Latest Trends in Software Architecture and Development

Boston .NET Architecture Group

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Robert Hurlbut

RobertHurlbut.com • @RobertHurlbut

ROBERT HURLBUT CONSULTING SERVICES

securedevelop.NET

Robert Hurlbut

Software Security Consultant, Architect, and Trainer

- Owner / President of Robert Hurlbut Consulting Services
- Microsoft MVP – Developer Security 2005-2009, 2015-2017
- (ISC)2 CSSLP 2014-2017

Contacts

- Web Site: https://roberthurlbut.com
- Twitter: @RobertHurlbut, @AppSecPodcast

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What is Software Architecture?*

Serves as system and project blueprint

Defines work of design and implementation teams

Exhibits qualities such as performance, availability, usability, modifiability, interoperability, security, etc.

An artifact for early analysis makes sure design approach will yield acceptable system

Helps identify design risks and mitigate them early in the development process

(* based on definition found at http://www.sei.cmu.edu/architecture/)

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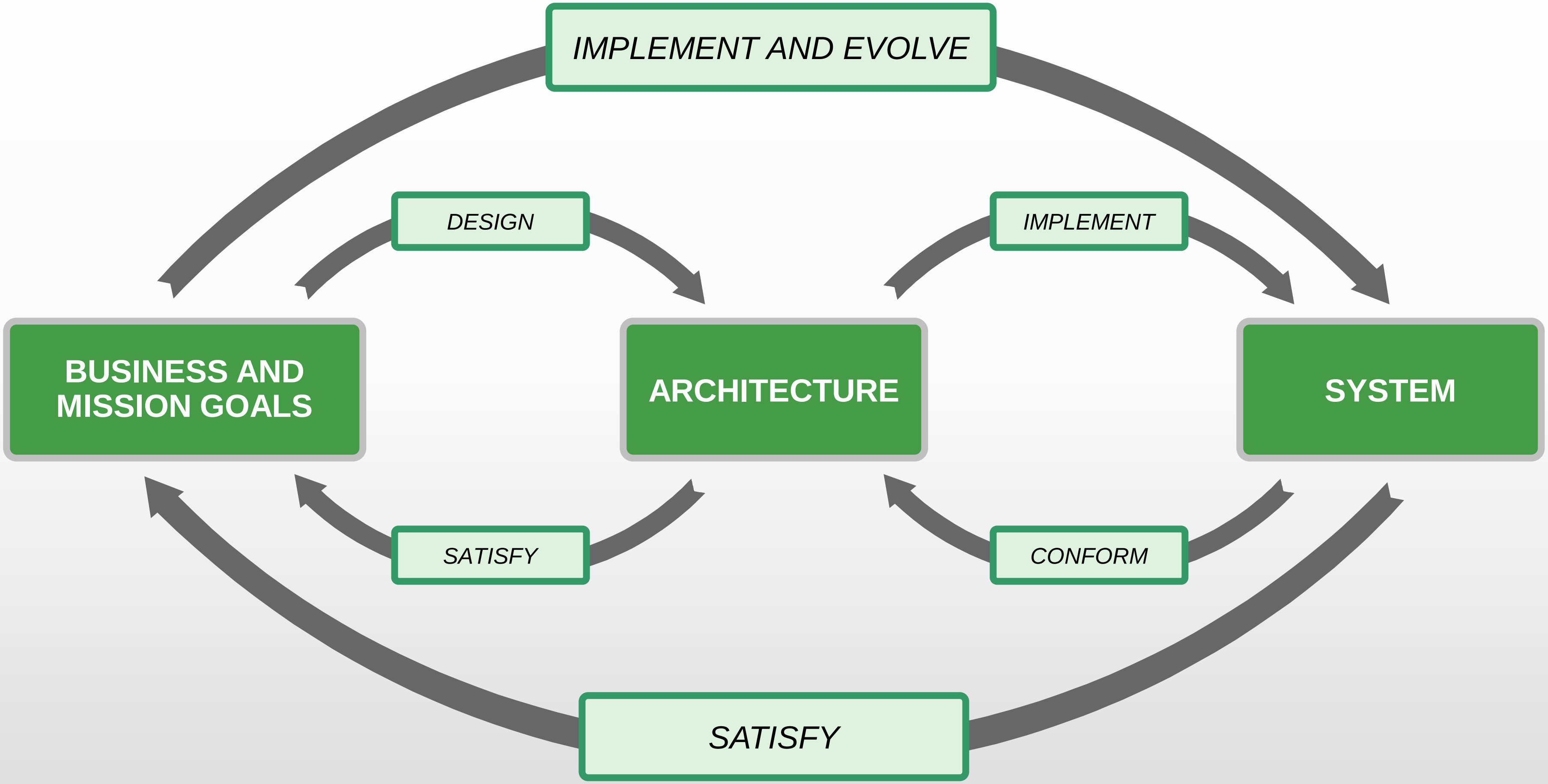
Central Role of Architecture*



(* based on resources found at http://www.sei.cmu.edu/architecture/)

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Architecture Advancements

Architectural patterns

Component-based approaches

Company specific product lines

Model-based approaches

Frameworks and platforms

Standard interfaces

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What’s changed?

- Increased connectivity
- Scale and complexity
  - decentralization and distribution
  - “big data”
  - increased operational tempo
  - inter-reliant ecosystems
  - vulnerability
  - collective action
- Disruptive and emerging technologies

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Software Development Trends (2014)* – Still valid in 2016?

Application frameworks

Open source

Cloud strategies

NoSQL (Hadoop – 2014, Spark – 2016?)

Machine Learning

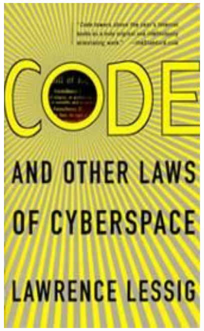
MDD (Model Driven Development)

Incremental approaches

Dashboards

Distributed development environments

DevOps



FREE CULTURE
HOW BIG MEDIA USES TECHNOLOGY AND THE LAW TO LOCK DOWN CULTURE AND CONTROL CREATIVITY
LAWRENCE LESSIG

(* based on resources found at http://www.sei.cmu.edu/architecture/)

Architecture and Accelerated Capability

How much architecture design is enough?

Can architecture design be done incrementally?

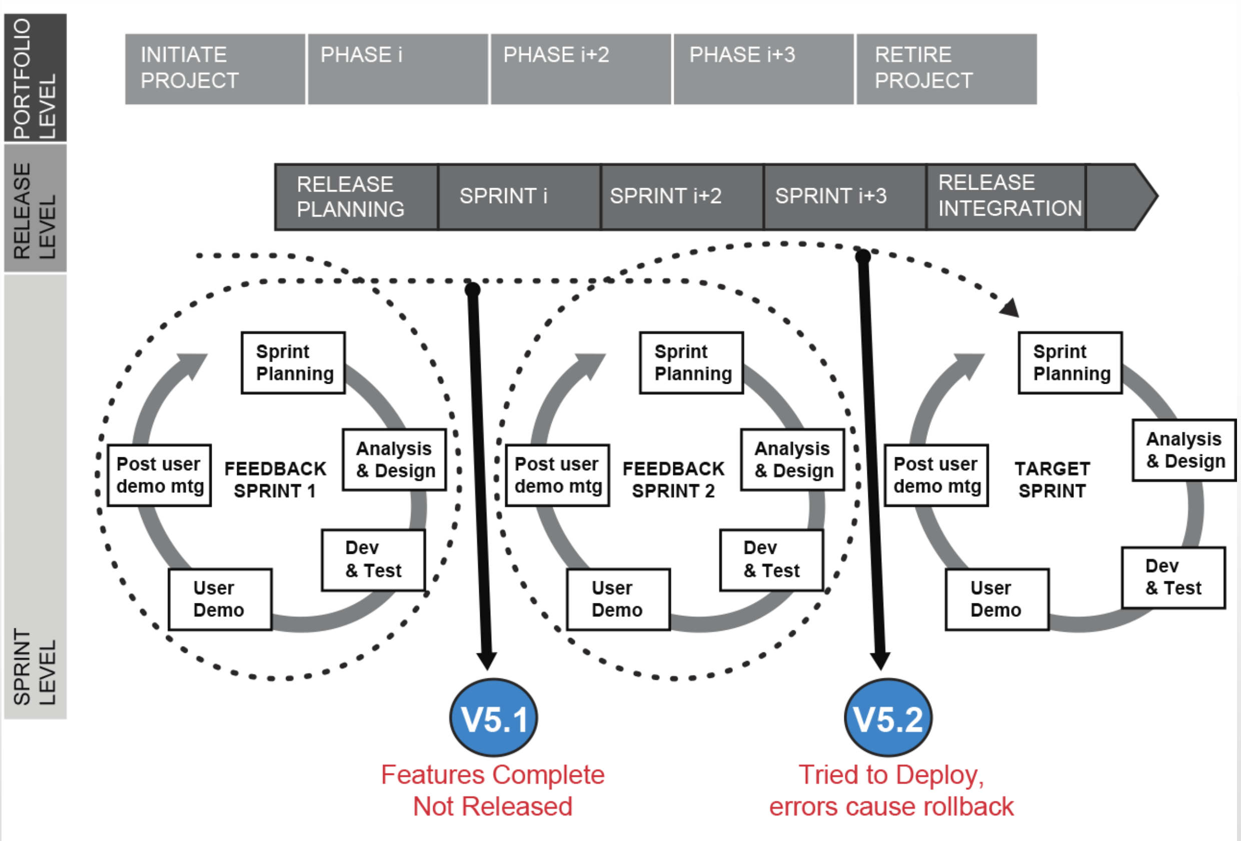
There is a difference between
being agile and doing agile.

Agility is enabled by architecture –
not stifled by it.

Managing technical debt is key.

Deployment Challenges

The **DevOps** movement continues what Agile started.



DevOps: State of the Practice

Focus is on

- culture and teaming
- process and practices
  - value stream mapping
  - continuous delivery practices
  - *Lean* thinking
- tooling, automation, and measurement
  - tooling to automate repetitive tasks
  - static analysis
  - automation for monitoring architectural health
  - performance dashboards

Architecture and DevOps

Design decisions that involve deployment-related limitations can blindside teams.

DevOps Tips

Don’t let designing for deployability be an afterthought.

Use measurable deployability quality attributes.

Consider architectural tactics that promote modifiability, testability, and operational resilience.

Use architectural abstractions to reason about deployability implications of design options and tradeoffs.

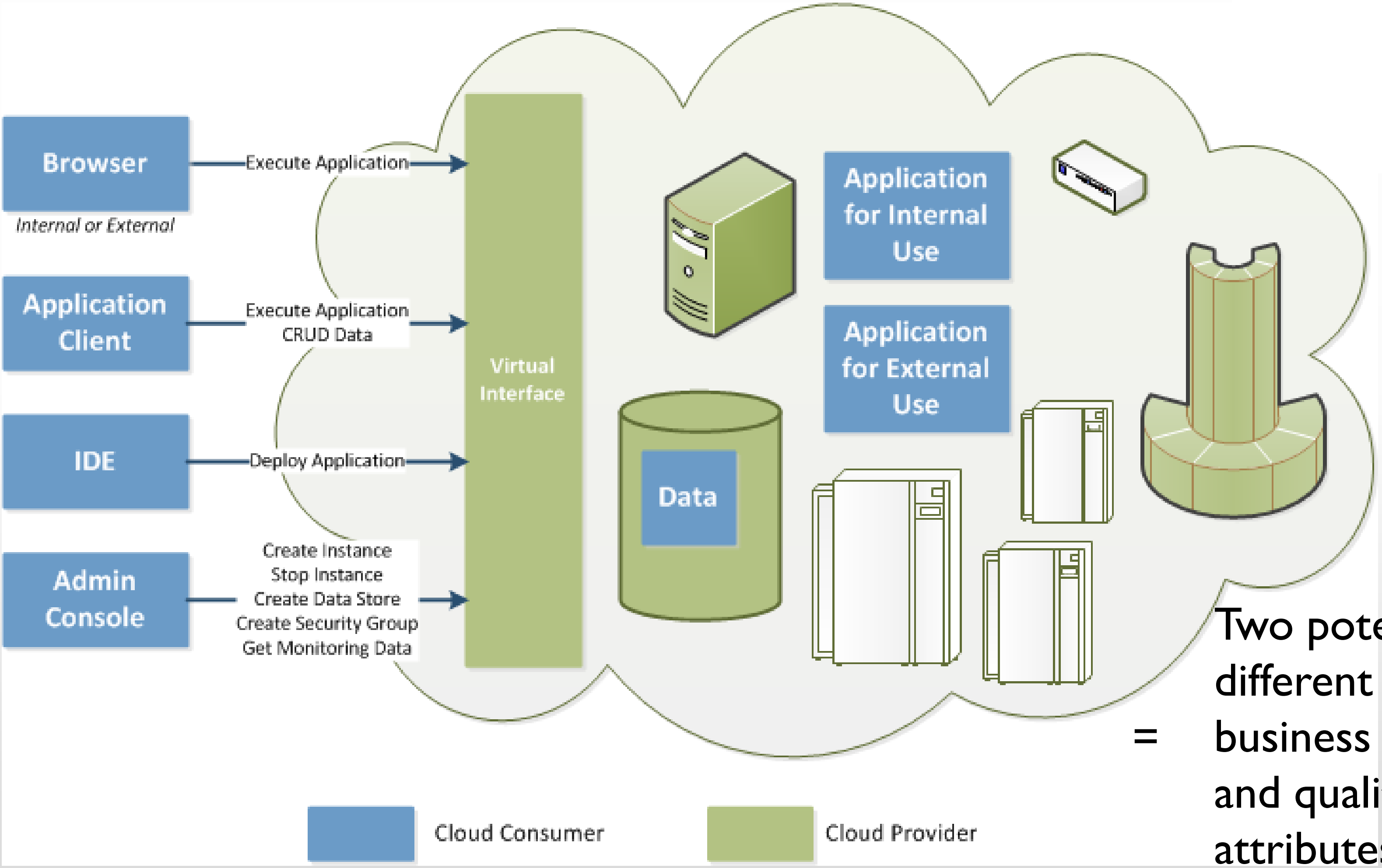
Establish monitoring mechanisms.

Architecture and Scale

- Cloud strategies
- Cloud strategies for mobility
- Big data

"Scale Changes Everything"

Two Perspectives of Software Architecture in Cloud Computing



= Two potentially different sets of business goals and quality attributes

Cloud Computing and Architecting

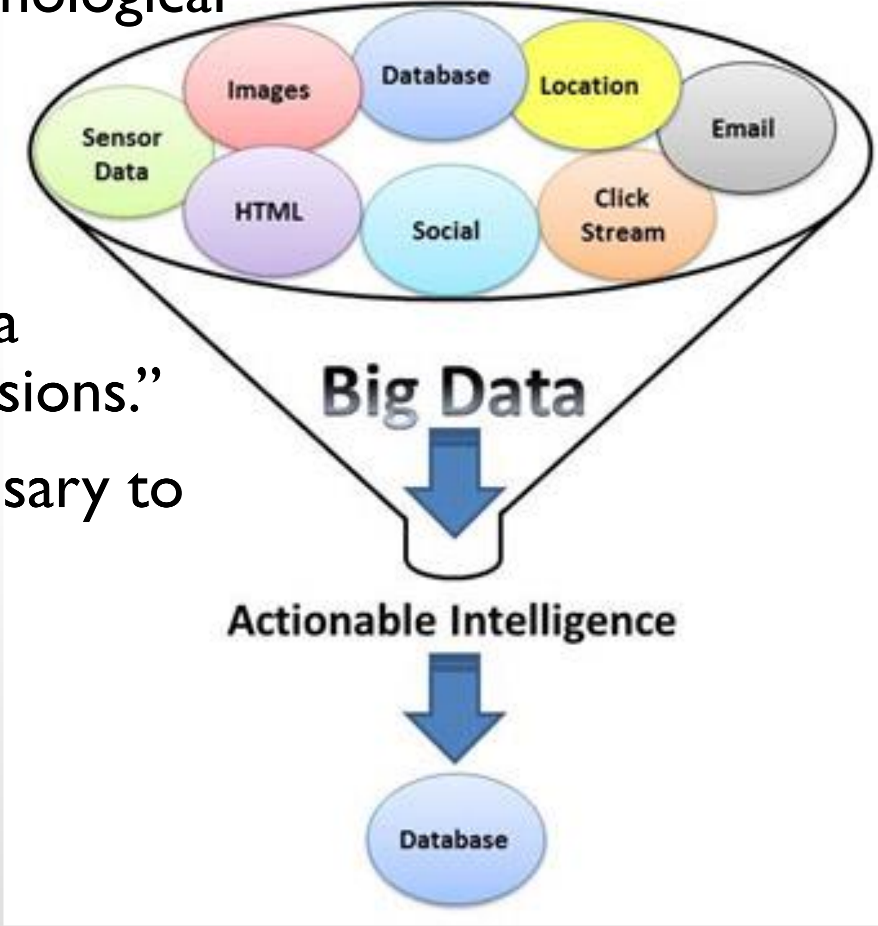
SLAs cannot prevent failures

In cloud environments,

- cloud consumers have to design and architect systems to account for lack of full control over important quality attributes.
- cloud providers have to design and architect infrastructures and systems that provide the most efficient way to manage resources and keep promises made in SLAs.

Big Data Systems

- Two very distinct but related technological thrusts
  - data analytics
  - Infrastructure
- Analytics is typically a massive data reduction exercise – "data to decisions."
- Computation infrastructure necessary to ensure the analytics are
  - fast
  - scalable
  - secure
  - easy to use



Big Data – State of the practice “The problem is not solved”

Building scalable, assured big data systems is hard.

HealthCare.gov
Take health care into your own hands

NETFLIX

amazon

Google

NASDAQ®

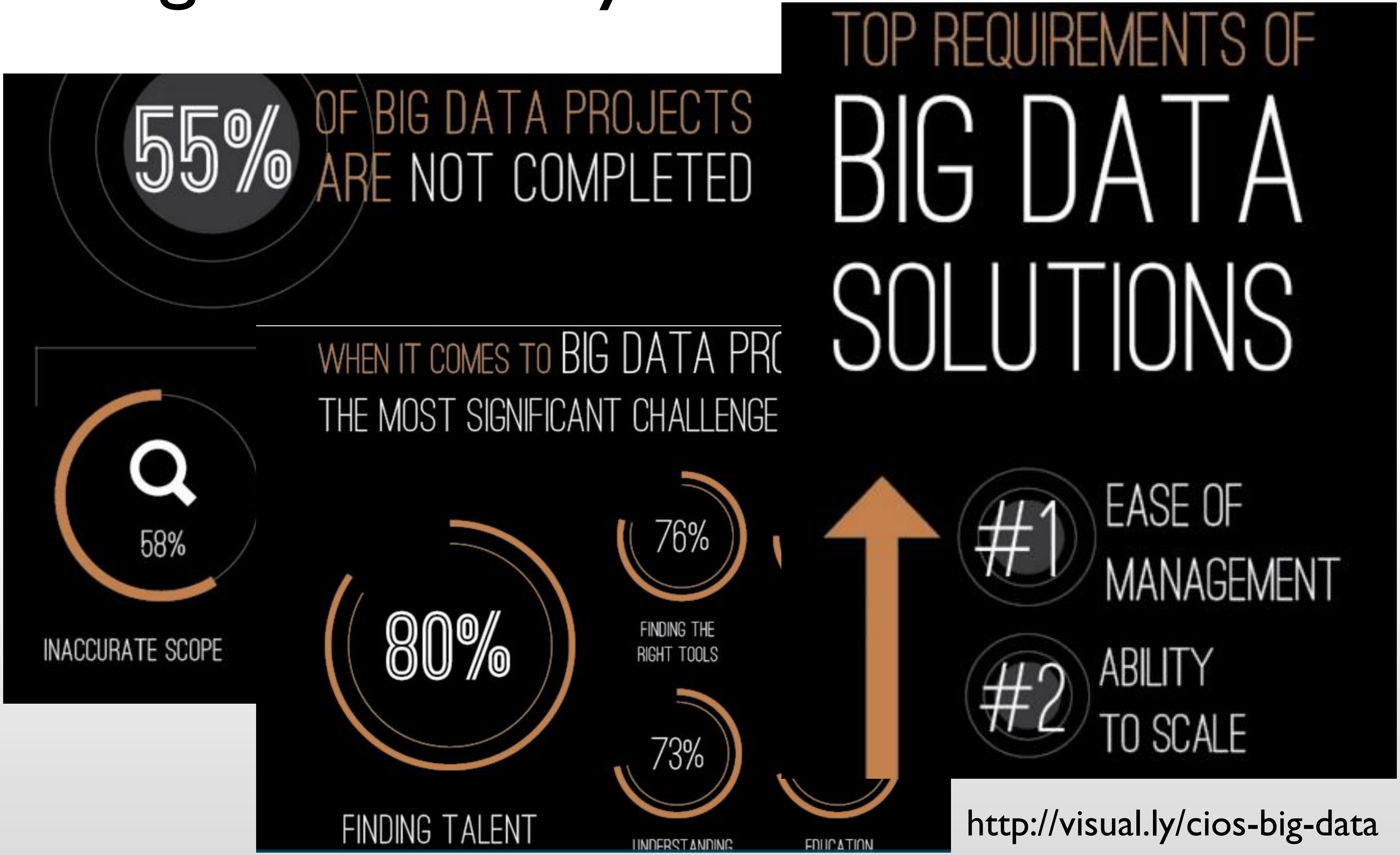
Building scalable, assured big data systems is expensive.

Google

facebook

amazon

Big Data Survey



55% OF BIG DATA PROJECTS ARE NOT COMPLETED

WHEN IT COMES TO BIG DATA PRO
THE MOST SIGNIFICANT CHALLENGE

TOP REQUIREMENTS OF BIG DATA SOLUTIONS

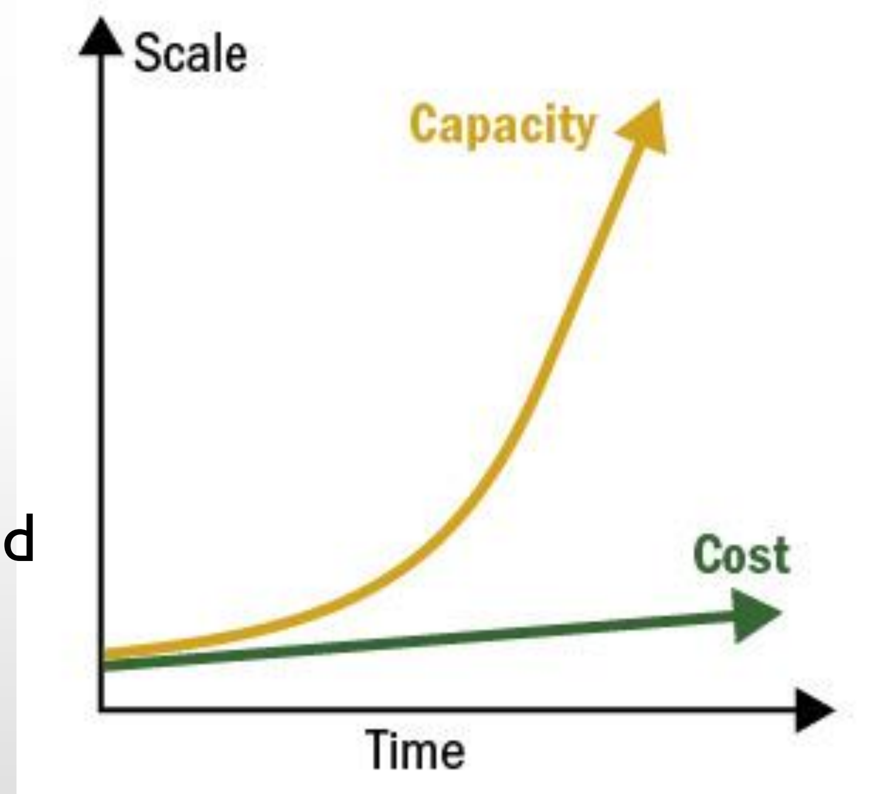
#1 EASE OF MANAGEMENT

#2 ABILITY TO SCALE

http://visual.ly/cios-big-data

Architecture and Big Data

- System costs must grow more slowly than system capacity.
- Approaches
  - scalable software architectures
  - scalable software technologies
  - scalable execution platforms
- Scalability reduces as implementation complexity grows.
- NoSQL models are not created equal.
- You can’t manage what you don’t monitor.



Software Development Trends Now and in Future (?)

Containers (Docker, etc.) vs VMs / Hypervisors

Microservices (Azure Service Fabric, etc.)

Real-time everything

JavaScript MVC UI Frameworks (Angular 2, React)

JavaScript Servers (node.js)

Typescript

.NET, Java, Python, PHP, Swift, Go

Mobile Web Apps vs Native Apps for Mobile Devices

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Application Security Trends

SDL – Secure Development Lifecycle

Threat Modeling / Secure Design

SAST – Static Application Security Testing

DAST – Dynamic Application Security Testing

Penetration Testing

Fuzzing

Incident Response

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Microsoft / .NET Development Trends Now and in Future(?)

.NET Core (ASP.NET Core 1) vs .NET Framework 4.6.x

SQL Server 2016

Azure – where is it going?

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Questions?

Contacts

Web Site: https://roberthurlbut.com

Twitter: @RobertHurlbut,
@AppSecPodcast

Email: robert at roberthurlbut.com

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