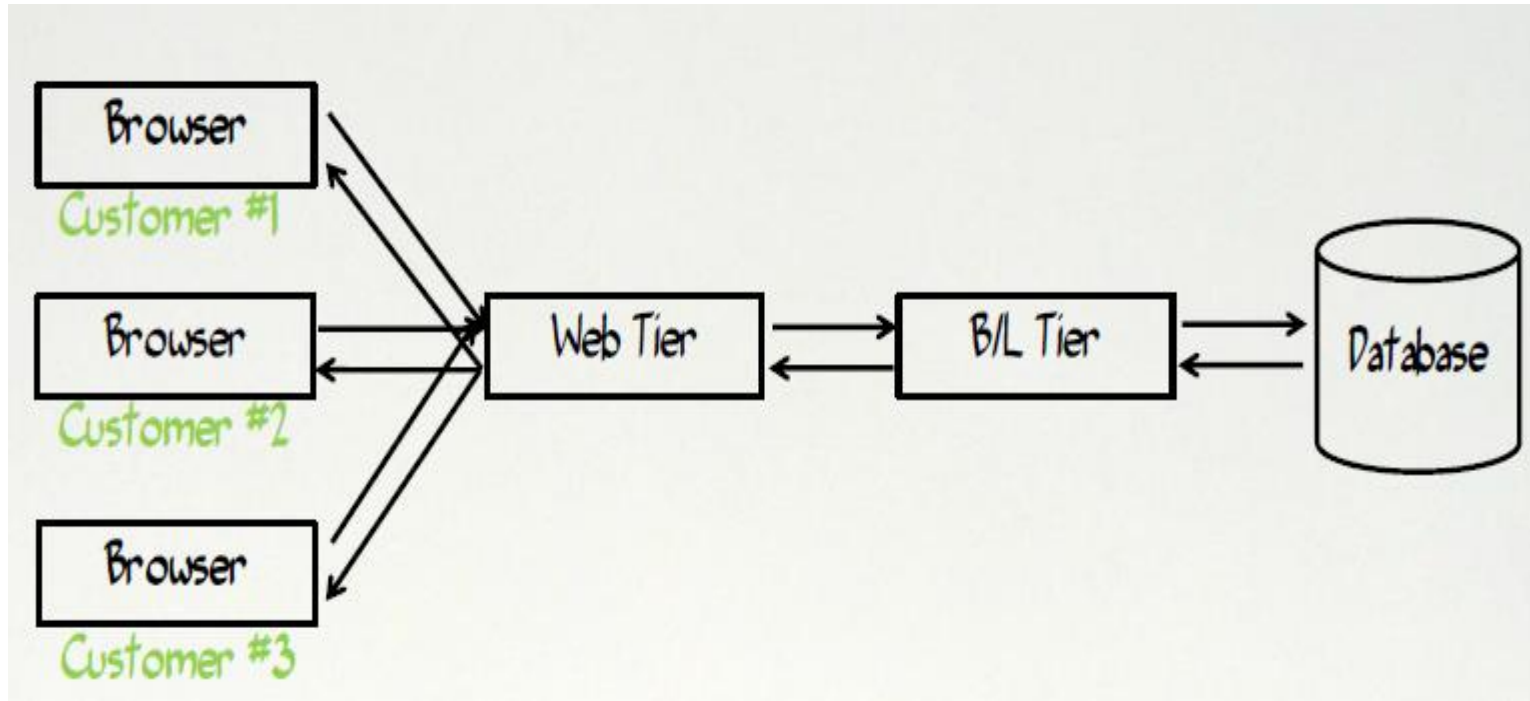


Each Customer has its own Schema

- Flexible and highly isolated. Tenant restore is high.
- Costly. Difficult to upgrade schemas

Cost Saving Patterns

Multi-tenancy Pattern : Using Database Design for Scale

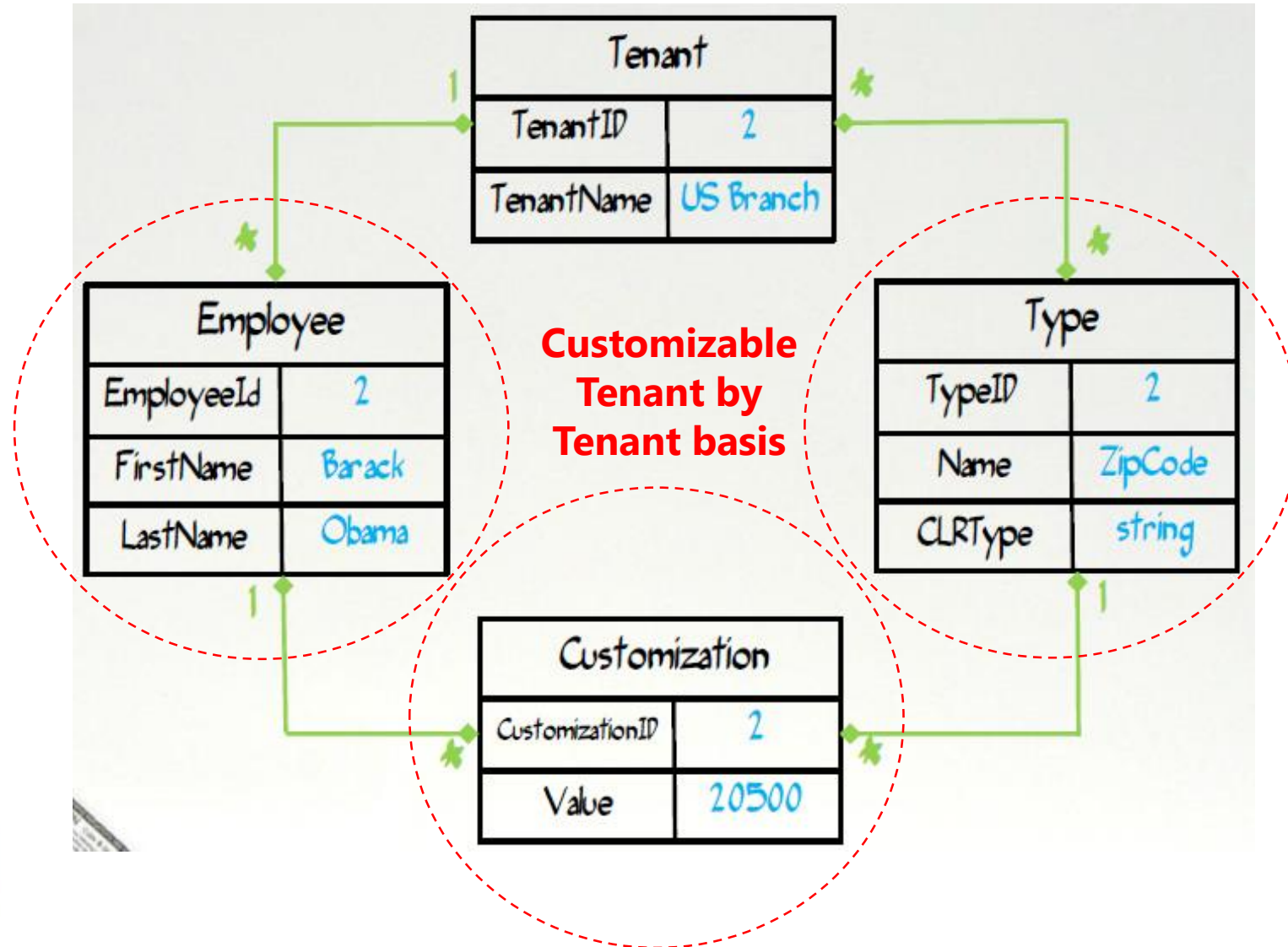


Fixed Schema with customizations

- Customers can add their own custom fields
- Tenant restore is difficult

Schema Customizations

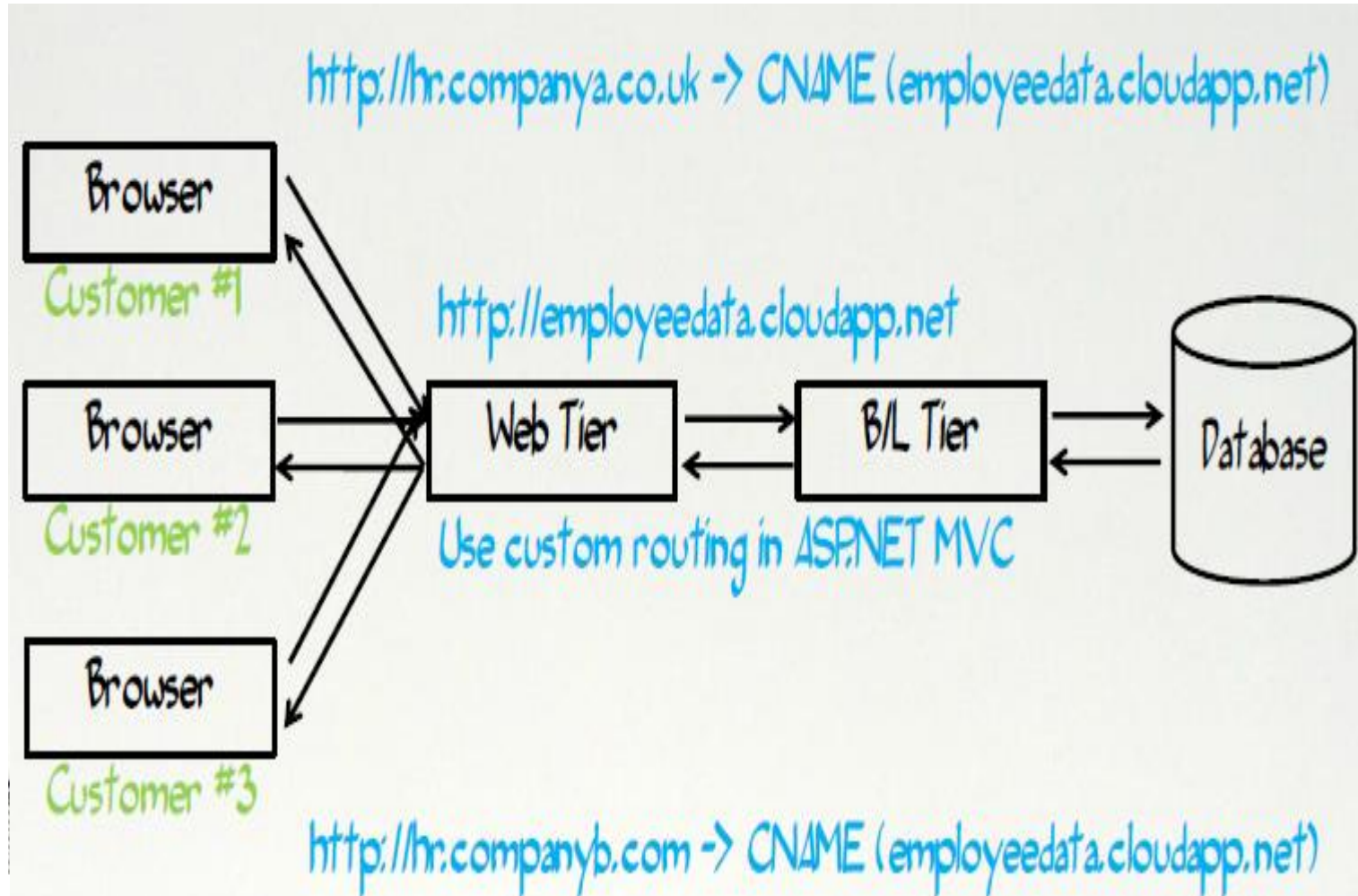
**Fixed
Schema
Applies to all
tenants**



**Customizable
Tenant by
Tenant basis**

**Could be
both**

UI Customizations

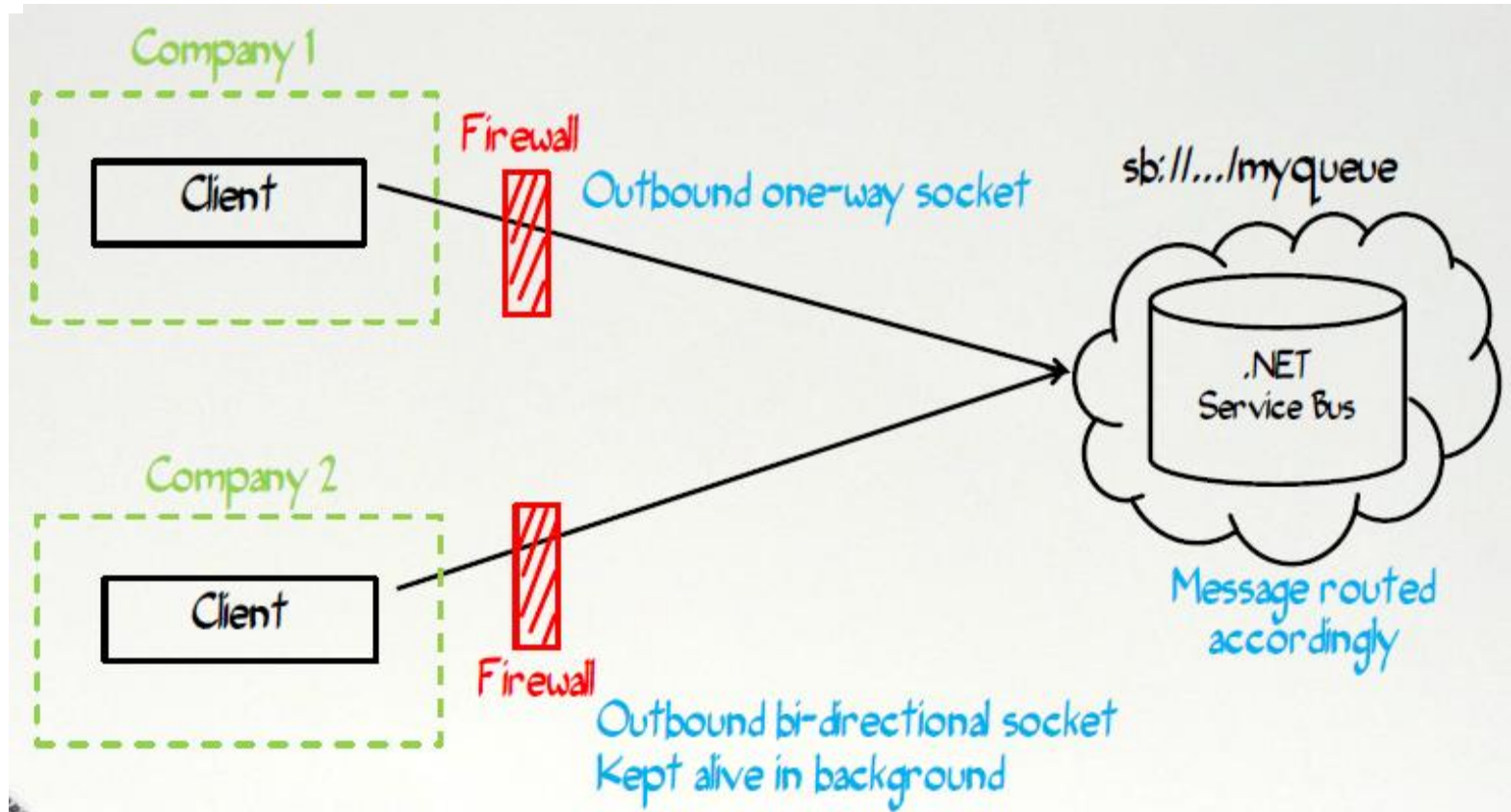


Scenario: E-Commerce Solution

- Large Designer and Manufacturing company
- Goal: Attract GenX customers
- Technology: Open Source Stack
- Complexity: Manage 14 different brand sites on 14 different deployment platforms and as many creative agencies for the brands
- Architecture Patterns
 - Eventual Consistency Pattern
 - Map Reduce Pattern
 - Database Sharding Pattern
 - Auto-Scaling Pattern
- Costs Reduced by 30% in 8 months after deployment from 4.5K USD /month to 3K USD /month

Cost Saving Patterns

Communication Patterns : Using the Cloud for "Communication"

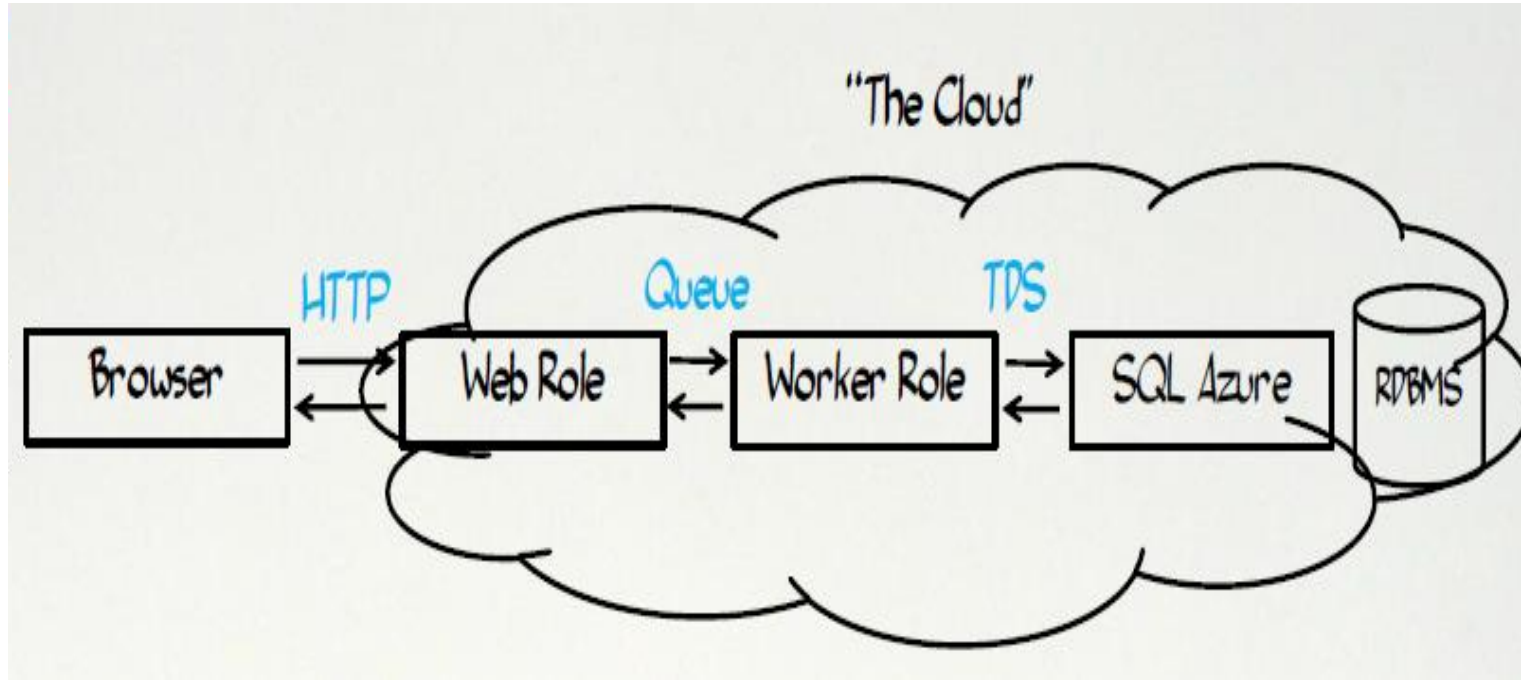


Key Take Aways

- Understand .Net Service Bus Traversal process
- Firewalls/ NATs can add additional trouble for non-http
- Pay attention when consuming azure queues via REST

Cost Saving Patterns

Storage Patterns: Using the Cloud for "Storage"

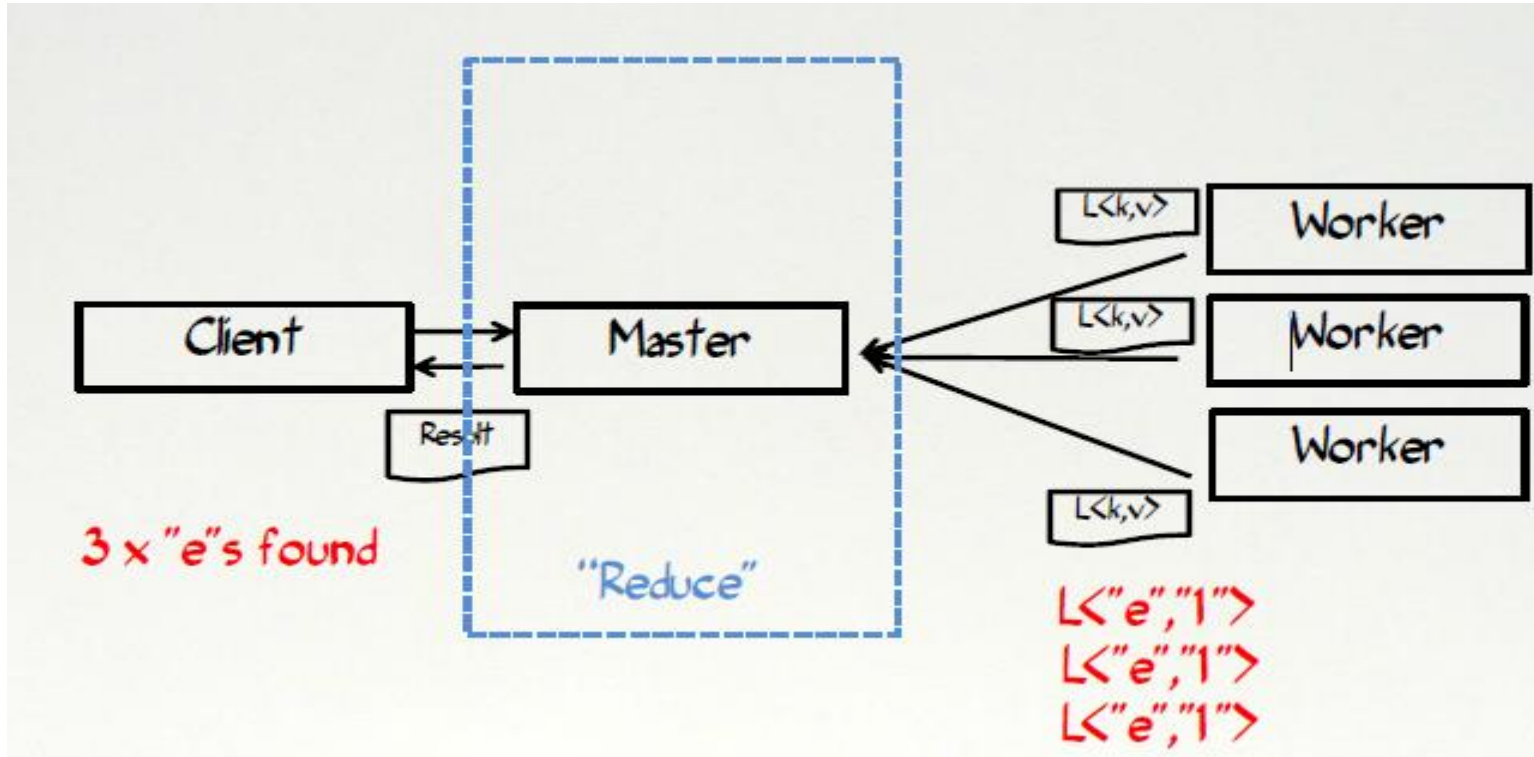


Key Take Aways

- Apply Code Near and Code Far Storage Patterns as per business need
- Pay attention to pricing model of storage on cloud
- Leverage Hybrid Cloud Storage to save costs (StorSimple)

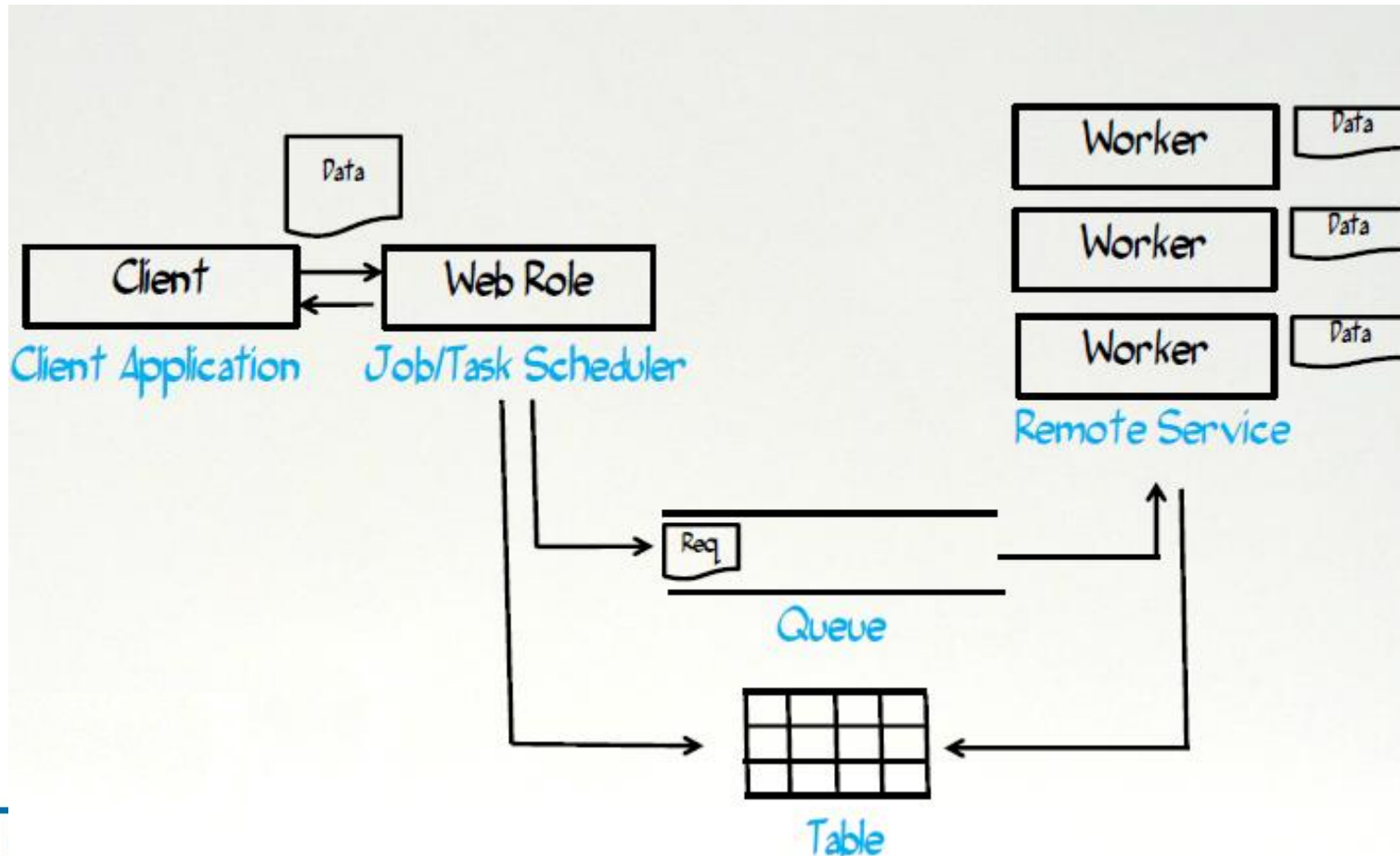
Cost Saving Patterns

Compute Patterns: Using the Cloud for "Compute"



Cost Saving Patterns

Compute Patterns: Using the Cloud for "Compute"



Key Take Aways

- Apply MapReduce for distributed computing using HDInsight
- Understand other standard frameworks

Key Cloud Architecture Patterns

- Scalability Pattern
- Queue-Centric Workflow Pattern
- Eventual Consistency Pattern
- Map Reduce
- Database Sharding
- Multi-tenancy
- Busy Signal
- Node Failure
- Multi-site Deployment Pattern
- CDN Pattern
- Valet Key
- Colocate
- Network Latency
- Auto-Scaling
- Horizontal Scaling Compute

Key Take Aways: Paths to Savings Cost

- Follow Cloud Fundamental and Architecture principles to save costs
- Focus on Architecture and Design to Save costs
- Understand pricing models to choose deployment wisely to optimize costs
- Monitor, Analyze, and Tune to manage costs
- Remember – Weakest link in the Cloud is application (Hence Pay attention)

References

Related references for you to expand your knowledge on the subject

- Cloud Architecture Patterns: <http://it-ebooks.info/book/947/>
- Cloud Design Patterns: Prescriptive Architecture Guidance for Cloud Applications : <http://msdn.microsoft.com/en-us/library/dn568099.aspx>
- Cloud Cover: <http://channel9.msdn.com/Shows/Cloud+Cover>
- Microsoft Azure Pricing Models: <http://azure.microsoft.com/en-us/pricing/details/virtual-machines/>

TechNet
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