Software Engineering

Part (I)-Introductory Session

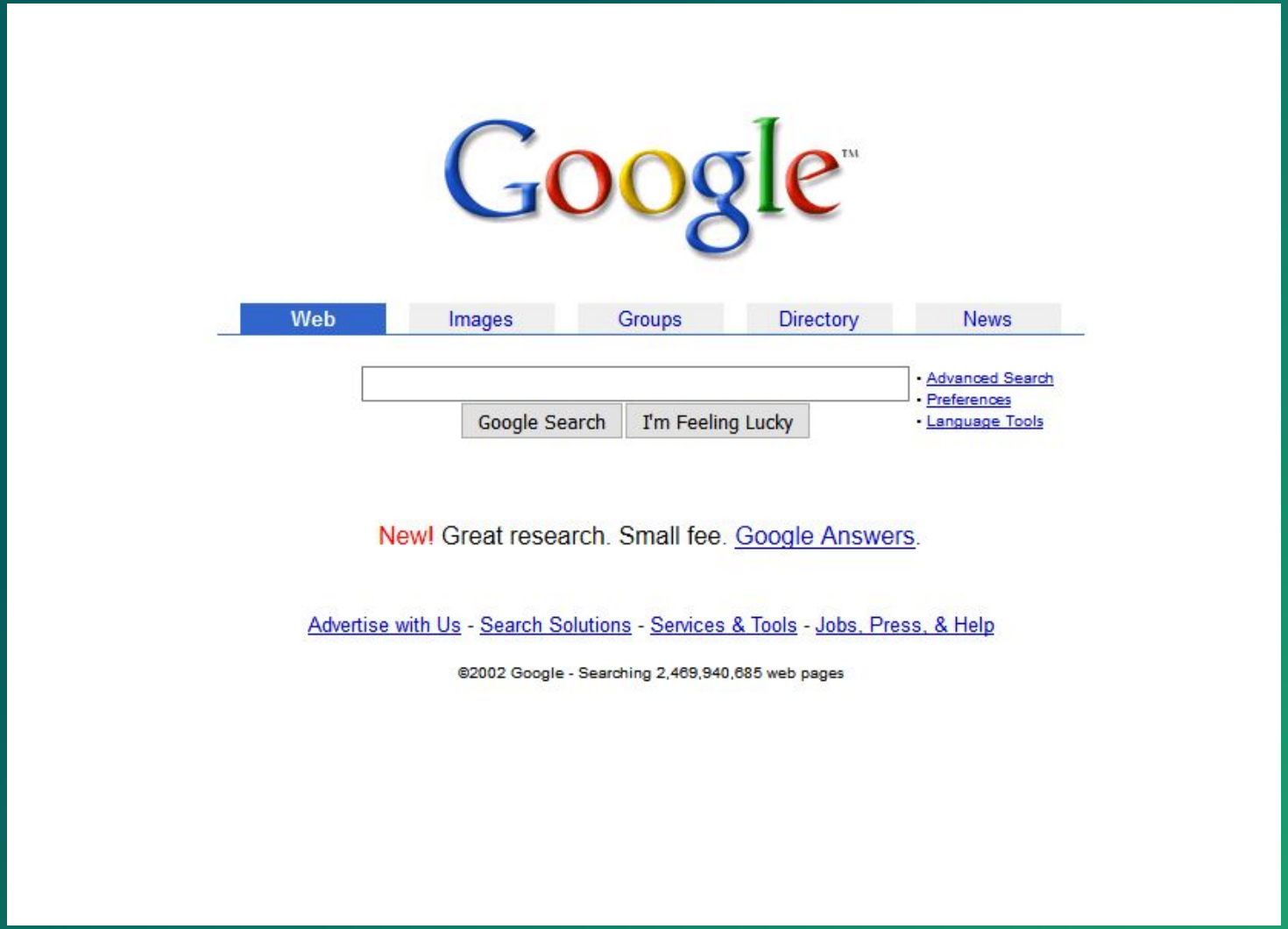
By: Mehran Alidoost Nia
Shahid Beheshti University, Fall 2023

1 The Story of Software Technologies

2002

2002

2002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2002

Personalize
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Y! Games - Play free online games - Pool, Literati, Dominoes, Chess, Spades, Euchre and more...
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New!
Yahoo! Mail Plus - Powerful. Affordable. Sign up now
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More Yahoo!...
High-speed Internet. Coming right up.
Free DSL modem.
Free activation. Free installation.
Enter your phone number to check for DSL availability:
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check
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Web Site Directory - Sites organized by subject
Suggest your site
Business & Economy
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Regional
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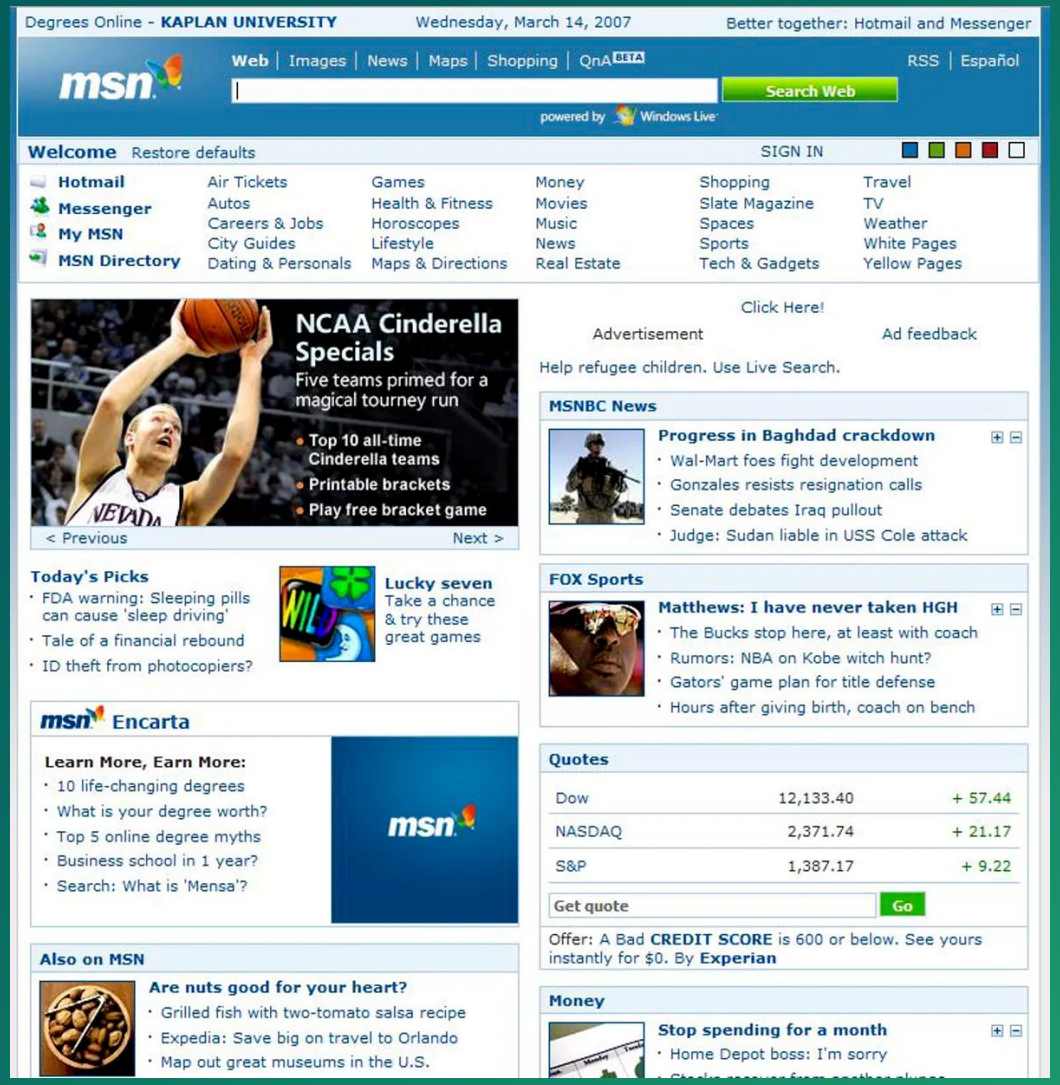
Society & Culture
People, Environment, Religion...
Personal Assistant
Sign In
Sign up to personalize Yahoo! - learn more
Yahoo! Autos
Free Quotes, Research, Compare, Buy New, Buy Used, Credit Center
2003 Nissan 350Z
In The News
12:04am PT, Fri Nov 29
Simultaneous attacks targeting Israelis at hotel, airliner kill at least 12 in Kenya
Inspectors visit Iraq bioweapons 'hot zone'
United Airlines mechanics nix $700M pay cut
Zsa Zsa Gabor in coma after auto accident
Michael Jordan to retire after this season
NFL - College hoops - LV Cup - NHL
News - Photos - Weather - Sports - Stocks
Marketplace
Yahoo! Web Hosting - Hosting solutions for small businesses
Y! Store - build an online store in 10 minutes
SBC Yahoo! DSL - only $39.95/mo for first 12 months
Free online credit report - check your score

2002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Wednesday, March 14, 2007
Better together: Hotmail and Messenger
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RSS | Español
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Welcome Restore defaults
SIGN IN
Hotmail
Messenger
My MSN
MSN Directory
Air Tickets
Autos
Careers & Jobs
City Guides
Dating & Personals
Games
Health & Fitness
Horoscopes
Lifestyle
Maps & Directions
Money
Movies
Music
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Real Estate
Shopping
Slate Magazine
Spaces
Sports
Tech & Gadgets
Travel
TV
Weather
White Pages
Yellow Pages
NCAA Cinderella Specials
Five teams primed for a magical tourney run
Top 10 all-time Cinderella teams
Printable brackets
Play free bracket game
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Ad feedback
Help refugee children. Use Live Search.
MSNBC News
Progress in Baghdad crackdown
Wal-Mart foes fight development
Gonzales resists resignation calls
Senate debates Iraq pullout
Judge: Sudan liable in USS Cole attack
Today's Picks
FDA warning: Sleeping pills can cause 'sleep driving'
Tale of a financial rebound
ID theft from photocopiers?
Lucky seven
Take a chance & try these great games
FOX Sports
Matthews: I have never taken HGH
The Bucks stop here, at least with coach
Rumors: NBA on Kobe witch hunt?
Gators' game plan for title defense
Hours after giving birth, coach on bench
msn Encarta
Learn More, Earn More:
10 life-changing degrees
What is your degree worth?
Top 5 online degree myths
Business school in 1 year?
Search: What is 'Mensa'?
msn
Quotes
Dow 12,133.40 + 57.44
NASDAQ 2,371.74 + 21.17
S&P 1,387.17 + 9.22
Get quote
Go
Offer: A Bad CREDIT SCORE is 600 or below. See yours instantly for $0. By Experian
Also on MSN
Are nuts good for your heart?
Grilled fish with two-tomato salsa recipe
Expedia: Save big on travel to Orlando
Map out great museums in the U.S.
Money
Stop spending for a month
Home Depot boss: I'm sorry

MSN.com - Microsoft Internet Explorer

File Edit View Favorites Tools Help

http://www.msn.com/ Go

Best of the Web | Channel Guide | Customize Links | Free Hotmail | Internet Start | Microsoft | Windows Media | Windows Update

Get Vonage Free! Friday, February 02, 2007 Get to know the new Messenger

msn

Web | Images | News | Maps | Shopping | QnA Beta RSS | Español

Search Web

powered by Windows Live

Welcome Restore defaults SIGN IN

Hotmail
Messenger
My MSN
MSN Directory

Air Tickets
Autos
Careers & Jobs
City Guides
Dating & Personals

Games
Health & Fitness
Horoscopes
Lifestyle
Maps & Directions

Money
Movies
Music
News
Real Estate

Shopping
Slate Magazine
Spaces
Sports
Tech & Gadgets

Travel
TV
Weather
White Pages
Yellow Pages

Deadly Storms Strike Florida

At least 14 dead; homes ruined & 20,000 still without power

- Live video of the storms' aftermath

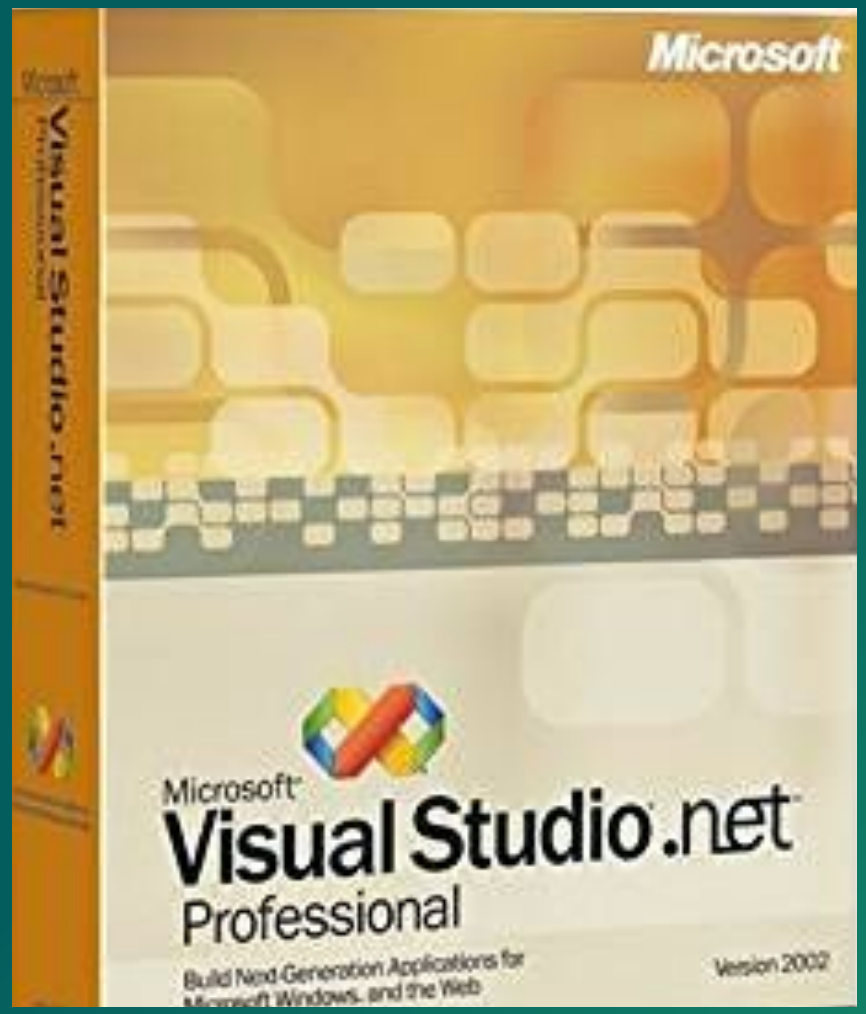
< Previous Next >

Today's Picks

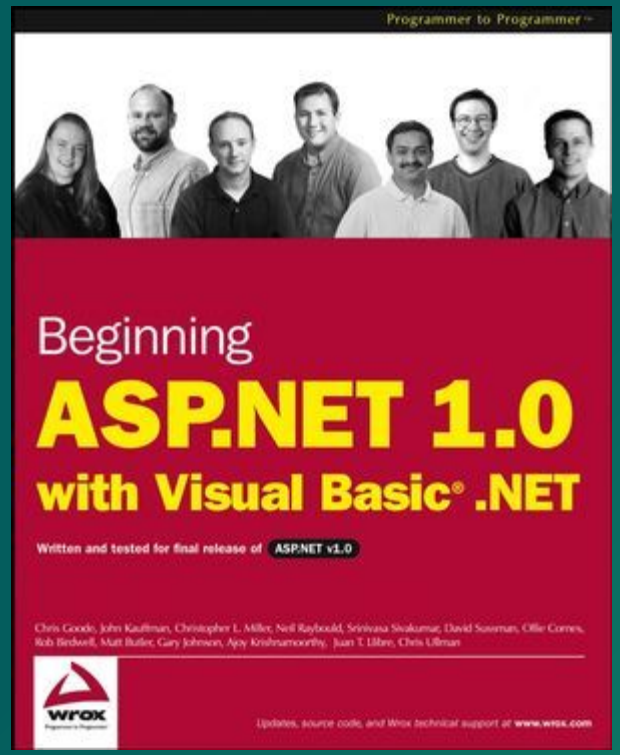
Early spring?

Done

2002



22 Languages, one Platform



Microsoft ASP.net

2002

2002

2003

2005

Web Development

2006

2007

Samsung Products After iPhone

Apple iPhone Announced

Jan. 9, 2007

i8510 INNOV8
Sep. 2008

i8910 Omnia HD
May 2009

M7600 Beat DJ
May 2009

Jet S8000
Jun. 2009

i5700 Galaxy Spica
Nov. 2009

Sunburst
Mar. 2010

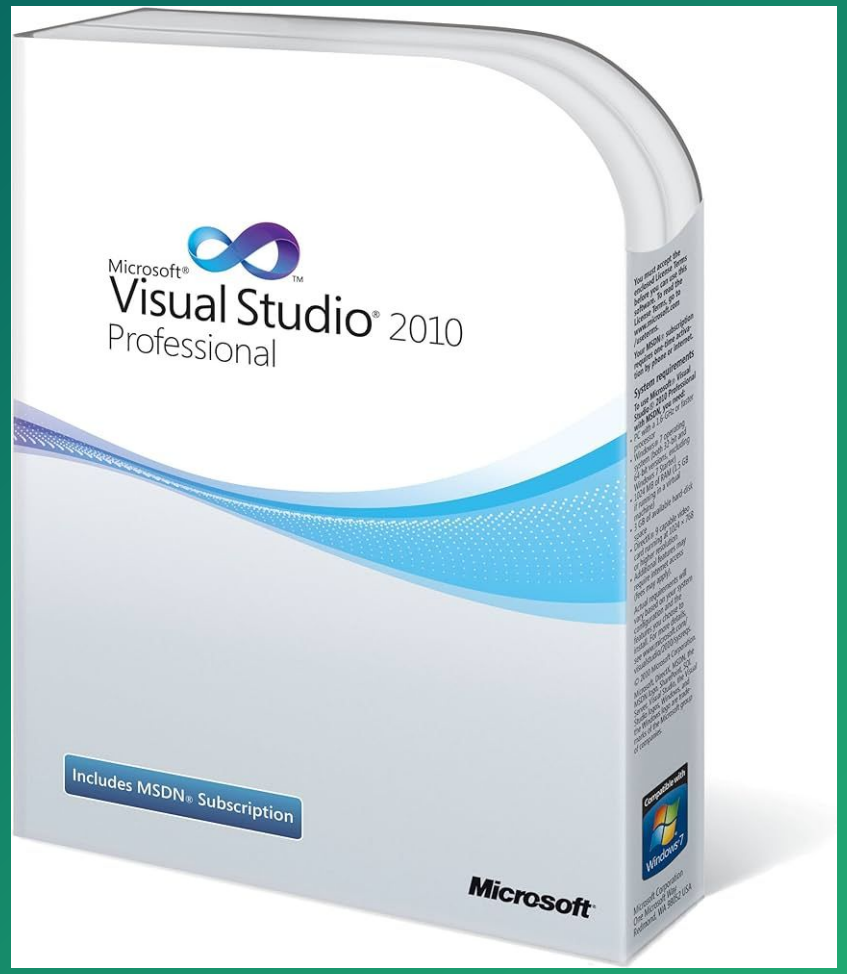
Microsoft®
.NET
ASP.NET | MVC | Web API

2007

ORACLE
Sun
microsystems
Java

2009

Windows Azure™



2010

2010

2010

Windows® Internet Explorer 9

chrome

2011

2011

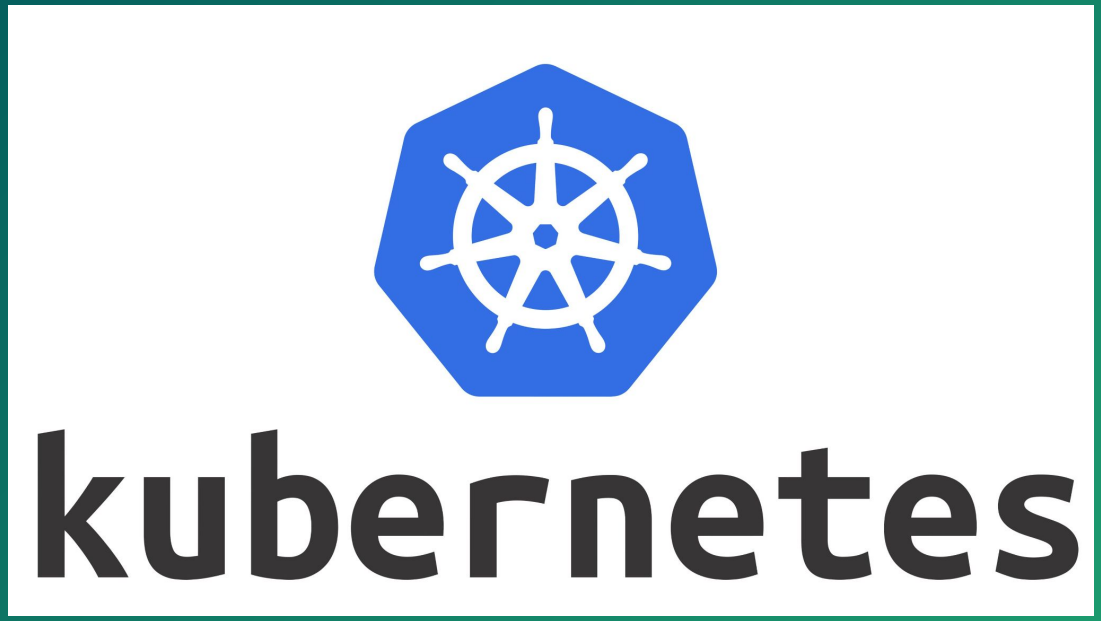
2012

2012

2013

2014

2015



.NET Core

2016

2017

2019

2018

2020

2020

2021

2022

2023

2 Software Engineering in Real World

Take a time capsule back to 2001:

- Google is struggling to search through 1.3 billion web pages.

- Mobile phones look like this:

- Amazon is struggling with a monolithic architecture.

https://www.youtube.com/watch?v=esEFaY0FDKc
Rob Brigham: DevOps at Amazon, AWS Reinvent 2015

- There is no Cloud.

SE Evolution

- Free & open source software.
- Horizontal scaling.
- Extreme programming
  - Test-first development.
  - Continuous integration.
  - Refactoring.
- Infrastructure as code.
- Continuous delivery.
- Low dependency architecture.

Mary Poppendieck

GNU Manifesto, 1985
(Richard Stallman)

The Unlikely Rise of Free and Open Source Software

- 1991

  A Helsinki student wrote an operating system "Just for Fun".

- 1999

  IBM invested $1 billion in Linux

(Linus Torvalds)

- 1993

  A group of eight developers started enhancing the NCSA HTTPd web server.

- 1999

  THE APACHE SOFTWARE FOUNDATION Was founded.

  Today Apache is used by >40% of all websites.

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Horizontal Scaling: File System

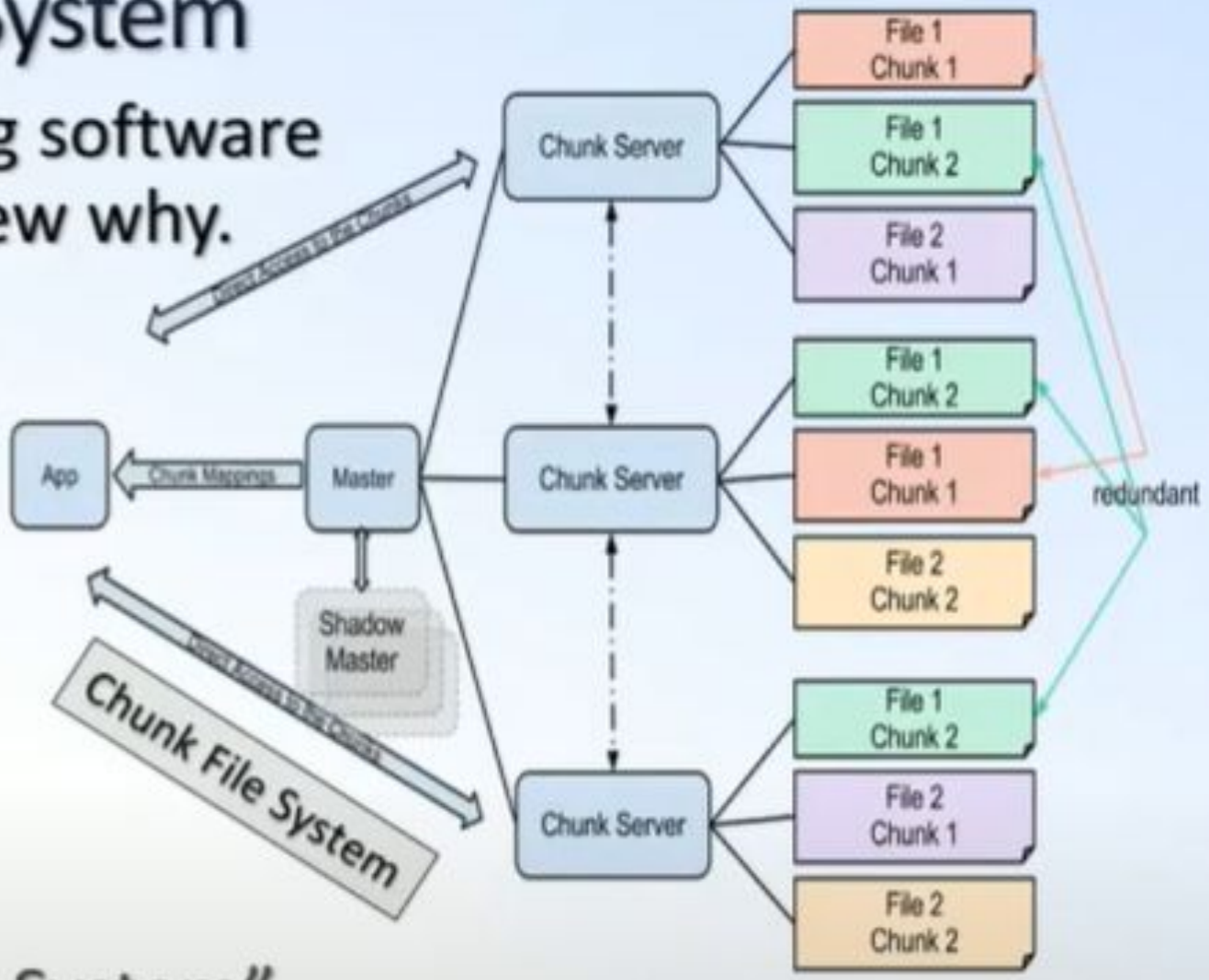
In spring 2000, Google's indexing software stopped working. No one knew why.

Two engineers found out:

Jeff Dean

Photo Credit: ACM

Sanjay Ghemawat



The cause – faulty hardware.

The solution: "The Google File System"

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Horizontal Scaling: Transaction Processing

During the 2000 holiday season Amazon had the biggest available database server, but it could not keep up with transaction demand.

Option 1: Handle More Transactions

Option 2: Break Apart Transactions

Amazon Choose Option 2:

Break transactions into services.

Conway's Law

Organize into teams, each responsible for a service.

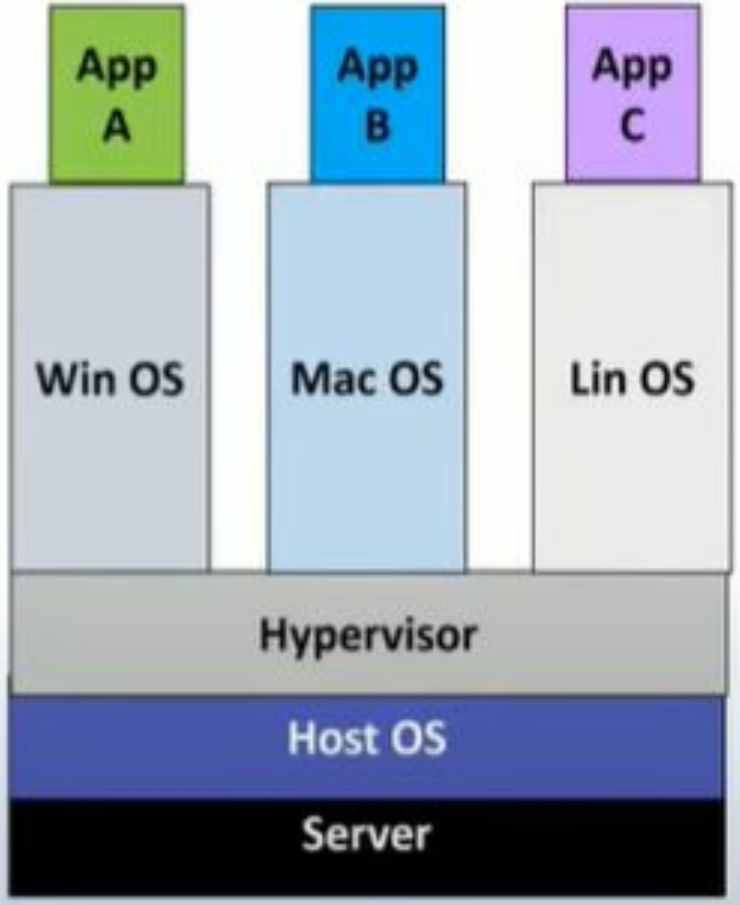
Do not constrain teams – let them act independently.

amazon web services

Step 1: Virtualization (2000 – 2010)

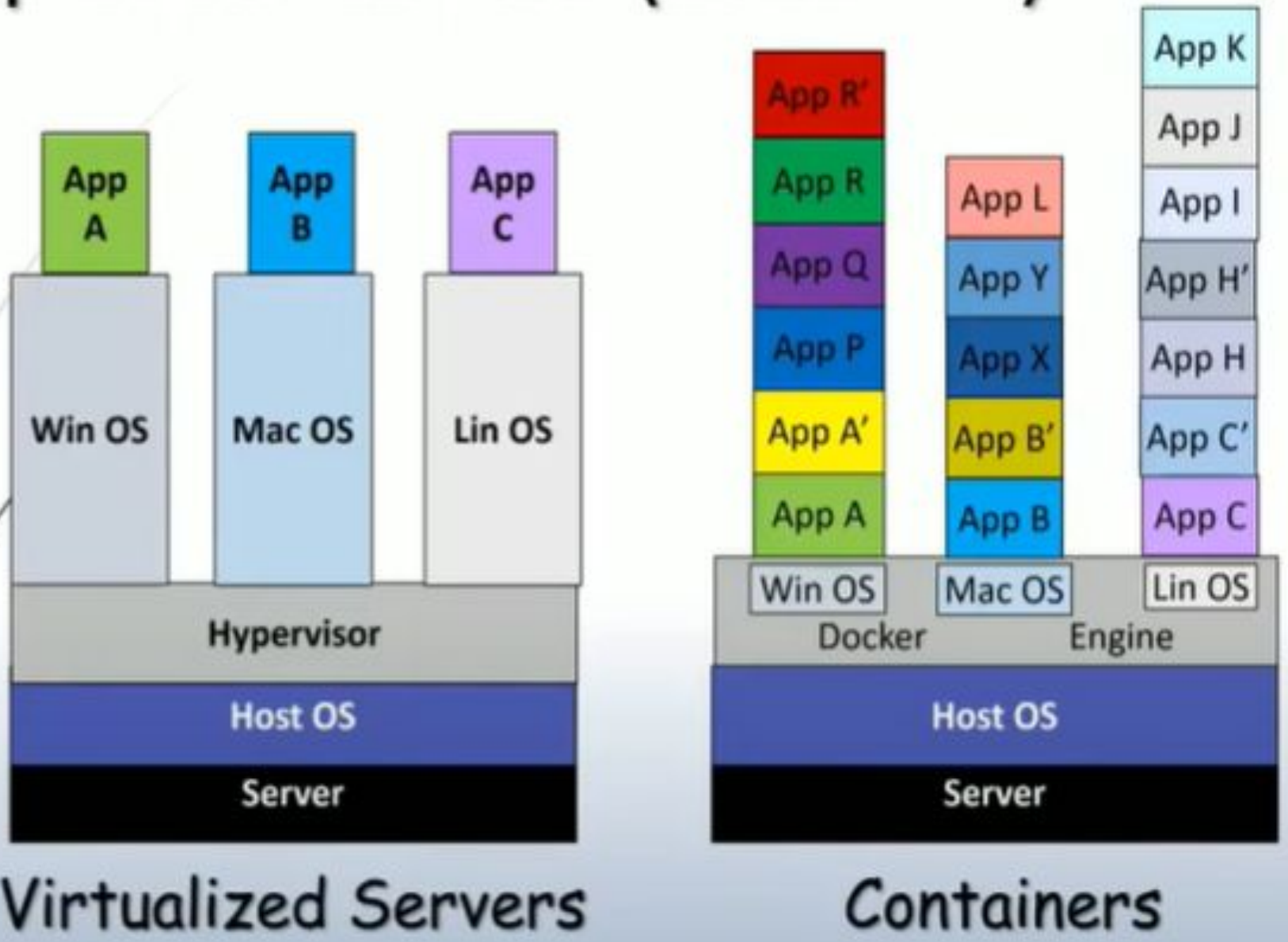
High Friction

Hardware



Virtualized Servers

Step 2: Containers (2011 – >)



Virtualized Servers

Containers

Step 3: Continue to Reduce Friction... (2015 –>)

Serverless Functions

Self-Provisioning
Event-Driven
Functions

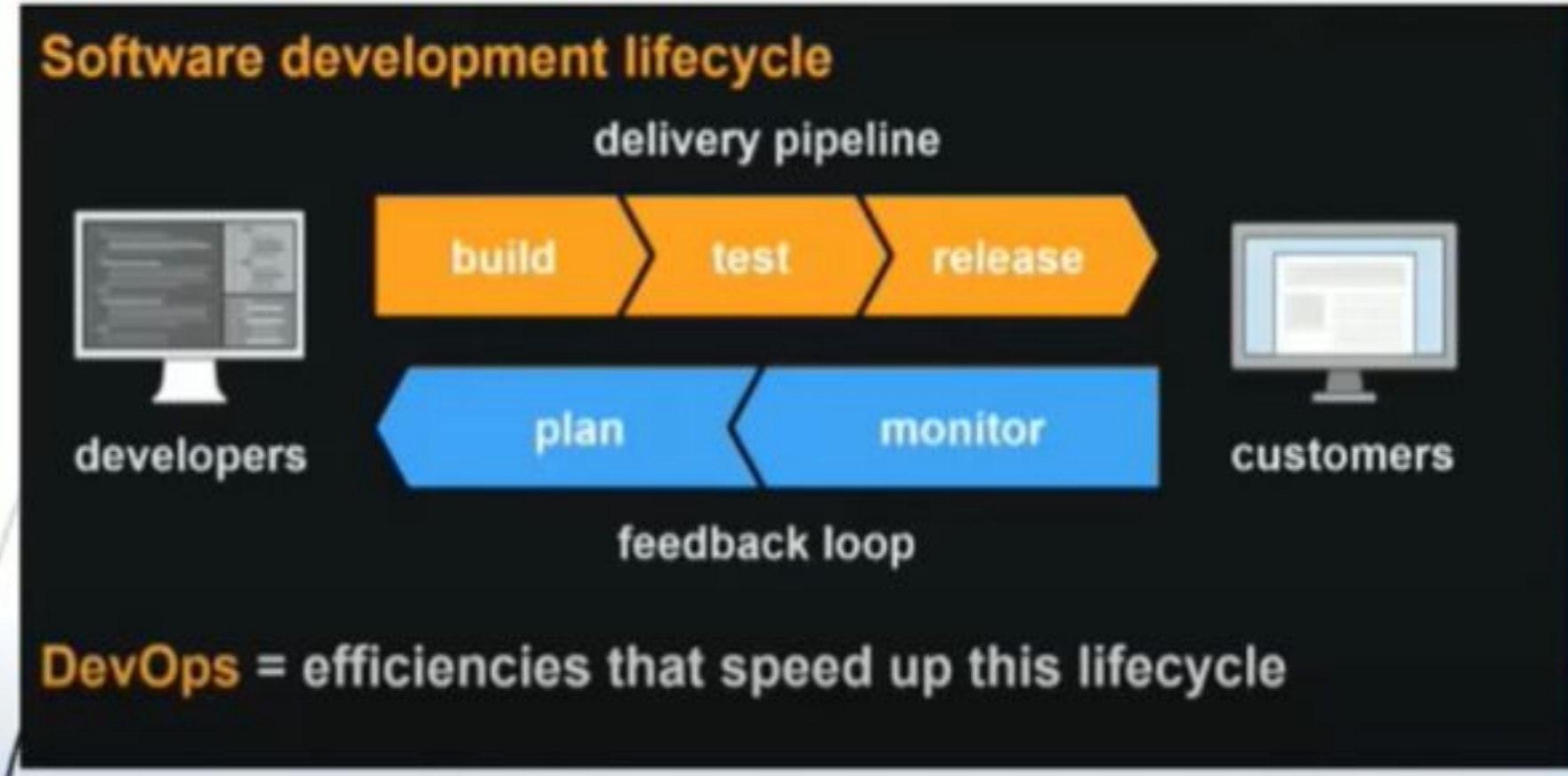
Faster
Simpler
Lower Cost

IoT / Edge Computing

Local Computation:
Reduced Latency
Increased Reliability

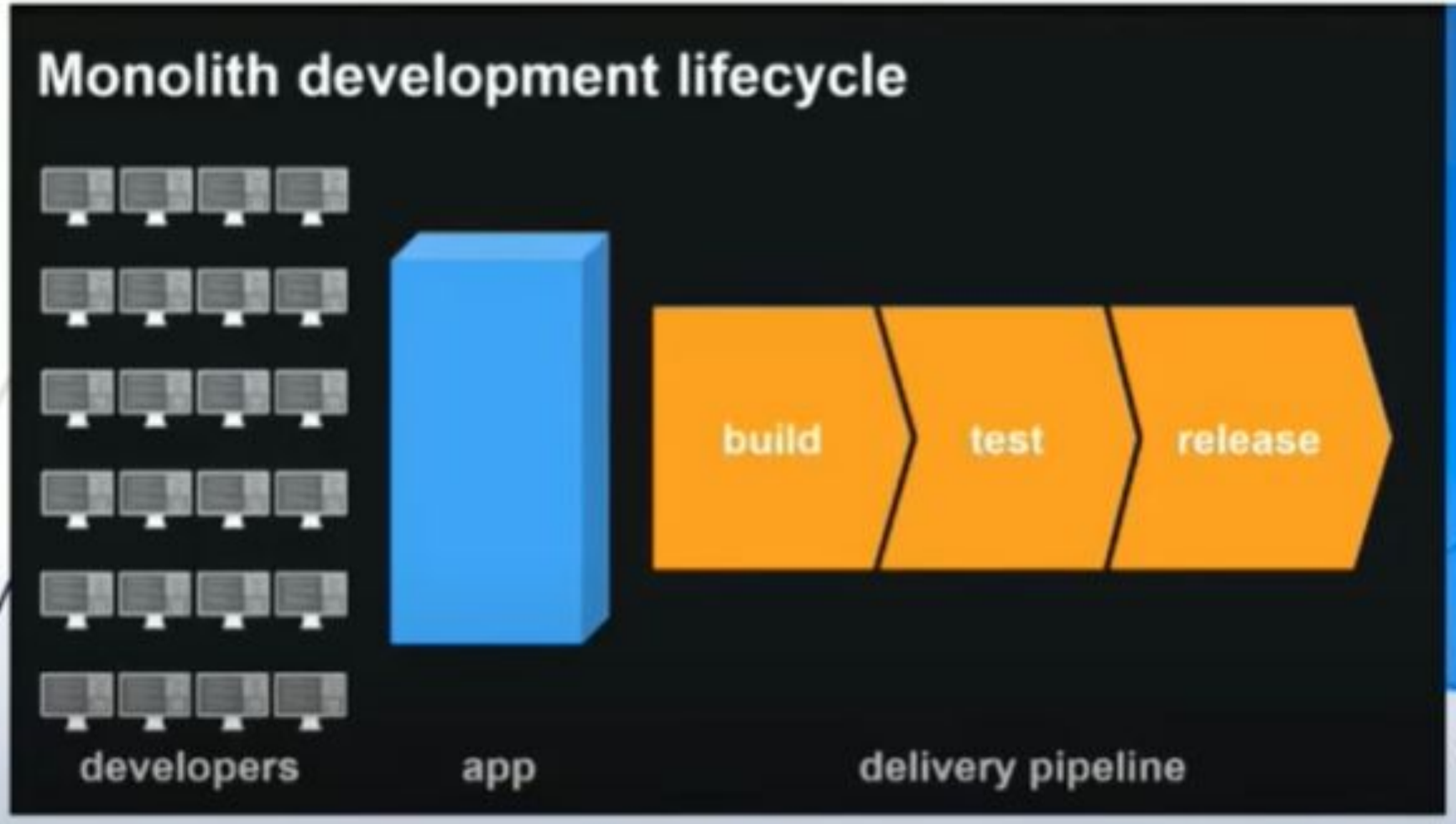
Very Low Friction

Putting it All Together



https://www.youtube.com/watch?v=esEFaY0FDKc
Rob Brigham: DevOps at Amazon, AWS Reinvent 2015

Embarrassingly Slow! (c. 2001)

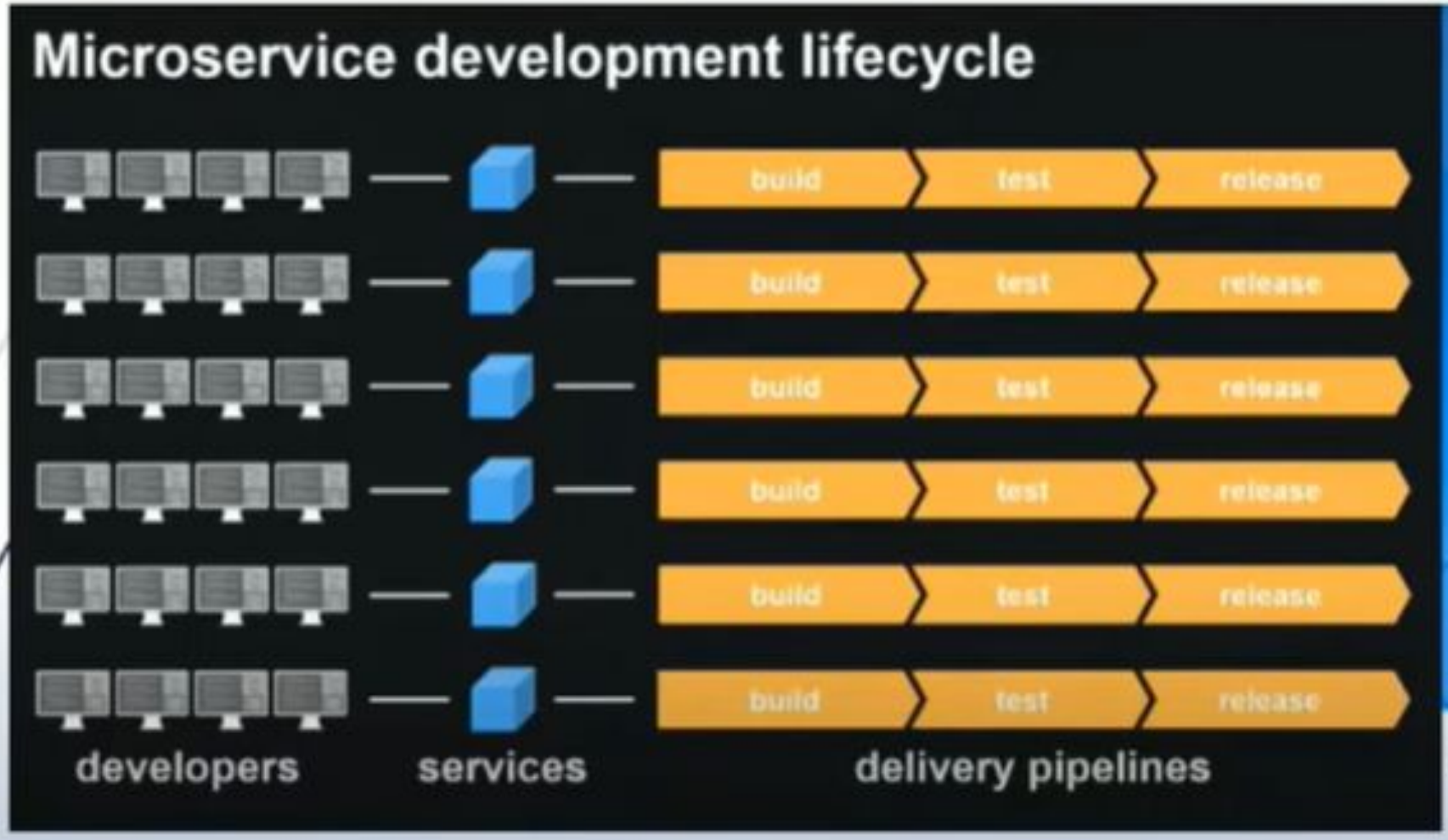


https://www.youtube.com/watch?v=esEFaY0FDKc
Rob Brigham: DevOps at Amazon, AWS Reinvent 2015

(The complete loop includes monitor, plan, build, test, and release an improved service.)

High Friction

50 Million Deployments / Year (2014)



https://www.youtube.com/watch?v=esEFaY0FDKc
Rob Brigham: DevOps at Amazon, AWS Reinvent 2015

(The complete loop includes monitor, plan, build, test, and release an improved service.)

Very Low Friction

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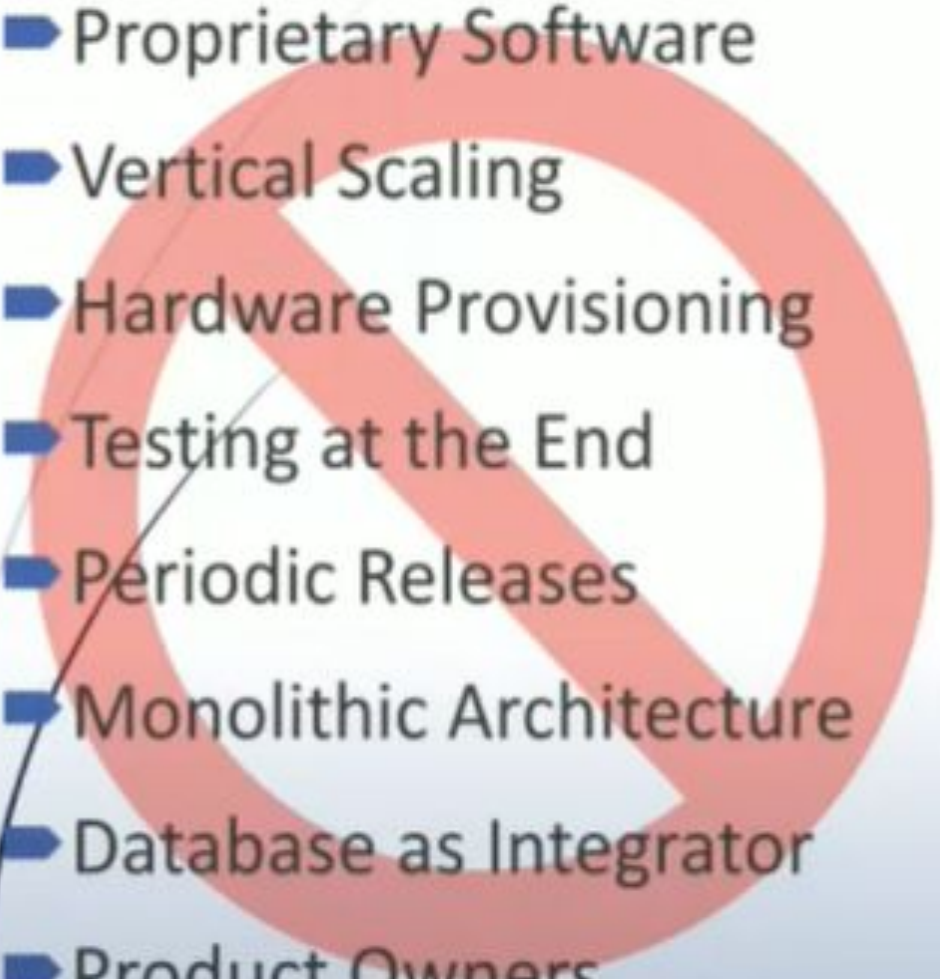
Technologies that Enable Business Agility



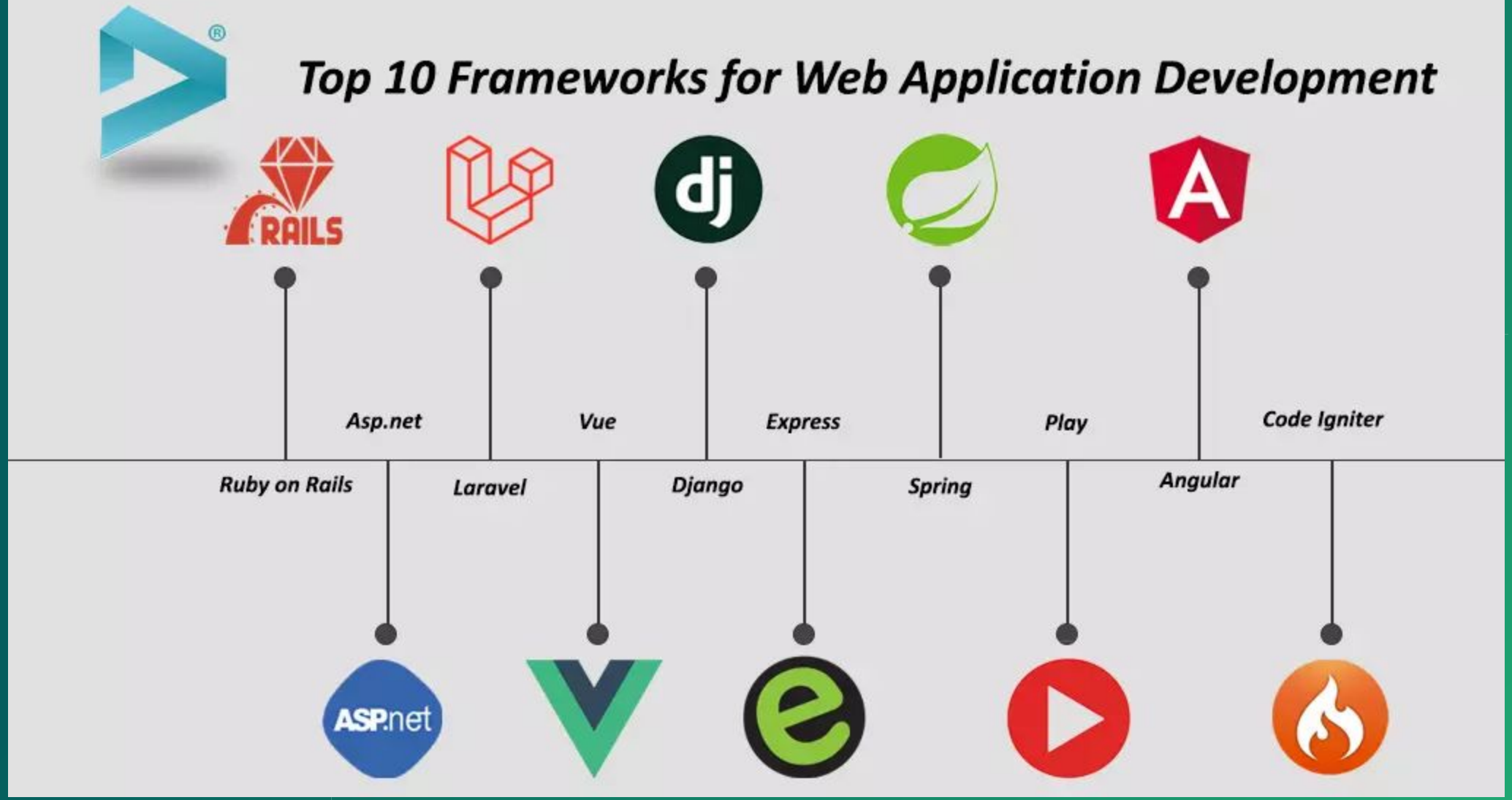
The Old Way

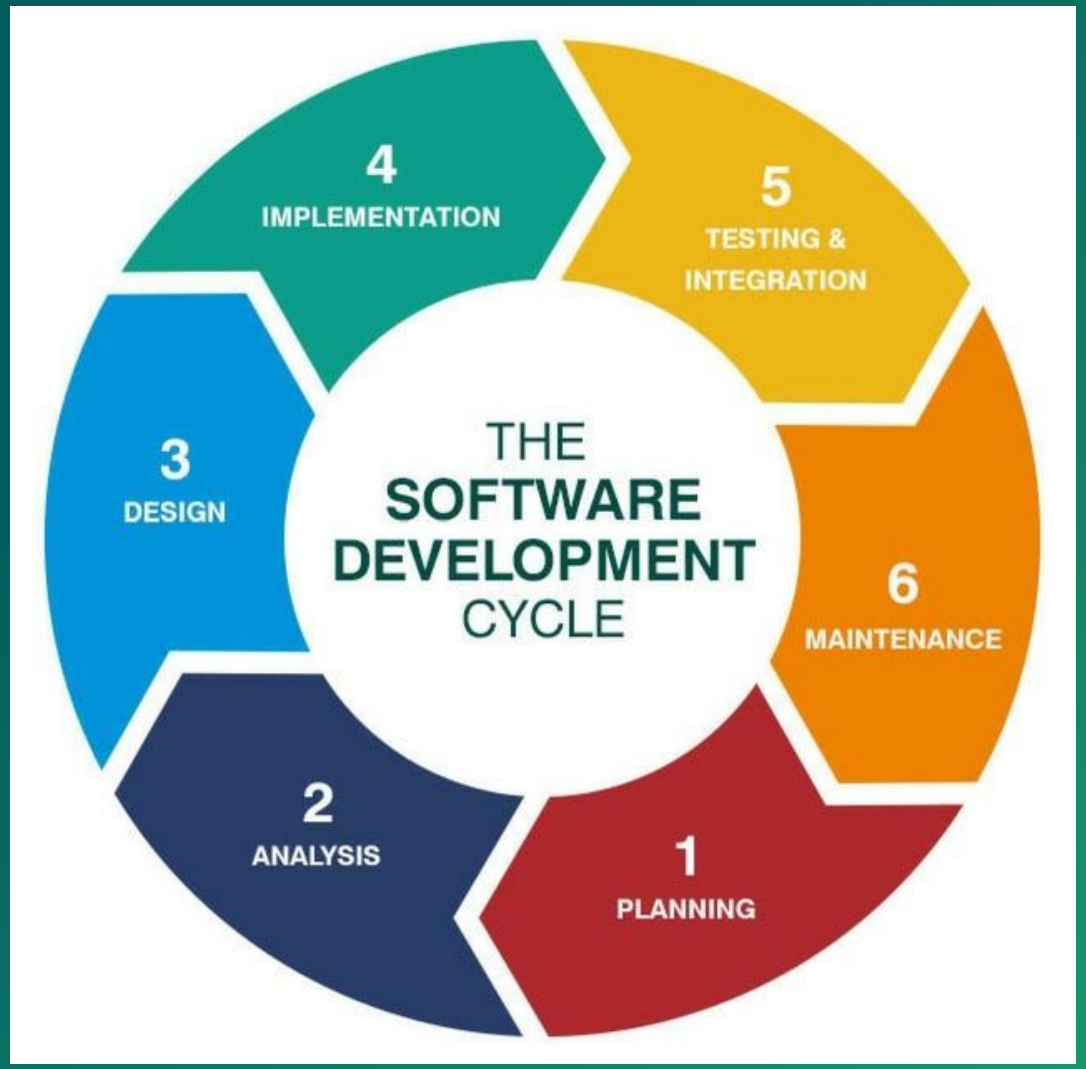
- Proprietary Software
- Vertical Scaling
- Hardware Provisioning
- Testing at the End
- Periodic Releases
- Monolithic Architecture
- Database as Integrator
- Product Owners
  (Not responsible for any of the above)

The New Way

- Open Source
- Horizontal Scaling
- On Demand Infrastructure
- Tests as Specification
- Continuous Delivery
- Federated Architecture
- API's as Integrators
- Single Threaded Leaders
  (Responsible for all of the above)

Top 10 Frameworks for Web Application Development




4
IMPLEMENTATION
5
TESTING &
INTEGRATION
3
DESIGN
THE
SOFTWARE
DEVELOPMENT
CYCLE
6
MAINTENANCE
2
ANALYSIS
1
PLANNING

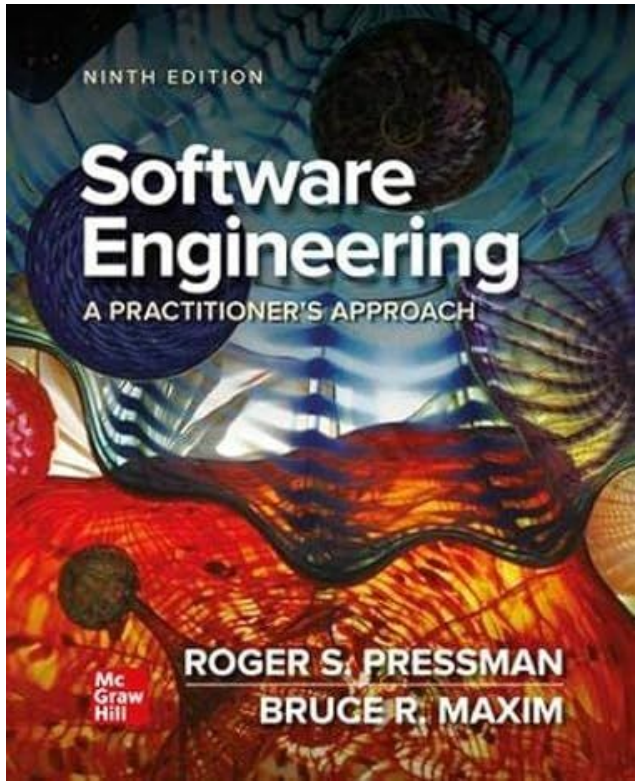
3 Course Config.

Grading

- Assignments= 20 points
  - 4 series of assignments.
- Projects= 30 points
  - 3 phases.
- Midterm = 30 points
  - Azar 11, 1402.
- Final = 30 points
- Late submission has 30% penalty (is allowed until revealing the answers).

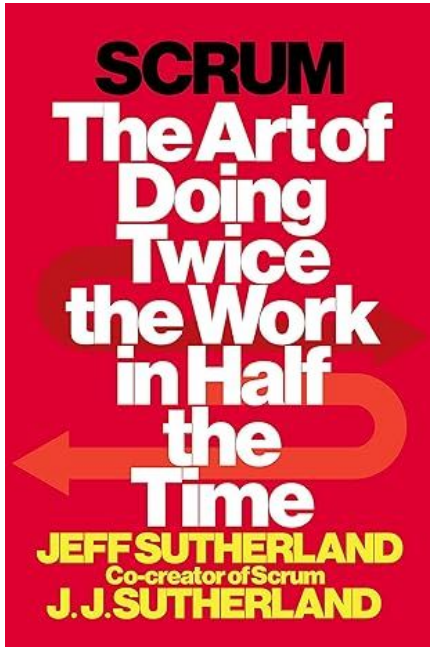
The Main Reference

- Software Engineering: A Practitioner's Approach, Roger Pressman and Bruce Maxim, 9th Edition, September 2019.



The Main Reference

- Scrum: The Art of Doing Twice the Work in Half the Time Hardcover, Jeff Sutherland, J.J. Sutherland, September 2014.



Complementary Resources

- Product Leadership: How Top Product Managers Launch Awesome Products and Build Successful Teams, Richard Banfield, Martin Eriksson, Nate Walkingshaw, 1st Edition, 2017.
- Software Engineering at Google: Lessons Learned from Programming Over Time, Titus Winters, Tom Manshreck and Hyrum Wright, 1st Edition, 2020.
- Clean Architecture: A Craftsman's Guide to Software Structure and Design, Robert Martin, 1st Edition, 2017.
- Domain-Driven Design: Tackling Complexity in the Heart of Software, Eric Evans, 1st Edition, 2003.
- Requirements Engineering for Software and Systems (Applied Software Engineering Series), Phillip A. Laplante, 3rd Edition, October 2017.

4 Contact the Instructor

- Email: mehran.alidoost.nia@gmail.com
- Telegram: @alidoostnia