

# Building Scalable Web Applications

## Introduction

Ivan Pepelnjak ([ip@ipSpace.net](mailto:ip@ipSpace.net))

ipSpace.net AG

The logo for ipSpace, featuring the text "ipSpace" in a white, cursive script font. The logo is positioned on a background of diagonal stripes in shades of orange, yellow, and brown.

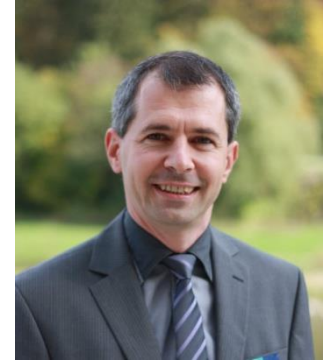
MISSION:

Don't spoil a  
great idea  
with poor  
execution



# Who is Ivan Pepelnjak ... in 30 Seconds

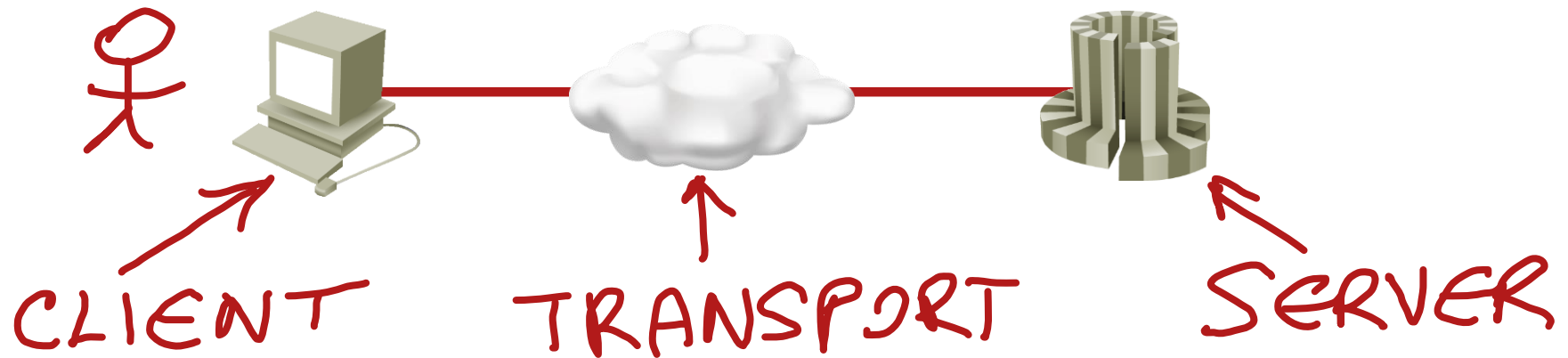
- Programming since early 1980's (from device drivers to web sites)
- Networking engineer since 1985 (DECnet, Netware, X.25, OSI, IP ...)
- Technical director, later Chief Technology Advisor @ NIL Data Communications
- Started the first commercial ISP in Slovenia (1992)
- Developed BGP, OSPF, IS-IS, EIGRP, MPLS courses for Cisco Europe
- Architect of Cisco's Service Provider (later CCIP) curriculum
- Consultant, blogger ([blog.ioshints.info](http://blog.ioshints.info)), book author ...



## Focus:

- Core routing/MPLS, IPv6, VPN, Data centers, Virtualization
- Scalable web-based applications
- Rock climbing, mountain biking ;)

# Focus Areas



## Client

- HTML and CSS
- Mobile audiences
- Progressive enhancement
- Graceful degradation
- Mashups and APIs

## Transport

- TCP
- HTTP

## Server

- Virtualization and Cloud Computing
- Scalability
- Databases
- High availability
- API: JSON, REST, SOAP, OAuth

Web site optimization, Caching, Security, APIs



# Recommended Reading

## Books:

- JavaScript: The Good Parts
- Learning jQuery
- Eric Meyer on CSS
- Scalability Rules

## Blogs:

- HighScalability.Com

<https://www.evernote.com/pub/ioshints/scaleMatters>



**Always Start with the Business**

# Business First

Find a problem:

- Don't clone others!
- Can you figure out why other solutions work/fail?
- Can your solution solve a well-defined problem?

Can you describe it?

- Elevator pitch

What?

- Web-based application
- Thick-client (mobile) app

## Business First (2)

Why?

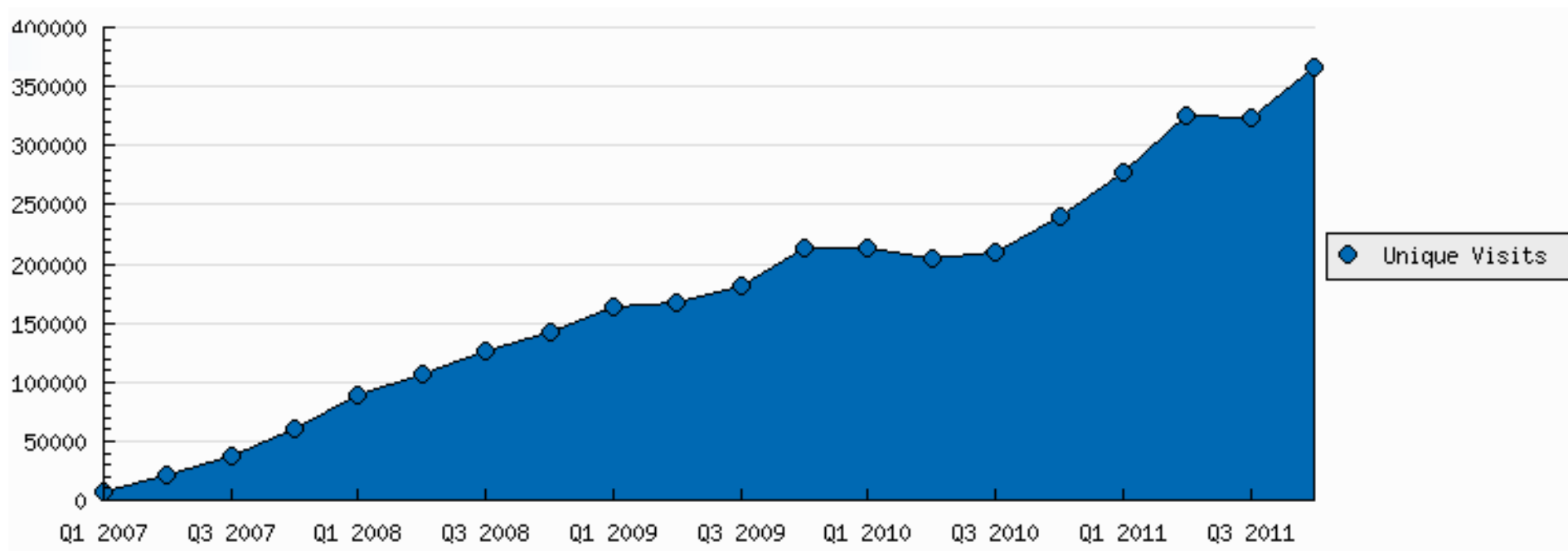
- Fun
- Challenge
- Profit

Funding / Revenue streams

- Free
- Ad-driven
- Product
- Support services for a free product



# It Takes a Long Time To Succeed

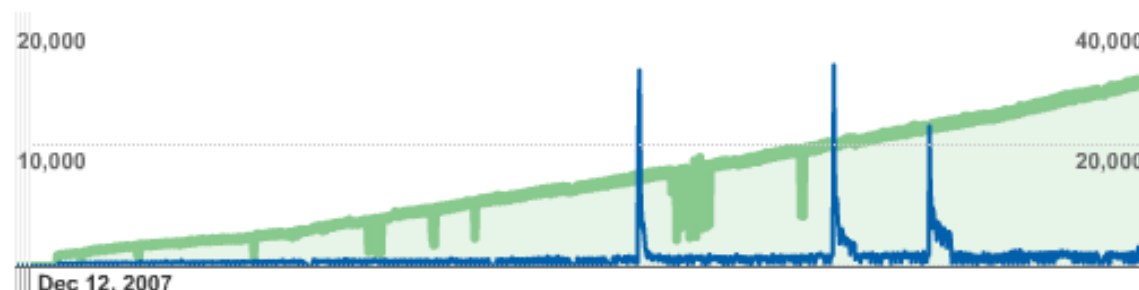


Quarterly unique visits to blog.ioshints.info  
Source: statcounter.com

RSS subscribers to blog.ioshints.info  
Source: feedburner.google.com

## Feed Stats Dashboard

Show stats for



# Google Is Your Friend



## 63.19% Search Traffic

67,122 Visits

## 13.71% Referral Traffic

14,568 Visits

## 12.33% Direct Traffic

13,101 Visits

## 10.77% Campaigns

11,436 Visits

1.	google	65,903
2.	bing	515
3.	yahoo	301
4.	search	216
5.	yandex	92
6.	baidu	54

## Returning visitors



## 51.95% Search Traffic

28,220 Visits

## 18.28% Referral Traffic

9,927 Visits

## 11.89% Direct Traffic

6,457 Visits

## 17.88% Campaigns

9,713 Visits

# 5P of Marketing

Product

Promotion

Price

Place

People

More info:

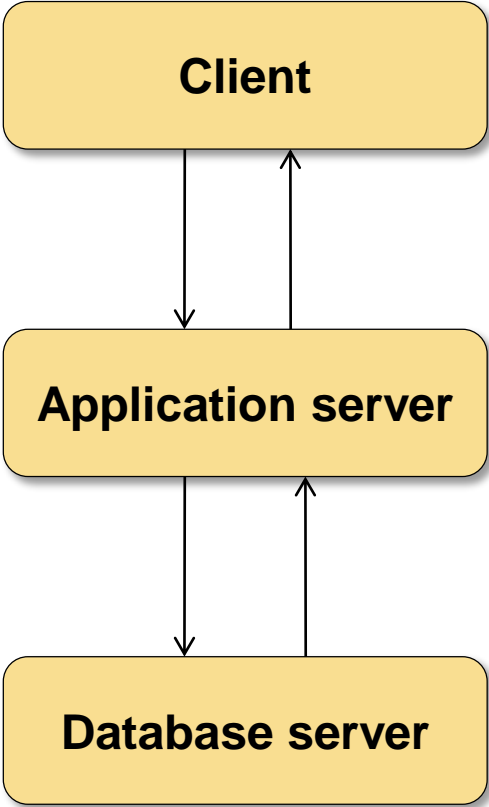
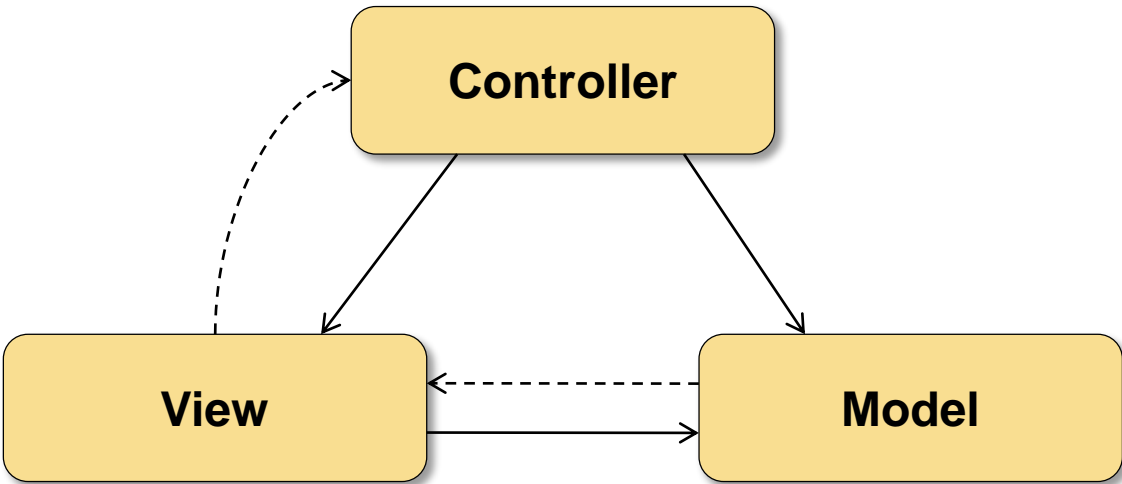
<http://en.wikipedia.org/wiki/Marketing>

<http://www.businessstoolchest.com/articles/data/20040220194417.shtml>

# ARCHITECTURES

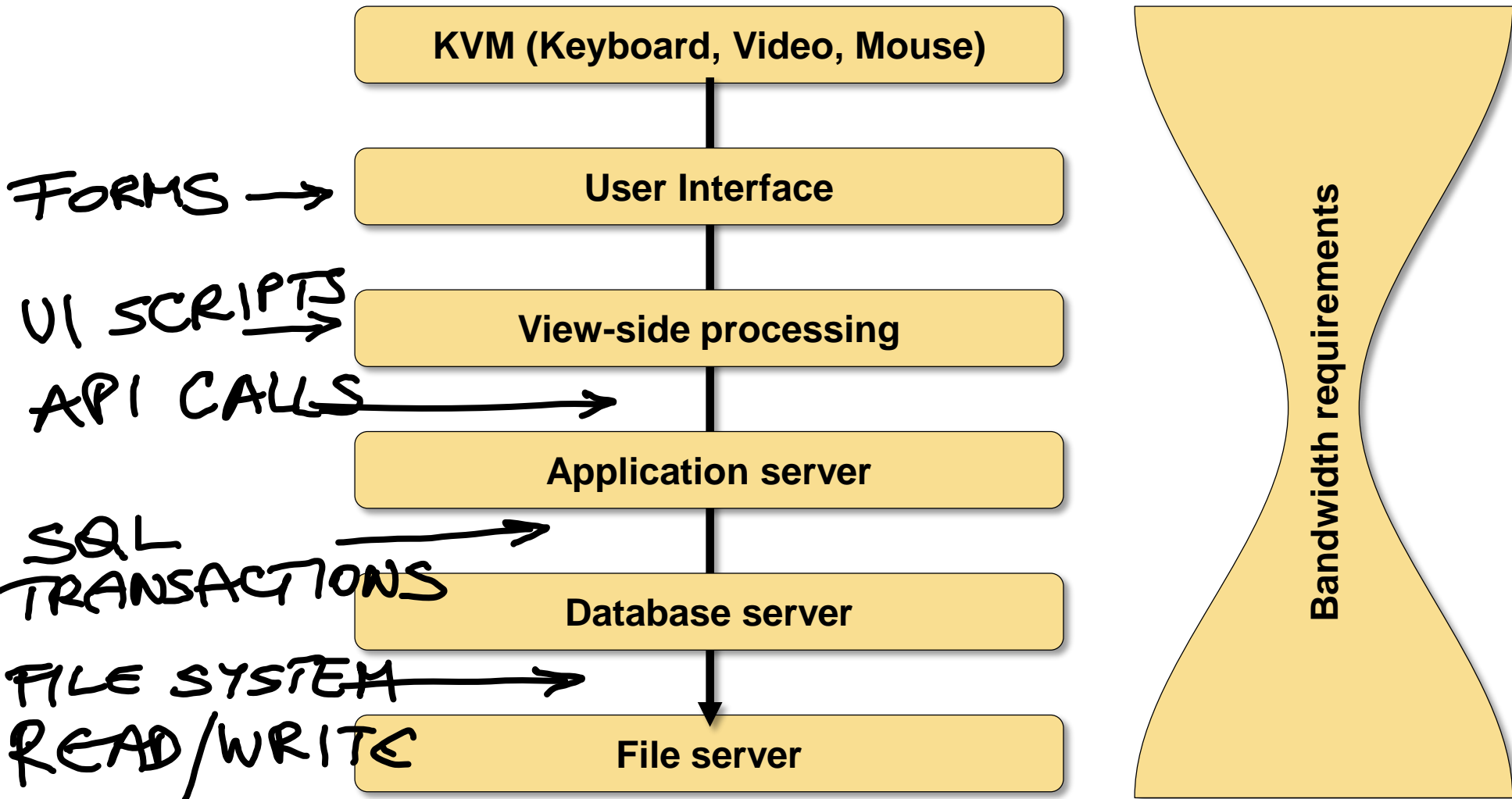


# Typical Application Architecture



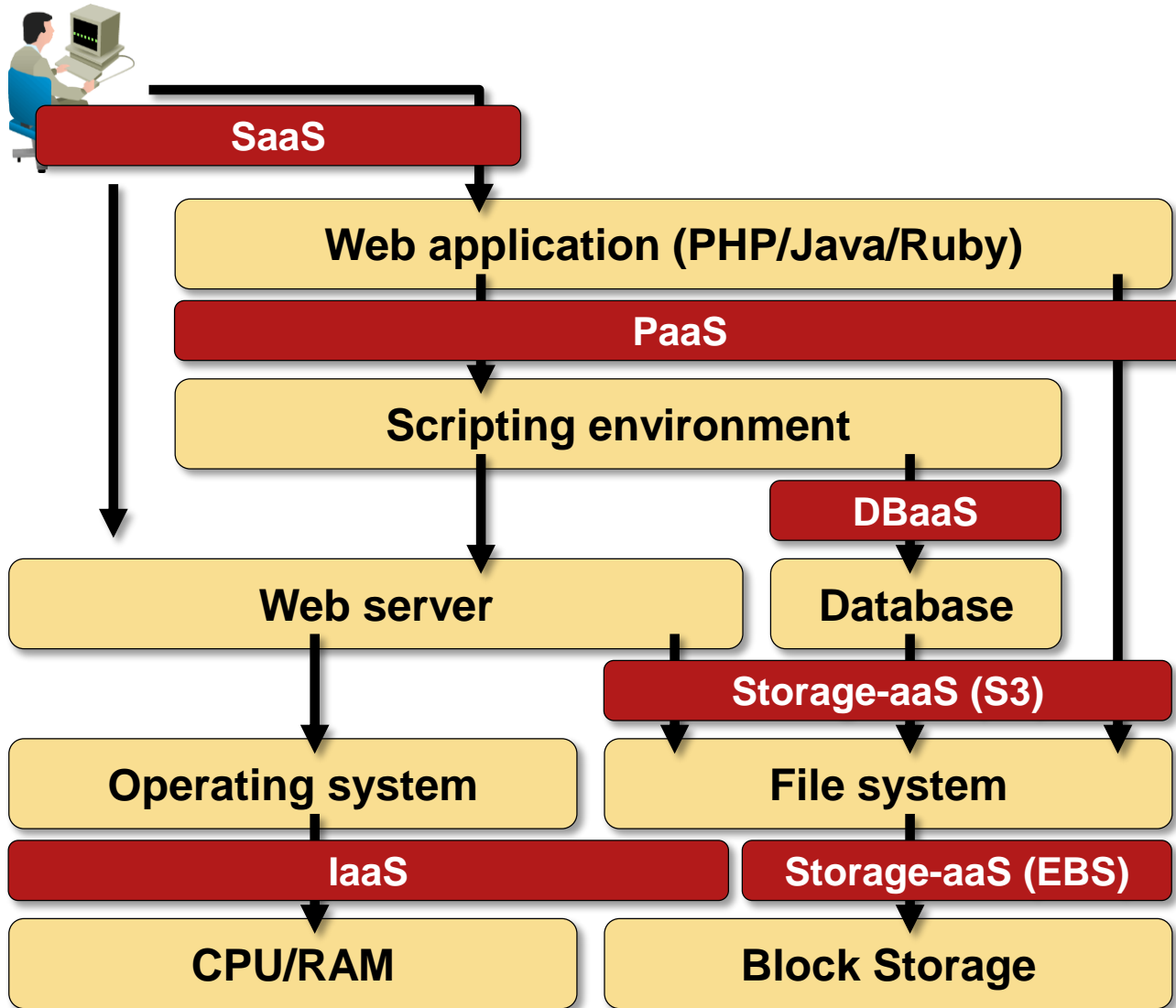


# Application Architecture Stack

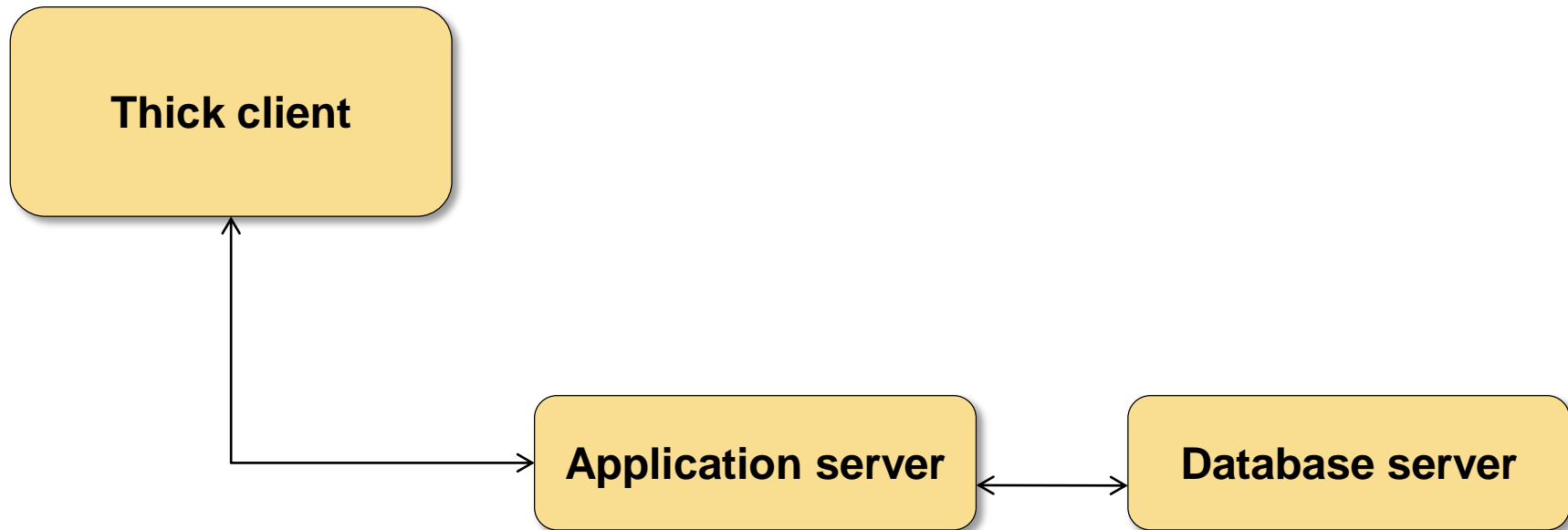




# Typical Application Architecture Components

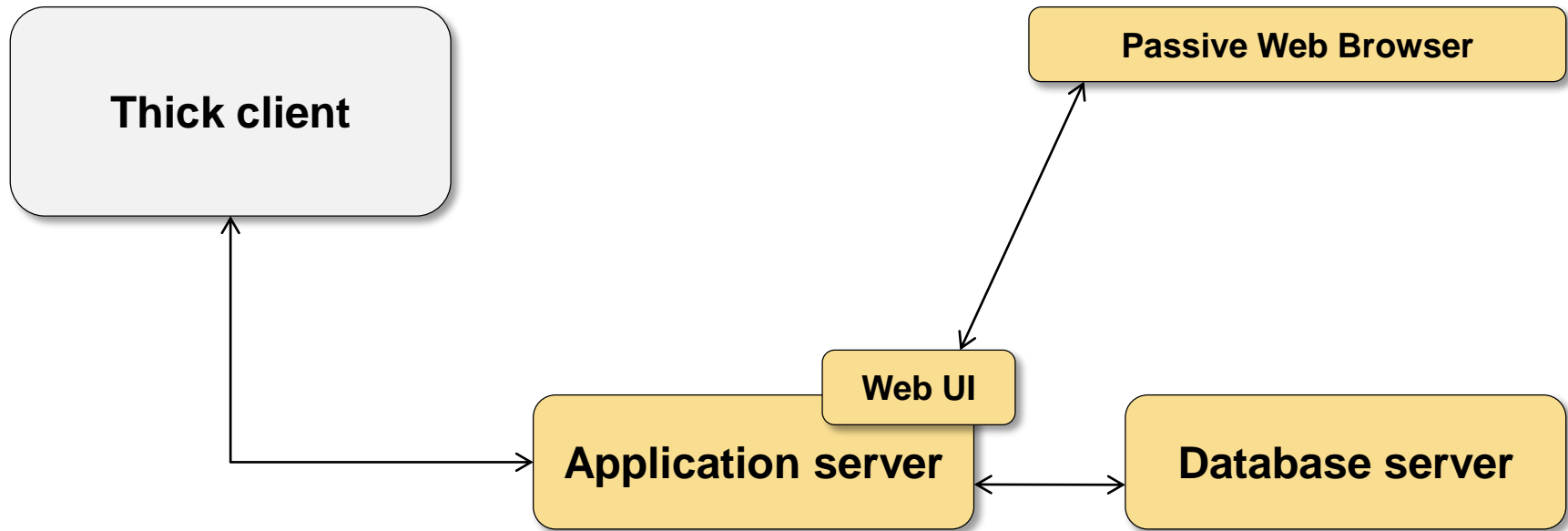


# Client Types: Thick Client



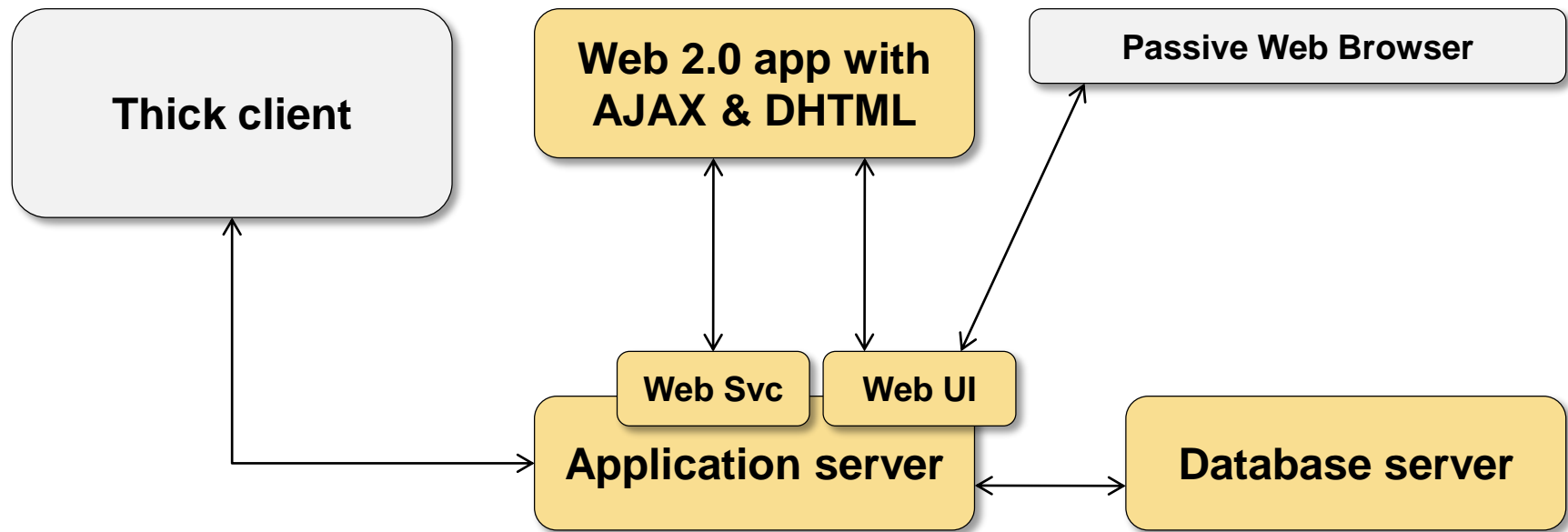
- Client is a standalone workstation application
- UI and some business logic runs on client side
- Transactions are sent to the application server
- Application server implements critical parts of business logic

# Client Types: Thin Client



- UI in a web browser (using HTML and CSS for formatting)
- Rudimentary browser-side error checking
- Form data is sent to the application server
- Web page is refreshed on every transaction
- **Benefits:** cross-platform, automatic upgrades

## Client Types: Web 2.0 Application

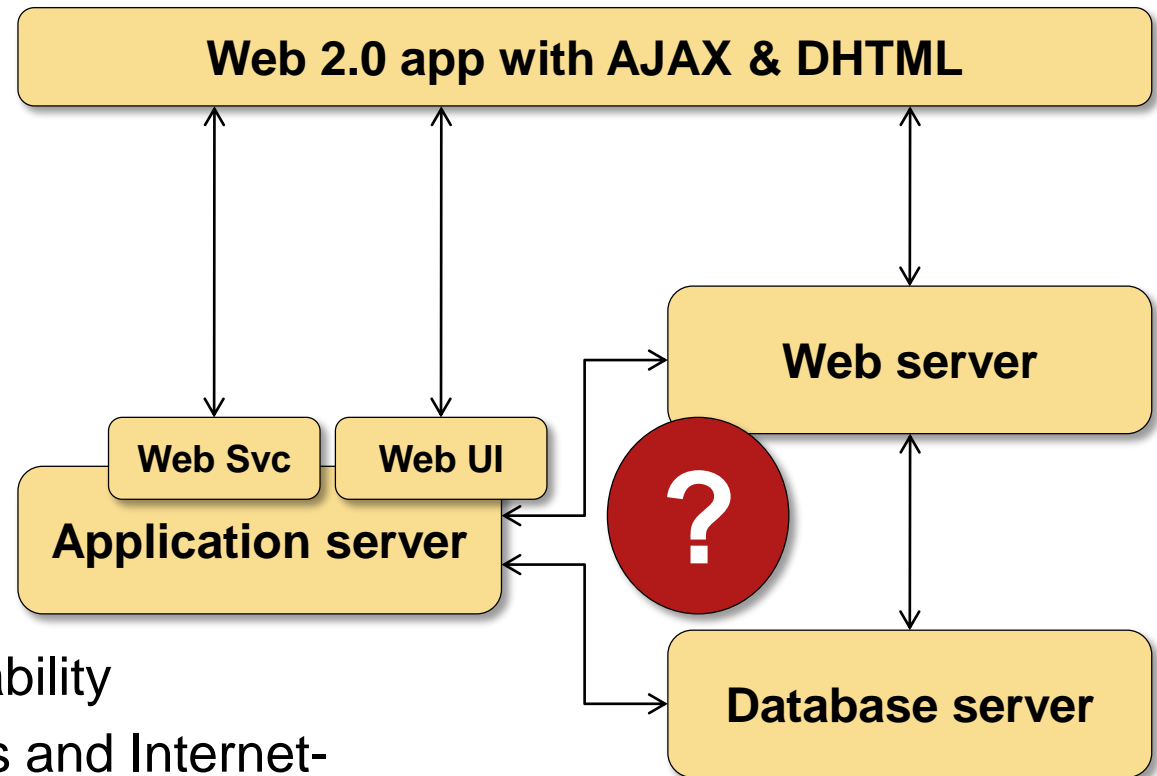


- Web application enhanced with dynamic capabilities (DHTML, heavy JavaScript, dynamic formatting)
- Two-way data exchange with the application server (form data or transactions)
- Parts of the business logic are executed in the web application

# Web Application Implementation Concerns

## Implementation Options

- Web server runs the application (PHP, J2EE ...)
- Web UI and Web Services add-on for the application server
- Dedicated application and web servers
  - Increased security and scalability
  - Commonly used in Extranets and Internet-facing applications



# Typical Deployment Scenario

## Low-end scenario

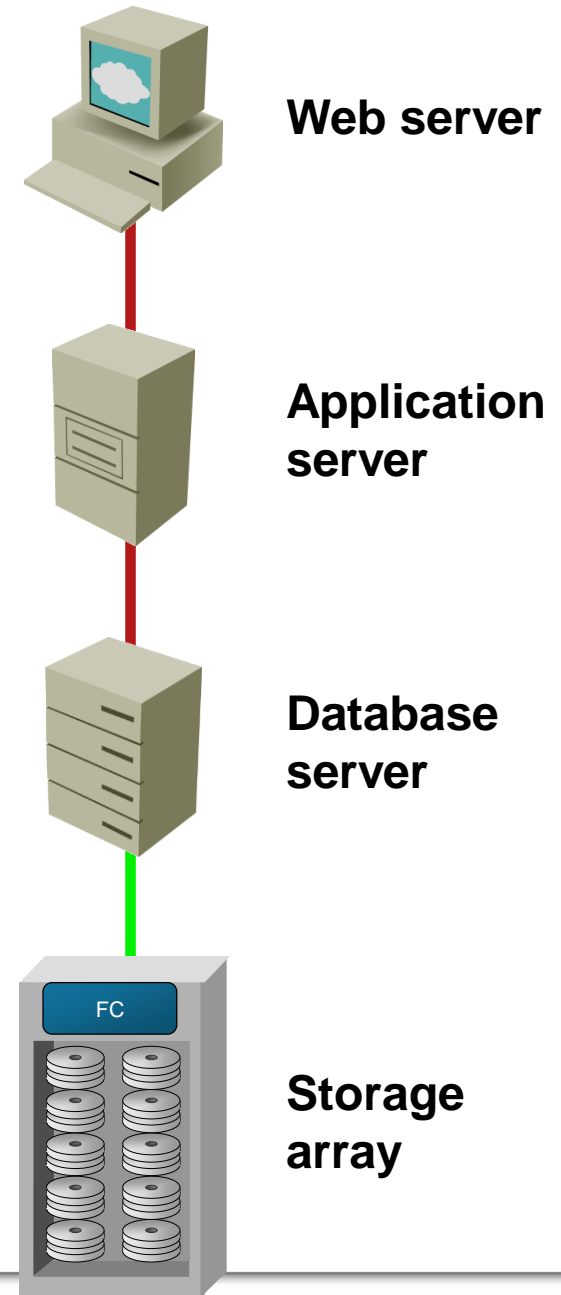
- Application implemented in web server
- Web server and database on the same host

## High-end scenario

- Pools of servers dedicated to each task
- Centralized storage

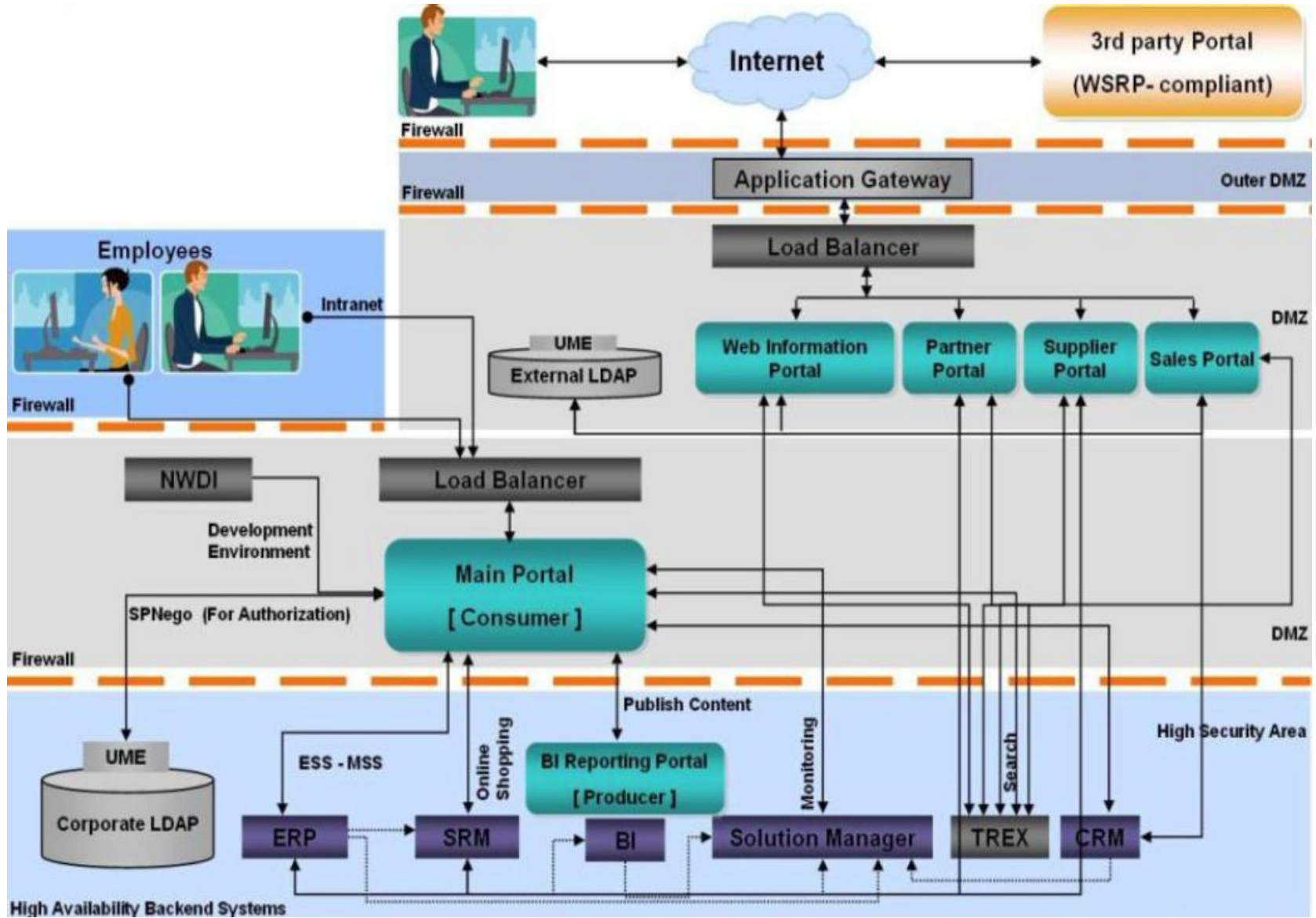
## Drivers

- Scalability
- Security
- Reliability
- Availability



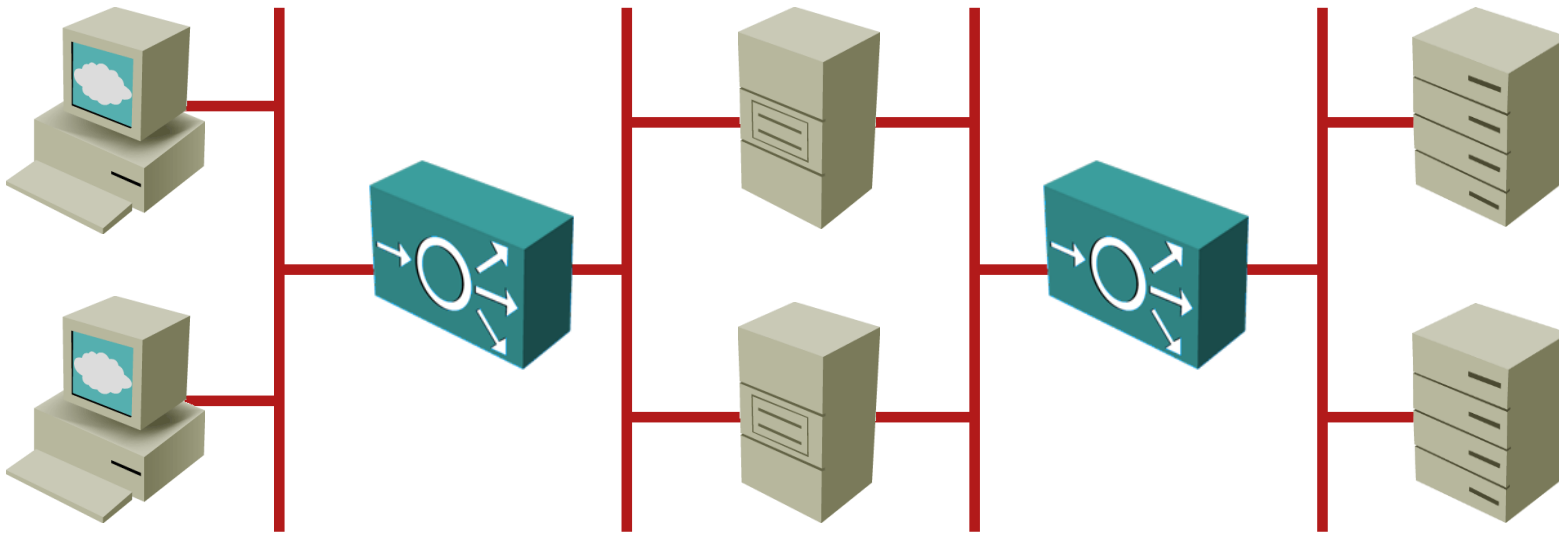


# Real-Life Example: SAP



Source: Best Practices for Implementing a Global Portal using SAP NetWeaver Portal, SAP, September 2008

# Coping With Load: Scale Up or Scale Out?



**Problem:** Coping with increasing/unpredictable load

- Scale-up: bigger servers
- Scale-out: split the work across many servers

**Challenges:** Shared state, transactional consistency





# Tool Selection Considerations

## Packaging

- Standalone product
- Custom web app
- Customized web site

## Deployment

- SaaS
- PaaS
- IaaS / web hosting
- Dedicated servers

## Tools

- Development frameworks
- Libraries
- Languages
- Databases

# Modular Web-based Application Development

## Cloud platforms

- Google Docs
- Blogger/Wordpress
- Picasa/Flickr

## Open-source solutions

- Wordpress (blogs)
- Mediawiki (wiki)
- Joomla (Content management)

## Hosted open-source solutions

- Wordpress blogging platform

## Mashups

- Use multiple web services within the same page
- Usually simple integration (include a script library)
- Also available as packaged code (example: Blogger gadgets)

## Feeds

- Content published in predefined format (RSS or ATOM)
- Summaries or whole text included in other web pages

Blog hosted on Blogger

Third-party RSS feed

Custom JavaScript library

Comments managed with JS-Kit (current hit: Disqus)

The screenshot shows the ipSpace blog homepage. At the top left is the ipSpace logo. The navigation menu includes HOME, BLOG, WEBINARS, RECORDINGS, SUBSCRIPTIONS, ARTICLES, ABOUT, and CONTACT. The main content area features an 'UPDATED WEBINAR ROADMAPS' section with a '10 Days remaining until DMVPN Designs' event on March 8th. Below this is a list of webinar categories: Data Center, Virtualization, IPv6, and Virtual Private Networks (VPN). A 'SUBSCRIBE TO' section allows users to subscribe to posts and comments. A 'POPULAR POSTS' section lists recent articles like 'Nicira Open vSwitch' and 'IBM launched a Network Competitor'. A 'RELATED POSTS BY CATEGORIES' section lists various articles under the 'Data Center' category. At the bottom, there is a Disqus comment box with a login field and a share button.

RSS feed provided through FeedBurner

Traffic monitoring with StatCounter and Google Analytics



# Benefits and Drawbacks

## Benefits of open-source tools

- Well known & widely used
- No licensing fees

## Benefits of hosted platforms

- Fast deployment
- Simple customizations are easy

## Benefits of mashups

- Don't reinvent the wheel
- Reduce development costs
- Quick implementation of new functionalities
- Deploy field-proven solutions

## Drawbacks of open-source tools

- Check the support model
- Sometimes you get what you pay for

## Drawbacks of hosted platforms

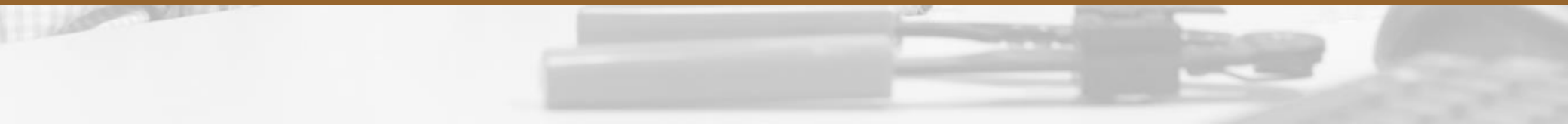
- Dependence on third-party infrastructure
- Usually no SLA and no support
- Data ownership and retention issues

## Drawbacks of mashups:

- Reliance on numerous external services
- Security considerations
- Cross-server scripting
- Styling
- Single sign-on (use OAuth)
- Slower web page rendering



## Some Parting Thoughts



**JUST GOOD  
ENOUGH  
ALWAYS WINS**

**KEEP IT SIMPLE  
(AND STUPID)**

**FOCUS ON REAL-  
LIFE SCENARIOS**

**IMPLEMENTATION IS  
IMPORTANT, BUT  
ARCHITECTURE  
REALLY MATTERS**



**ALWAYS CONSIDER  
THE WHOLE STACK**



## Some (More) Parting Thoughts

**ALWAYS DO AN  
EXCEPTIONAL  
JOB**

**LEARN SOMETHING  
NEW EVERY DAY**

**FOCUS ON  
KNOWLEDGE, NOT  
RECIPES**

**TRY TO GRASP THE  
BIG PICTURE**

**UNDERSTAND THE  
WHYS, NOT JUST  
THE HOWS**

**THE MORE THINGS  
CHANGE, THE  
MORE THEY STAY  
THE SAME**



**BALANCE BETWEEN  
BEING GENERALIST  
AND SPECIALIST**

Now Let's Move On

