An Overview of Serverless Architecture

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Presented by Cope Crisson
Who I am from a Technical Perspective

Radio and TV repair - Atmore Area Vocational Training Center
U.S. Army, Signal Corp - Microwave Radio Repair and Operation
Texas Instruments - Software Engineer and Quality Assurance (20+ yrs)

Education:
- Associate of Applied Science - Electronics Technology
- Bachelor of Science - Computer Science
- Master of Liberal Studies - Information Networking and Telecommunication.

Teaching:
- Adjunct instructor since 1987
- Collin College adjunct since 1991
- Fulltime at Collin College since 1999
- Teach various classes in the Computer Networking program:
  IT Essentials, CCNA and CCNA Security, CCNP

Other:
- Computer Networking Discipline Lead
- Cisco Lab Manager
Why Am I Here?
- The Business and Industry Leadership Team (BILT) recommended investigation of Serverless Architecture as possible content for a course.
- Dr. Beheler ask if I would like to attend a Serverless Architecture Conference in Austin, Tx and make a short presentation to the BILT and/or members of NSF.
EVOLUTION OF COMPUTING

"... and this one comes with two trilobites of memory!"
Abacus
Electronic Calculators
Mainframe with terminal
Desktop
Computer Networks

- Communications
- Sharing Software
- Sharing Files
- Sharing Information
- Sharing Hardware
- Sharing Data
- Security
- Preservation
- Information
Client – server

Where have all the Servers gone?
Into the Cloud
Cloud services
Define and describe Serverless Architecture

• Serverless architectures refer to applications that significantly depend on third-party services (known as Backend as a Service or "BaaS") or on custom code that's run in ephemeral containers (Function as a Service or "FaaS"), the best known vendor host of which currently is AWS Lambda.

https://martinfowler.com/articles/serverless.html
Serverless Architecture

**SaaS**
Software as a Service
- Email
- CRM
- Collaborative
- ERP

**PaaS**
Platform as a Service
- Application Development
- Decision Support
- Web
- Streaming

**IaaS**
Infrastructure as a Service
- Caching
- Legacy
- Networking
- Technical
- Security
- System Mgmt
Cloud Layers

SaaS

PaaS

IaaS

Examples:
- SendGrid, Tivoli Live, Salesforce.com
- IBM BlueMix, Microsoft Azure, Cloudbees
- IBM SoftLayer, Amazon EC2, Rackspace

Infrastructure as a Service

• Infrastructure as a Service (IaaS) is a form of cloud computing that provides virtualized computing resources over the Internet.

• In an IaaS model, a third-party provider hosts hardware, software, servers, storage and other infrastructure components on behalf of its users. IaaS providers also host users' applications and handle tasks including system maintenance, backup and resiliency planning.

http://searchcloudcomputing.techtarget.com/definition/Infrastructure-as-a-Service-IaaS
Platform as a Service

• A category of cloud computing services that provides a platform allowing customers to develop, run, and manage applications without the complexity of building and maintaining the infrastructure typically associated with developing and launching an app.

• PaaS can be delivered in two ways:
  – as a public cloud service from a provider, where the consumer controls software deployment with minimal configuration options, and the provider provides the networks, servers, storage, operating system (OS), 'middleware' (e.g. Java runtime, .NET runtime, integration, etc.), database and other services to host the consumer's application;
  – or as a private service (software or appliance) inside the firewall, or as software deployed on a public infrastructure as a service.
Software as a Service

• Software as a service (SaaS) is a software distribution model in which a third-party provider hosts applications and makes them available to customers over the Internet.

• SaaS removes the need for organizations to install and run applications on their own computers or in their own data centers. This eliminates the expense of hardware acquisition, provisioning and maintenance, as well as software licensing, installation and support.

http://searchcloudcomputing.techtarget.com/definition/Software-as-a-Service
PRINCIPLES

• Use a service to execute code-on-demand
• Single purpose functions
• Event driven
• Powerful front end
• Use third party services

Serverless Architectures on AWS: With examples using AWS Lambda, Peter Sbarski p.9-12, Manning Publications, 2017
Basic Request-Response (client-server) Message Exchange Pattern

1. User performs an action that requires data from a database to be displayed.
2. A request is formed and sent from the client to the web server.
3. The request is processed and the database is queried.
4. Data is retrieved.
5. An appropriate response is generated and sent back.
6. Information is displayed to the user.
Vendor Specific Topologies
IBM OpenWhisk

https://medium.com/openwhisk/uncovering-the-magic-how-serverless-platforms-really-work-3cb127b05f71
Cloud Service Providers

- **Amazon Web Services**
- **Windows Azure**
- **Google Cloud Platform**
- **IBM Bluemix**
AWS Lambda

- AWS Lambda lets you run code without provisioning or managing servers. You pay only for the compute time you consume - there is no charge when your code is not running. With Lambda, you can run code for virtually any type of application or backend service - all with zero administration. Just upload your code and Lambda takes care of everything required to run and scale your code with high availability. You can set up your code to automatically trigger from other AWS services or call it directly from any web or mobile app.

  [Link to AWS Lambda]

  [Link to AWS Lambda]
Microsoft Azure is a growing collection of integrated cloud services that developers and IT professionals use to build, deploy, and manage applications through our global network of datacenters. With Azure, you get the freedom to build and deploy wherever you want, using the tools, applications, and frameworks of your choice.

- Deploy anywhere with your choice of tools
- Choose how you deploy Azure—connecting cloud and on-premises with consistent hybrid cloud capabilities and using open source technologies—for maximum portability and value from your existing investments.
- Build your apps, your way
- Use the tools and open source technologies you already know and trust, because Azure supports a broad selection of operating systems, programming languages, frameworks, databases, and devices.
- Extend on-premises data and apps
- Azure offers hybrid consistency everywhere: in application development, management and security, identity management, and across the data platform.
- Deploy the cloud on-premises
- Bring Azure capabilities to your datacenter with Azure Stack. Leverage the Azure portal, PowerShell, and DevOps tools experience and app model across the cloud and on-premises.
Why Google Cloud Platform?

**Future-Proof Infrastructure**
Secure, global, high-performance, cost-effective and constantly improving. We’ve built our cloud for the long haul.

**Seriously Powerful Data & Analytics**
Tap into big data to find answers faster and build better products.

**Serverless, Just Code**
Grow from prototype to production to planet-scale, without having to think about capacity, reliability or performance.

Everything You Need To Build And Scale
Based on the open source architecture of Cloud Foundry, the Bluemix cloud platform gives you the flexibility to integrate the development frameworks, languages, and services that suit your needs.

- **Mobile solutions**
- **IoT solutions**
- **Cognitive solutions**
- **Open architecture solutions**
- **Hybrid Cloud solutions**
IOpipe is a high fidelity metrics and monitoring service which allows you to see inside Amazon Lambda functions for better insights into the daily operations and development of serverless applications.

Find out when functions are performing poorly, why, and how to fix them. Discover how cold starts are affecting your application, and when. Debug your serverless applications faster with instant access to errors and logs.

Why Iopipe?

• Knowing what’s working and what isn’t is a basic and essential operational challenge for developers. The capability to debug your applications across dev, staging, and production environments is table stakes for any developer platform. Yet, today, this experience is lacking for developers of Function-as-a-Service applications on platforms such as AWS Lambda. It’s a new ecosystem and rapidly improving, but there’s a clear gap in tooling, especially around application performance and monitoring.

Few to none of the tools built for traditional application performance, server, or container monitoring have been adapted for serverless applications.

https://www.iopipe.com/
Use Box Platform to build secure content experiences in your web and mobile apps.

Box Platform helps you handle all the complexities of content in your apps. From UI to infrastructure, our platform provides an end-to-end solution for building secure and engaging content experiences.

https://www.box.com/platform
StackStorm is a powerful open-source automation platform that wires together all of your apps, services and workflows. It’s extendable, flexible, and built with love for DevOps and ChatOps.

StackStorm is a platform for integration and automation across services and tools. It ties together your existing infrastructure and application environment so you can more easily automate that environment. It has a particular focus on taking actions in response to events.

https://docs.stackstorm.com/overview.html
A Cloud Guru
AWS Certification and Training for the Amazon Cloud

• Certified Solutions Architect - Associate 2017
  Learn the major components of Amazon Web Services, and prepare for the associate-level AWS Certified Solutions Architect exam.

• Certified Security - Specialty 2017
  Learn about security within Amazon Web Services and pass this specialty exam.

• Amazon DynamoDB - From Beginner to Pro
  Deep dive and become an expert with Amazon's managed, scalable and fast NoSQL database platform, even if you’ve never used it before!

• Alexa Development For Absolute Beginners
  In this course you will learn how to build 10 different skills for the Amazon Echo / Alexa service.

• Serverless for Beginners - Build a Video Sharing App
  Get hands-on and build a fully serverless video sharing app on AWS, Auth0 and Firebase!

• AWS Tech Essentials
  Getting started with AWS? Learn the fundamentals of the cloud with our free Amazon Web Services tutorial for beginners.

https://acloud.guru/
Gone Serverless

The Serverless Framework is a core component of The Coca-Cola Company’s initiative to reduce IT operational costs and deploy services faster.” - Patrick Brandt, Solutions Architect

We’re all about the Internet of Garbage (IoG). We’re bringing sensors and big data analytics to residential garbage routes so municipalities can reduce expenses, reduce emissions and provide better services to their citizens.

the leading global consumer robot company, designs and builds robots that empower people to do more both inside and outside of the home.
**Pros:**
- Reduced operational cost
- Backend as a Service (BaaS)- reduced development cost
- Function-as-a-Service (FaaS)- scaling costs
- Easier Operational Management
- ‘Greener’ computing?

**Cons:**
- Vendor control- With any outsourcing strategy you are giving up control of some of your system to a 3rd-party vendor.
- Vendor lock-in- It’s very likely that whatever Serverless features you’re using from a vendor that they’ll be differently implemented by another vendor.
- Security concerns- increased number of different security implementations. increased surface area for malicious intent.
- Multitenancy Problems - multiple running instances of software for several different customers (or tenants) are run on the same machine, and possibly within the same hosting application.

[https://martinfowler.com/articles/serverless.html#benefits](https://martinfowler.com/articles/serverless.html#benefits)
Links

• Youtube link for presentations
  https://www.youtube.com/channel/UCqlcVgk8SkUmve4Kw4xSlgw
• Link to Serverless topologies:
  https://www.google.com/search?q=&tbm=isch&tbs=rimg:Cakr1vv4CVgHljgb5px73ScfEADbV0yhswQjIPMzDdvW1sf6KrqkOZ7RyLwnQF9_1yZNwrD6Hh6-FkTbQkMUMQPiSoCRvnmHvdJx8QEwYQzixC7VLMKhJANFt1tWHiGwRoagdlKjQzAqEgnBCMg8zMN29RGJ0QveWUO1-CoSCaWx_1oquqQ5nEbnwufKjMmP9KhJtHlvCdAX3_1IR8skjqKe4Y30qEglk3CsPoeHr4RFOzrtj8xKpKSoSCWRNtCQxCxA-Ea34RiHqjjf-&tbo=U&sa=X&ved=0ahUKEwjOsb_JpbvUAhW14MKHQ3BACgQ9C8lHA&biw=1280&bih=666&dpr=1

References for images

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https://en.wikipedia.org/wiki/ENIAC
http://www.tvdsb.ca/webpages/baxterc/resources.cfm?subpage=134829
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