Running BSD on AWS

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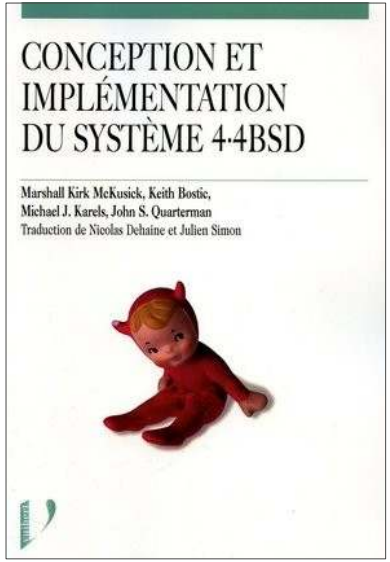
Who we are

Julien



https://medium.com/@julsimon

@julsimon

Nicolas

https://nuage.ninja

@nuage_ninja

Agenda

- AWS Infrastructure
- Instances, VMs, OSes
- Building BSD AMIs
- Benchmarking ‘buildworld’
- Q&A

AWS Infrastructure

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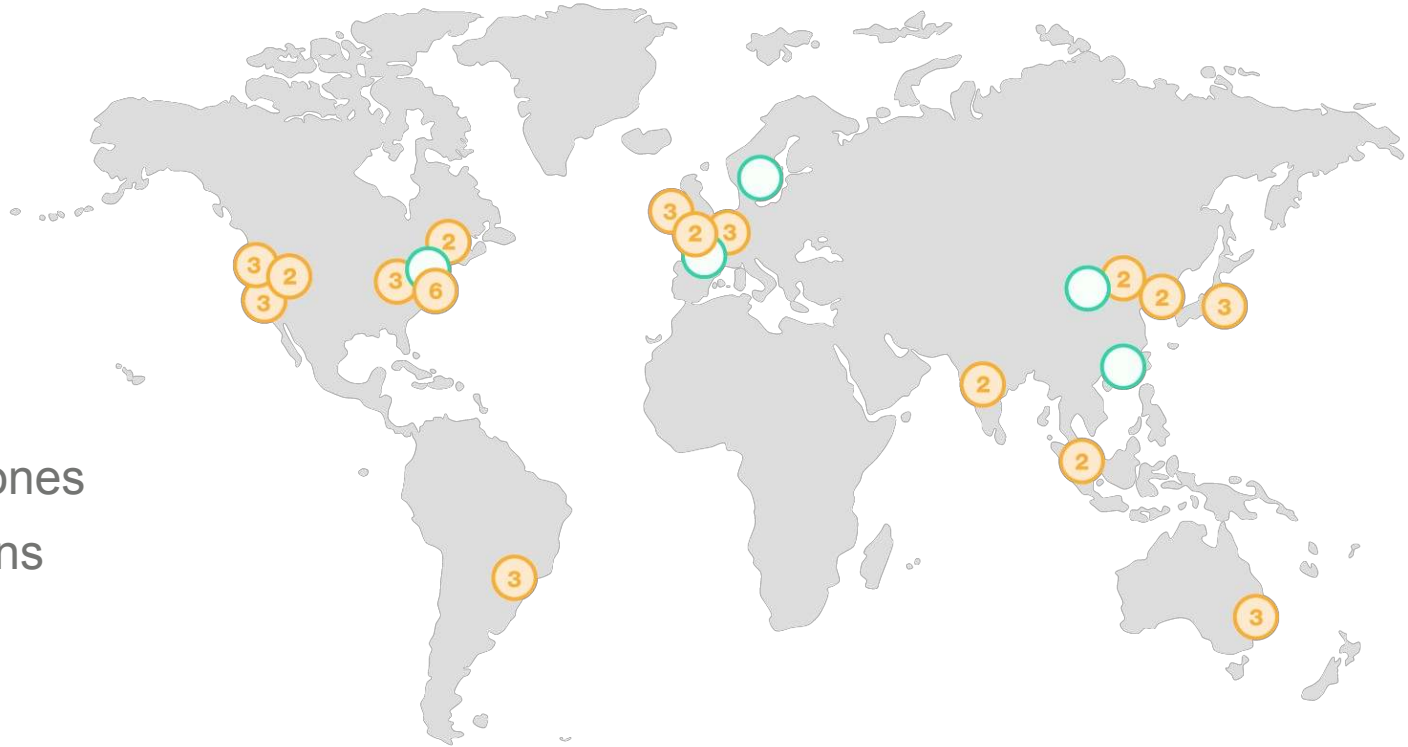
AWS Global Infrastructure



16 Regions

44 Availability Zones

91 Edge Locations

https://aws.amazon.com/about-aws/global-infrastructure/

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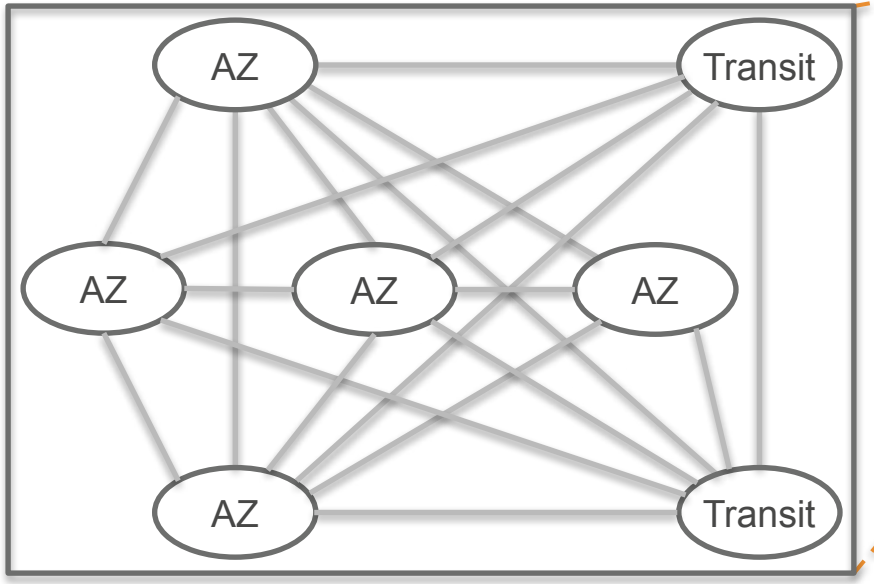
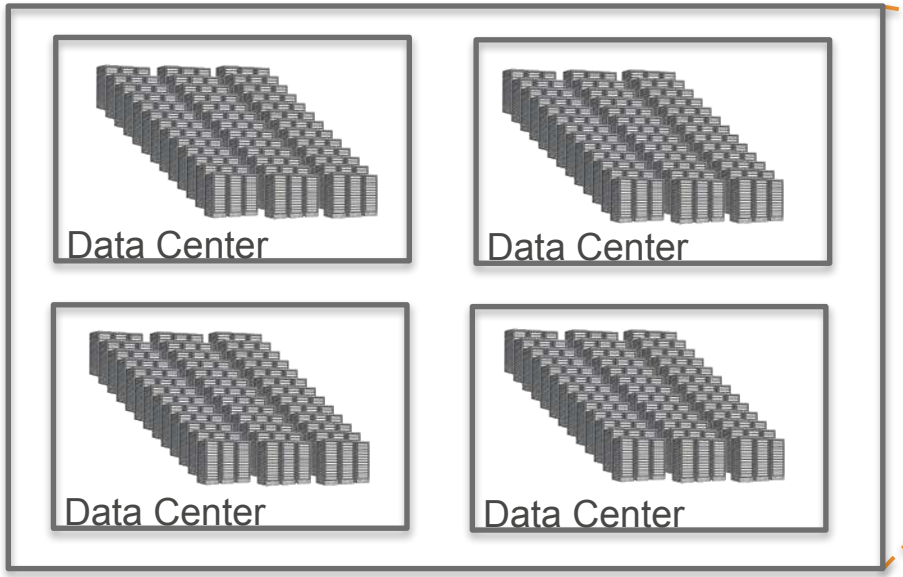
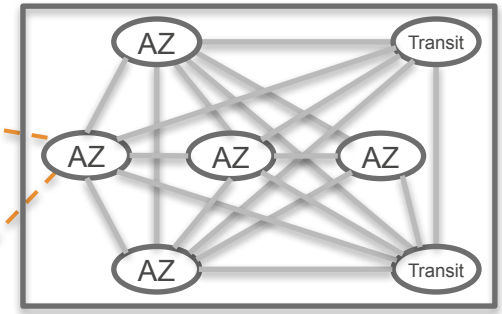
Example AWS Region



- Redundant paths to transit centers
- Transit centers connect to:
  - Private links to other AWS regions
  - Private links to AWS Direct Connect customers
  - Internet through peering & paid transit
- Metro-area DWDM links between AZs
- AZs <2ms apart & usually <1ms

Example AWS Availability Zone





- All regions have 2 or more AZs
- Each AZ is 1 or more DC
  - No data center is in two AZs
  - Some AZs have as many as 6 DCs
- DCs in AZ less than ¼ ms apart

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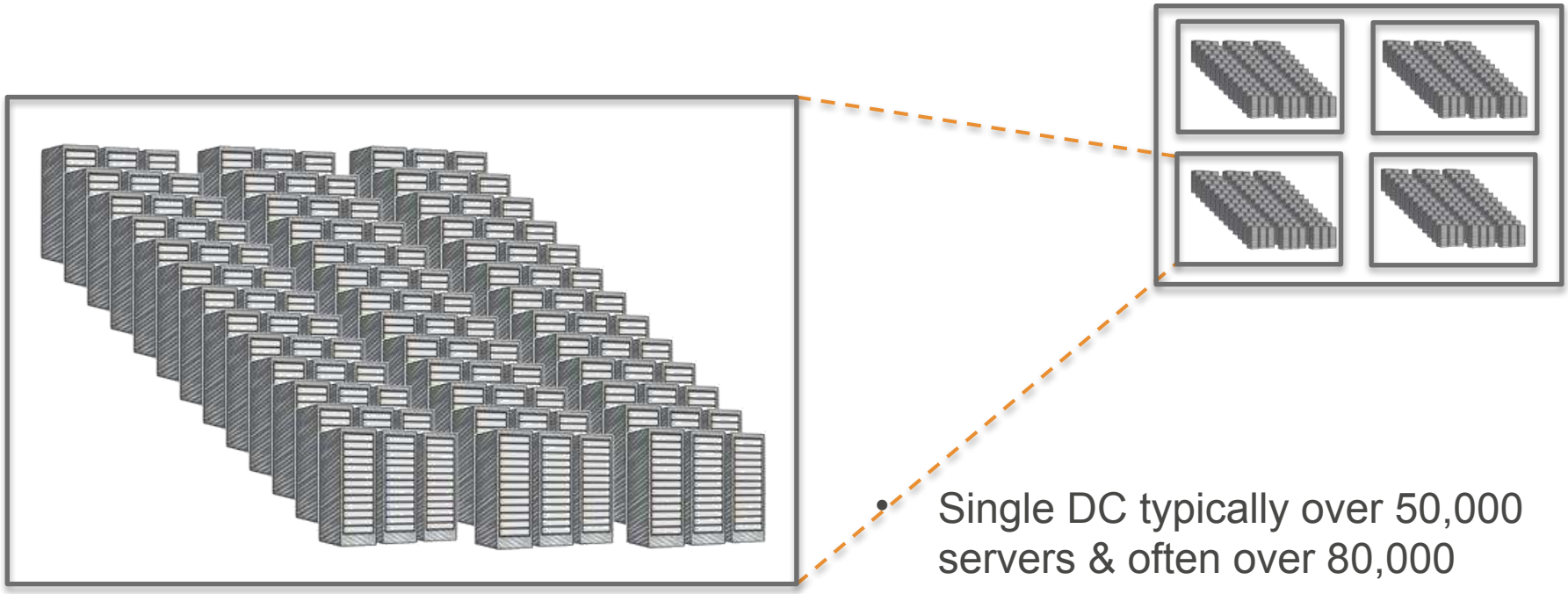
Example AWS Data Center



- Single DC typically over 50,000 servers & often over 80,000
  - Larger DCs undesirable (blast radius)
- Custom network equipment
- Custom protocol stack

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Instances, Virtual Machines & Operating Systems

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Amazon EC2 AWS Free Tier

- Infrastructure as a Service, launched in 2006
- Virtual machines (“EC2 instances”) and images (“Amazon Machine Image”, “AMI”)
- Amazon AMIs, vendor AMIs (“EC2 Marketplace”), community AMIs, or your own

- All-inclusive: networking (Virtual Private Cloud), storage (Elastic Block Storage), firewalling (Security Group), load balancing (Elastic Load Balancing), high availability (Availability Zones), automatic scaling (Auto Scaling groups), monitoring (Cloudwatch)

- **Until now**, pay on an hourly basis. Reserved Instances and Spot for large savings
- **Starting October 2nd**, pay on a per second basis, minimum 1 minute (boot time)

https://aws.amazon.com/ec2/
http://aws.amazon.com/free/
https://aws.amazon.com/ec2/pricing/reserved-instances/
https://aws.amazon.com/ec2/spot/

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« *I can get less expensive VMs at X, Y or Z* »

- Comparing apples and oranges?

- Take a long hard look at:
  - Geographical coverage
  - Width and depth of technical services
  - High availability: not all “regions” are born equal
  - Scalability
  - Security
  - Compliance

05/01/16 https://aws.amazon.com/blogs/aws/happy-new-year-ec2-price-reduction-c4-m4-and-r3-instances/
11/08/16 https://aws.amazon.com/blogs/aws/amazon-elastic-block-store-ebs-update-snapshot-price-reduction-more-piopsgib/
14/11/16 https://aws.amazon.com/blogs/aws/ec2-price-reduction-c4-m4-and-t2-instances/
03/05/17 https://aws.amazon.com/blogs/aws/ec2-price-reductions-reserved-instances-m4-instances/

Instances Types

<Family><Generation>.<Size>, e.g. m4.xlarge

General purpose: t2 (burstable), m4
Compute-optimized: c4
Storage-optimized: i3 (I/O), d2 (Density)
Memory-optimized: r4, x1
GPU: g3, p2

t2.nano: 1 vCPU, 512MB RAM, EBS storage
x1e.32xlarge: 128 vCPU, 4TB RAM, 2x1920 GB SSD, 25Gb network

https://aws.amazon.com/ec2/instance-types/

AWS EC2 Instances with Intel Xeon

AWS Instance Type	High Memory X1	Compute-Optimized C4	Storage-Optimized D2	General Purpose M4	Memory-Optimized R4	IO-Optimized I3	Graphics-Optimized G3	Burstable Performance T2
Intel Xeon Processor	E7-8880 v3	E5-2666 v3	E5-2676 v3	E5-2686 v4 E5-2676 v3	E5-2686 v4	E5-2686 v4	E5-2686 v4	Intel Xeon Family
Intel AVX	AVX 2.0	AVX 2.0	AVX 2.0	AVX 2.0	Yes	Yes	Yes	Yes
Intel AES-NI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Intel Turbo Boost	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intel TSX	Yes	No	No	No	No	No	No	No
Per core P- and C-state control	No	Yes (8xlarge only)	No	No	No	No	No	No
SSD Storage	EBS Optimized by default	EBS Optimized by default	No	EBS: Optimized by default	Yes	Yes	EBS: Optimized by default	EBS only

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X1e Instance - Tons of Memory

- Features up to 4TB of memory and 128 vCPU.
- Uses Intel E7 v3 Haswell processors.
- Features the new generation 25Gbps ENI.
- Is designed for demanding enterprise workloads, including production installations of SAP HANA, Microsoft SQL Server, Apache Spark, and Presto.

C4 Instance - Tons of Compute

- Uses Intel Xeon E5-2666 v3 Haswell processors @ 2.9Ghz
- Features up to 36 vCPU and 60GB of RAM
- Designed to deliver maximum single core performance (C-state, P-state, TurboBoost up to 3.5GHz) to compute-intensive applications

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I3 Instance - Tons of I/O

- Uses Intel Xeon E5-2686 v4 Broadwell processors @ 2.3Ghz
- Features up to 488GB of memory, 64 vCPU.
- Up to 15.2TB of SSD Storage: 8 NVMe SSDs, 3.3M IOPS
- Features the new generation 25Gbps ENI.
- Is designed for high throughput and low latency including relational databases, NoSQL databases, search engines, data warehouses, real-time analytics, and disk-based caches.

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AWS EC2 Storage Options – EBS Volumes

	Solid-State Drives (SSD)		Hard Disk Drives (HDD)	
	General Purpose SSD	Provisioned IOPS SSD	Throughput-Optimized HDD	Cold HDD
Max volume size	16 TiB	16 TiB	16 TiB	16 TiB
Max IOPS/volume	10,000	20,000	500	250
Max throughput/volume	160 MiB/s	320 MiB/s	500 MiB/s	250 MiB/s
Use cases	• Recommended for most workloads • System boot volumes • Virtual desktops • Low-latency interactive apps • Development and test environments	• I/O-intensive workloads • Relational DBs • NoSQL DBs	• Streaming workloads requiring consistent, fast throughput at a low price • Big data • Data warehouses • Log processing • Cannot be a boot volume	• Throughput-oriented storage for large volumes of data that is infrequently accessed • Scenarios where the lowest storage cost is important • Cannot be a boot volume

AWS EC2 Storage Options – Instance Storage

- Is local, complimentary direct attached block storage.
- Includes availability, number of disks, and size based on EC2 instance type.
- Is optimized for up to 3.3M IOPS.
- Is SSD or magnetic.
- Has no persistence.
- Automatically deletes data when an EC2 instance stops, fails or is terminated.

Benchmarking ‘buildworld’

	C4	X1	I3
RAM	60GB	2TB	488GB
Compute	36 vCPU Intel Haswell	128 vCPU Intel Haswell	64 vCPU Intel Broadwell
Storage	EBS 10k PIOPS SSD	Instance store 2 x 1.92TB SSD	Instance store 8 x 1.92TB NVMe
Filesystem	UFS	UFS	ZFS (2 4-disk pools)
SSD time			
Ramdisk time			
Price			

Benchmarking ‘buildworld’

- x1.32xlarge
  /usr/src on first local SSD, /usr/obj on second local SSD (ufs)
  make –j128
- c4.8xlarge
  /usr/src and /usr/obj on same EBS volume (SSD, 10k IOPS, ufs)
  make –j36
- i3.16xlarge
  /usr/src and /usr/obj on 2 ZFS pools (4 local NVMe SSD each)
  make –j64

Building BSD AMIs

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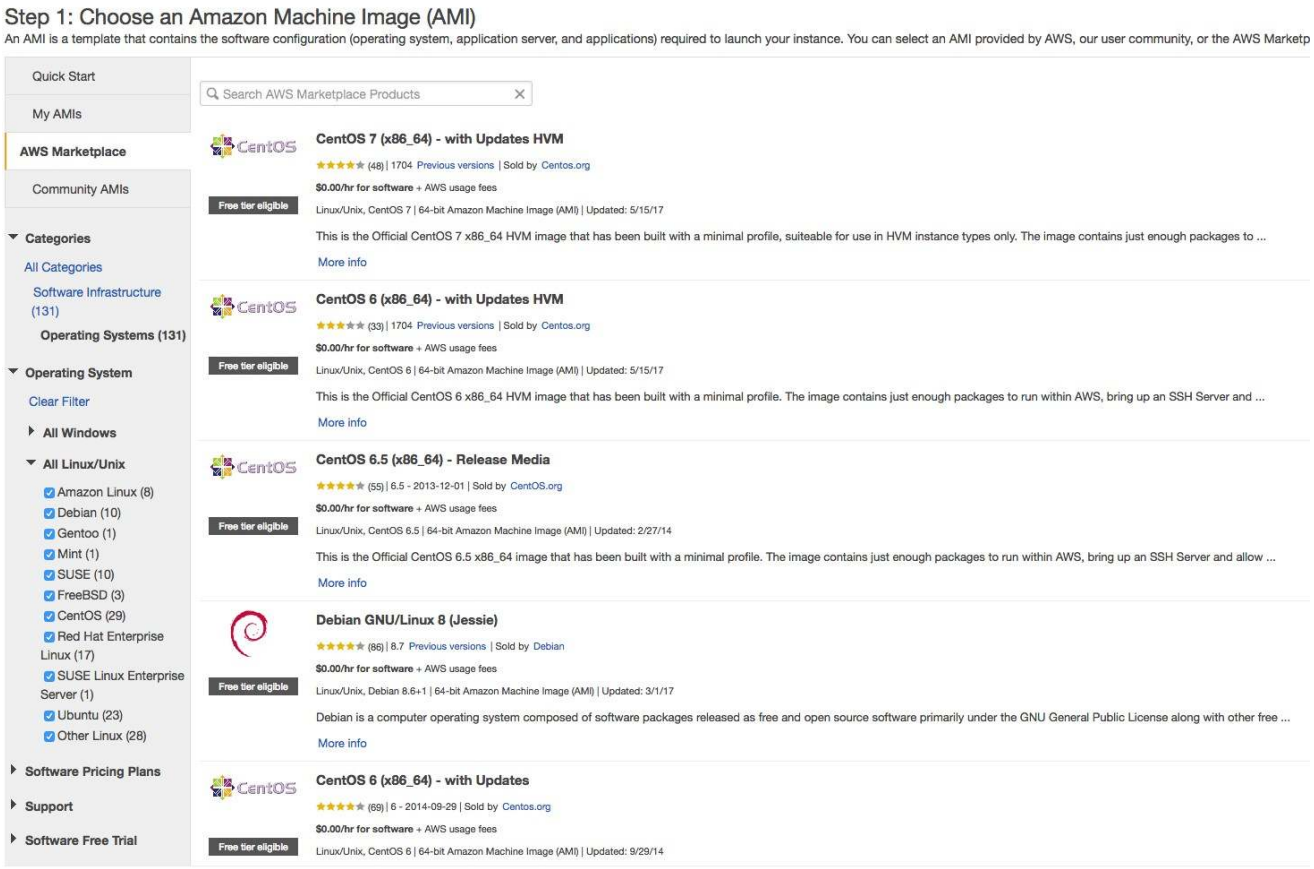
130+ UNIX AMIs on the AWS Marketplace



CentOS

debian GNU/Linux

FreeBSD

redhat

NetBSD

SUSE We adapt. You succeed.

OpenBSD

ubuntu

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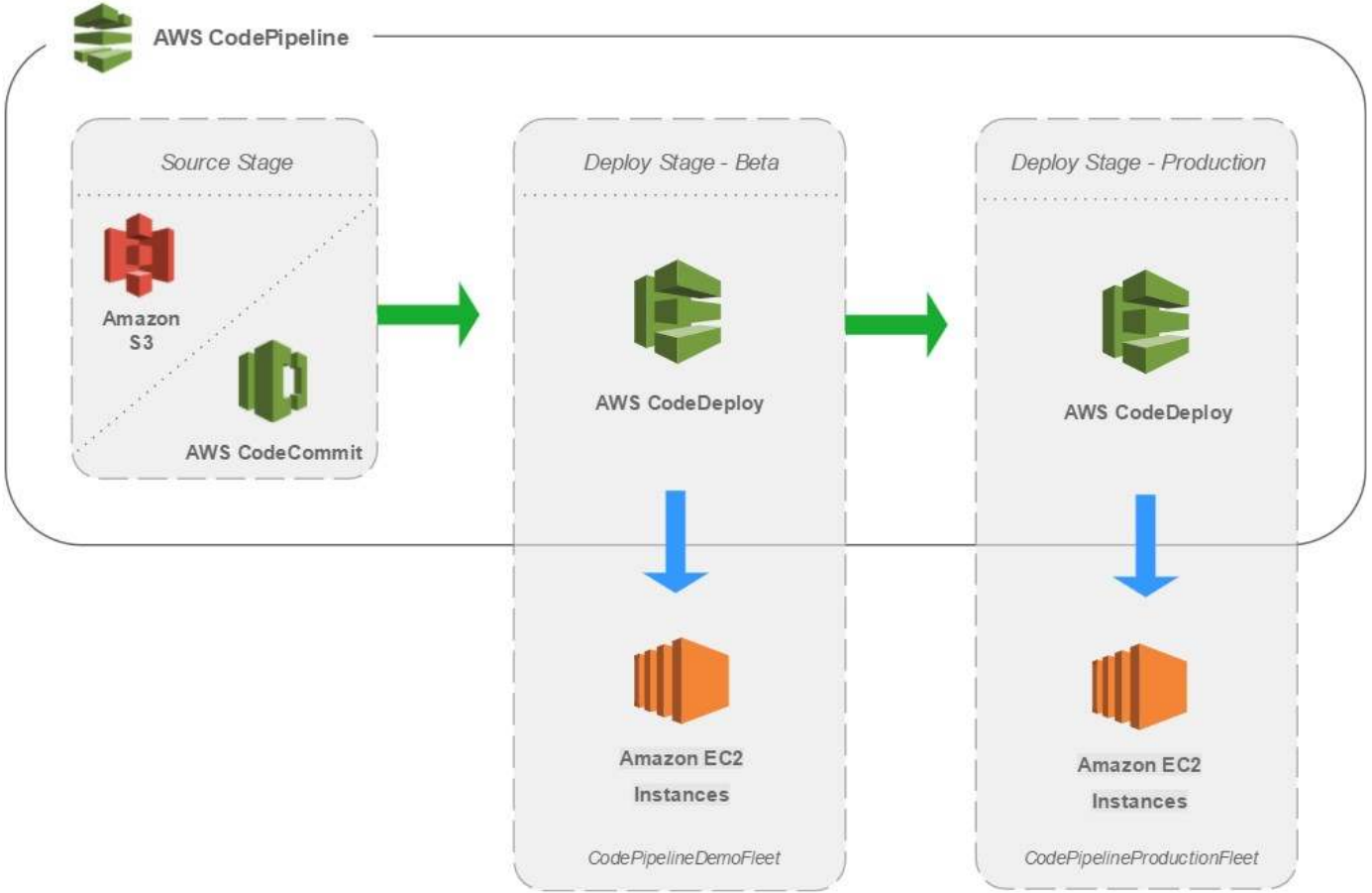
https://aws.amazon.com/marketplace/

Baking your own AMI

- AWS CLI/AWS Shell CLI: aws ec2 create-image.
- Aminator: Netflix tool, EC2 only for Red Hat and CentOS.
- Packer: Hashicorp tool, more features.

http://docs.aws.amazon.com/cli/latest/reference/ec2/create-image.html
https://github.com/Netflix/aminator
https://www.packer.io

BSD AMI factory – 1/4

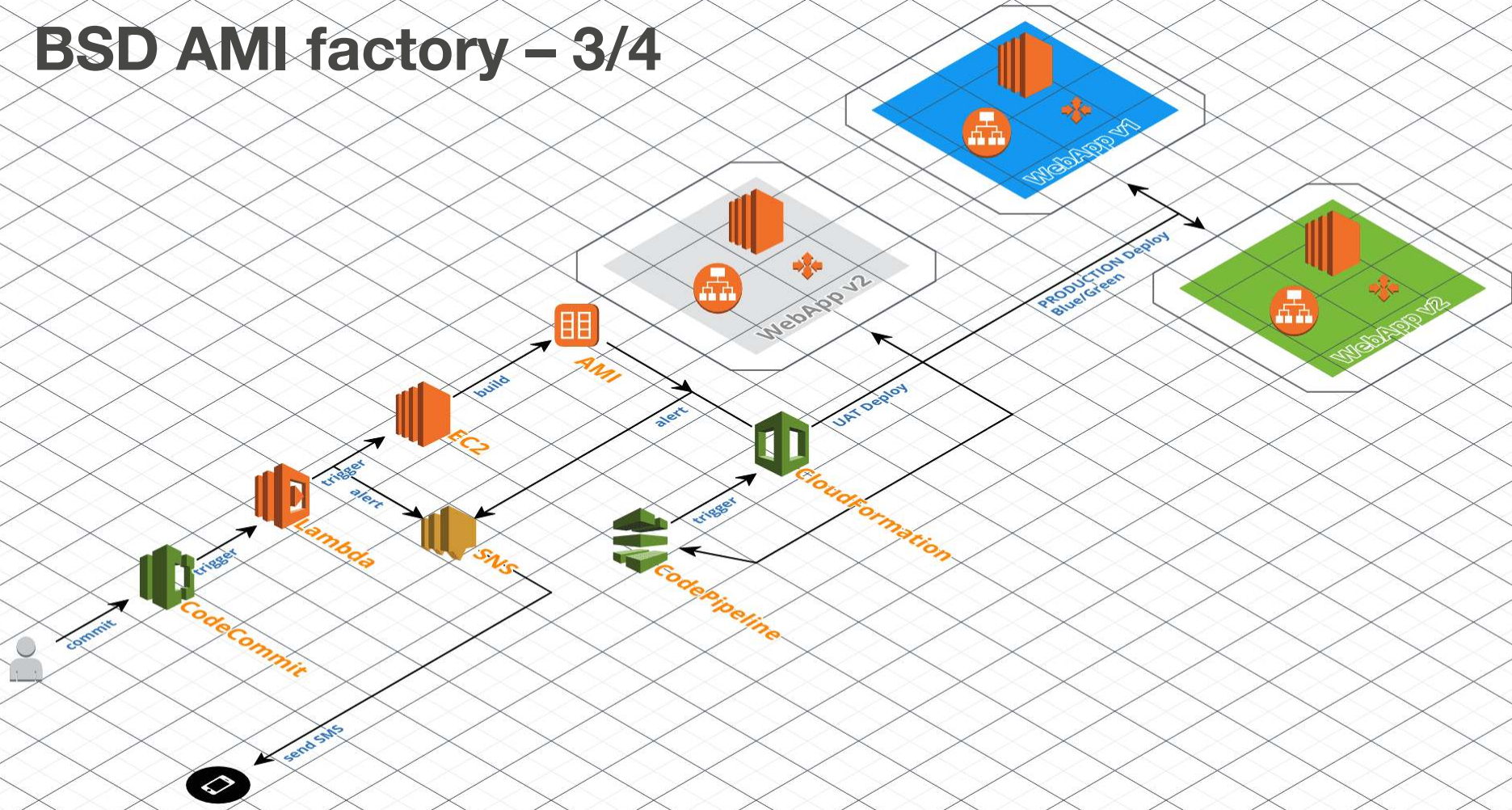


https://aws.amazon.com/getting-started/projects/set-up-ci-cd-pipeline/

BSD AMI factory – 2/4

- OpenBSD host w/ 12gb available (ami+4gb tmp files)
- create-ami.sh (Thanks **ajacoutot@** !)
  - doas, curl, ec2-api-tools, awscli and vmdktool packages installed.
  - AWS_ACCESS_KEY_ID/AWS_SECRET_ACCESS_KEY set
  - MIRROR set to the closest AWS Region

BSD AMI factory – 3/4



BSD AMI factory – 4/4

DevOps for AMIs !

1. Commit to git
2. Bake the AMI
3. Notify Teams & Code Pipeline
4. Deploy Infrastructure for UAT Environment + use new AMI
5. Test !
    1. Security/Compliance ? AWS Inspector
    2. Load ? Bees with Machine Guns
    3. Other stuff ? Features, Load+Security, etc.

6. Move on to Production once UAT results are satisfactory

http://davini.co/ebc-openbsd-2017
https://github.com/newsapps/beeswithmachineguns

Takeways

- DevOps is for AMIs, also for Containers
- No servers, just services
- Security is for everyone, and everywhere
- Pay by the usage

How you can help

1. Test FreeBSD on AWS and report issues
2. Write « Getting started with FreeBSD on AWS »
3. Work on « instant server » metaports
   - Instant webserver, instant Wordpress, etc.

Get in touch with **Colin Percival**
<cperciva@freebsd.org>

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Benchmarking results

	C4	X1	I3
RAM	60GB	2TB	488GB
Compute	36 vCPU Intel Haswell	128 vCPU Intel Haswell	64 vCPU Intel Broadwell
Storage	EBS 10k PIOPS SSD	Instance store 2 x 1.92TB SSD	Instance store 8 x 1.92TB NVMe
Filesystem	UFS	UFS	ZFS (2 4-disk pools)
SSD time	11mn 39s	11mn 40s	10mn 58s
Ramdisk time			
Price			

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RAM	60GB	2TB	488GB
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Ramdisk time	11mn 10s	11mn 26	11mn 07s
Price			

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Filesystem	UFS	UFS	ZFS (2 4-disk pools)
SSD time	11mn 39s	11mn 40s	10mn 58s
Ramdisk time	11mn 10s	11mn 26	11mn 07s
Price	$1.591	$13.338	$4.992

Conclusion

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CentOS
debian
GNU/Linux
redhat.
SUSE
We adapt. You succeed.
ubuntu
FreeBSD
NetBSD
OpenBSD
iOS
Java
node
Microsoft
.NET
python
php
docker
kubernetes
RANCHER
CoreOS
OPENSHIFT
MySQL
ANSIBLE
GitHub
SALTSTACK
puppet
labs
CHEF
Jenkins
MariaDB
mongoDB
redis
cassandra
RabbitMQ
PostgreSQL
Spark
presto
HIVE
APACHE
HBASE
amazon
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AWS is a rich and lively environment for BSD and Open Source platforms

Your choice: DIY, Marketplace, Partners, AWS Managed Services

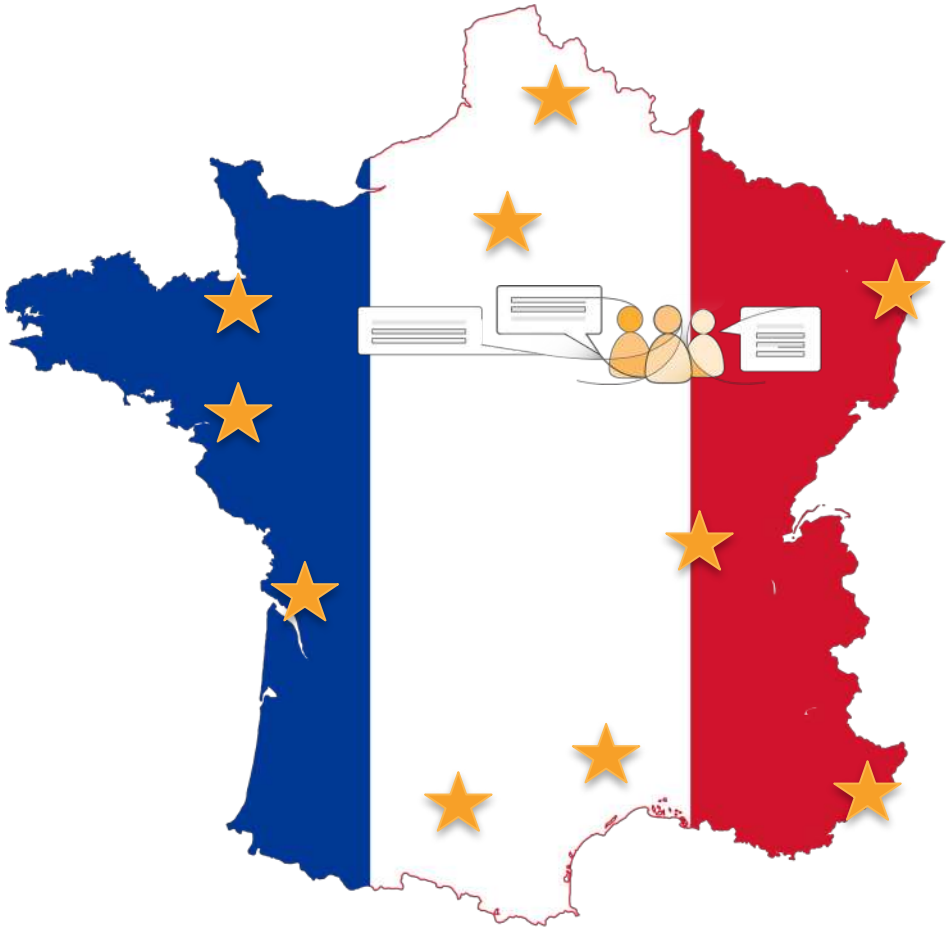
The tools & projects you love, without the infrastructure drama

Built-in high availability, scalability, security & compliance

Focus on creativity and productivity, not on plumbing

AWS User Groups

Lille
Paris
Rennes
Nantes
Bordeaux
Lyon
Montpellier
Toulouse
Côte d'Azur
Grand Est



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