

**REAL WORLD**

# Core Difference

- **Project**
  - You define the problem statement

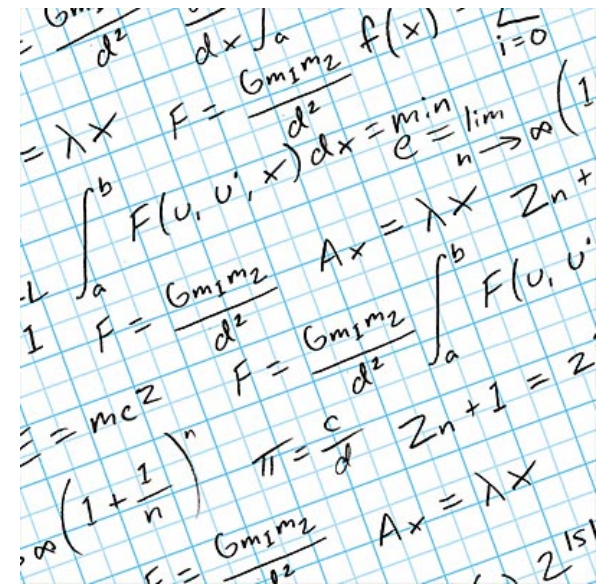
# Core Difference

- **Project**
  - You define the problem statement
  - You are the primary user

INPUT DATE: 03 / 06 / 2010

# Core Difference

- **Project**
  - You define the problem statement
  - You are the primary user
  - Often technically challenging and novel



Handwritten mathematical formulas on a blue grid background:

$$\begin{aligned} &= \frac{Gm_1m_2}{d^2} \quad \frac{d}{dx} \int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{i=0}^{n-1} f(x_i) \Delta x \\ &= \lambda x \quad F = \frac{Gm_1m_2}{d^2} \quad \frac{d}{dx} \int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{i=0}^{n-1} f(x_i) \Delta x \\ &= \lambda x \quad \int_a^b F(u, u', x) dx = \min_{u} \lim_{n \rightarrow \infty} \sum_{i=0}^{n-1} F(u_i, u'_i, x_i) \Delta x \\ &= \lambda x \quad F = \frac{Gm_1m_2}{d^2} \quad A_x = \lambda x \quad Z_{n+1} \\ &= \lambda x \quad F = \frac{Gm_1m_2}{d^2} \quad \int_a^b F(u, u', x) dx \\ &= \lambda x \quad F = \frac{Gm_1m_2}{d^2} \quad Z_{n+1} = Z_n + \Delta Z \\ &= \lambda x \quad \pi = \frac{c}{d} \quad Z_{n+1} = Z_n + \Delta Z \\ &= \lambda x \quad c = \frac{Gm_1m_2}{d^2} \quad A_x = \lambda x \end{aligned}$$

# Core Difference

- **Project**
  - You define the problem statement
  - You are the primary user
  - Often technically challenging and novel
- **Product**
  - Solving someone else's problem
  - Someone else is using the product
  - Often **simple solutions** to complex problems

# Overview

- Usability
- Security
- Reliability
- Performance

# USABILITY



# Usability

- **Most important, but often overlooked**
  - Very difficult task



# Usability

- **Most important, but often overlooked**
  - Very difficult task
  - Silently observe user

**Make common easy,  
and uncommon possible**

# Google Search



[Advanced search](#)

[Language tools](#)

Google Search

I'm Feeling Lucky

# Google Search

Google

usability

About 51,000,000 results (0.08 seconds)

Advanced search

Everything

Images

Videos

News

Books

Blogs

More

Toronto, ON

Change location

The web

Pages from Canada

Any time

Past hour

Past 24 hours

Past 2 days

Past week

Past month

Past year

Custom range...

All results

Sites with images

Timeline

More search tools

► [Usability - Wikipedia, the free encyclopedia](#)

[en.wikipedia.org/wiki/Usability](#) - Cached

**Usability** is the ease of use and learnability of a human-made object. The object of use can be a software application, website, book, tool, machine, ...

Web usability      Category  
Usability testing      Universal usability  
Usability engineering      World Usability Day  
Jakob Nielsen      Usability inspection

[More results from wikipedia.org >](#)

[Web usability - Wikipedia, the free encyclopedia](#)

[en.wikipedia.org/wiki/Web\\_usability](#) - Cached

Web **usability** is the application of **usability** in those domains where web ...

[Show more results from wikipedia.org](#)

[Home | Usability.gov](#)

[www.usability.gov/](#) - Cached

Provided by the National Cancer Institute. Includes information and resources on making web sites and other user interfaces more useful, **usable**, ...

[Usability 101: Definition and Fundamentals - What, Why, How \(Jakob ...\)](#)

[www.useit.com/alertbox/20030825.html](#)

25 Aug 2003 – What is **usability**? How, when, and where to improve it? Why should you care? Overview answers basic questions + how to run fast user tests.

[useit.com: Jakob Nielsen on Usability and Web Design](#)

[www.useit.com/](#)

Research findings from many **usability** studies 1994-2011. Regular Alertbox ...

[Show more results from useit.com](#)

[Usability First: Usability in Website and Software Design](#)

[www.usabilityfirst.com/](#) - Cached

**Usability** resources: a glossary of **usability**-related terms, **usability** methods, best practices, humor, and more. A free service of Foraker Design.

Make common easy,  
uncommon possible

# Google Search

The image shows a Google search interface for the term "usability". The search bar at the top contains the word "usability" and shows "About 51,000,000 results (0.08 seconds)". A red box highlights the "Advanced search" button next to the search bar.

On the left side, a sidebar contains several filter categories, each with a red box around it:

- Everything**: Includes links to Images, Videos, News, Books, and Blogs.
- Toronto, ON**: Includes a link to "Change location".
- The web**: Includes a link to "Pages from Canada".
- Any time**: Includes links for "Past hour", "Past 24 hours", "Past 2 days", "Past week", "Past month", "Past year", and "Custom range...".
- All results**: Includes links for "Sites with images" and "Timeline".
- More search tools**: A link at the bottom of the sidebar.

The main search results area displays several links:

- Usability - Wikipedia, the free encyclopedia**: Includes a snippet about the definition of usability and a list of related topics like "Web usability", "Usability testing", "Usability engineering", "Jakob Nielsen", "Category", "Universal usability", "World Usability Day", and "Usability inspection".
- Web usability - Wikipedia, the free encyclopedia**: Includes a snippet about the application of usability in web domains.
- Home | Usability.gov**: Includes a snippet about the National Cancer Institute's resources on making web sites and other user interfaces more useful.
- Usability 101: Definition and Fundamentals - What, Why, How (Jakob ...)**: Includes a snippet about a 2003 article on usability.
- useit.com: Jakob Nielsen on Usability and Web Design**: Includes a snippet about research findings from 1994-2011.
- Usability First. Usability in Website and Software Design**: Includes a snippet about a glossary of usability-related terms.

On the right side, an "Advanced Search" panel is visible, showing various search filters like "Find web pages that have...", "But don't show pages that have...", "Need more tools?", "Reading level", "Results per page", "Language", "File type", and "Search within a site or domain".

**Make common easy, uncommon possible**

# Reasonable Defaults

- Customizable interface
  - But 90% users do not customize
  - They use what system provides by default

# Features vs Solutions

- **People are inherently lazy**
  - They do not want to use your product
- **But people have real life problems**
  - And they want the **easiest** way to solve the problem
- **If a “feature” is not easy to use, it does not exist**

# Google+



**People in your circles (13)**   People who've added you (0)   Find and invite (487)

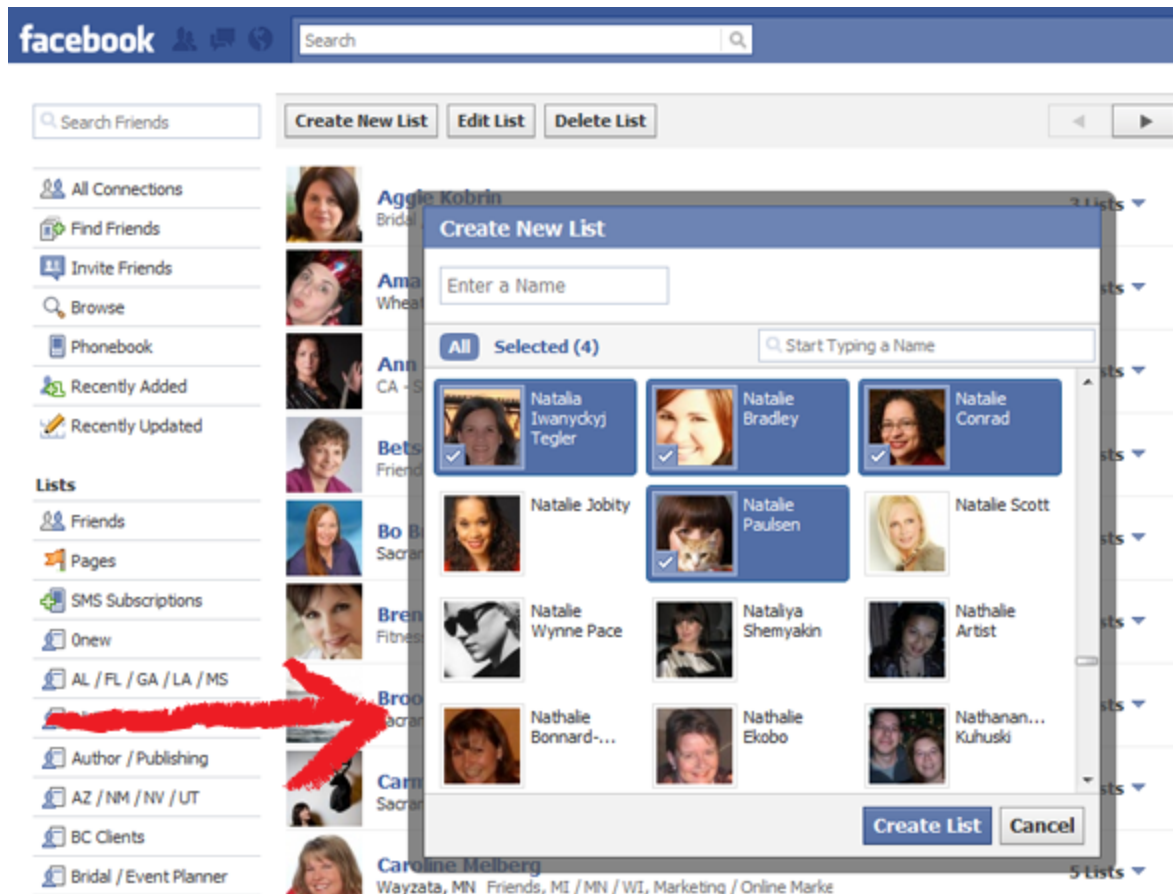
Sort by: **Relevance** ▾   Remove   Clear selection   View profile   **More actions** ▾

Drag people to your circles to follow and share

**Family**  
Circle with 5 members.  
Your close and extended family, with as many or as few in-link as you want.



# Facebook always had lists



# Affordance: Knobs are for *turning*



A quality of an object that allows an individual to perform an action

# Buttons for *pressing*



# Is This Really Necessary?



# Affordance

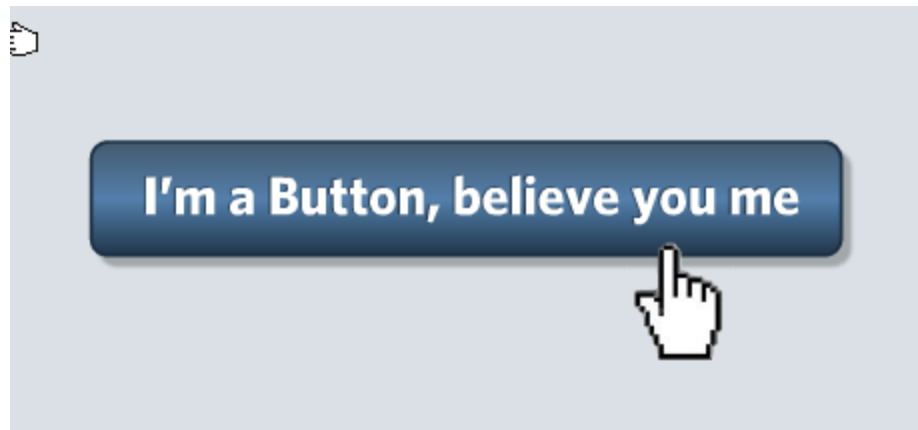
I'm a Button, believe you me

# Affordance



**I'm a Button, believe you me**

# Affordance



# Typography and Content Display

- **More important information in bigger font**
  - Progressively move down
  - Use bold / yellow backgrounds to highlight



**Backpack®**

**Better Organize  
Your Business.**

Share information with your team. Keep your documents, discussions, and schedules in one place all the time.

Web-based, secure, and backed-up daily.



# Layout

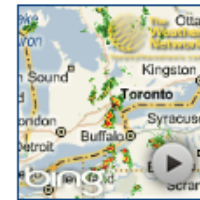
- Toronto Weather

**Current Weather** Tues. Aug 9, 2011, 22:00 EDT Pearson Airport



**Feels Like** : - **Relative Humidity** : 88%  
**Wind** : S 4km/h **Pressure** : 100.01 kPa ▼  
**Sunrise** : 6:16 **Visibility** : 24.0 km  
**Sunset** : 20:31 **Ceiling** : 27000 ft

**Radar Map**  
Tuesday, 11:05 pm EDT



**Video Forecast**  
Today, 9:25 pm EDT



[Hourly](#) [Last 24 Hours](#) [Historical](#) [Webcams](#) [Radar Maps](#) [UV Report](#)

**Plan for anything.**  
Download our App  
for a chance to WIN!

## Toronto Photos & Videos

Richmond Hill, ON    Toronto, ON    Toronto, ON    North York, ON    Toronto, ON

[View Gallery](#) [Upload](#) [Share your weather image!](#)

## Short Term Forecast

Updated: Tues, Aug 9, 2011, 20:00 EDT

	<b>Tuesday Overnight</b>	<b>Wednesday Morning</b>	<b>Wednesday Afternoon</b>	<b>Wednesday Evening</b>	<b>Wednesday Overnight</b>
	Chance of thunder- showers	Chance of thunder- showers	Chance of thunder- showers	Isolated showers	Isolated showers
<b>Temp.</b>	20°C	22°C	24°C	20°C	16°C
<b>Feels Like</b>	-	-	29	-	-
<b>Wind</b>	W 15km/h	W 15km/h	W 30km/h	W 20km/h	W 15km/h
<b>Relative Humidity</b>	78%	78%	65%	56%	64%

# Layout

- Toronto Weather

Current Weather Tues, Aug 9, 2011, 22:00 EDT Pearson Airport



21°C

°C °F

Partly cloudy

Feels Like : -

Wind : S 4km/h

Sunrise : 6:16

Sunset : 20:31

Relative Humidity : 88%

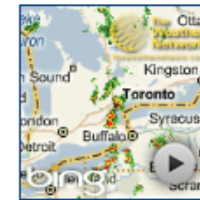
Pressure : 100.01 kPa ▼

Visibility : 24.0 km

Ceiling : 27000 ft

## Radar Map

Tuesday, 11:05 pm EDT



## Video Forecast

Today, 9:25 pm EDT




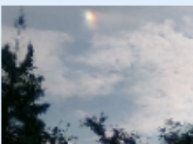



[Hourly](#)
[Last 24 Hours](#)
[Historical](#)
[Webcams](#)
[Radar Maps](#)
[UV Report](#)








**Plan for anything.**  
Download our App  
for a chance to WIN!

## Toronto Photos & Videos

[View Gallery](#)
[Upload](#)
[Share your weather image!](#)

## Short Term Forecast Updated: Tues, Aug 9, 2011, 20:00 EDT

	Tuesday Overnight	Wednesday Morning	Wednesday Afternoon	Wednesday Evening	Wednesday Overnight
					
	Chance of thunder- showers	Chance of thunder- showers	Chance of thunder- showers	Isolated showers	Isolated showers
<u>Temp.</u>	20°C	22°C	24°C	20°C	16°C
<u>Feels Like</u>	-	-	29	-	-
<u>Wind</u>	W 15km/h	W 15km/h	W 30km/h	W 20km/h	W 15km/h
<u>Relative Humidity</u>	78%	78%	65%	56%	64%

# Typography / Text

Name: Marshall Mathers

User Id: eminem

Location: Detroit

Bio: I am not afraid

Url: <http://twitter.com/eminem>

Picture:



# Typography / Text

Name: Marshall Mathers

User Id: eminem

Location: Detroit

Bio: I am not afraid

Url: <http://twitter.com/eminem>

Picture:



**Marshall Mathers**

**@Eminem** Detroit

*I'm not afraid.*

<http://twitter.com/eminem>

# Consistency

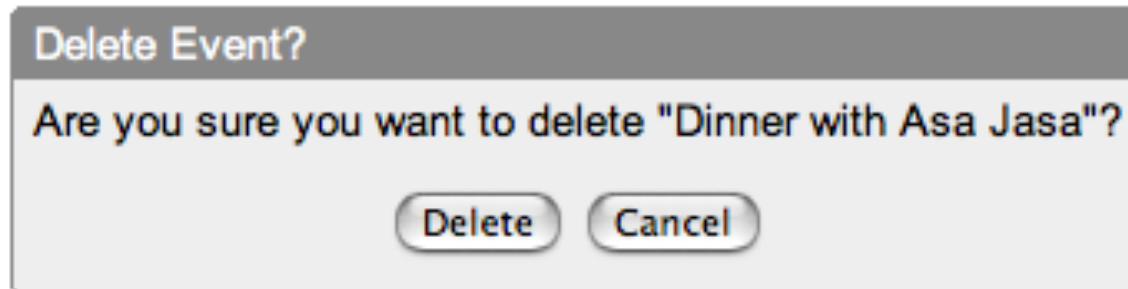
- **Consistent terminology**
  - Login or Sign In? Pick one.
  - Do not mix Logout and Sign Out.
- **Different terminology**

User Settings  
Account Settings

**User Preferences**  
**Account Settings**

# Example: Delete / Undo

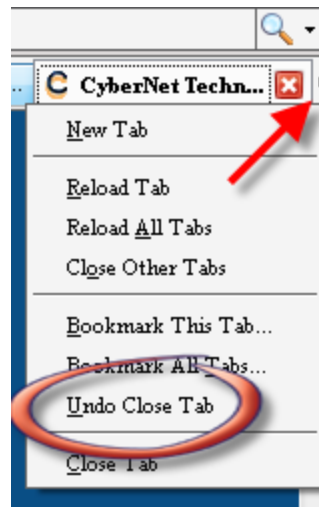
- Confirmation boxes are intrusive



# Example: Delete / Undo

- Provide an Undo option

The conversation has been moved to the Trash. [Undo](#)



# Aesthetics

- **Beauty matters.**
- **Direct correlation to sales**
  - Clients will buy a sleeker looking software over one with more features





# Please, do not design like this



# SECURITY

# ALWAYS think about security

- **Sony Playstation Network**
  - Personal data of 77 million users stolen
- **Lots of bad guys out there**
  - IBM monitors 150,000 security events per second
  - Mostly automated, exploit common flaws
  - Want to use your server as a bot
- **Anonymous, LulzSec and others**



# XSS: Cross Site Scripting

- Attacker injects a script into web page

Contents of index.php:

```
<input value="<? echo $_GET['name'] >" />
```

Request: index.php?name="/><script ...

- Escape HTML from all dynamic content before displaying
  - Java has `StringEscapeUtils.escapeHtml(...)`

# SQL Injection

```
SELECT login_id, full_name  
FROM table  
WHERE email = 'x' AND 1=(SELECT COUNT(*) FROM table);';
```

- **Always escape strings**
  - Use PreparedStatement (in Java)

# Other Security Issues

- **Always store passwords using one-way encryption**
  - Can not be decrypted
- **Check for user privileges**
  - Specially when including or redirecting to other files
- **Keep base system secure**
  - Stop unnecessary services
  - Update regularly for security patches
  - Use firewalls

**RELIABILITY**

# Uptime

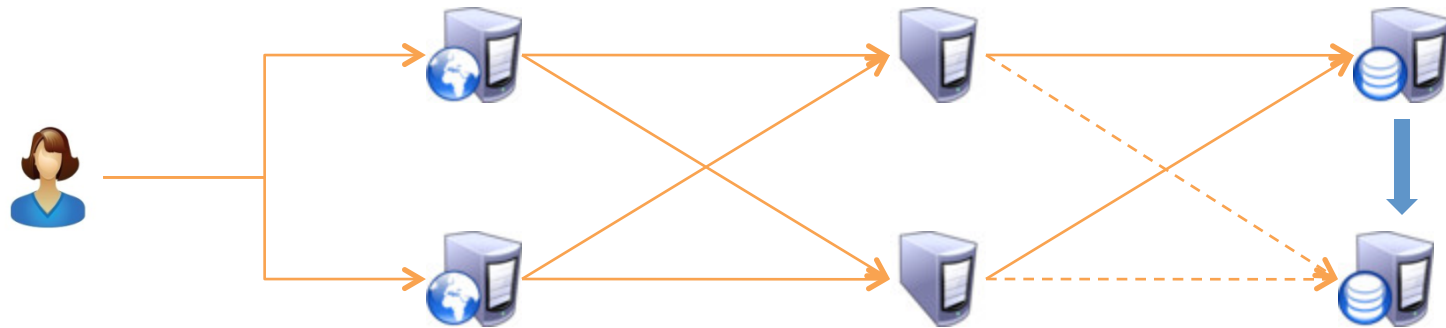
- **Near-100% availability is important**
  - System is always operational
- **No data loss**
  - Backups and disaster recovery
- **Remember**
  - **Failures are correlated**
  - **Human errors** are common cause



# Redundancy

- **Hot Failover**
  - Automatic switch from failed to available system
- **Hardware Redundancy**
  - RAID 10 – mirror all data
  - Two network switches, two Ethernet cards, two power supplies, two HBA (host bus adapter) controllers etc..
- **Redundant Infrastructure**

# Simplified Infrastructure Example



## Apache HTTPD

Use of *virtual IP* to make sure the user is always directed to the server that is available. Apache acts as front-end proxy to redirect the request to backend Tomcat.

## Application Server

Tomcat is commonly used Java app server. Most code runs on this machine. Apache HTTPD Load Balancer and Proxy Pass module are used to provide failover and redundancy.

## Databases

Master – Slave replicated database servers. Application server maintains the state of each server to provide reliability. All writes must happen on master.

# Monitoring

- **Open Source**
  - Cacti
  - Nagios
- **Custom**
  - Internal System Check module
- **Paid Hosted**
  - Site 24x7

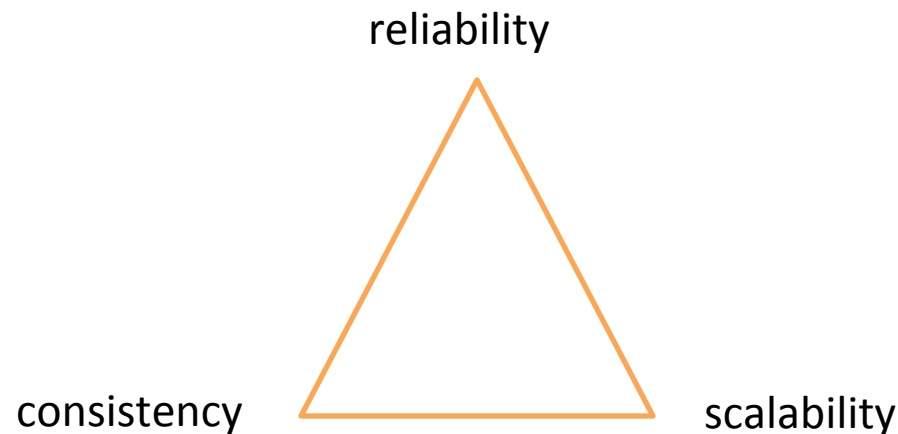
# PERFORMANCE

# Performance and Scalability

- **Don't optimize until you need to**
  - Make code readable
  - Use Profiler (for Java, Netbeans is great and free)
- **Common tricks**
  - Cache
  - Pre-compute
  - Sample
  - Parallelize
    - Using multi-core
    - To different machines

# Scalability, Consistency, Reliability

- **You can only easily have two of the three**
  - Consistency: among multiple replica of data
  - Reliability: continuous operational
  - Scalability: growing with increase in number of users

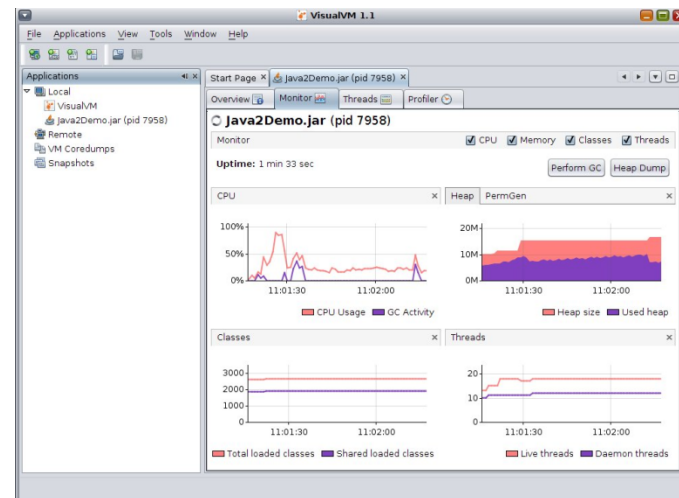


# Caching and Pre-computing

- **User queries are correlated**
  - Caching is most common optimization
  - Must be willing to sacrifice some consistency
- **Fully or partially pre-compute**
  - Every night, create useful statistics (e.g., a statistical histogram of word frequencies in search services)
- **Sample**
  - Approximate results are fine

# CPU Optimizations

- **Multi-thread**
  - Java has package to manage Executors
  - Pay attention to thread safety
- **Use optimized collections**
  - CERN Colt, GNU Trove to save memory
- **Use a Profiler**





# Code Quality vs Performance

- **KISS – Keep It Simple Stupid**
- **KIWI – Kill It With Iron**
  - Upgrade your hardware (more disks, more memory, etc.)

# CONCLUSION

# Questions?

