Web Server Languages
Summer 2017

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http://www.pint.com/classes/cse135

Housekeeping

- Syllabus review
- Class page http://classes.pint.com/cse135/
- Updated syllabus, notes, homework specifications, etc. will always be posted there
- History of this class
- Current focus confusion and my solution
- My goals for this class
- Attendance and participation
- Teams and the “pledge”
- Standard academic issues (esp. cheating)

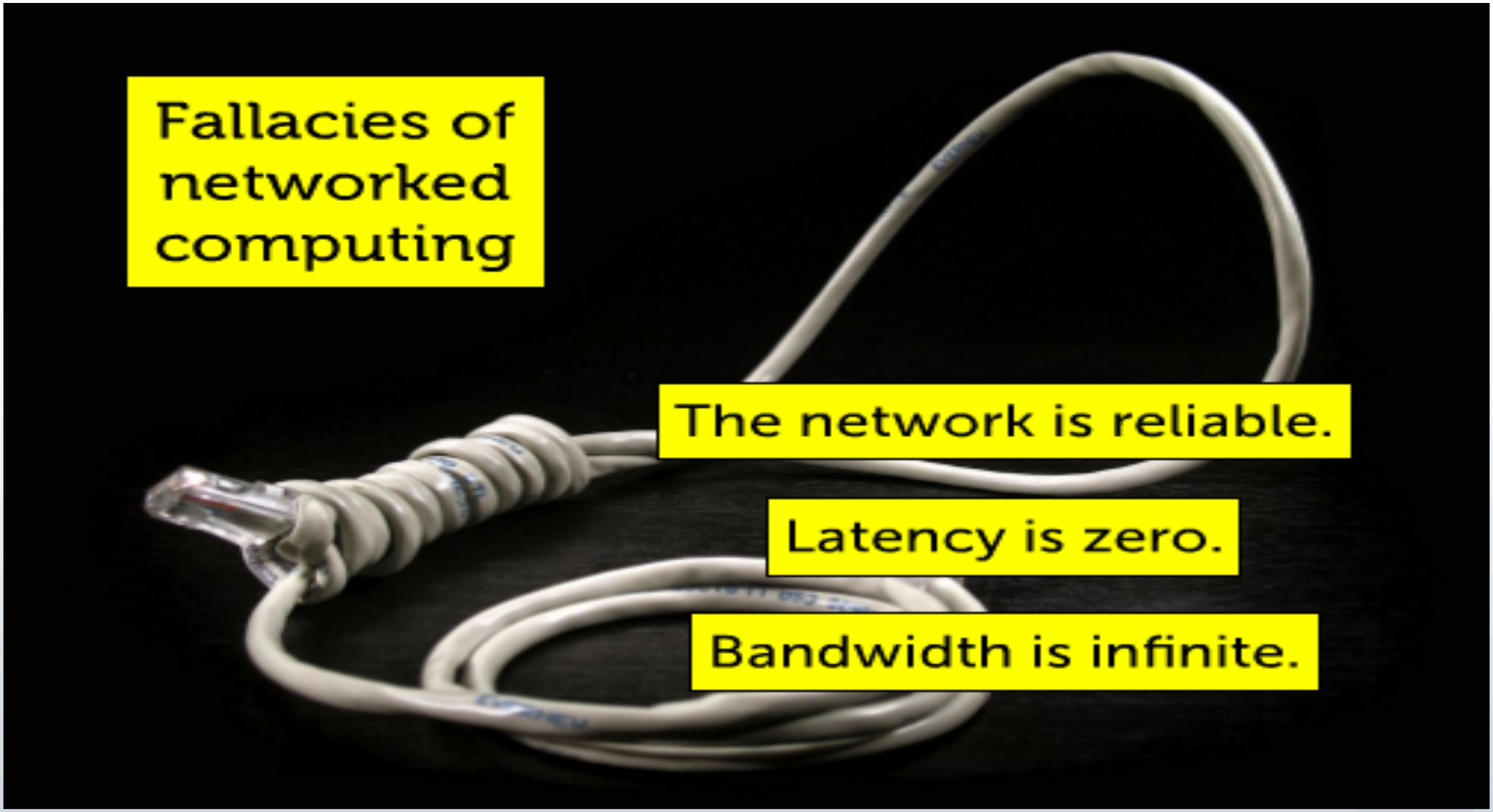
What's Web Programming All About

- Isn't web programming just a form of client-server programming?
- Yes but…
  - Huge issues with an insecure and potentially unreliable network running software built often by those lacking formal large systems design.
- If you were in 134 you heard most of this but let's make sure we spin it for the server-side and make sure to question things if we know more now.
- If you recently weren't in 134 I have to assume you know at least some HTML5, CSS, and some JS!
  - Sadly Street HTML != Real Client Side Knowledge
  - Avoiding knowing client tech creates a barrier for you and flies in the face of current dev trends (see Ajax)
  - We'll do our best to solve this, but keep this in mind if staying in
-

What's It All About

- Ok again isn't web programming just a form of client-server programming?
- Yes but…
  - Huge issues with an insecure and potentially unreliable network running software built often by those lacking formal large systems design.
- User constraints
  - Training and background issues
  - no common platform in OS/browser/screen size/color/multimedia/etc
  - Users do not necessarily have good intentions

It’s the Network Stupid



Web Development Is Hard

Douglas Crockford on browsers:

“The most hostile software development environment imaginable.”

Developer Trouble

- Lack of formal software engineering practices are common in Web projects
  - Artists as programmers, programmers as artists
  - Do everything "web masters"
  - Starting to change finally!
  - Common jargon, convention, and standards issues
- Little testing and consensus on "best practices"
- Economic "first mover" advantage and its downside

User Concerns

- Do you really think about them enough
- How do you know you are succeeding?
- Measuring and Fact Fitting
  - The Visitation Fallacy
    - More always = better?
  - The Understanding Fallacy
    - 99% rule, testing artifacts, ad hoc conventions.
  - The Bandwidth Fallacy
    - Patience goes the other way
- The human (nature and capabilities) will see to be the constant & technology is the variable.

Err...Do You Even Know What it Is?

- What is Web design / development is different things to different people
- Depending on the person Web “D” includes many things such as:
  - Visual design
  - Programming
  - HTML
  - Navigation issues
  - Usability
  - Business issues (marketing, commerce, etc.)
- Depending on the project Web design actually may draw from any of these areas so it truly can be a very multidisciplinary field.

Big Challenge

- This lack of common understanding has really hurt the field more than one can imagine
  - Poor use of jargon
    - Buzz word bingo - Web 2.0, Social, DHTML, Ajax, HTML5
  - No agreed upon site structures and UI conventions
    - Consider the equivalent in GUI design
  - Crazy marcom driven notations about trade-off less tech or 2.0 3.0 er 4.0 of anything
- Be careful though, I am not promoting a “this is Web design/dev” solution
  - Often you make false comparisons
  - There is a wide range of solutions to a problem

A Review of Some Fundamental Ideas

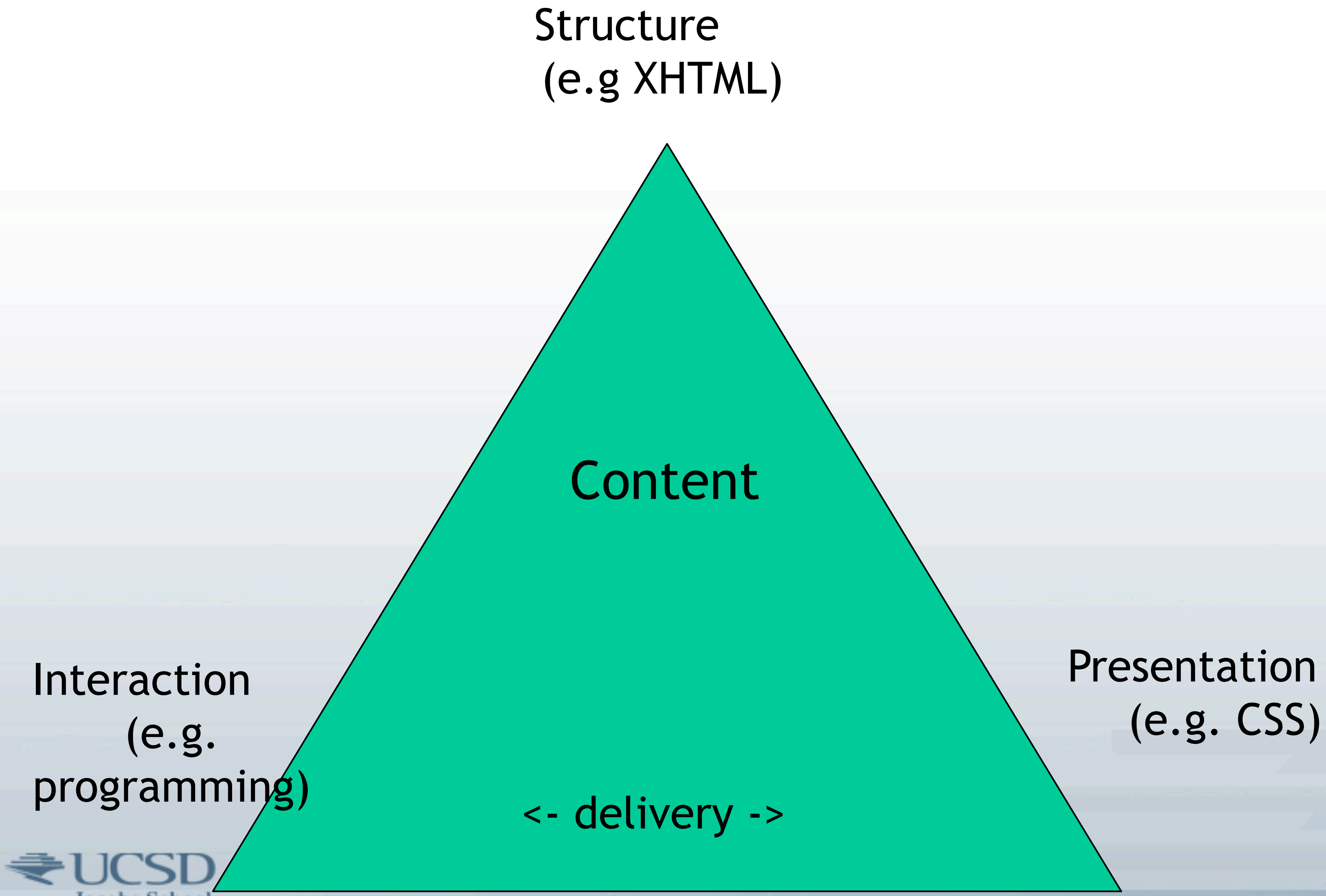
Best Sites?

- So given a "best practices" approach to Web design and development answer the following:
  - Question: What are the "best" sites you know on the Web? In other words who does it right?
  - My answers ______, ______, ______, _______
  - Now what did those look like?

The 5 Pillars

1. Content
2. Structure
3. Technology (Implementation)
4. Delivery
5. Design

Another Way to View Web Development



Structure (e.g XHTML)

Content

Interaction (e.g. programming)

<- delivery ->

Presentation (e.g. CSS)

2 Participants

1. Site Owners
   - Developers, people who pay for the site, etc.

2. Users

Rule: You must balance between what the users wants/needs are and the realities of the site owners' wants/needs

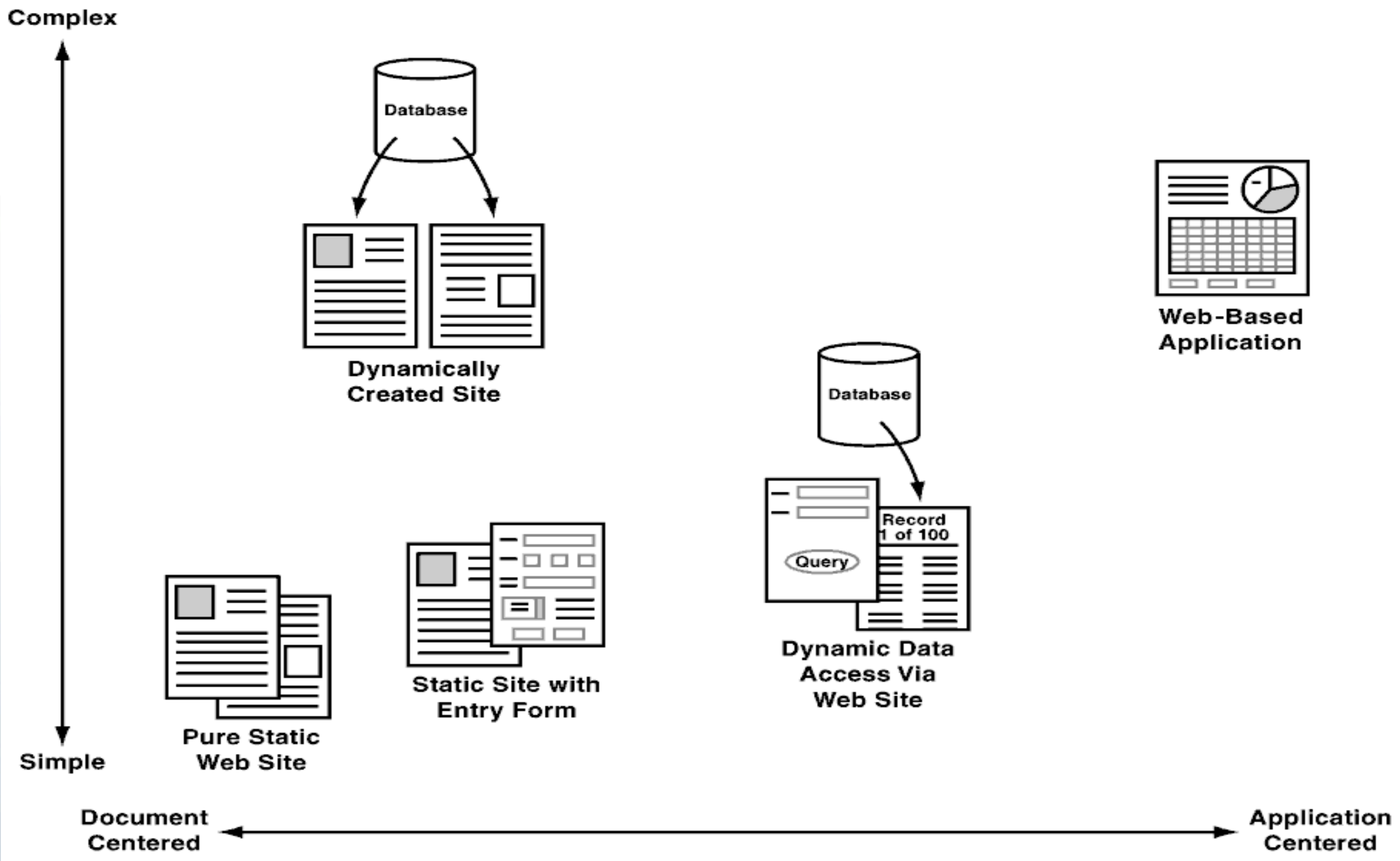
2 Participants – A Balance of power

- A balance of power
  - User in control – mistakes made?
  - Too much developer control – feel restrictive
- “Las Vegas” or “Disneyland” design
- *Seen it before the old Macintosh vs. command line argument*

Web Site Types

	Intranets	Extranets	Public
Info about Users	High	Medium	Low
Capacity Planning	Possible	Usually possible	Difficult to impossible
Bandwidth	High	Varies	Varies greatly
Ability to set technology	Yes	Sometimes	Rarely

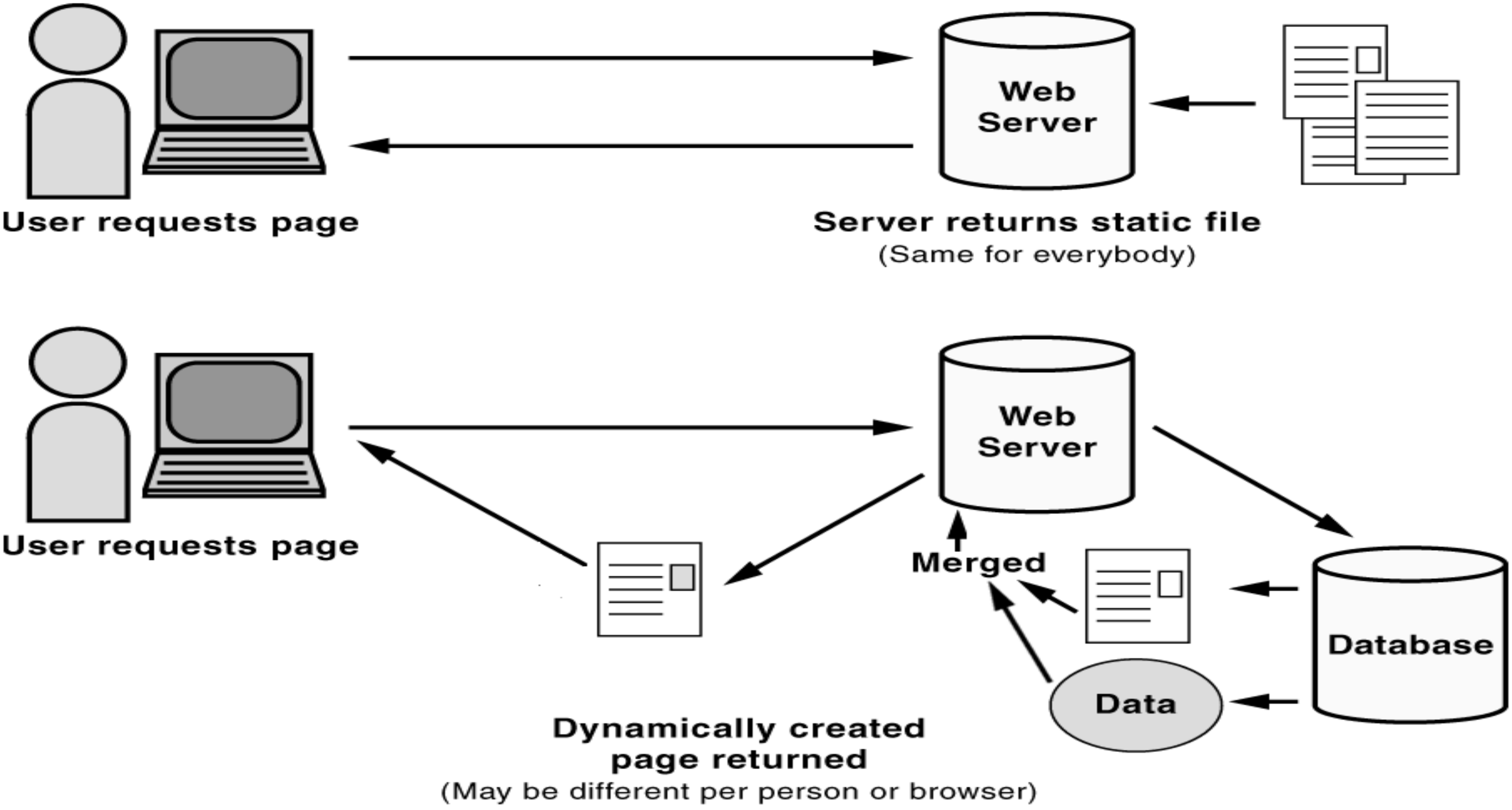
Range of Web Sites



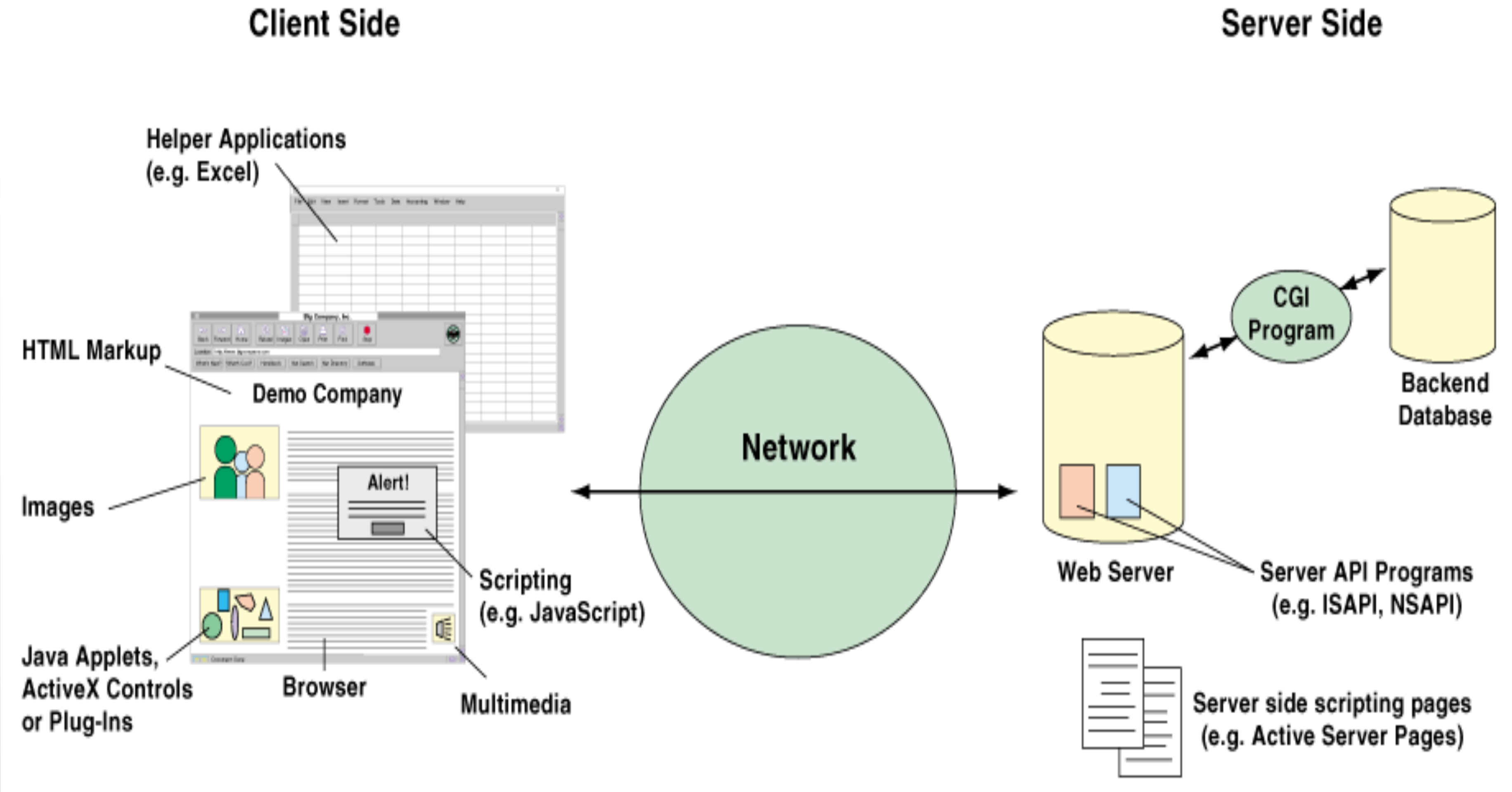
Site Types Contd.

- Static Sites
  - Most common
  - Pages don’t change per visitor and are built to fit users generically
- Dynamic Sites
  - Built on the fly for users
  - Personalized sites fall into this category (myYahoo)
  - Usually stored in a database
- Interactive sites
  - Those that allow the user to interact with content or site features in a significant fashion beyond simple selection

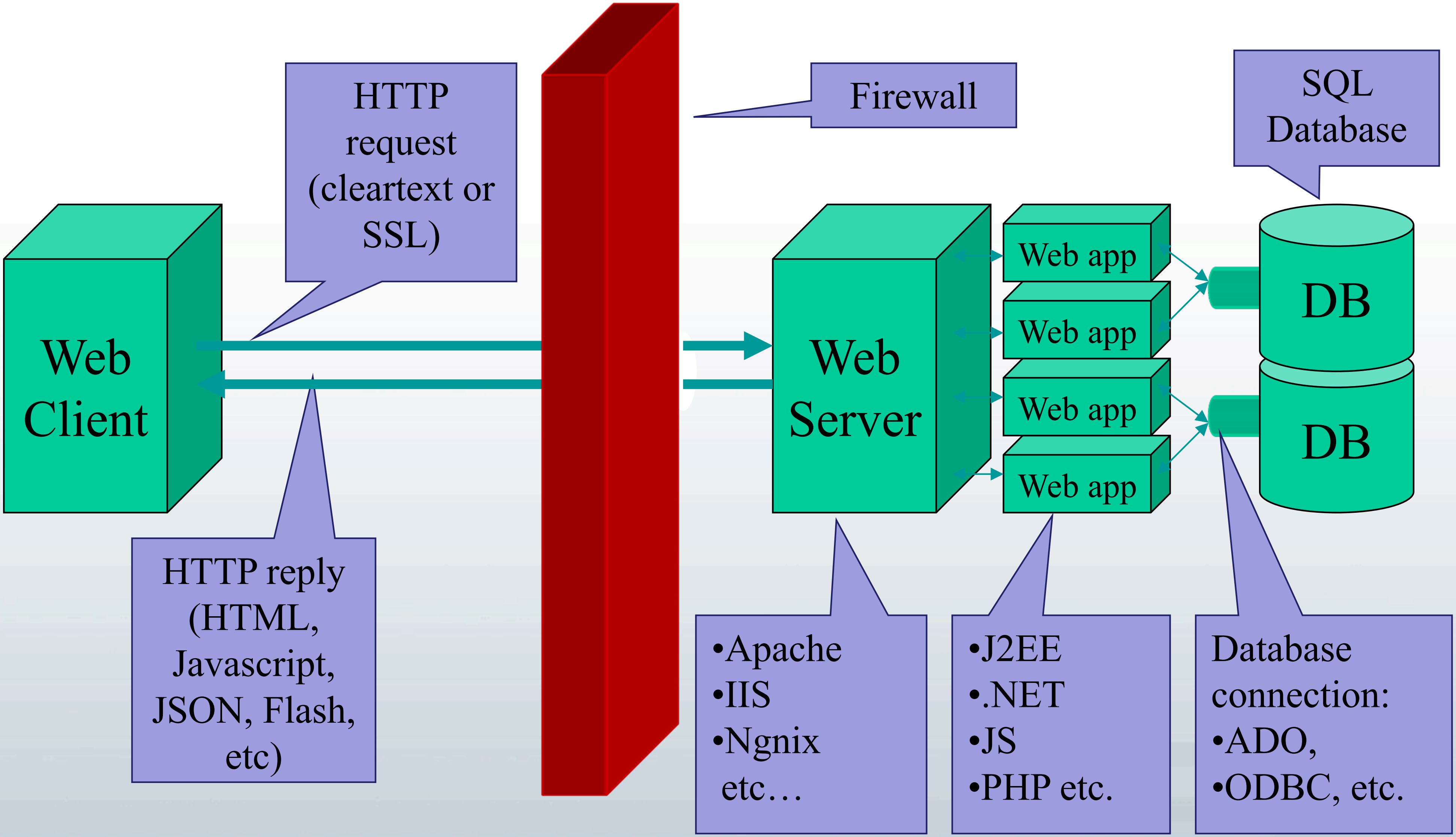
Dynamic Site Overview


Web Server
User requests page
Server returns static file
(Same for everybody)
Web Server
User requests page
Merged
Database
Data
Dynamically created page returned
(May be different per person or browser)

The Medium of Development & Context



Typical Web App Set-Up


HTTP request (cleartext or SSL)
Firewall
SQL Database
Web Client
Web Server
Web app
Web app
Web app
Web app
DB
DB
HTTP reply (HTML, Javascript, JSON, Flash, etc)

- Apache
- IIS
- Ngnix
etc…

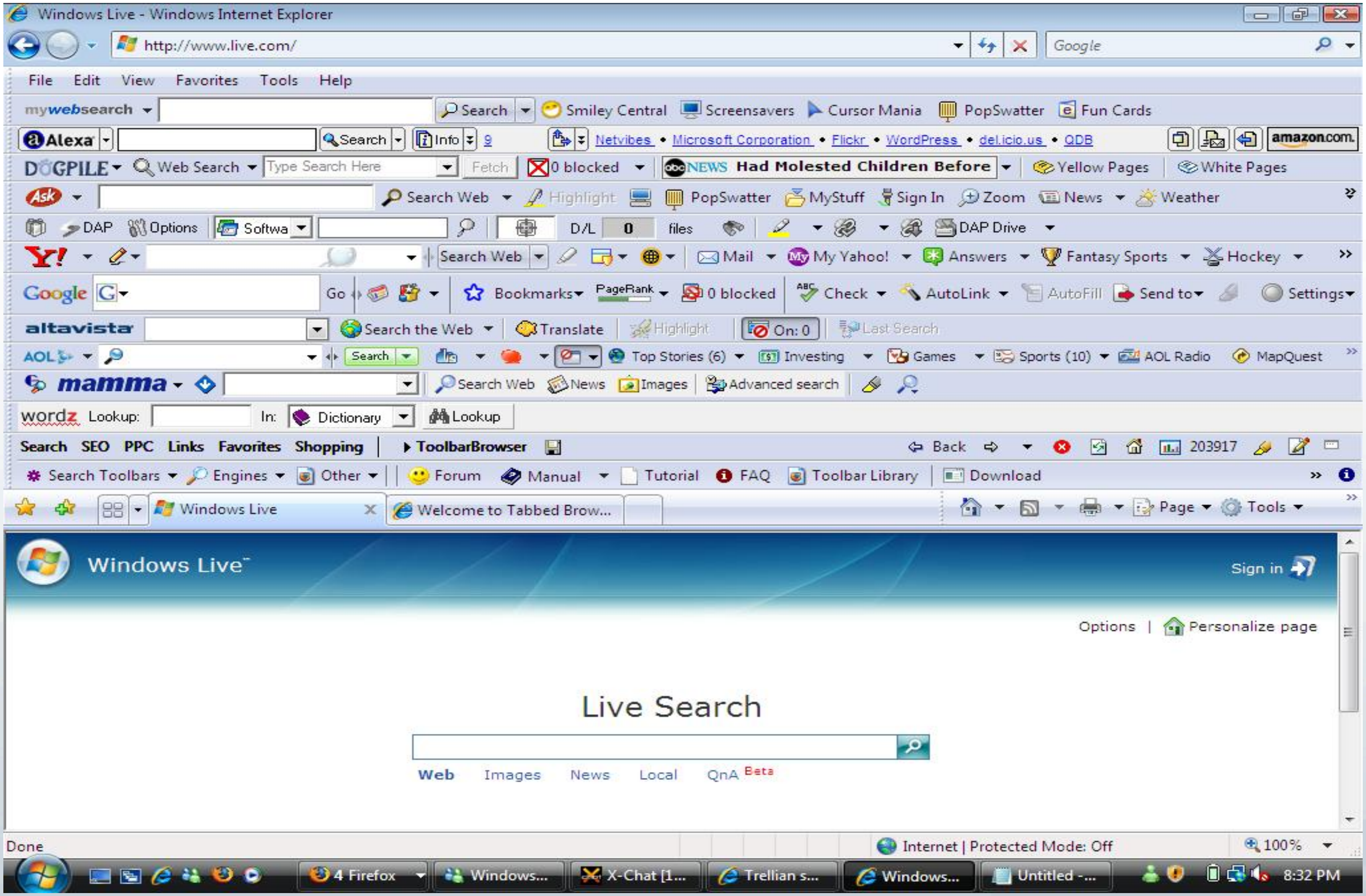
- J2EE
- .NET
- JS
- PHP etc.

Database connection:
- ADO,
- ODBC, etc.

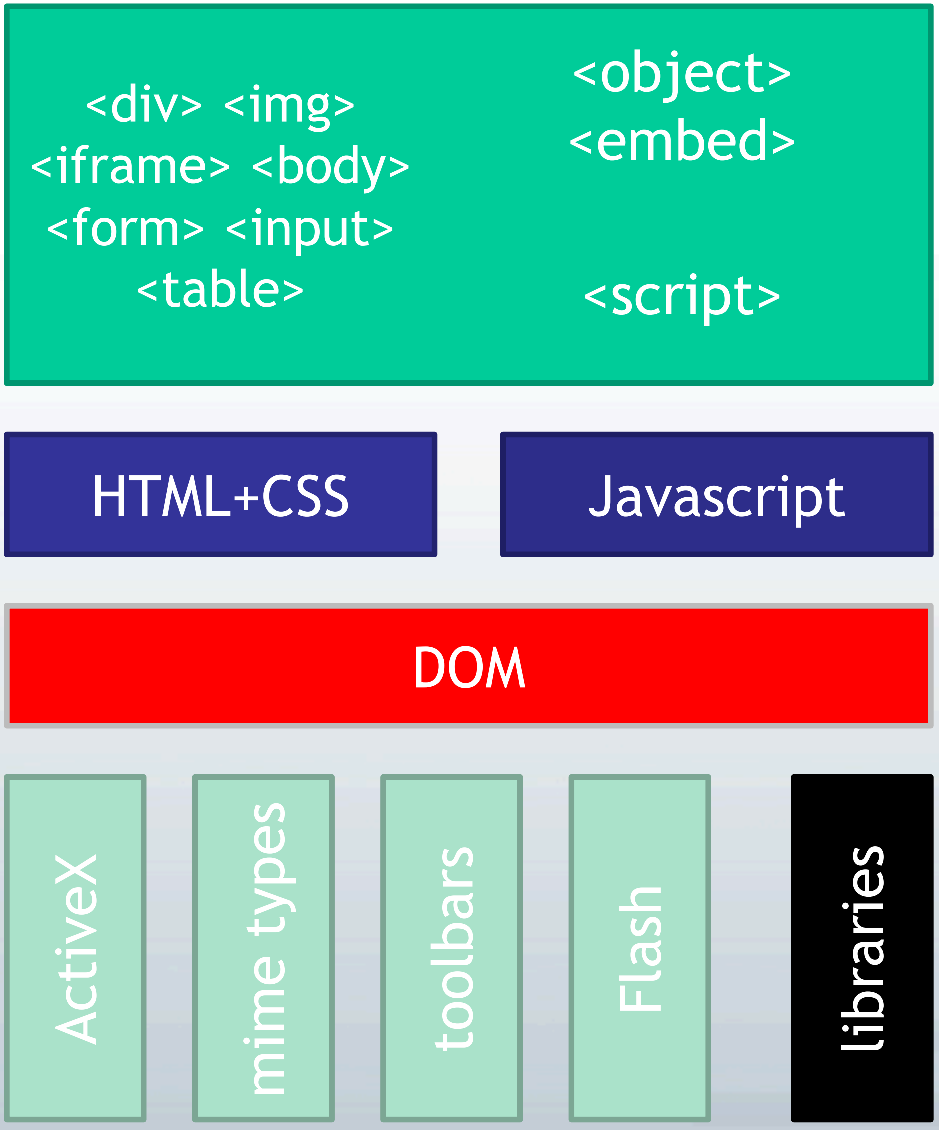
Web Programming Toolbox

Client Side	Server Side
Helper Applications	CGI scripts and programs
Netscape Plug-ins	Server API Programs * ISAPI * NSAPI * Apache Modules
ActiveX Controls	
Java Applets	Java Servlets
Scripting Languages * JavaScript * VBScript	Server-side scripting * Active Server Pages (ASP) * ColdFusion * PHP

What is a browser?

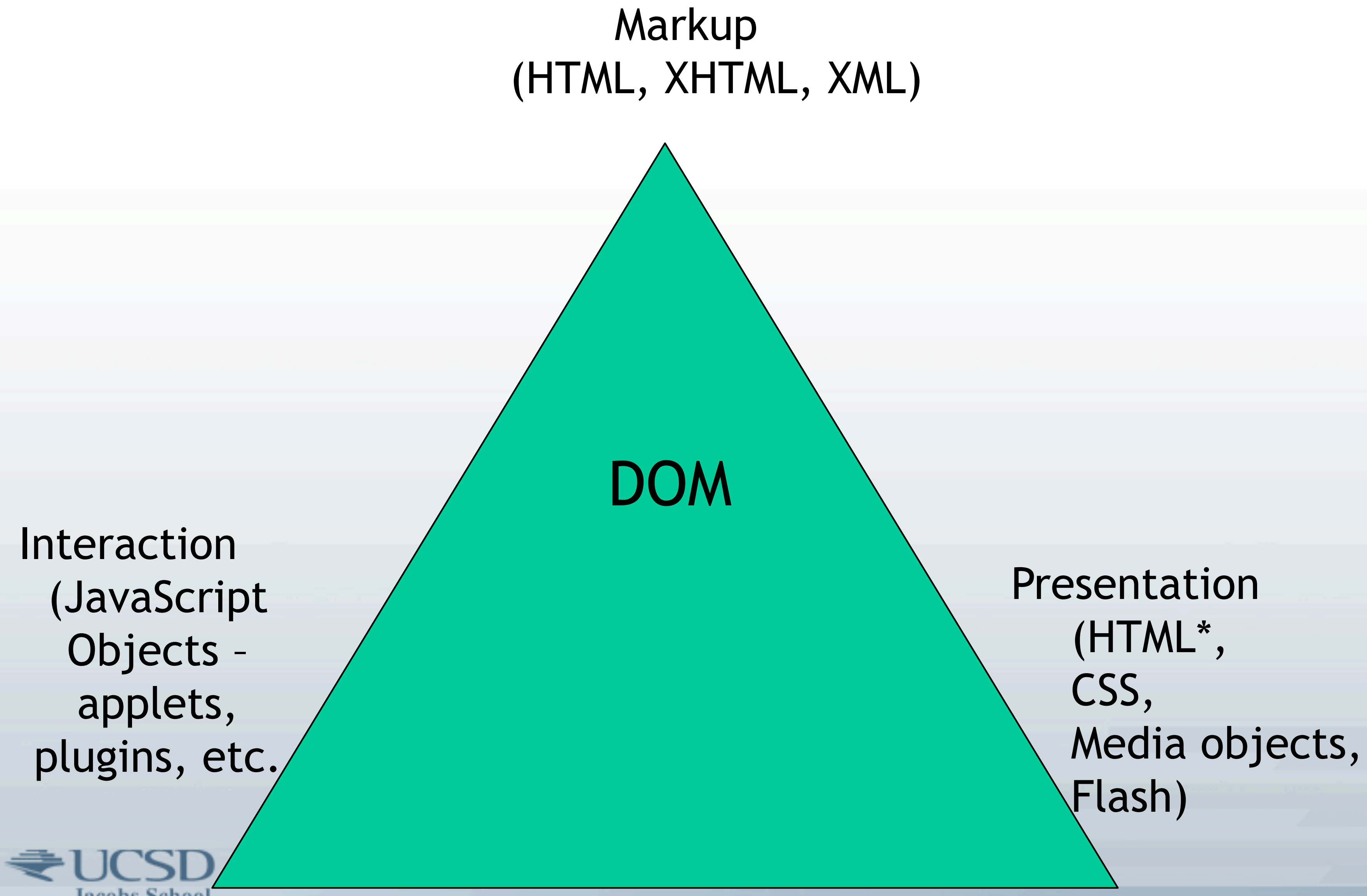

Windows Live - Windows Internet Explorer
http://www.live.com/
Google
File Edit View Favorites Tools Help
mywebsearch Search Smiley Central Screensavers Cursor Mania PopSwatter Fun Cards
Alexa Search Info 9 Netvibes • Microsoft Corporation • Flickr • WordPress • del.icio.us • QDB amazon.com
DOGPILE Web Search Type Search Here Fetch 0 blocked NEWS Had Molested Children Before Yellow Pages White Pages
Ask Search Web Highlight PopSwatter MyStuff Sign In Zoom News Weather
DAP Options Softwa D/L 0 files DAP Drive
Y! Search Web Mail My Yahoo! Answers Fantasy Sports Hockey
Google Go Bookmarks PageRank 0 blocked Check AutoLink AutoFill Send to Settings
altavista Search the Web Translate Highlight On: 0 Last Search
AOL Search Top Stories (6) Investing Games Sports (10) AOL Radio MapQuest
mamma Search Web News Images Advanced search
wordz Lookup: In: Dictionary Lookup
Search SEO PPC Links Favorites Shopping ToolbarBrowser Back 203917
Search Toolbars Engines Other Forum Manual Tutorial FAQ Toolbar Library Download
Windows Live
Welcome to Tabbed Brow...
Page Tools
Windows Live
Sign in
Options | Personalize page
Live Search
Web Images News Local QnA Beta
Done
Internet | Protected Mode: Off
100%
4 Firefox
Windows...
X-Chat [1...
Trellian s...
Windows...
Untitled -...
8:32 PM

Browser Side Interactions



Department of Computer Science and Engineering

Simple View of Client Side Web Development



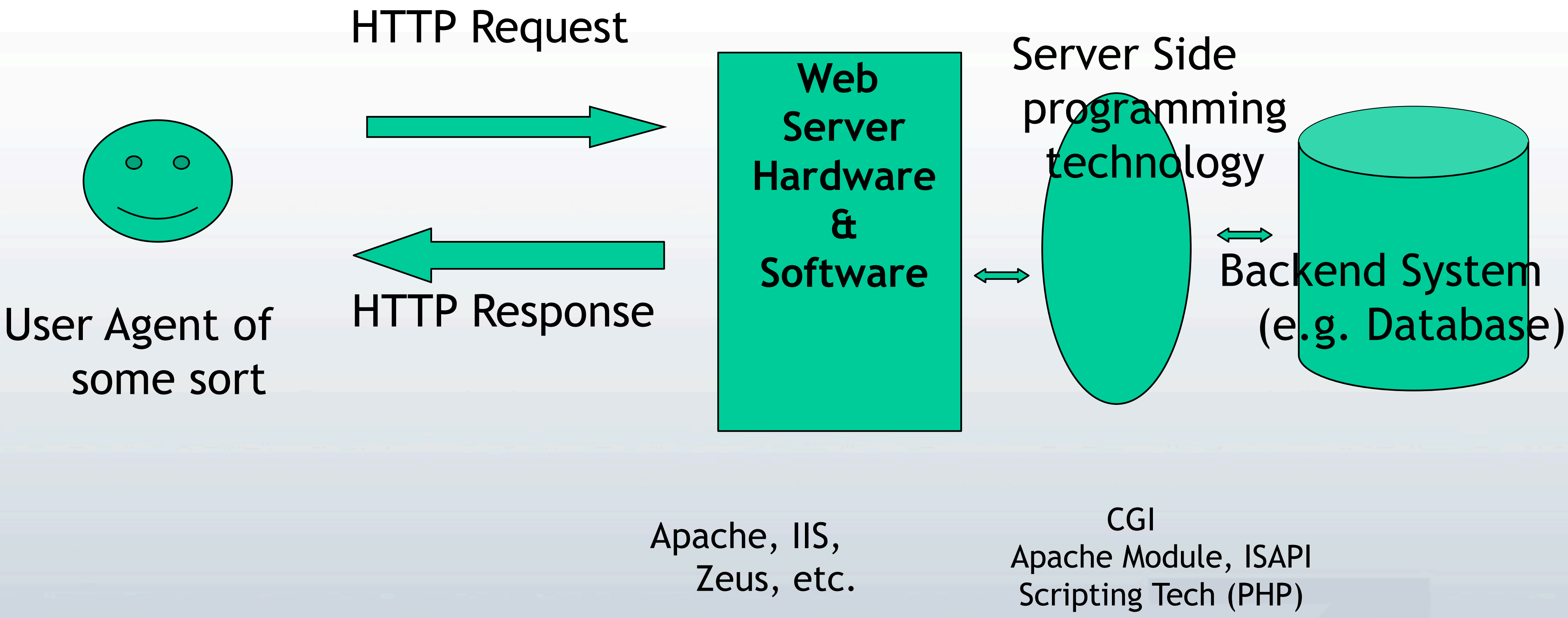
Markup (HTML, XHTML, XML)

DOM

Interaction (JavaScript Objects – applets, plugins, etc.

Presentation (HTML*, CSS, Media objects, Flash)

Simple View of Server-Side Web Development



HTTP Request

HTTP Response

User Agent of some sort

Web Server Hardware & Software

Server Side programming technology

Backend System (e.g. Database)

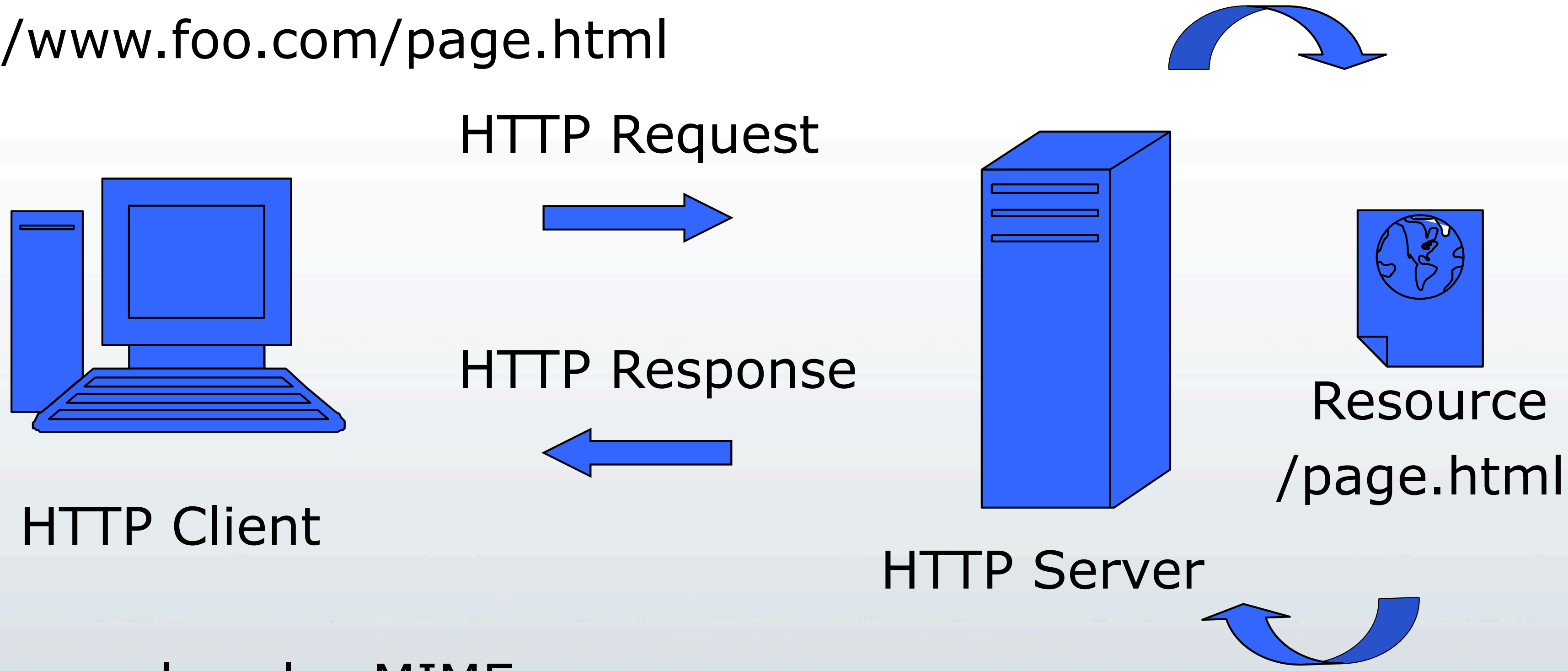
Apache, IIS, Zeus, etc.

CGI
Apache Module, ISAPI
Scripting Tech (PHP)

HTTP Request/Response Cycle Preview

Asks for resource by its URL:

http://www.foo.com/page.html



www.foo.com

HTTP Request

HTTP Response

HTTP Client

HTTP Server

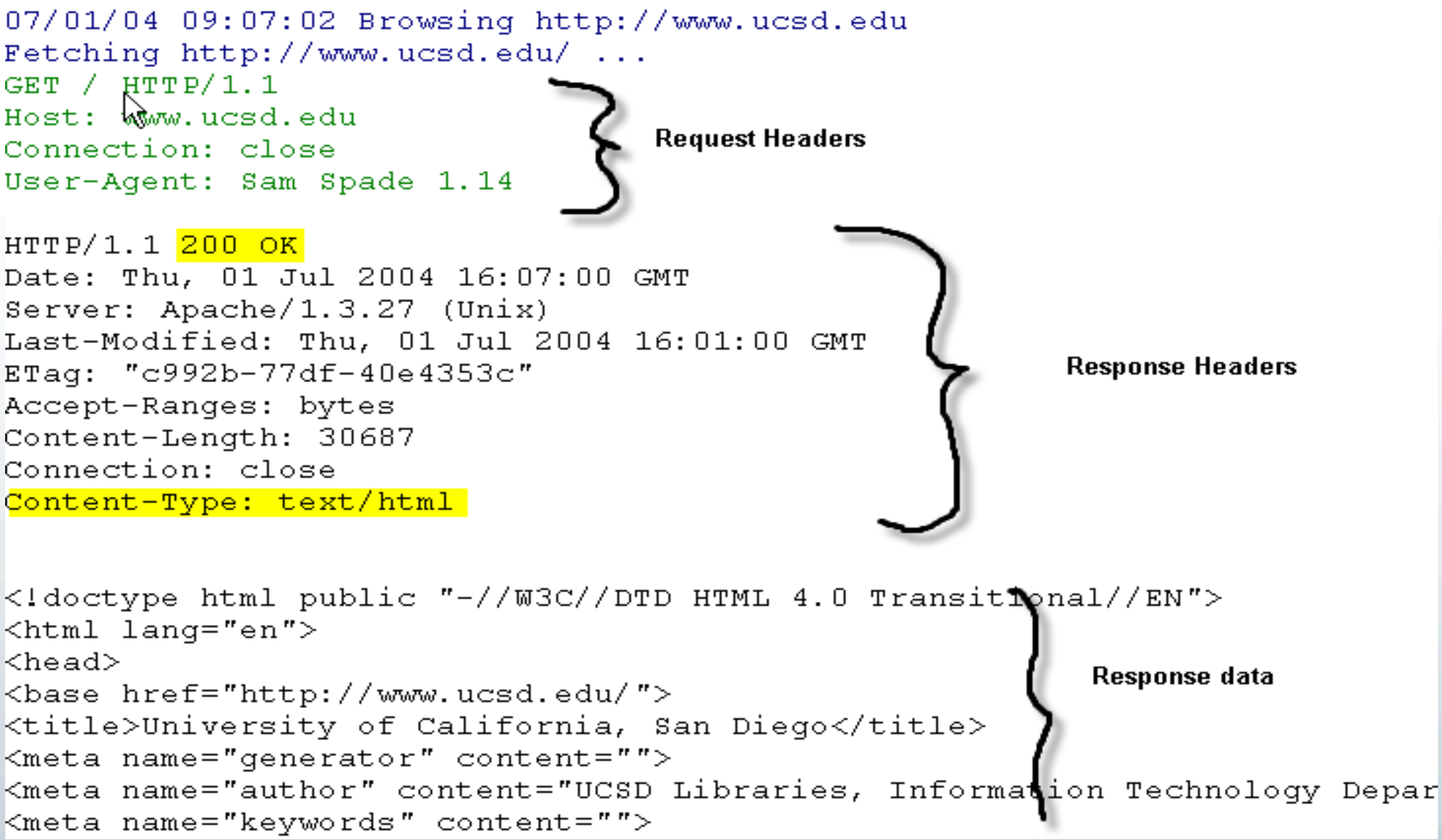
Resource

/page.html

Browser decodes MIME type and determines action

maps file extension .html to appropriate MIME type: text/html

HTTP Request Example Shows Process

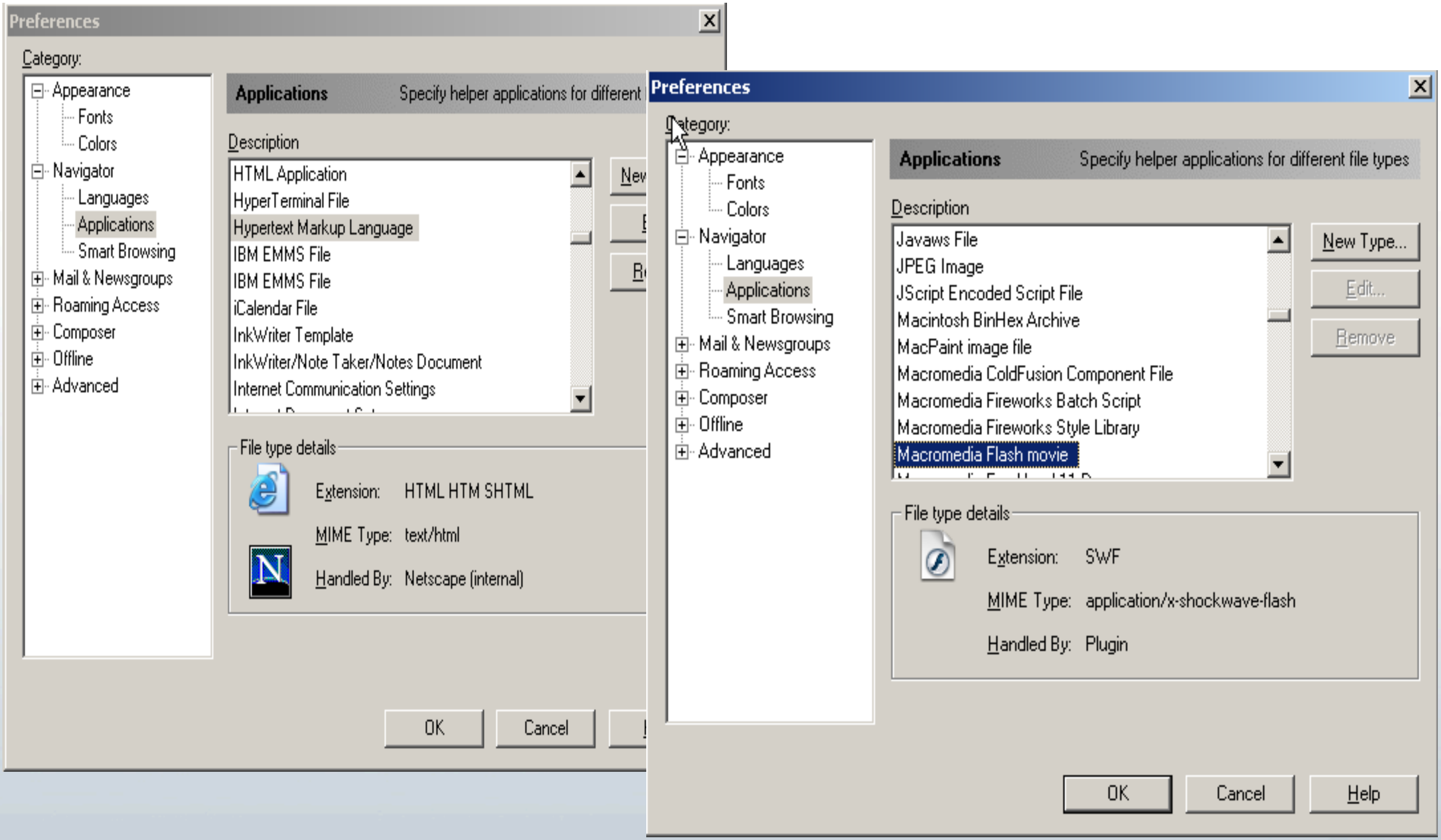


```
07/01/04 09:07:02 Browsing http://www.ucsd.edu
Fetching http://www.ucsd.edu/ ...
GET / HTTP/1.1
Host: www.ucsd.edu
Connection: close
User-Agent: Sam Spade 1.14

HTTP/1.1 200 OK
Date: Thu, 01 Jul 2004 16:07:00 GMT
Server: Apache/1.3.27 (Unix)
Last-Modified: Thu, 01 Jul 2004 16:01:00 GMT
ETag: "c992b-77df-40e4353c"
Accept-Ranges: bytes
Content-Length: 30687
Connection: close
Content-Type: text/html


<!doctype html public "-//W3C//DTD HTML 4.0 Transitional//EN">
<html lang="en">
<head>
<base href="http://www.ucsd.edu/">
<title>University of California, San Diego</title>
<meta name="generator" content="">
<meta name="author" content="UCSD Libraries, Information Technology Depar
<meta name="keywords" content="">
```

Browser Lookup for Action on Mime (or file type)



Extension: HTML HTM SHTML

MIME Type: text/html

Handled By: Netscape (internal)

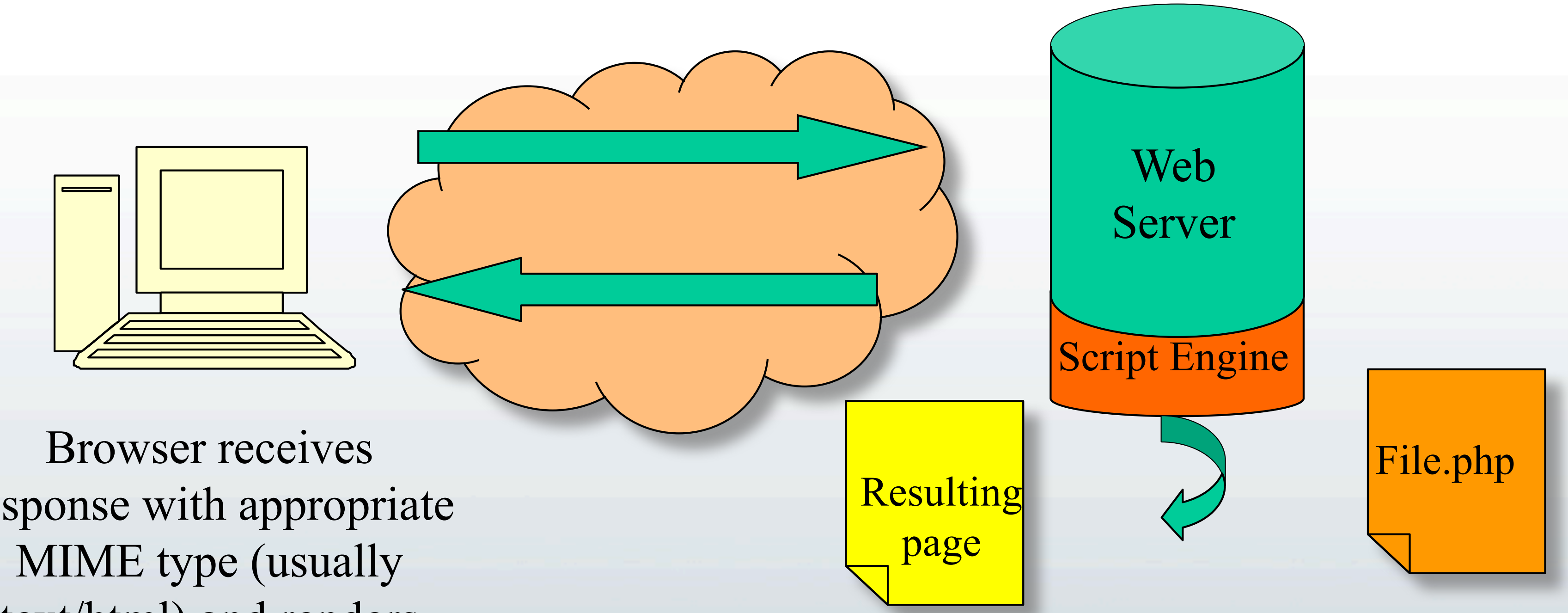
Extension: SWF

MIME Type: application/x-shockwave-flash

Handled By: Plugin

Example of file extensions and action

HTTP Request for file.php

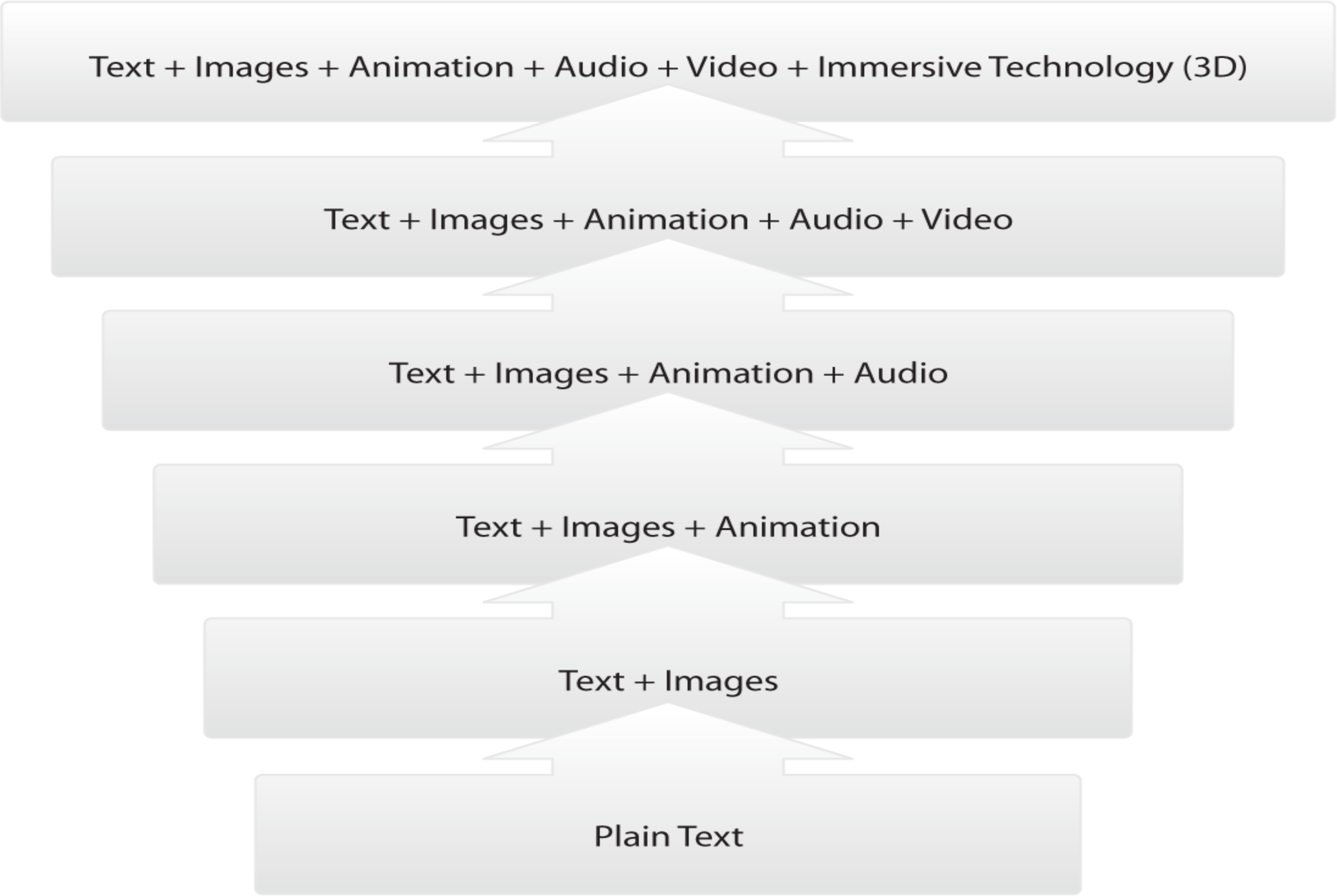


Browser receives response with appropriate MIME type (usually text/html) and renders

Script engine intercepts and evaluates PHP code

Q:If you view source what do you see?

Range of Interface – Progressive Enhancement



Text + Images + Animation + Audio + Video + Immersive Technology (3D)

Text + Images + Animation + Audio + Video

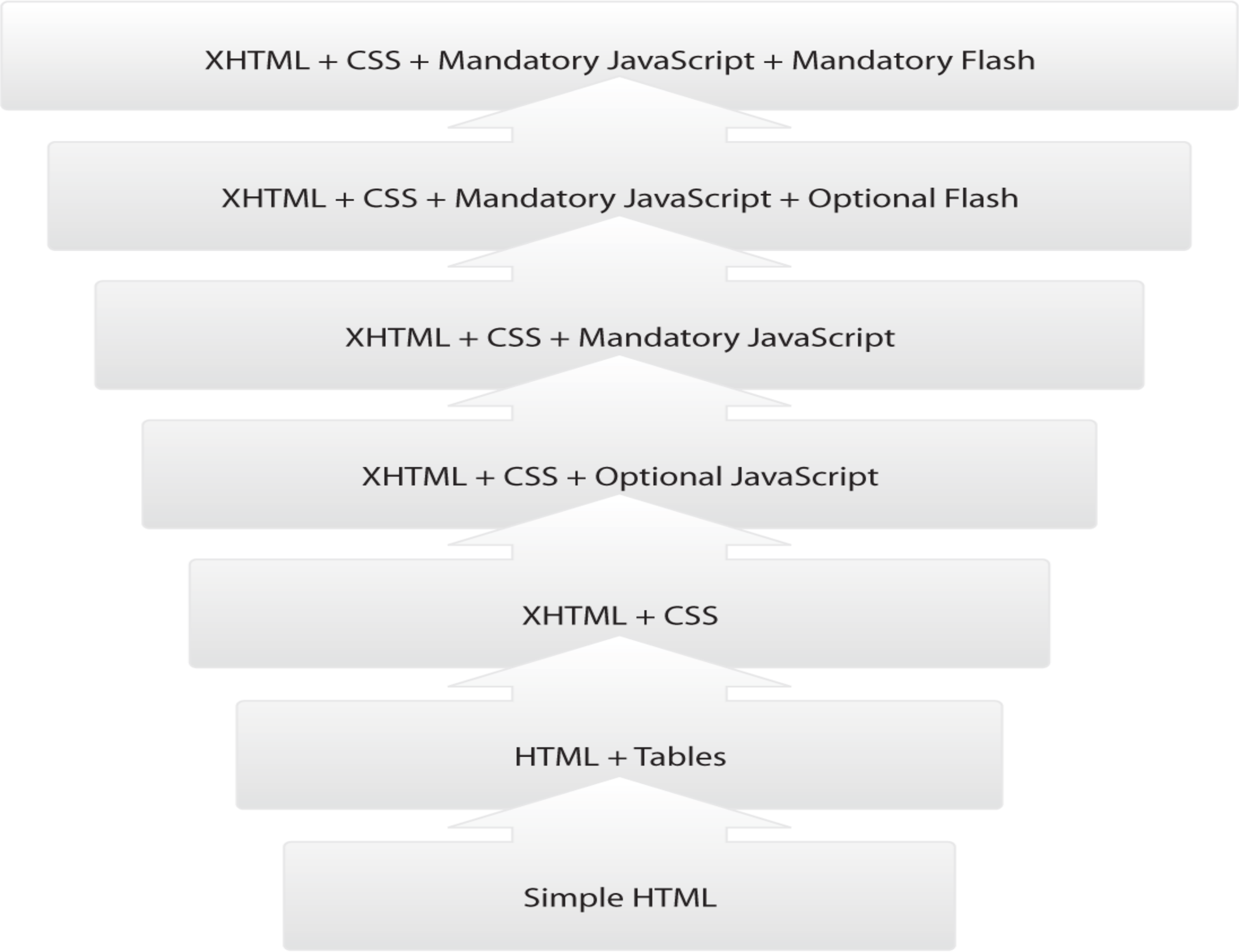
Text + Images + Animation + Audio

Text + Images + Animation

Text + Images

Plain Text

Range of Interface - Technology



XHTML + CSS + Mandatory JavaScript + Mandatory Flash

XHTML + CSS + Mandatory JavaScript + Optional Flash

XHTML + CSS + Mandatory JavaScript

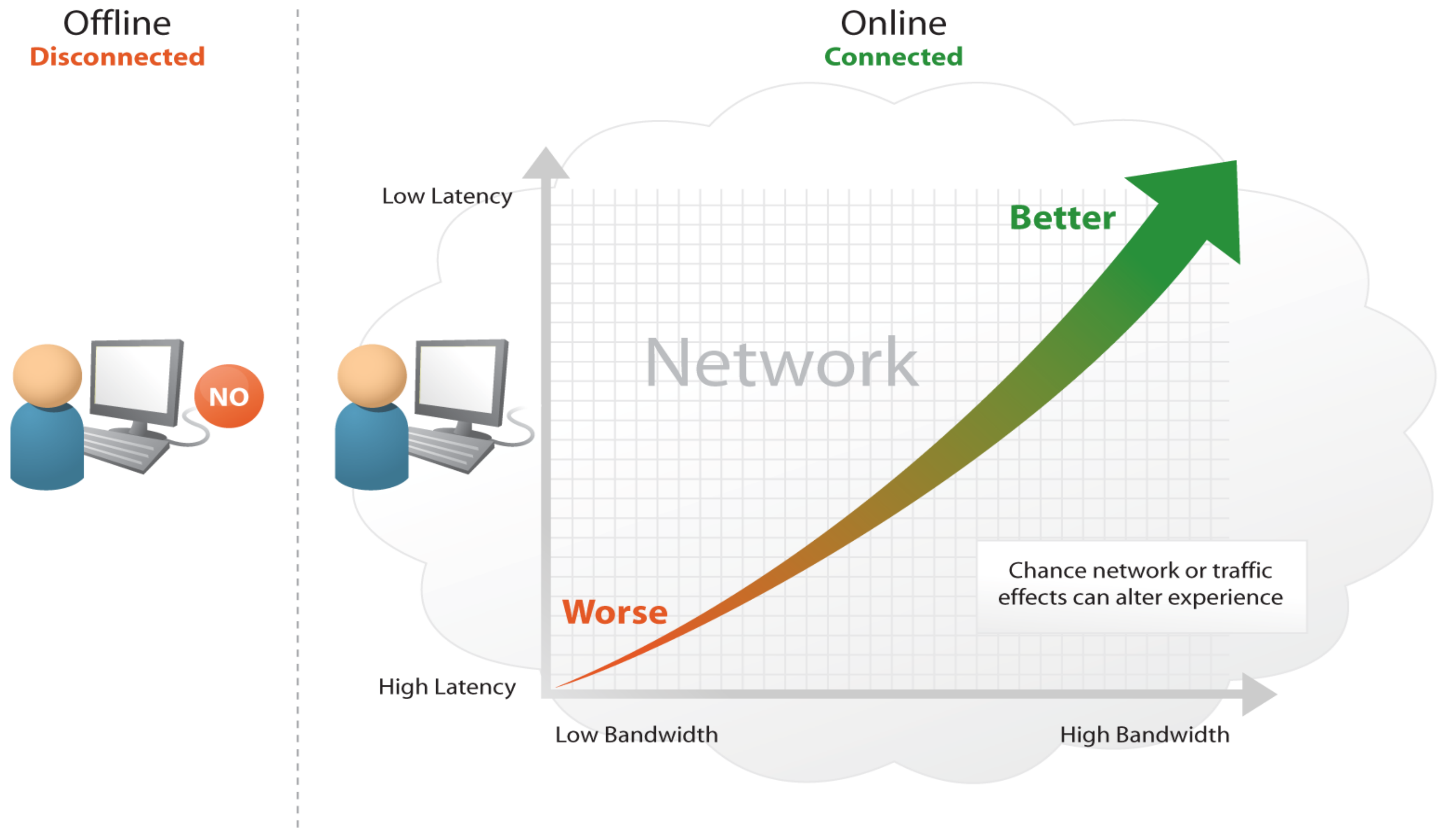
XHTML + CSS + Optional JavaScript

XHTML + CSS

HTML + Tables

Simple HTML

Range of Connectivity



Offline

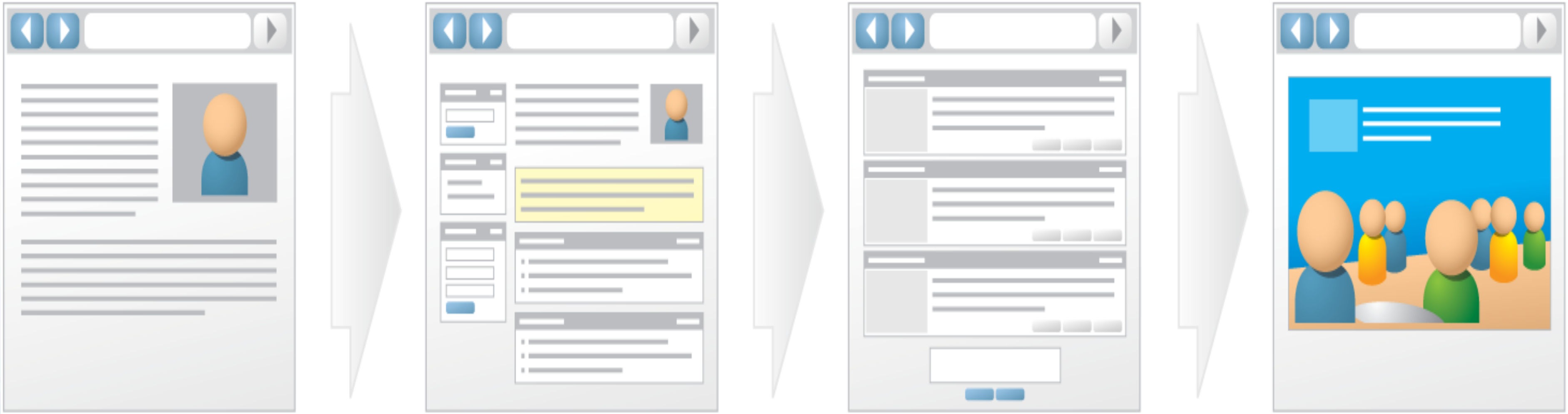
Disconnected

Online

Connected

Chance network or traffic effects can alter experience

Range of Interaction



Static Site

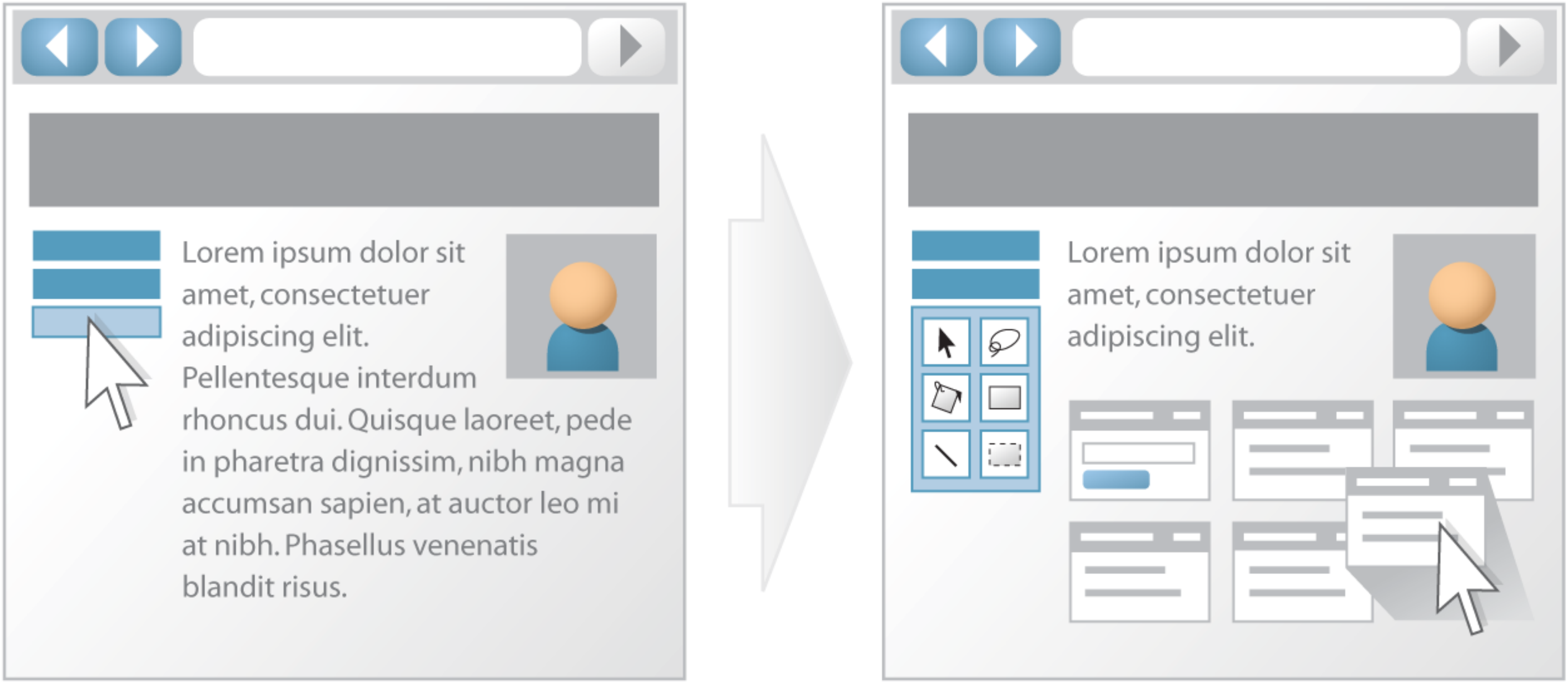
Custom
(ex. My Yahoo!)

Participatory
(ex. message board/wiki)

Beyond...
(ex. virtual space)

Interface Style Choices

Traditional Direct Manipulation



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Lorem ipsum dolor sit amet, consectetuer adipiscing elit.

Read, Understand, Click
(Simple links/press buttons)

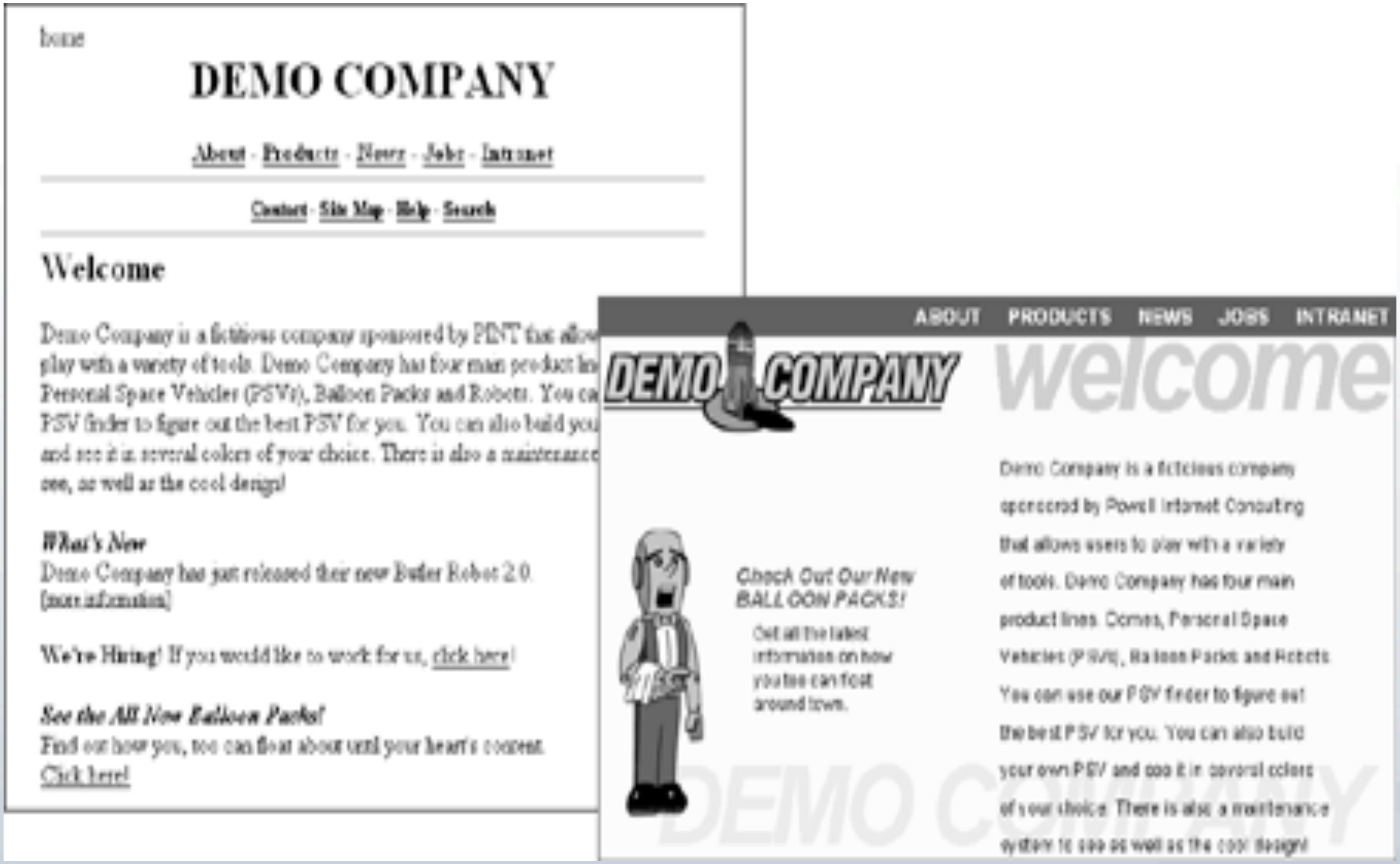
Drag & Combine
(Select region, drag and drop, fill, etc..)

Site Types Some Groupings

- Informational
- Transactional
- Community
- Entertainment
- Other
  - Blogs, artistic, personal

- Commercial
- Government
- Educational
- Non-profit
- Personal

Visual Groupings – Text Oriented



home

DEMO COMPANY

About - Products - News - Jobs - Intranet

Contact - Site Map - Help - Search

Welcome

Demo Company is a fictitious company sponsored by PINT that allow
play with a variety of tools. Demo Company has four main product lin
Personal Space Vehicles (PSVs), Balloon Packs and Robots. You ca
PSV finder to figure out the best PSV for you. You can also build you
and see it in several colors of your choice. There is also a maintenance
see, as well as the cool design!

What's New
Demo Company has just released their new Butler Robot 2.0.
[more information]

We're Hiring! If you would like to work for us, click here!

See the All New Balloon Packs!
Find out how you, too can float about until your heart's content.
Click here!

ABOUT PRODUCTS NEWS JOBS INTRANET

DEMO COMPANY

welcome

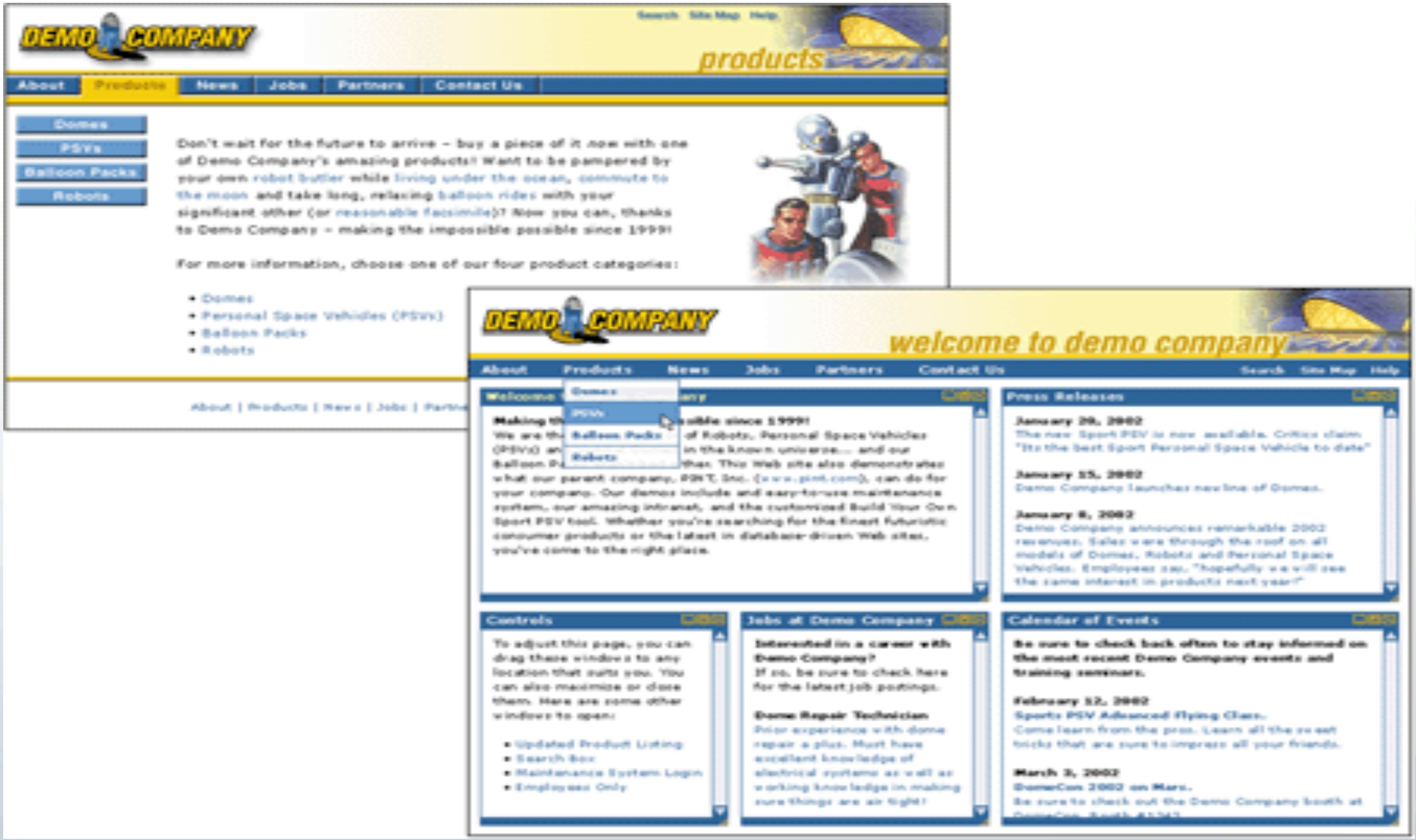
Demo Company is a ficticious company sponsored by Powell Internet Consulting that allows users to play with a variety of tools. Demo Company has four main product lines. Domes, Personal Space Vehicles (PSVs), Balloon Packs and Robots. You can use our PSV finder to figure out the best PSV for you. You can also build your own PSV and see it in several colors of your choice. There is also a maintenance system to see as well as the cool design!

Check Out Our New BALLOON PACKS!

Get all the latest information on how you too can float around town.

DEMO COMPANY

Visual Groupings – GUI Style



Don't wait for the future to arrive – buy a piece of it now with one of Demo Company's amazing products! Want to be pampered by your own robot butler while living under the ocean, commute to the moon and take long, relaxing balloon rides with your significant other (or reasonable facsimile)? Now you can, thanks to Demo Company – making the impossible possible since 1999!

For more information, choose one of our four product categories:

- Domes
- Personal Space Vehicles (PSVs)
- Balloon Packs
- Robots

About | Products | News | Jobs | Partne

Making th ossible since 1999!
We are th of Robots, Personal Space Vehicles (PSVs) an in the known universe... and our Balloon Pa than. This Web site also demonstrates what our parent company, PINT, Inc. (www.pint.com), can do for your company. Our demos include and easy-to-use maintenance system, our amazing intranet, and the customized Build Your Own Sport PSV tool. Whether you're searching for the finest futuristic consumer products or the latest in database-driven Web sites, you've come to the right place.

Press Releases

January 29, 2002
The new Sport PSV is now available. Critics claim "Its the best Sport Personal Space Vehicle to date"

January 15, 2002
Demo Company launches new line of Domes.

January 8, 2002
Demo Company announces remarkable 2002 revenues. Sales were through the roof on all models of Domes, Robots and Personal Space Vehicles. Employees say, "hopefully we will see the same interest in products next year!"

Controls

To adjust this page, you can drag these windows to any location that suits you. You can also maximize or close them. Here are some other windows to open:

- Updated Product Listing
- Search Box
- Maintenance System Login
- Employees Only

Jobs at Demo Company

Interested in a career with Demo Company?
If so, be sure to check here for the latest job postings.

Dome Repair Technician
Prior experience with dome repair a plus. Must have excellent knowledge of electrical systems as well as working knowledge in making sure things are air tight!

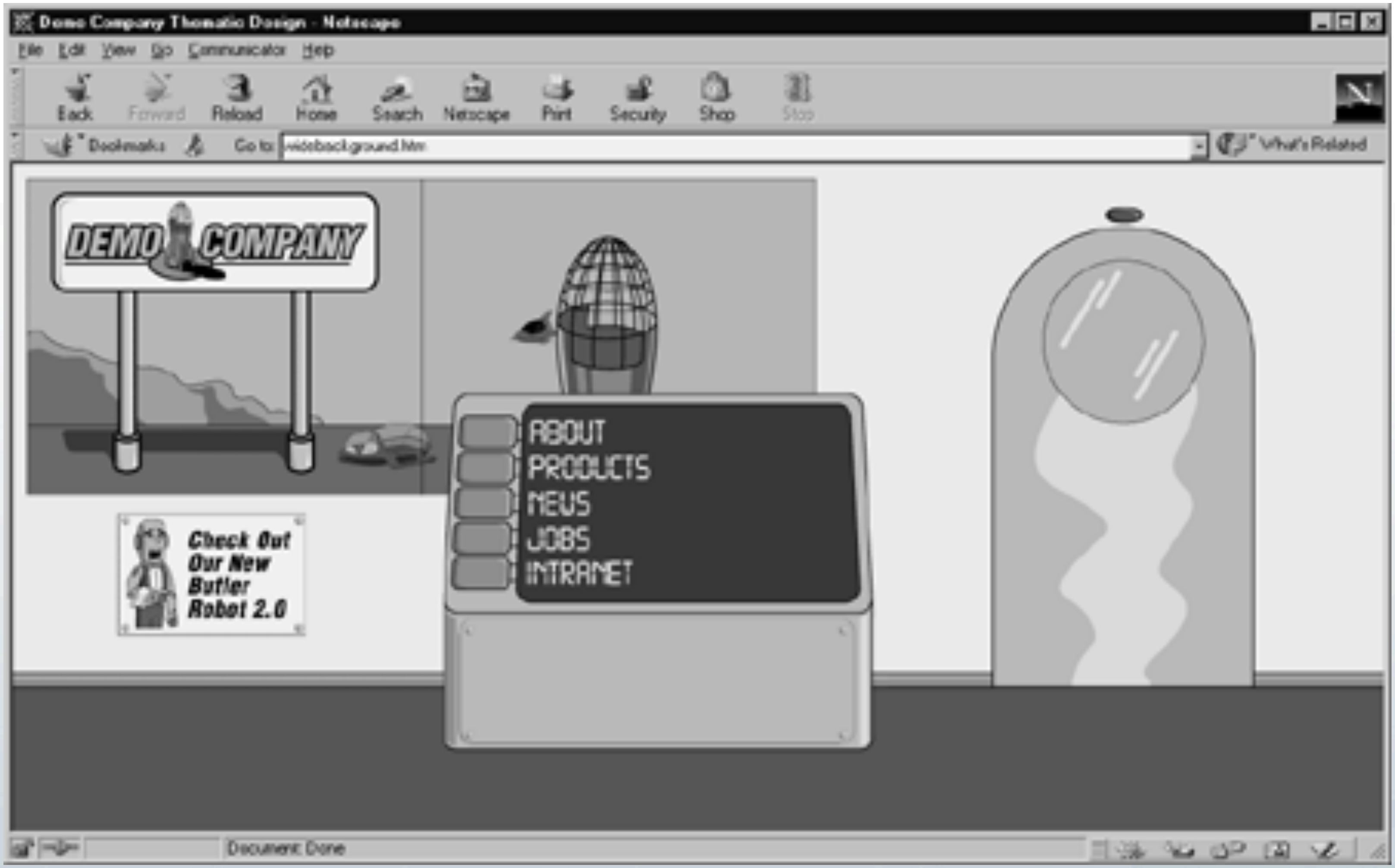
Calendar of Events

Be sure to check back often to stay informed on the most recent Demo Company events and training seminars.

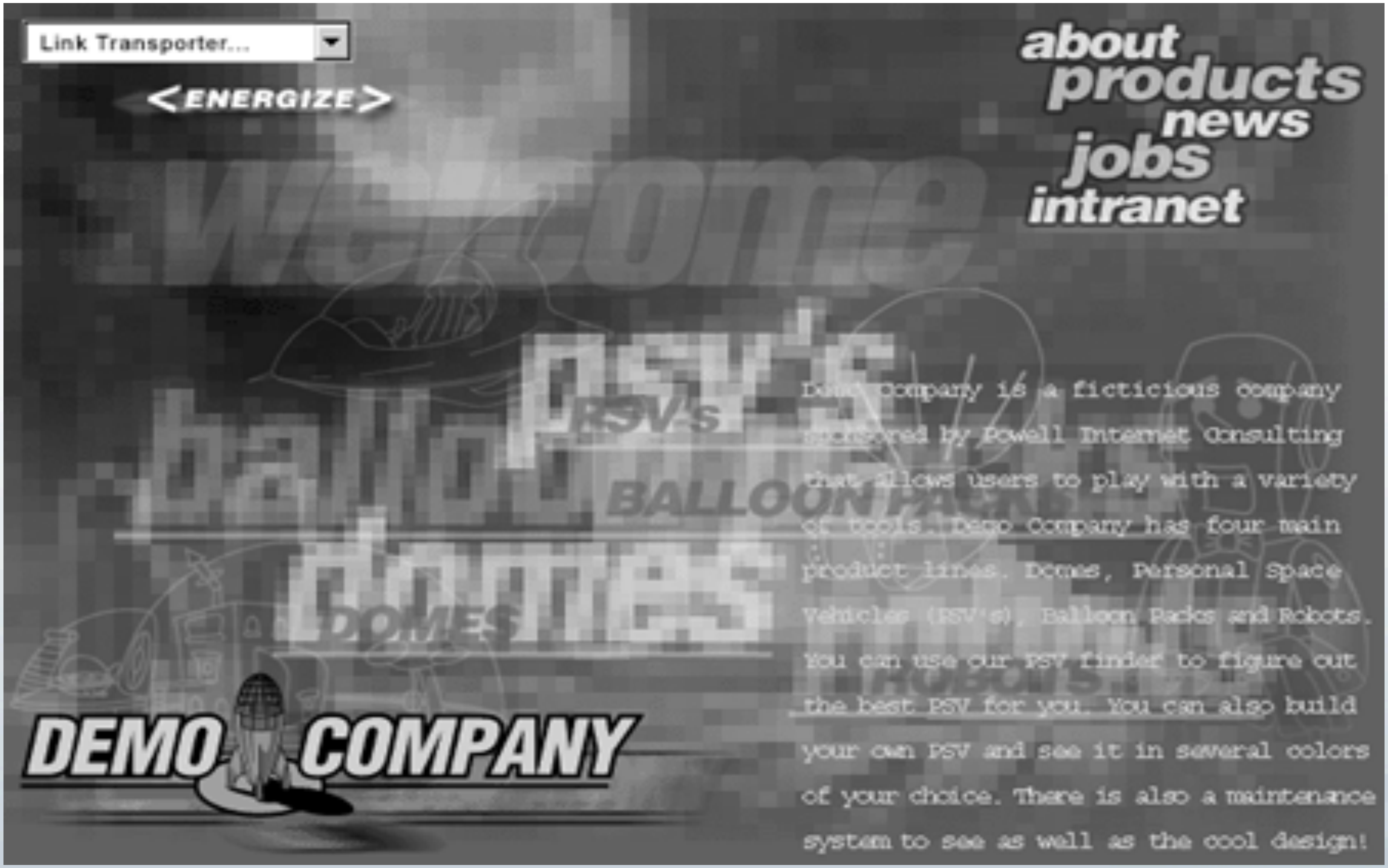
February 12, 2002
Sports PSV Advanced Flying Class.
Come learn from the pros. Learn all the sweet tricks that are sure to impress all your friends.

March 3, 2002
DomeCon 2002 on Mars.
Be sure to check out the Demo Company booth at DomeCon. Booth #1342

Visual Style - Metaphorical


Demo Company Thematic Design - Netscape
File Edit View Go Communicator Help
Back
Forward
Reload
Home
Search
Netscape
Print
Security
Shop
Stop
Bookmarks
Go to: wideback.ground.htm
What's Related
DEMO COMPANY
Check Out Our New Butler Robot 2.0
ABOUT
PRODUCTS
NEWS
JOBS
INTRANET
Document: Done

Visual Style - Experimental



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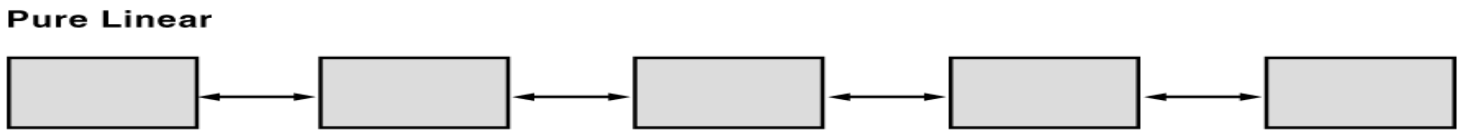
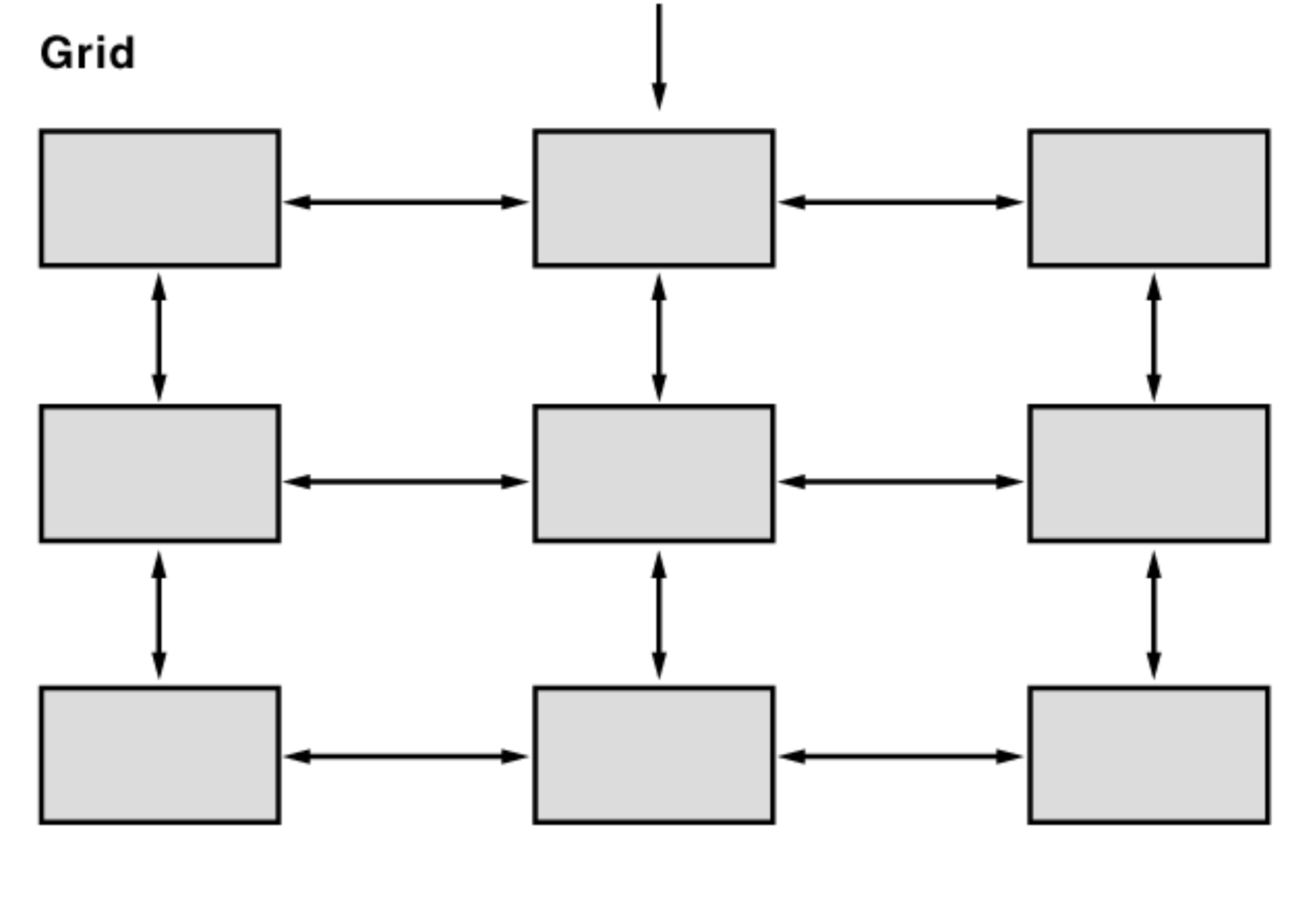
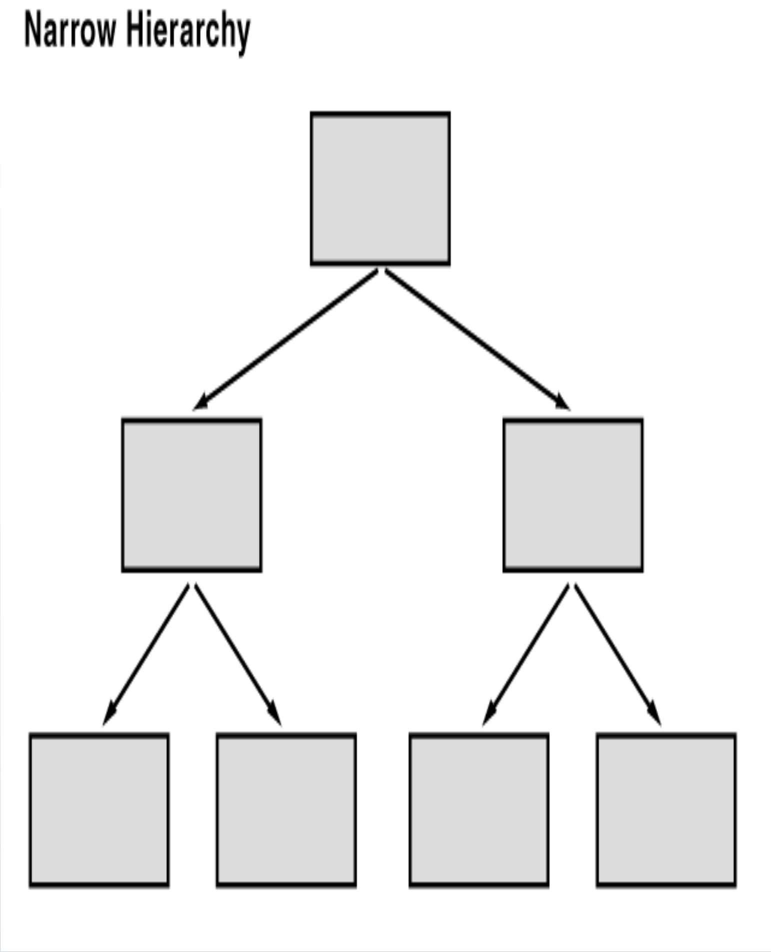
Range of Underlying Info Structure - Linear

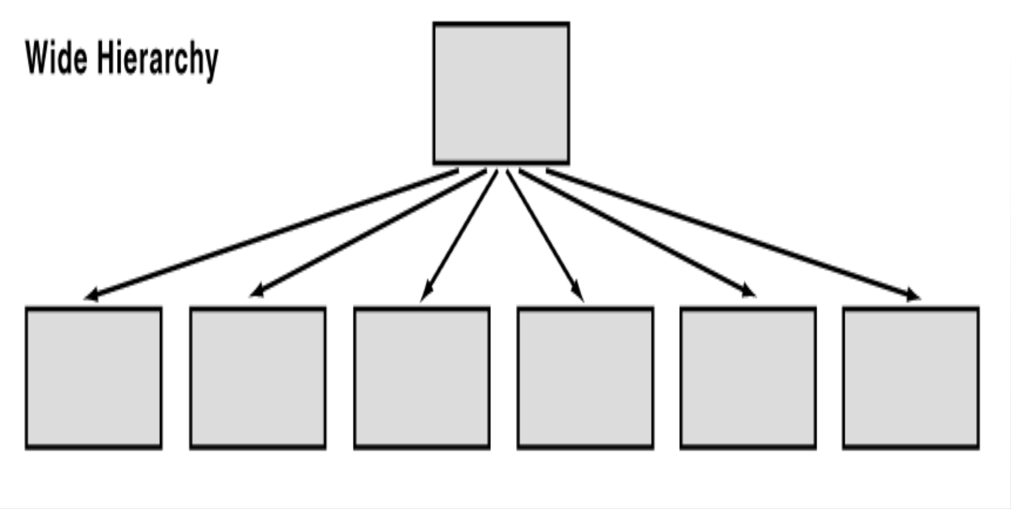


Range of Info Structures: Contd.

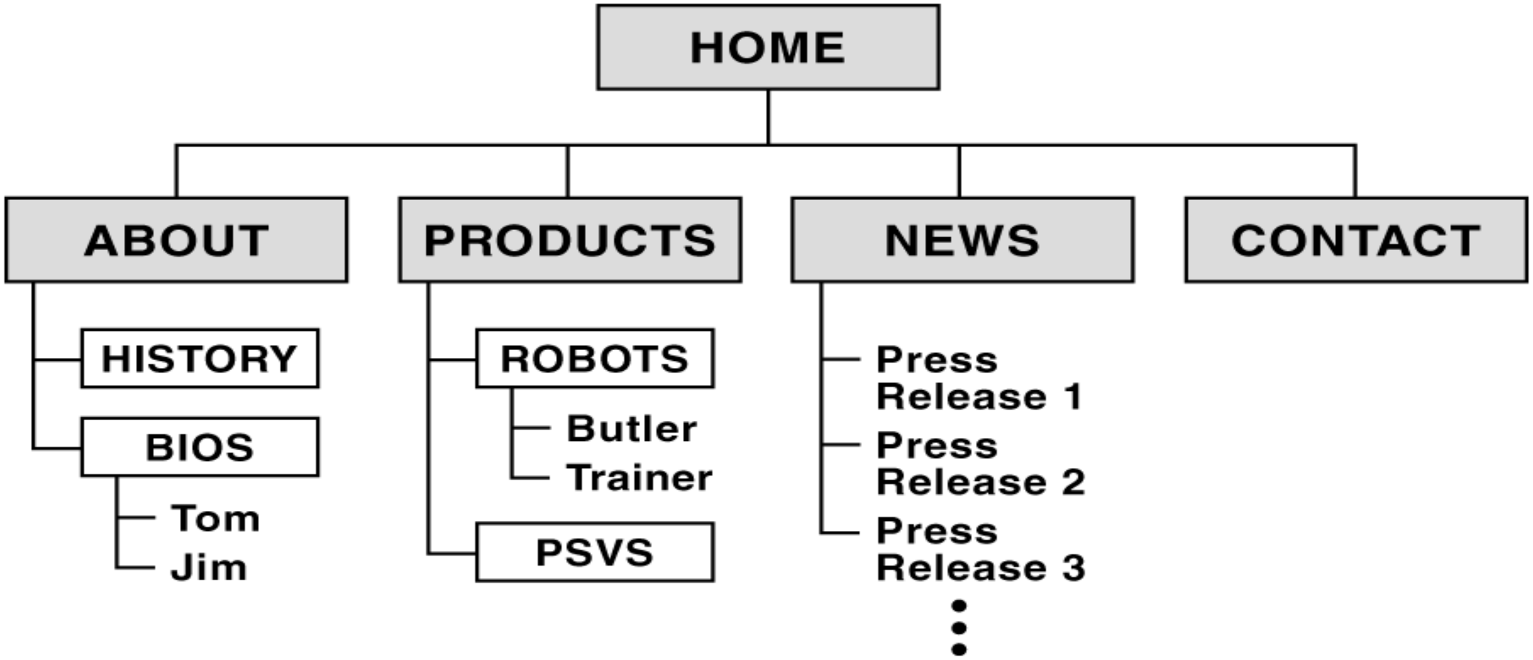


Range Contd: Web Site Structure and Trees

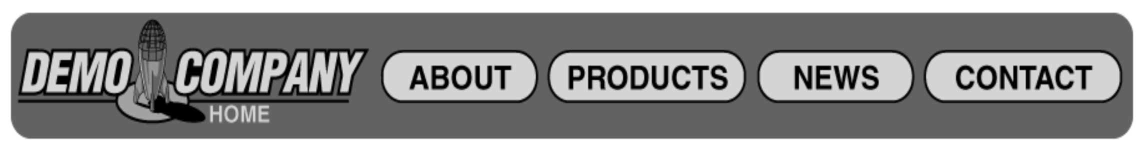




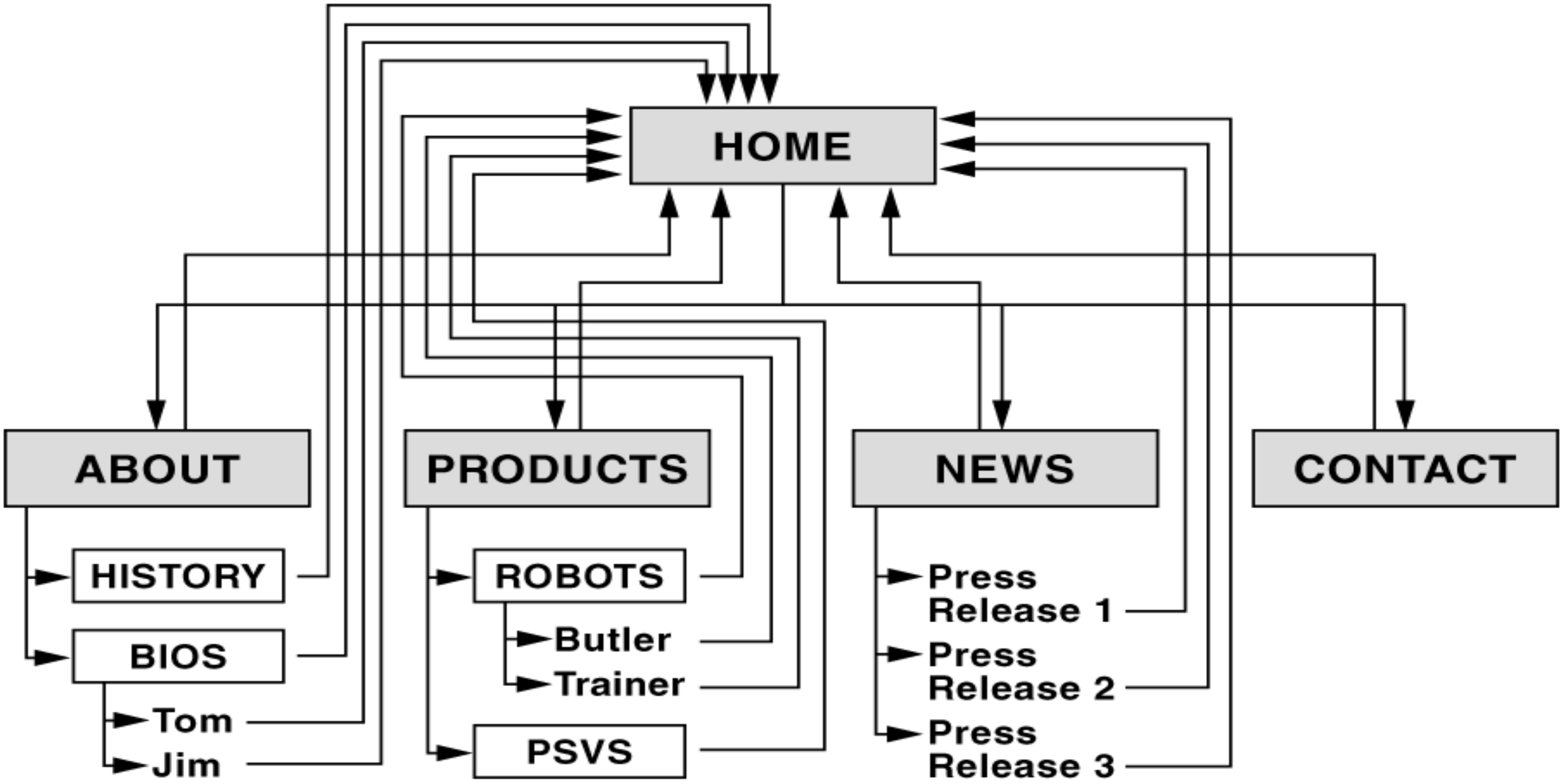
Applied Tree



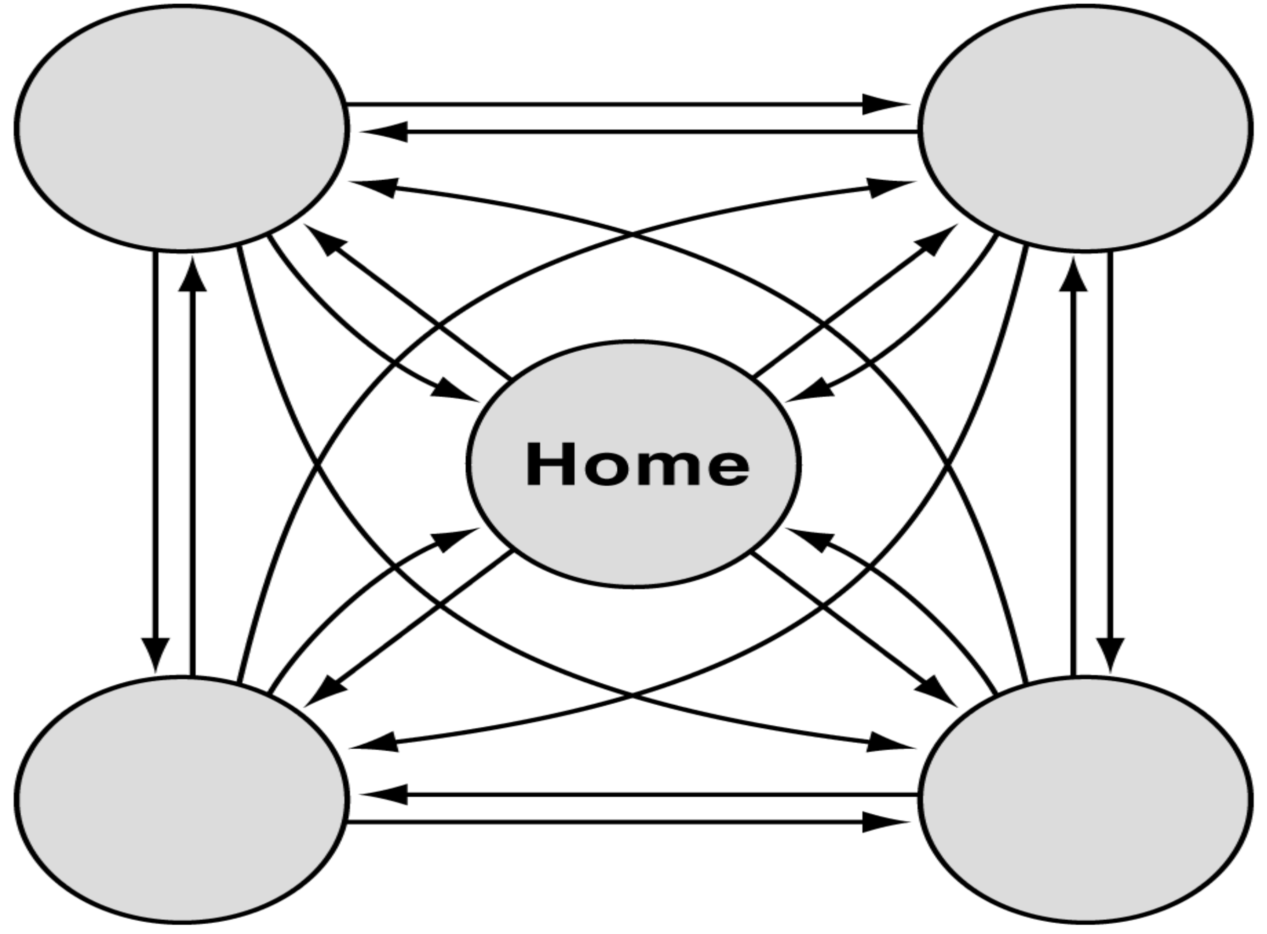
- HOME
  - ABOUT
    - HISTORY
    - BIOS
      - Tom
      - Jim
  - PRODUCTS
    - ROBOTS
      - Butler
      - Trainer
    - PSVS
  - NEWS
    - Press Release 1
    - Press Release 2
    - Press Release 3
    - ⋮
  - CONTACT



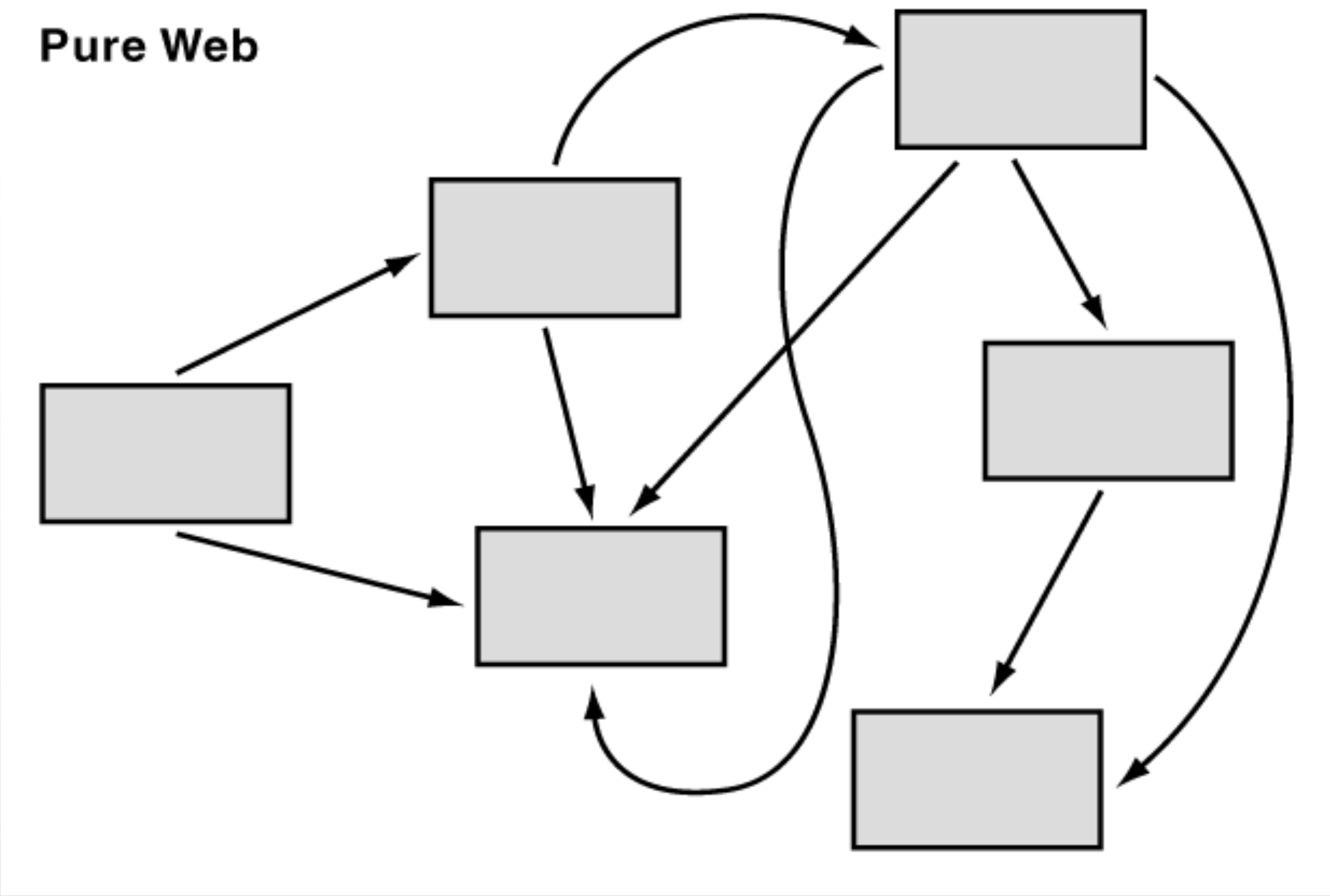
Is it a Tree?


HOME
ABOUT
PRODUCTS
NEWS
CONTACT
HISTORY
BIOS
Tom
Jim
ROBOTS
Butler
Trainer
PSVS
Press Release 1
Press Release 2
Press Release 3

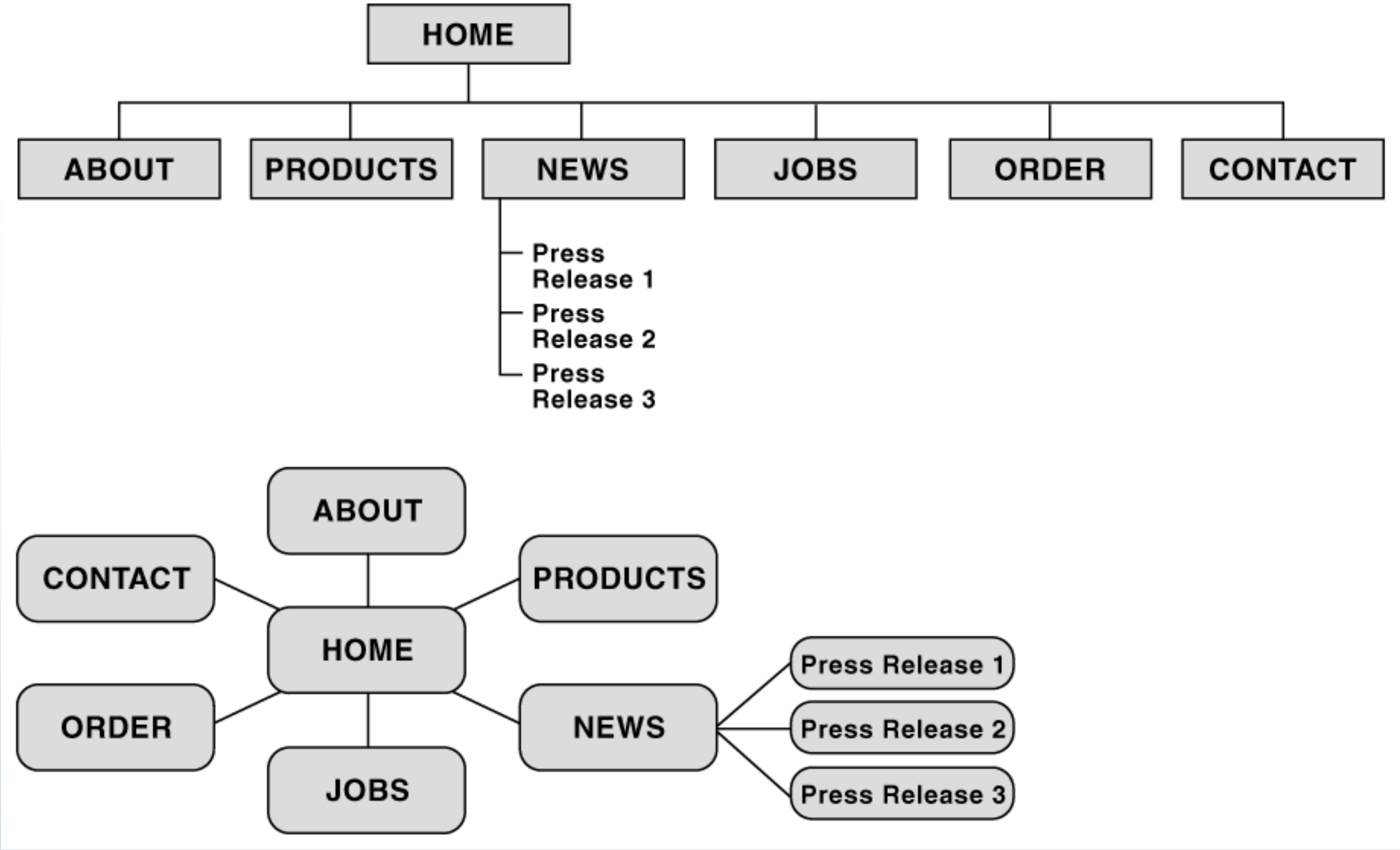
Give Them Infinite Choice?



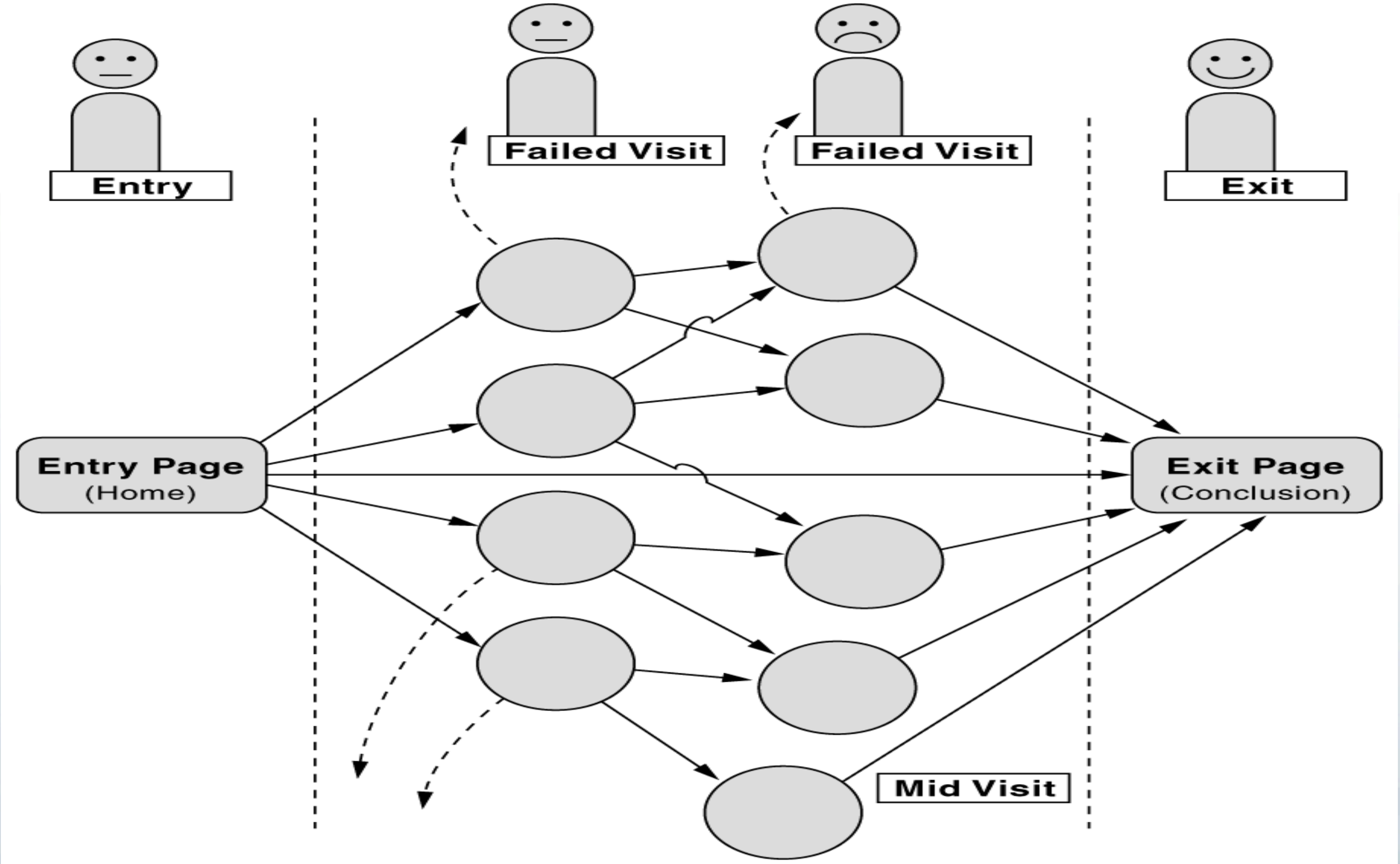
Just a Graph



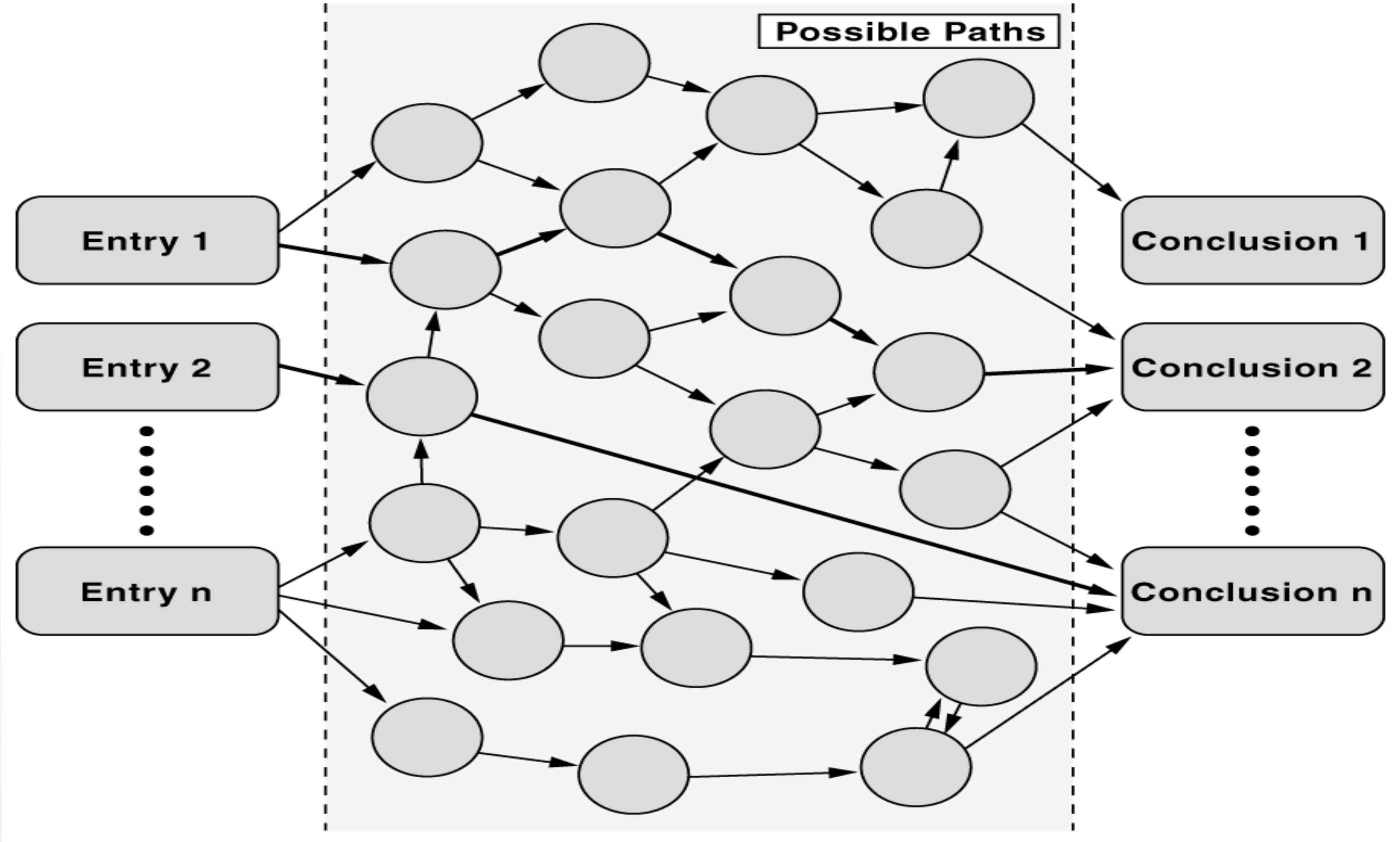
Don’t be Silly



Realistic User View of the Site



Well…it might be a bit more complicated

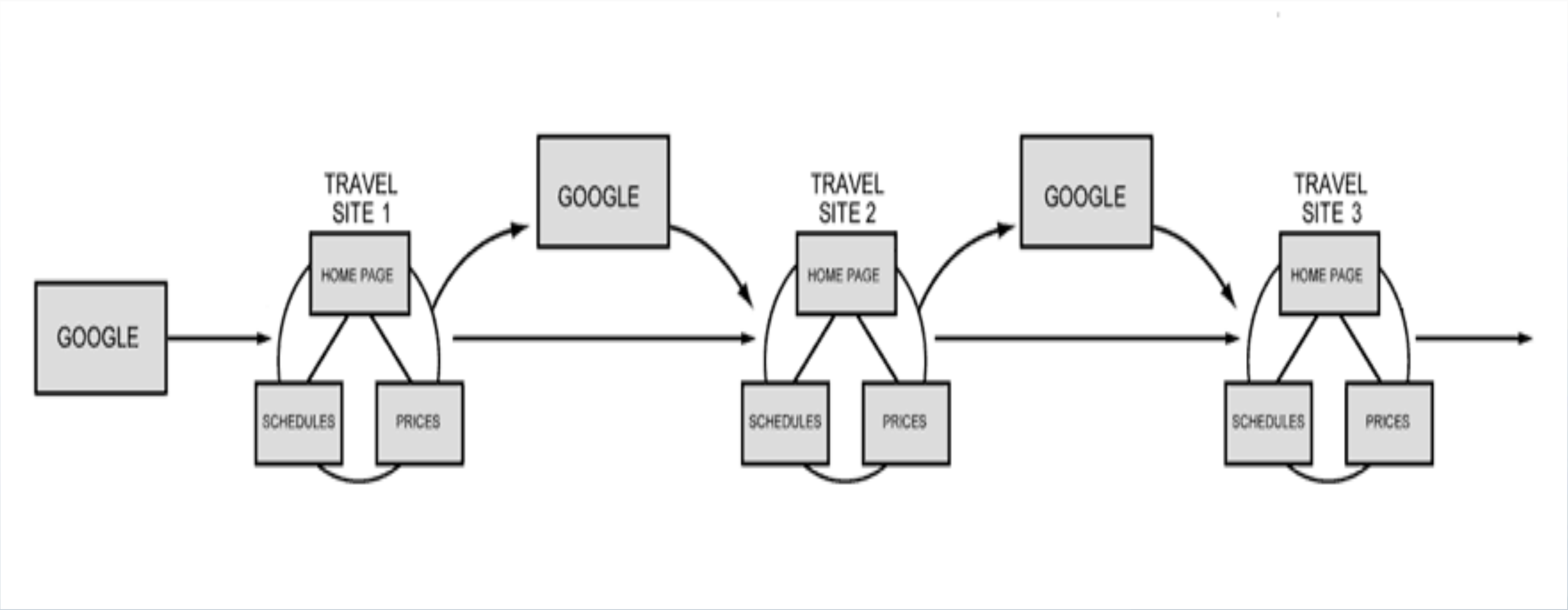


Goal Driven vs. Structure Driven Web Dev?

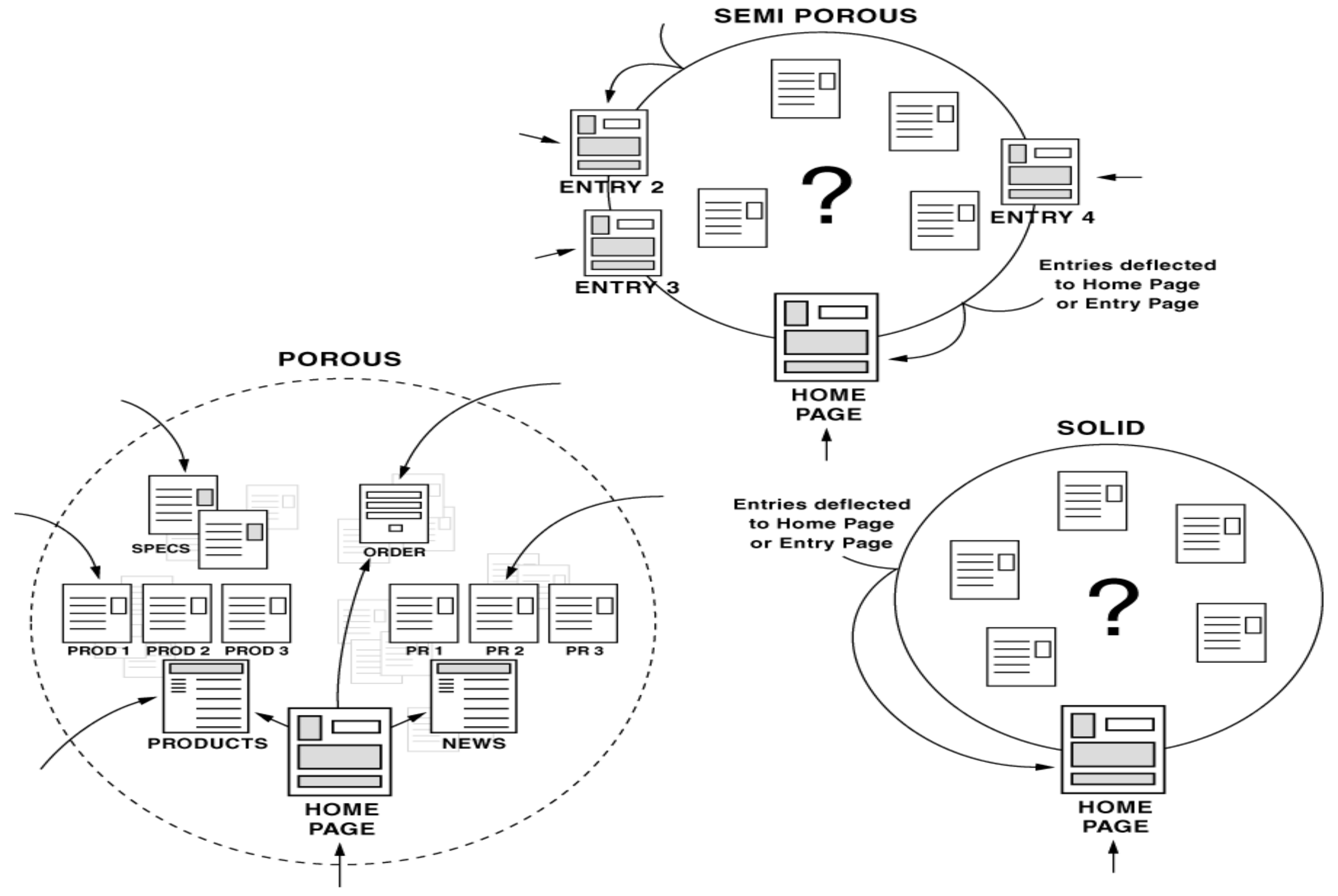
- Focusing on entry and exit and trying to get people to get what they want quickly
  - Amazon knows how many clicks you want to do…1!
- Consider Amazon's feature other people who bought this book bought these books
- This approach to navigation is known as information foraging
  - The wild animal and food example is good to keep in mind

Site Navigation vs. Web Navigation

- Remember that your site may just be one "Island Hop" on a user's visit to many sites trying to accomplish some overall task.



Entry Point Important: Consider This



What about Exit?

- Is there an exit?
- The idea of “closure”
- Statefulness, statelessness and the Web
  - HTTP by design
  - But…do they logout?
  - Security, Tracking, Errors,…HEADACHES!
- We are going to see that much of what happens even at user level is a side-effect of core aspects of things like HTTP

My Web Dev Definition

Web Development

> *“A multidisciplinary pursuit pertaining to the planning, and production of Web sites, including, but not limited to, technical development, information and its structure, visual design, and networked delivery.”*

Common Web App Design Themes

- Generally the major themes behind modern Web design include:
  - Designer/Client needs versus user needs
  - The balance of form and function
  - The quality of execution
  - Interplay between convention and innovation

User Focused Design

- UCD – the concept of designing something (in our case Web sites) always with the user and use in mind.

- Some important rules we cover:
  - Rule: YOU are NOT the USER
  - Rule: USERS are NOT DESIGNERS
  - Rule: Design for common, account for differences
  - Rule: Users are REAL PEOPLE

Form and Function

- Favorite Catchphrase: Form follows function!
- Rule: The visual form of a site should relate to its function
- Extreme examples to illustrate the point
  - Overly flash based site for your IRS tax form
  - All text driven move promotion site
- Interesting how design is not bottom-up today but top-down if this is true?

Execution: The Easy Part?

- Who does the user blame for mistakes?
  - Slow speed, no JavaScript, broken links, bad render, etc.
  - No limitations in most case for the user to leave – just click [no uninstall barrier]

- Reason for mistakes?
  - Misunderstanding the medium and its constraints
  - Lack of process
  - Lack of professional education
  - Lack of engineering style thinking

Conformity versus Innovation

- Users come to Web sites with history
  - 99% rule, big site effect, their operating system, etc.

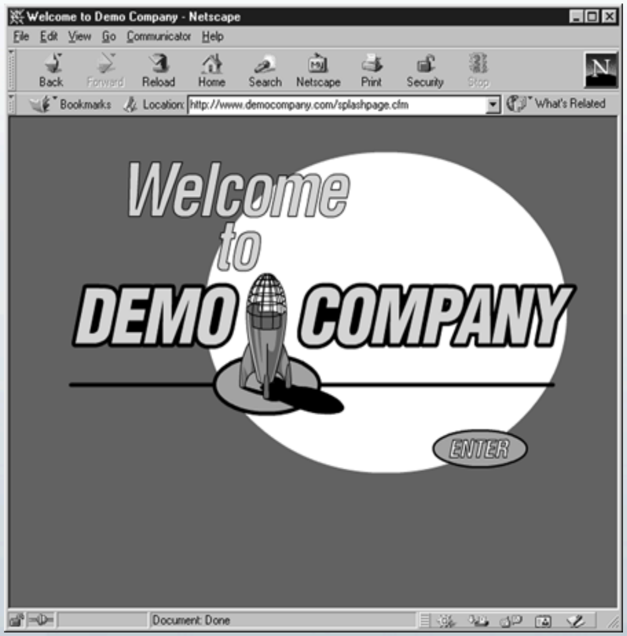
- There is a rich history in computer interfaces
- There is an emerging history in Web design

- Rule: Appropriately respect GUI and Web interface conventions

- You may want to break the rules when you know the rules!

Learning Web Design and Development

- Theory
- Observed Practice – Evaluations
- Your own implementations
- But hey we aren’t artists!
- Always remember there is no single form of “correct” Web ‘design’ that will fit every site or situation
  - Splash page example


Welcome to Demo Company - Netscape
File Edit View Go Communicator Help
Back
Forward
Reload
Home
Search
Netscape
Print
Security
Stop
Bookmarks
Location: http://www.democompany.com/splashpage.cfm
What's Related
Welcome to DEMO COMPANY
ENTER
Document: Done

We Should Know the Details

We get away with things

- The Web is different!?
  - Browsers fix many of your problems
    - Markup, CSS, some network configuration with MIME types and even JavaScript!
    - Imagine a C compiler trying to guess what you mean!

- We really have to do our job right particularly as the distinction between software genres melts away, but what is our job…is there something more than knowing the tech that is maybe tougher?

All About End Users?

- Users declare us good or bad for better or worse
  - They often only see results and things above the water
  - “The Iceberg Model”
- Example: Speed is all important – you can never have it fast enough!
  - User don’t care about bytes, they care about time so… implications?
    - Watch out for broadband fallacy
  - Is time and perception of slowness consistent?
  - Given the cycle of read, decide, click, wait, repeat can we play a trick? Yet to do so we have to have technical chops and an understanding of user and experience

The Inherent Trade-offs

- Client-side
  - No control – end user environments vary greatly and then can do what they want to your markup and code
    - Security! Security! Security!
  - Speed and scalability
    - Responsive interface since no network round-trip
    - Off load server from duties it shouldn't need to perform
- Server-side
  - Control is yours – you choose the technology and approach
  - The "secrets" hopefully should be safe
  - Speed and scalability could be a problem as you round-trip all the time and you find your systems are hung in network wait states all the time

Not a “versus” Issue

- You need both CS AND SS, it is just a question of what makes sense where
  - Client-side tends to be good for interface concerns
    - Validation, UI, etc.
  - Server-side tends to be good for data concerns
    - Submission and storage of sensitive data in particular
- Sacrifices and trade-offs are made, there is no vacuum here you may be forced or encouraged to balance CS and SS differently depending on user needs, internal conditions, developer familiarity or simply time.