



Semiconductor Design and Verification on AWS

Accelerating Innovation

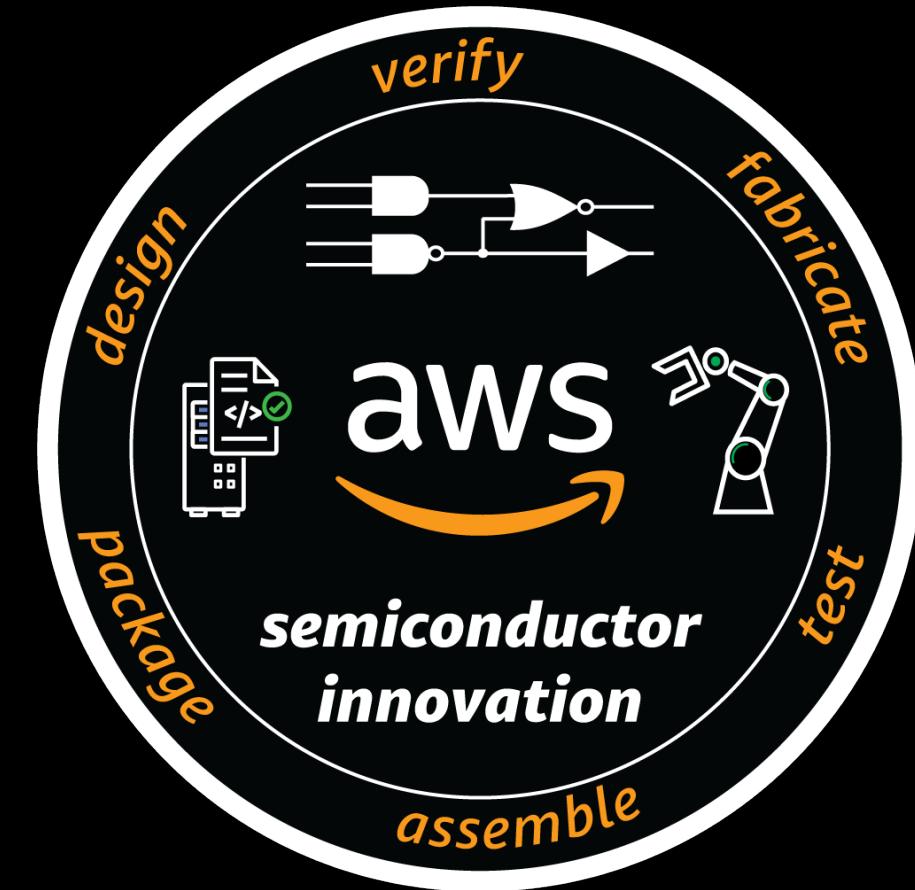
Karan Singh

Sr Solution Architect
Amazon Web Services



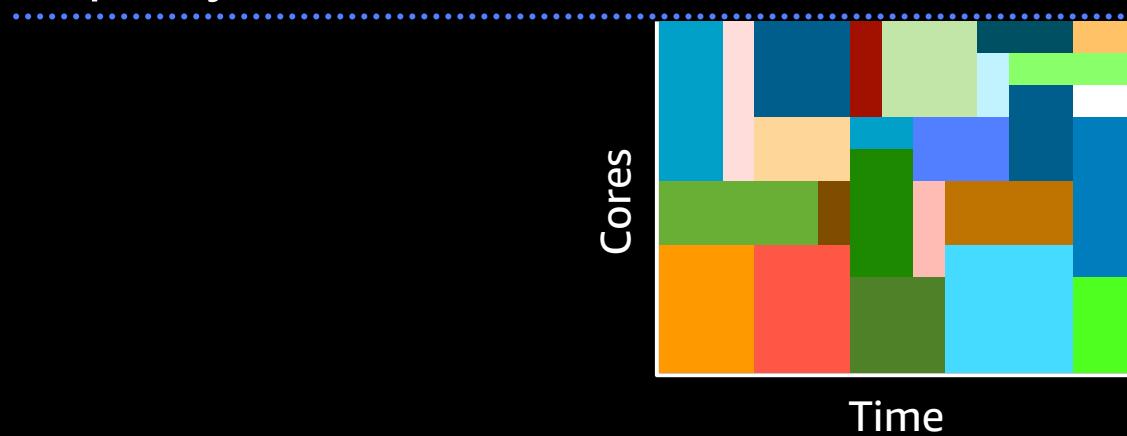
Agenda

- 1 Compute
- 2 Storage
- 3 Orchestration
- 4 Secure Collab Chambers
- 5 Reference Architectures

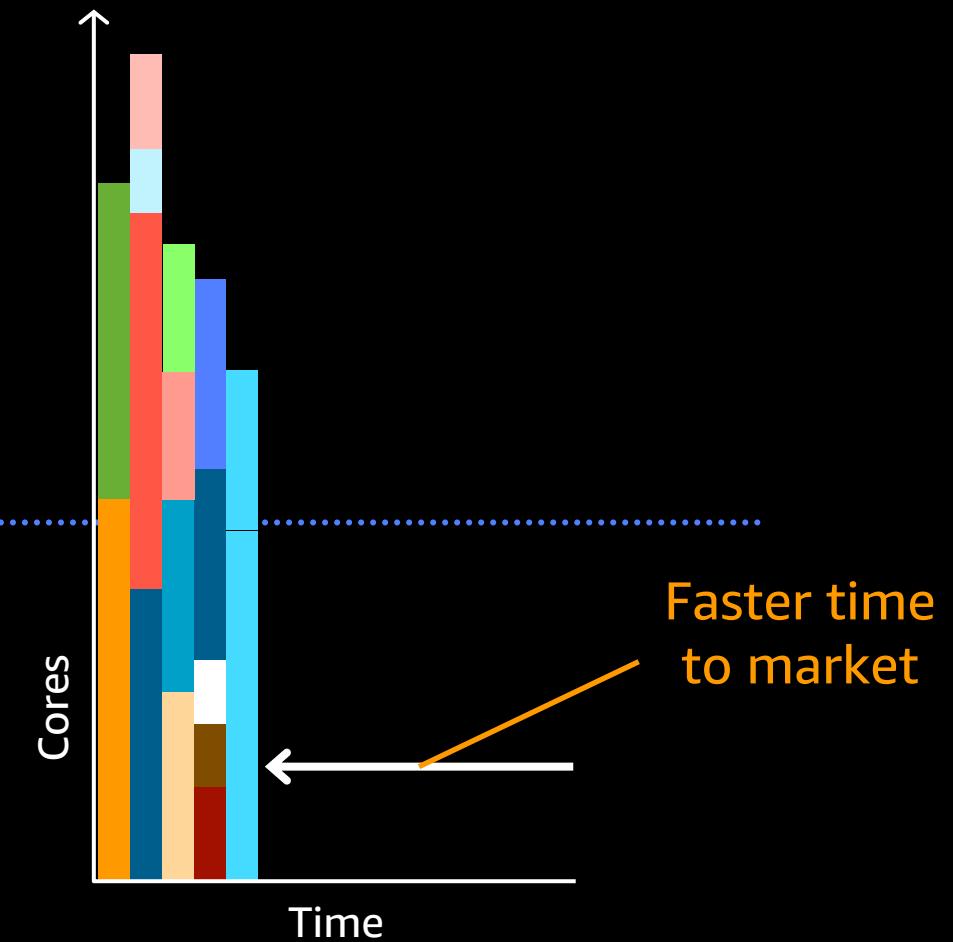


Cloud is a natural fit for semiconductor design

Fixed data center capacity limit



- Static capacity
- Long queue times
- Engineering bottlenecks



- Variable capacity
- No waiting for resources
- Jobs complete faster

Why Open Source EDA on AWS?

- **Innovate faster** – Prototype, design, and verify systems-on-chip, using scalable cloud resources for Open Source Electronic Design Automation (EDA). Leverage new computing paradigms to accelerate EDA jobs.
- **Collaborate better** – Work seamlessly and securely with third-party partners including Startups, Researchers, IP providers, and manufacturing service providers (foundries, OSATs, contract and original device manufacturers).
- **Reduce cost** – Stop wasting CAPEX on IT, and stop wasting valuable engineering time.

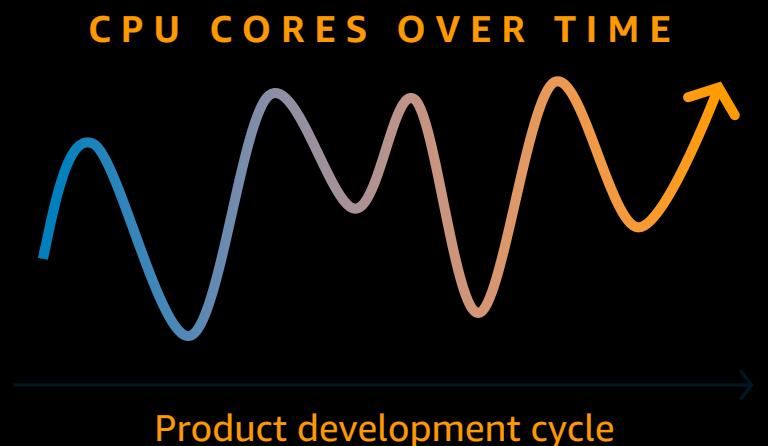
Faster design throughput with rapid, massive scaling

Scale up when needed, then scale down

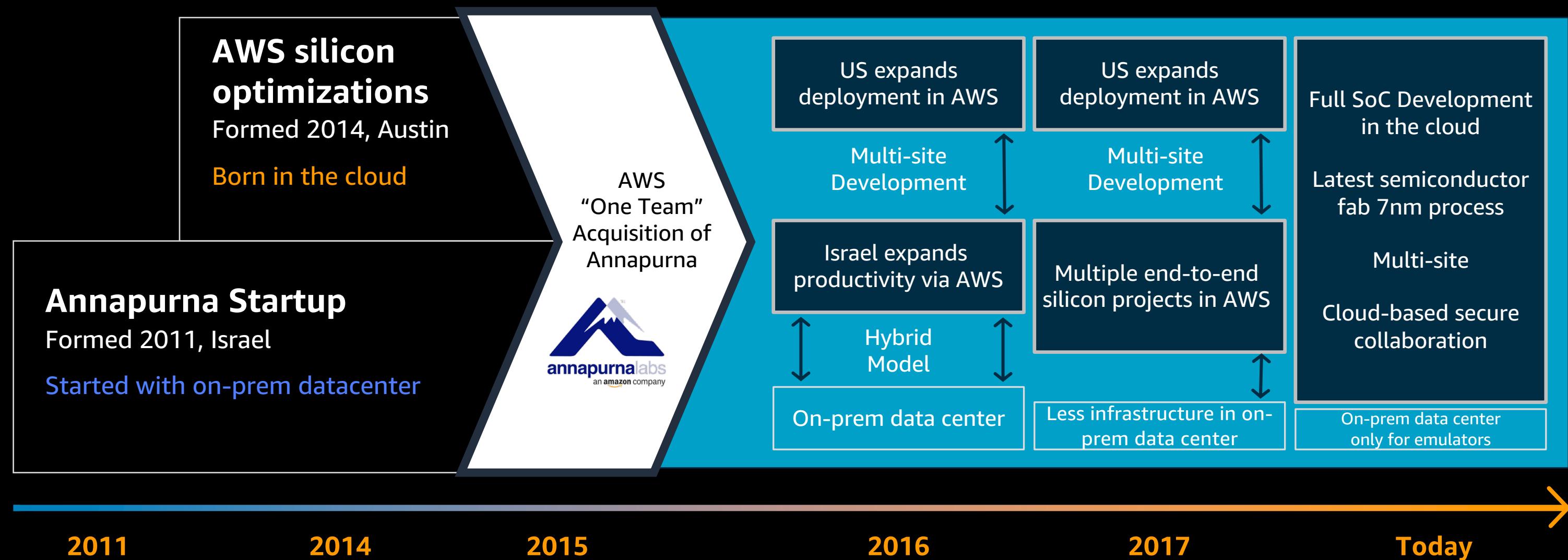
- In a traditional EDA datacenter, **the only certainty is that you always have the wrong number of servers**—too few, or too many
- Every additional server launched in the cloud can improve speed of innovation—if there are no other constraints to scaling
- Overnight or over-weekend workloads reduced to an hour or less

Think **BIG**

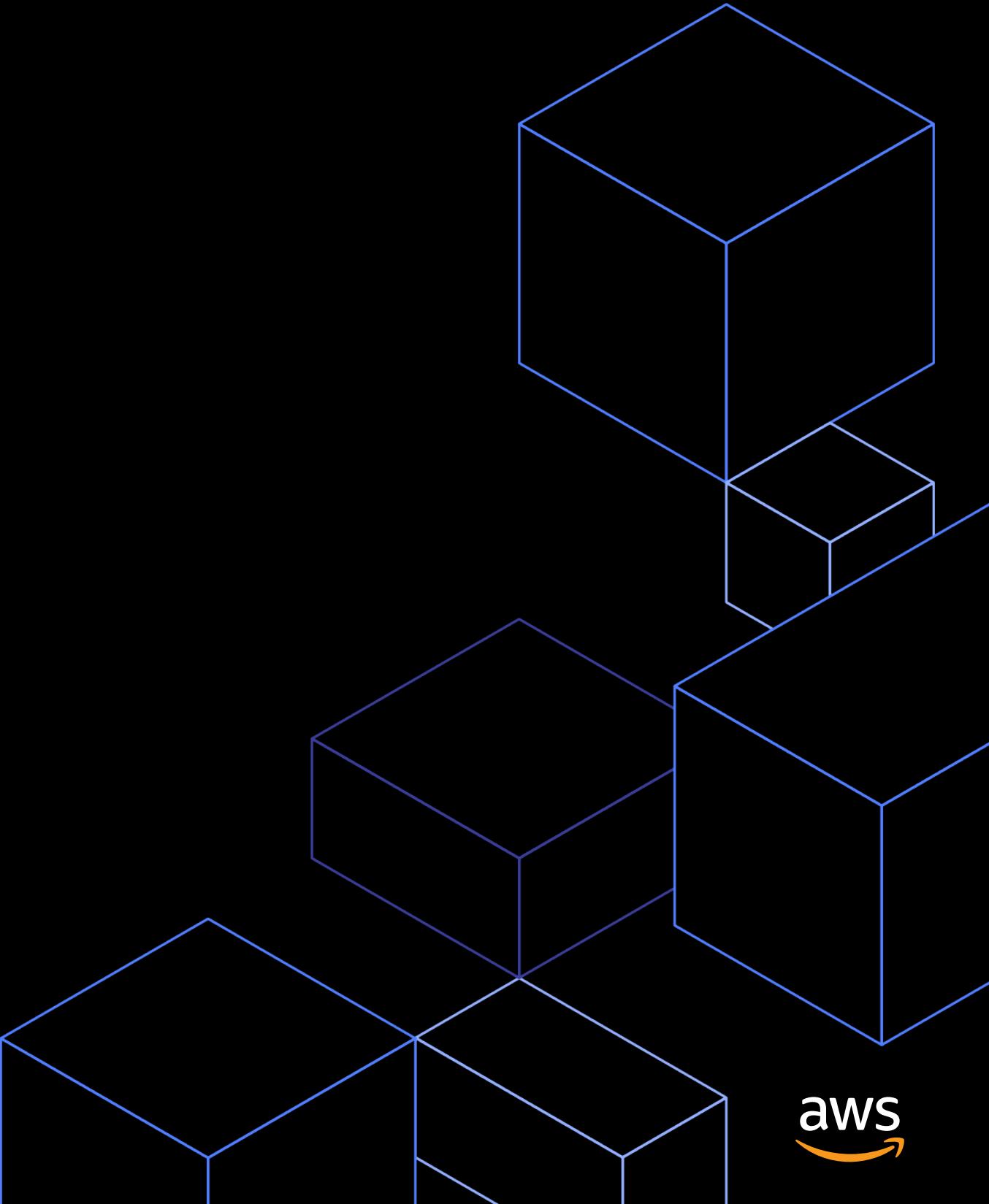
What if you could launch 1 million concurrent verification jobs?



Our own journey, and our own digital transformation

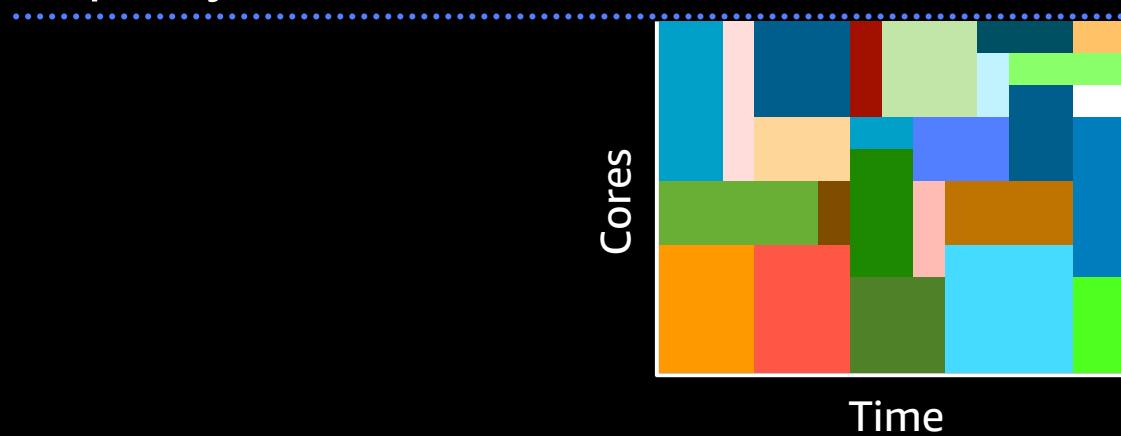


Compute

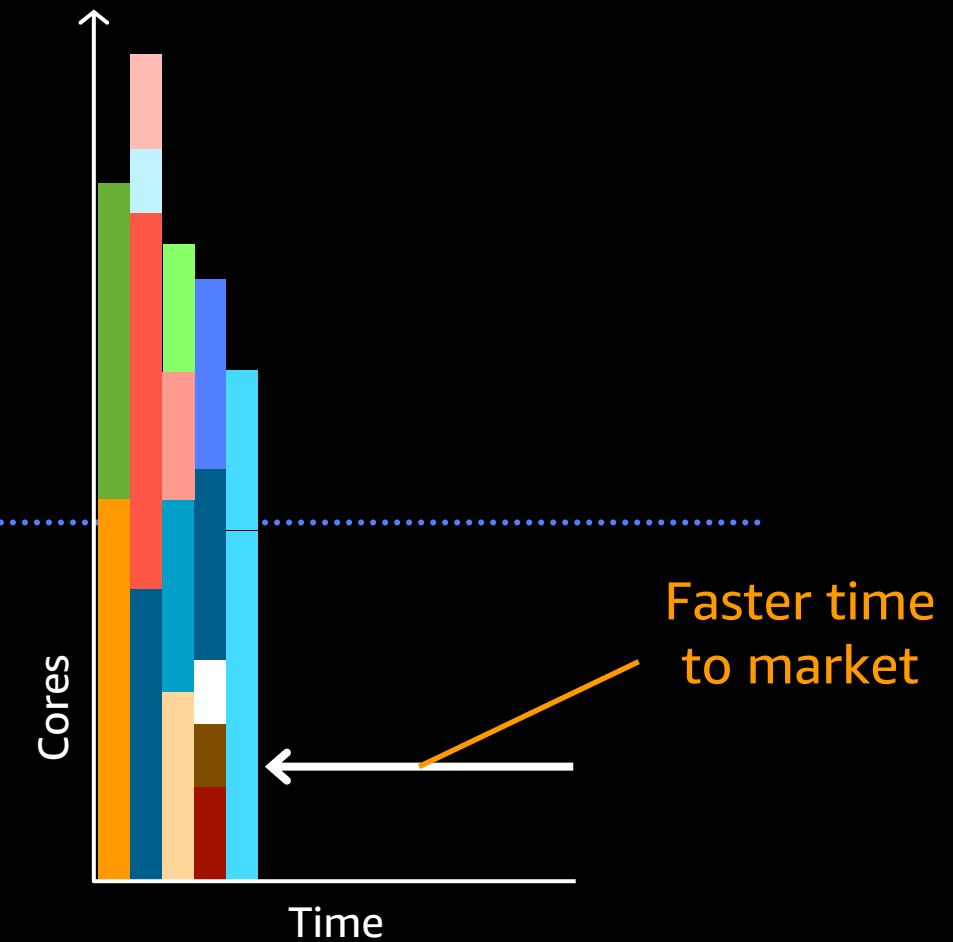


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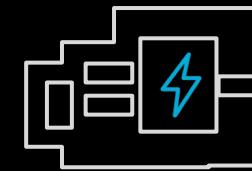


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AWS Nitro System

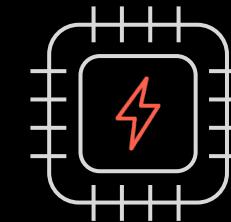


Nitro Card



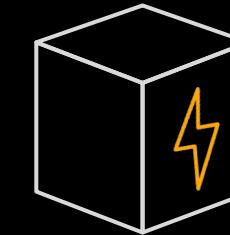
Local NVMe storage
Elastic Block Storage
Networking, monitoring,
and security

Nitro Security Chip



Integrated into motherboard
Protects hardware resources

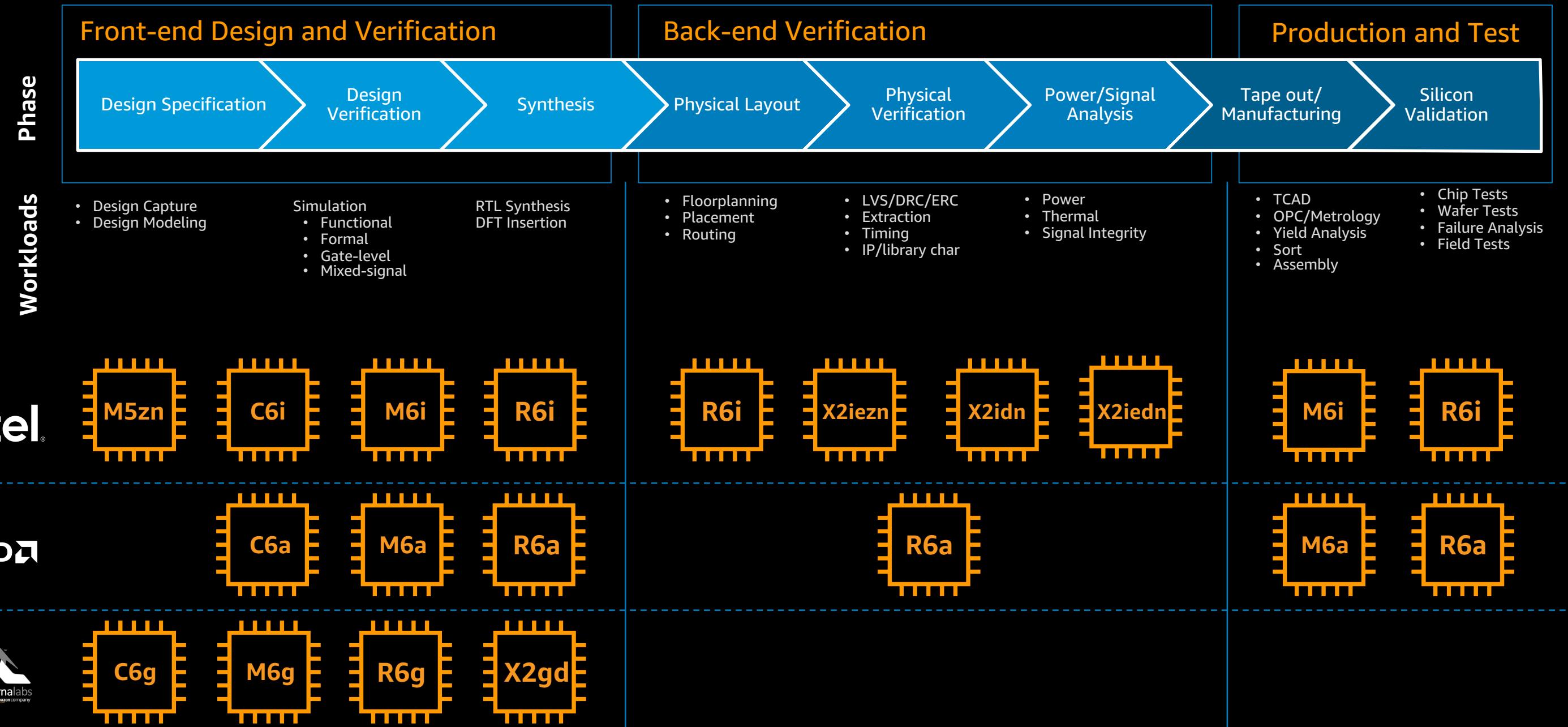
Nitro Hypervisor



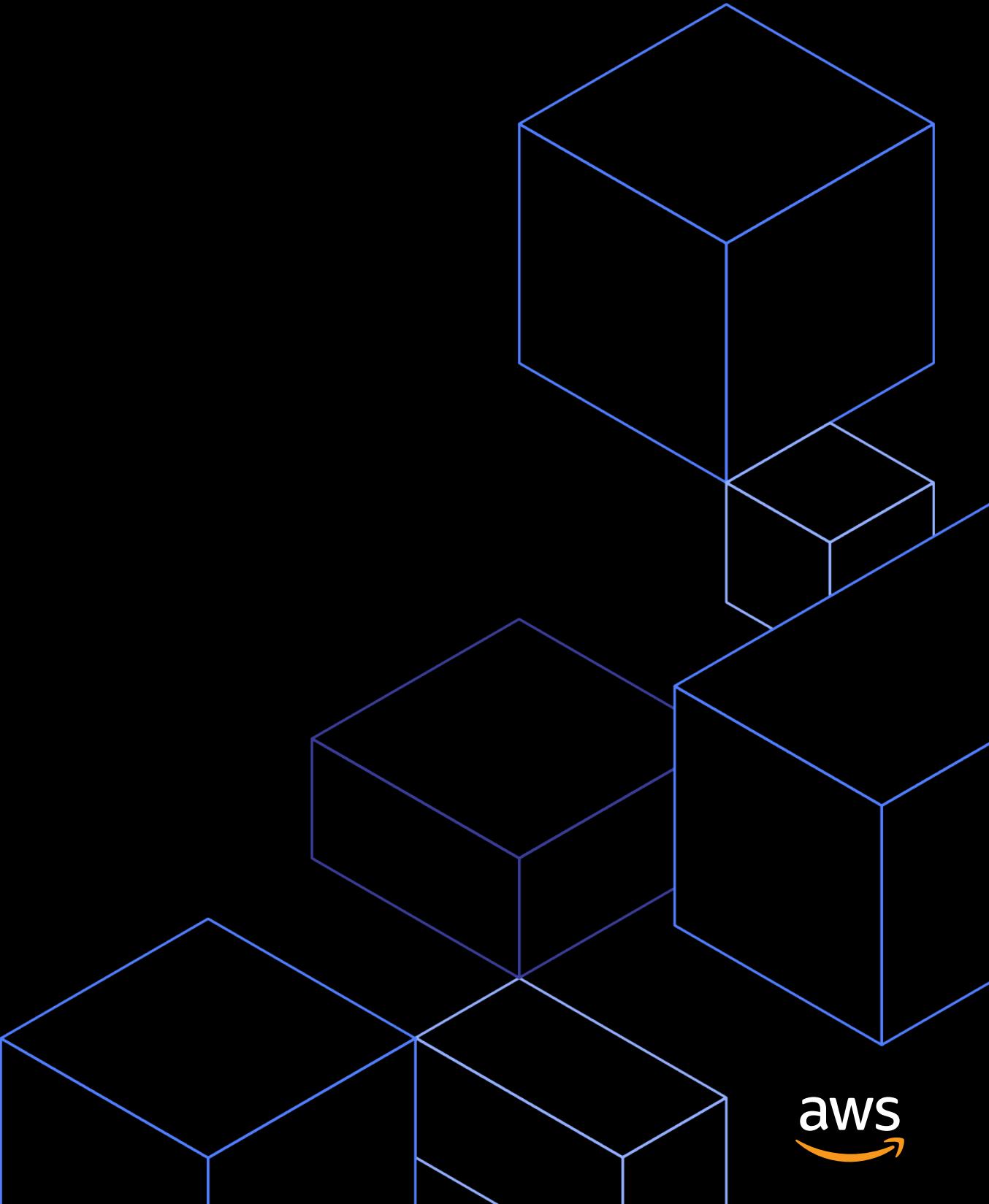
Lightweight hypervisor
Memory and CPU allocation
Bare metal-like performance

High performance virtualization enabled by the Nitro System

Shaping compute to workloads

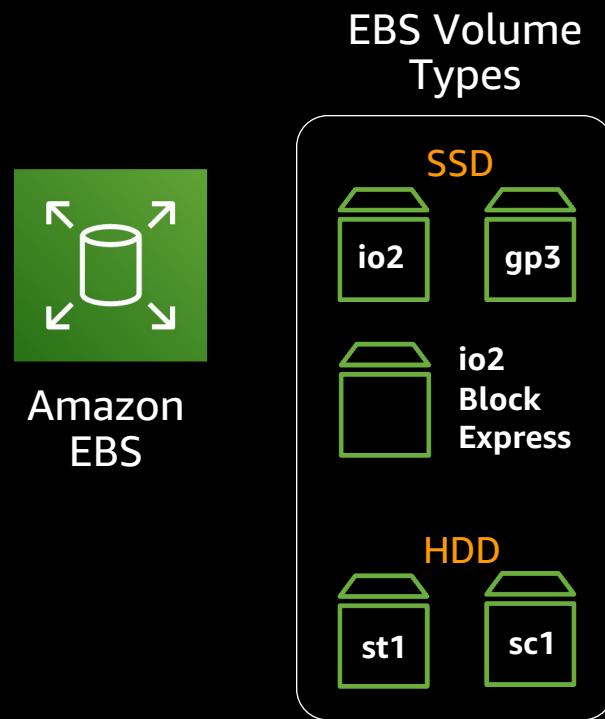


Storage



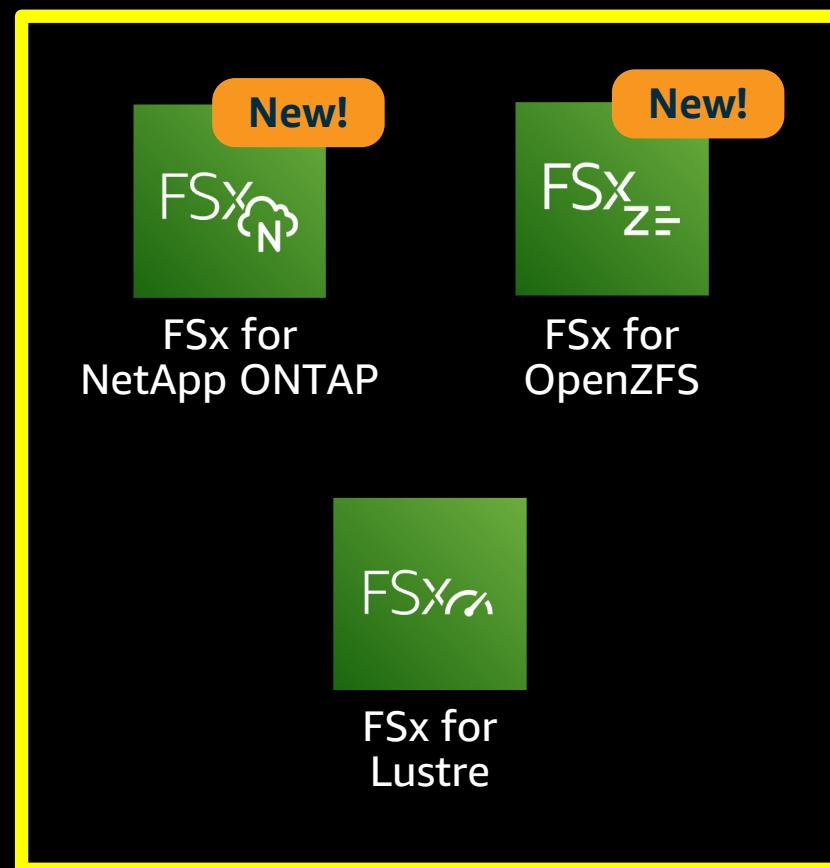
High performance storage options

Block Storage



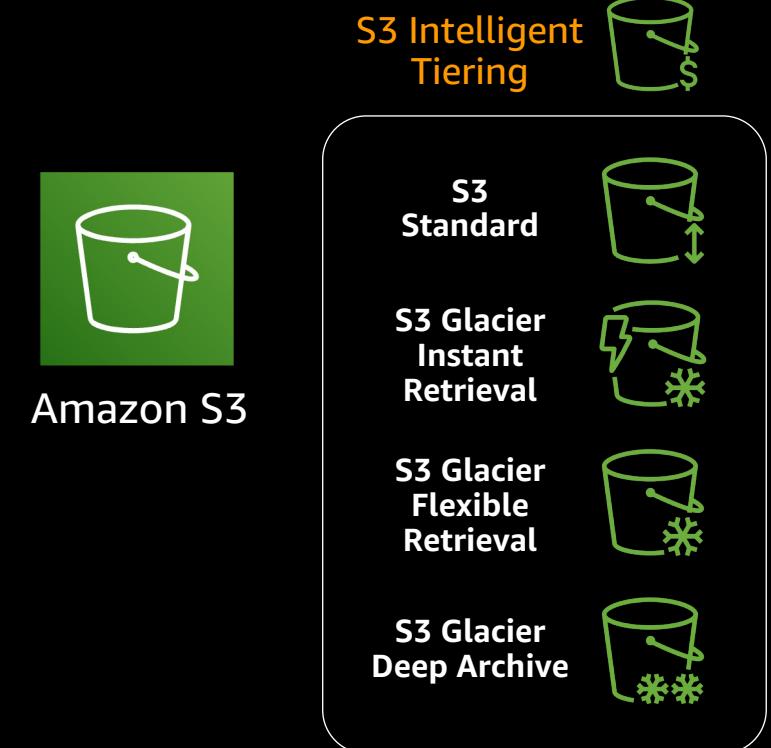
High performance, attached storage with 99.999% availability. Tune size and performance with elastic volumes.

File Storage



Fully managed file system options, providing enterprise NAS, scale-out storage, and petabyte-scale, elastic file storage accessible across applications, instances, and on-premises servers.

Object Storage



Low cost, highly scalable storage with 99.999999999% durability. Automatic data replication within regions.

Summary: File system options for semiconductor design

	 Amazon FSx for NetApp ONTAP	 Amazon FSx for OpenZFS	 Amazon FSx for Lustre
On-premises comparison	NetApp, commodity NAS	ZFS or other Linux based file servers	Scale-out file storage (Lustre, GPFS)
Deployment Options	Multi-AZ	Single-AZ	Single-AZ
Unique Features	Multi-protocol, replication, cloning, intelligent low-cost tiering, file access auditing, and anti-virus integration	Sub milli-second latency, up to 12.5 GB/sec throughput, up to 1 million IOPS	Scale-out performance, S3 data processing capabilities
Use Cases	On-prem integration with FlexCache and Snapmirror	Front-end workloads , small files, metadata heavy, random access	Back-end workloads , large files, sequential access

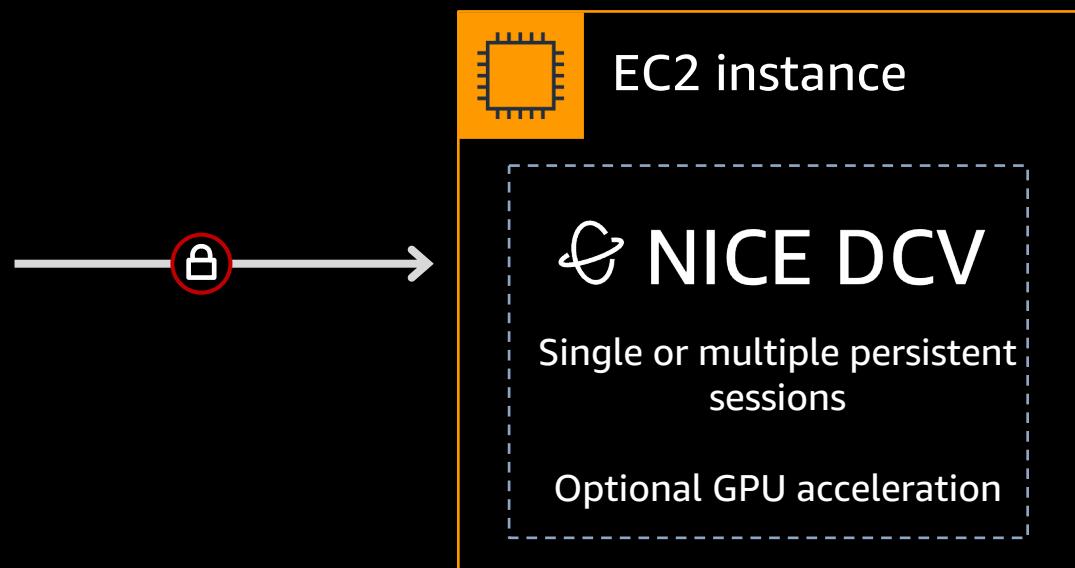
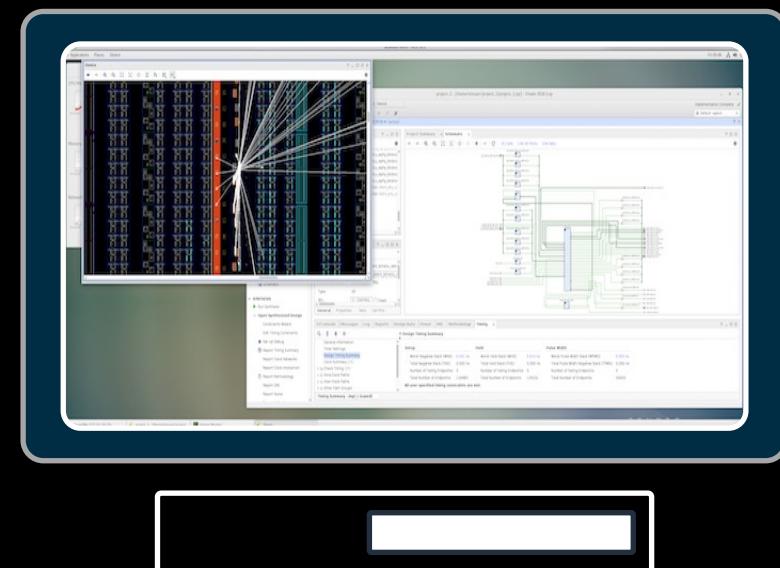
Remote desktops with NICE DCV

- Native clients for Linux, Mac, and Windows
- HTML5 for web clients
- Dynamic hardware compression
- Encrypted communication
- Multi-monitor support
- Extensive security options (restrict copy/paste, etc.)
- Support for peripherals (mice, sound, etc.)
- Optional GPU acceleration

Visit our booth #1841 for
NICE DCV Demo

SEMICON® WEST
July 11-13, 2023

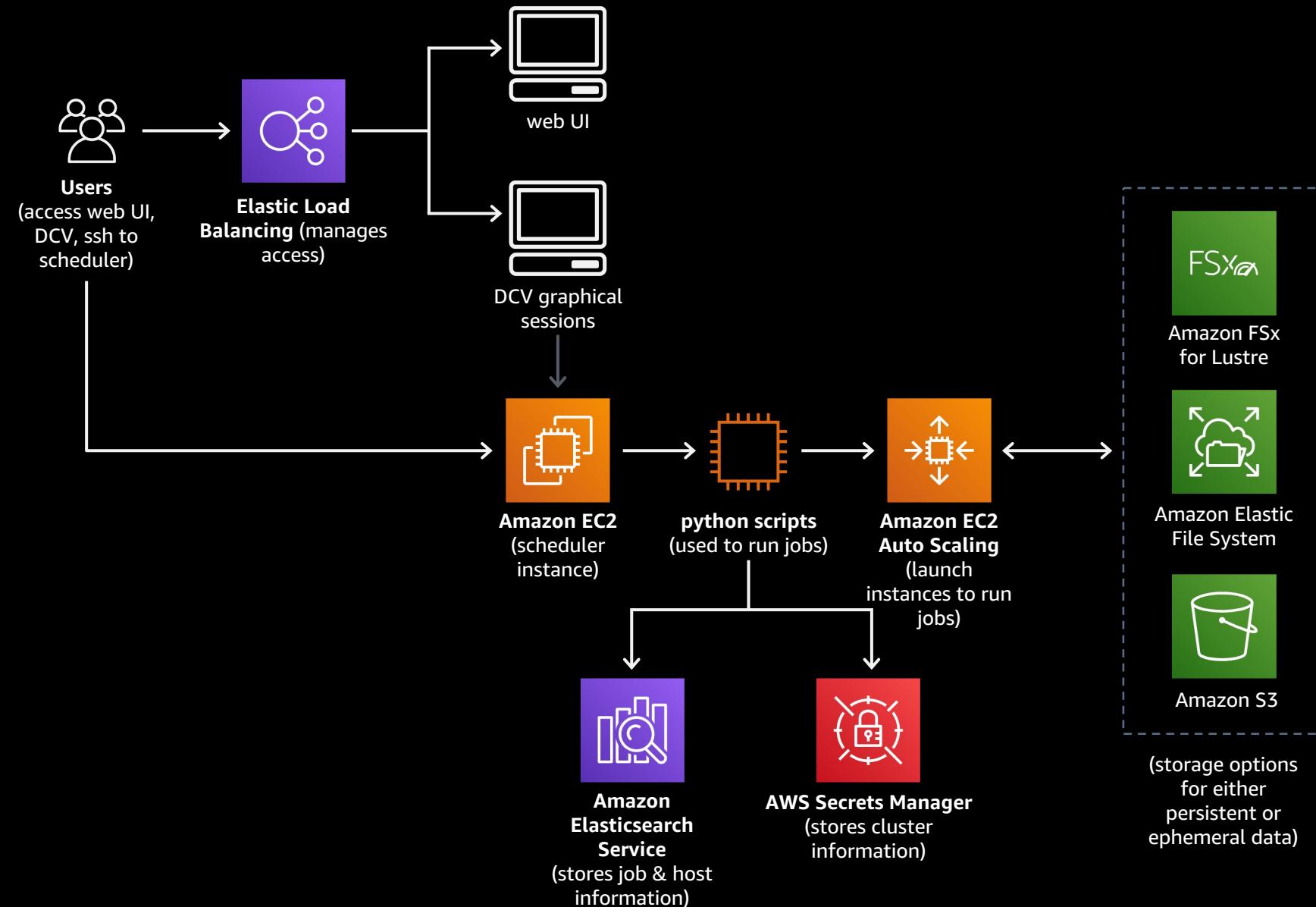
No added cost when
running on
Amazon EC2
Instances!



Scale-out computing on AWS

aws.amazon.com/solutions/scale-out-computing-on-aws

- AWS Solution
- EDA/HPC environment on AWS
- Easy installation in your AWS account
- Amazon EC2 Integration
- Simple job submission
- OS agnostic and AMI support
- Desktop cloud visualization
- Automatic errors handling
- Web UI
- 100% customizable
- Persistent and unlimited storage
- Centralized user-management
- Support for network licenses
- EFA support
- Simple cost/budget management
- Detailed cluster analytics
- Used in production

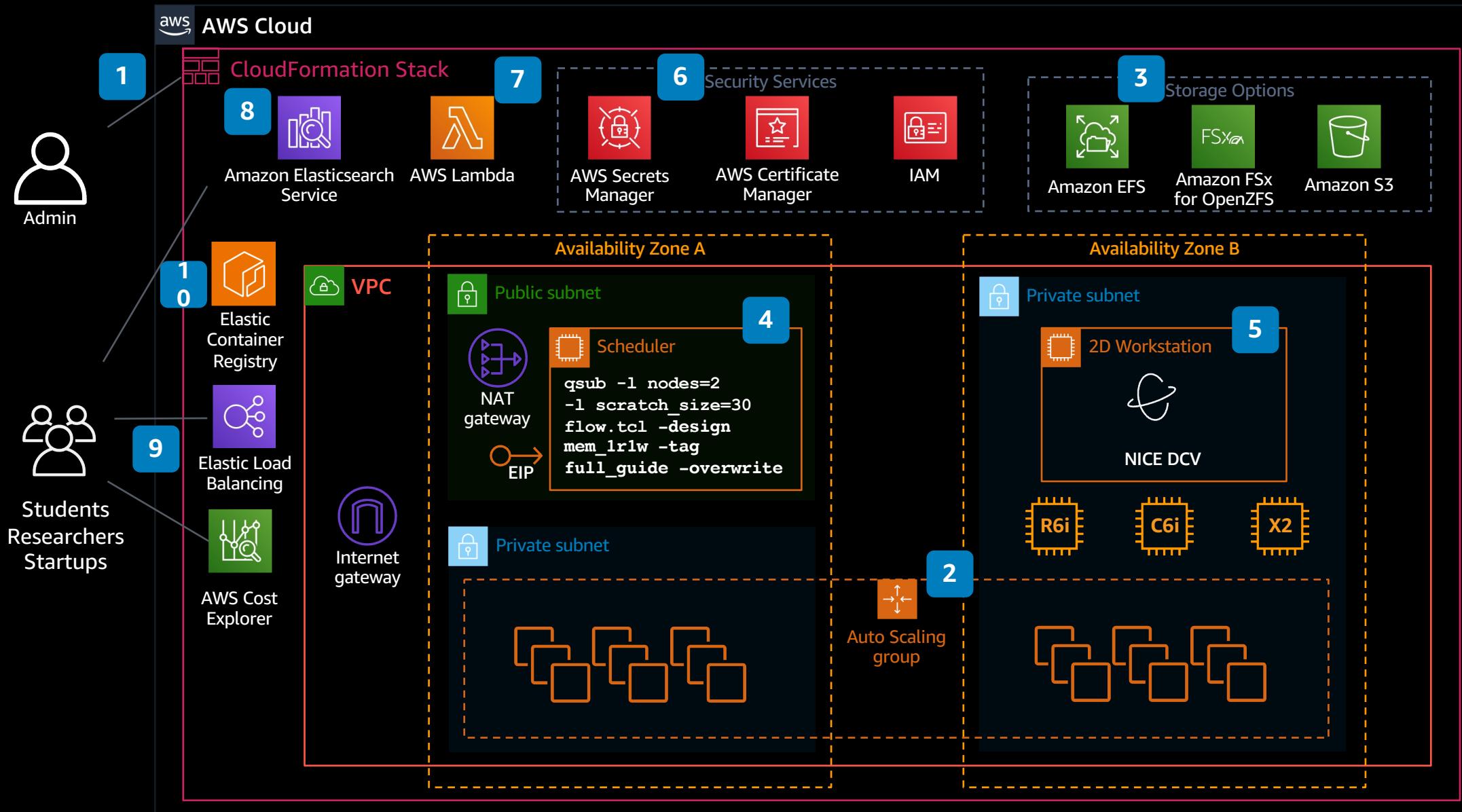


Open Source Chip Design on AWS

Launch a turnkey scale-out open source EDA environment in minutes

Solution location: <https://aws.amazon.com/solutions/scale-out-computing-on-aws/>

Source Code: <https://github.com/awslabs/scale-out-computing-on-aws>



- Specify required parameters (VPC, Subnet, storage, etc.) and launch the **AWS CloudFormation** stack, which launches several nested stacks.
- Choose to run in **multiple Availability Zones**, or use auto-reallocation in the case an instance isn't available in the Availability Zone.
- Choose from several storage options: **Amazon EFS**, **Amazon FSx for Lustre**, **Amazon S3**, **Amazon EBS**, and **Instance Store** to open source tools, design data, PDKs
- Log in, submit, and monitor EDA jobs from the Scheduler Instance.
- Launch a 2D or 3D Workstation that uses **NICE DCV**, that can be used to submit batch jobs and run GUI tools such as OpenROAD.
- Security services and resources that are used include **AWS Secrets Manager**, **AWS Certificate Manager**, **Security Groups**, and **AWS Identity and Access Management (IAM)**.
- AWS Lambda** is used throughout the entire deployment and architecture.
- Amazon Elasticsearch Service** is used to launch an analytics dashboard.
- Elastic Load Balancing** is used to ensure accessibility across Availability Zones, and **Cost Allocation Tags** are used with **AWS Cost Explorer**.
- Elastic Container Registry** used to store images of open source EDA tools



“NXP Semiconductors Selects AWS as Its Preferred Cloud Provider to Power Electronic Design Automation in the Cloud”



MediaTek

“Using AWS, our EDA workload characterization turnaround time was reduced from a few months to a few weeks.”

*Philippe Moyer, Vice President of Design Enablement,
Arm*

Met aggressive tapeout schedule to release world's first 5G integrated system-on-chip.

re:Invent 2019 session:
MFG206-L



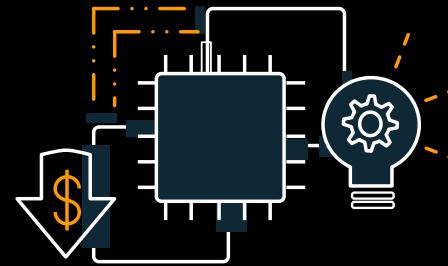
Astera Labs Develops Complex SoC
100% on AWS



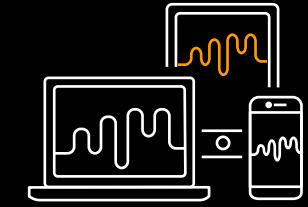
Higher likelihood of catching defects early, saving potentially millions of dollars each year.

re:Invent 2019 session:
MFG404

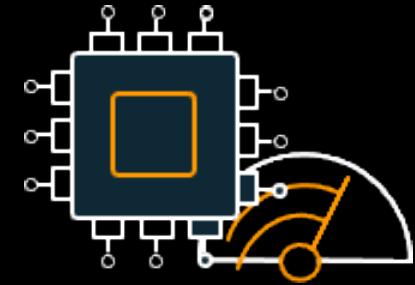
Semiconductor Industry Trends



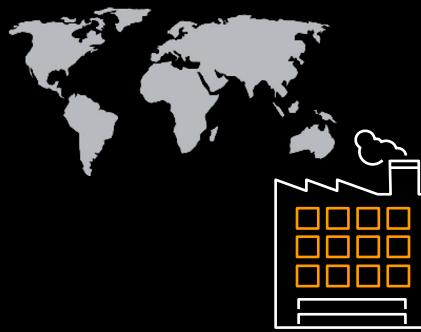
Supply Chain
Constraints and
Shortages



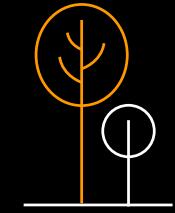
Increased Multi-
Party ASIC/SoC
Development



Balancing Power,
Performance, Area,
Cost (PPAC)



Engineering
Staffing
Shortages

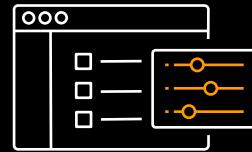


Sustainability
and ESH/ESG

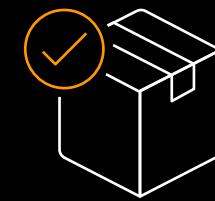
How Does Secure Collaboration Help?



Protecting and securing IP and supply chains



Enabling data analytics based decision making for business and engineering



Increases supply chain resilience and visibility



Improves yields and shortens ramp to high volume production



Cost reduction

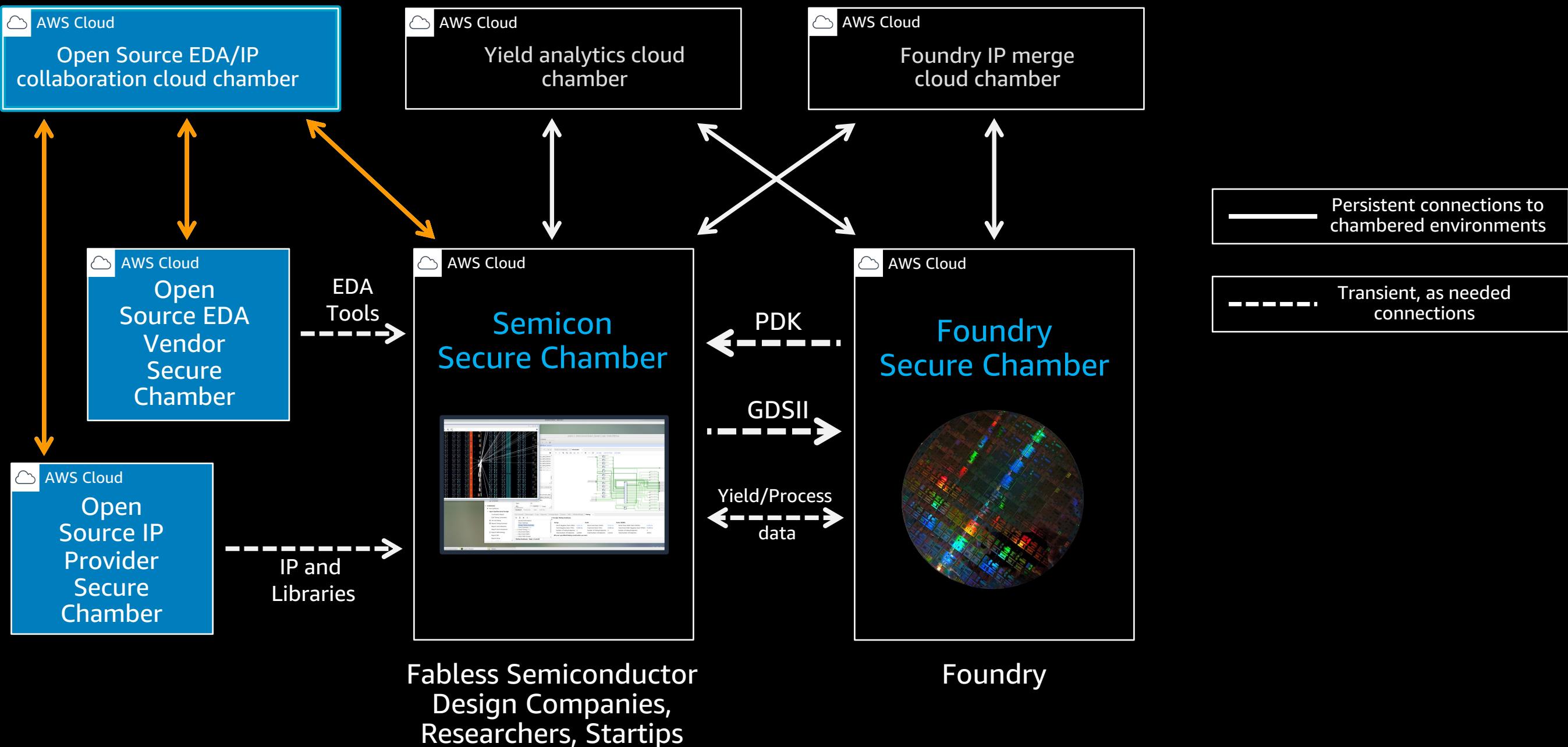


Create new revenue sources



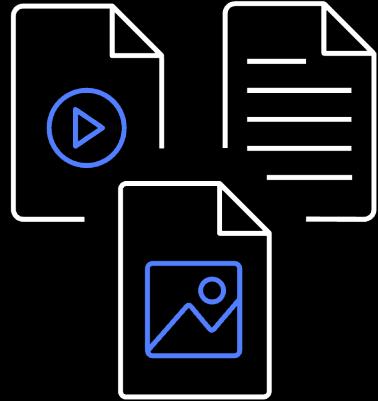
Worker attrition and training

Secure collaboration enabled on AWS



AWS resources for semiconductor design

<https://aws.com/semiconductor>



Under “Resources” link:

- White papers
- Blogs and articles
- Reference architectures
- Videos & webinars
- Technical tools & training

Semiconductor and Electronics Resources

Find whitepapers, videos, blogs, and technical tools for semiconductor and electronics.

Documentation

- Run Semiconductor Design Workflows on AWS
- Semiconductor Design on AWS
- Best practices for deploying ClioSoft SOS7 on AWS
- Using Ellexus Breeze for EDA workload migration to AWS



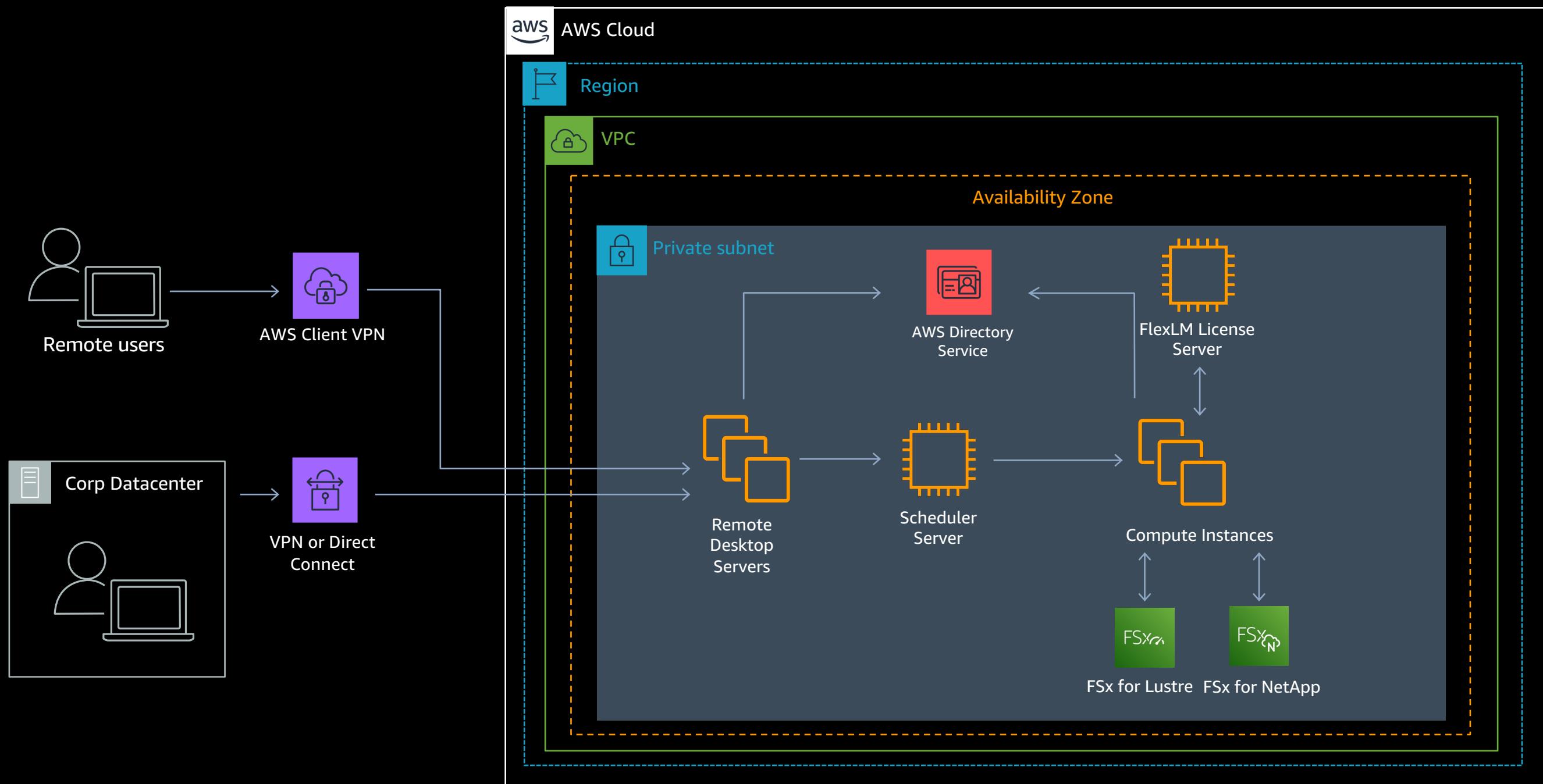
Thank you!

Reference Architectures

Secure collaboration

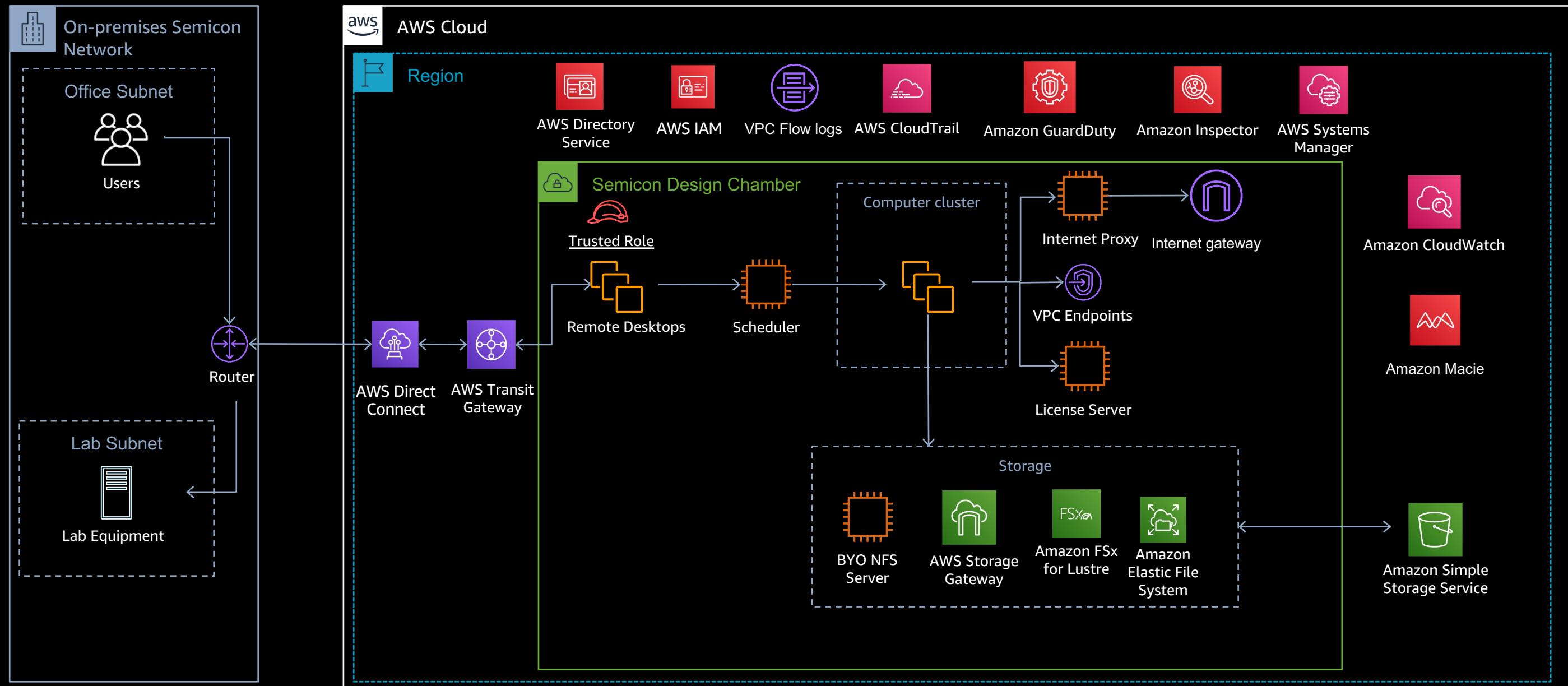


Cloud IC design collaboration chamber

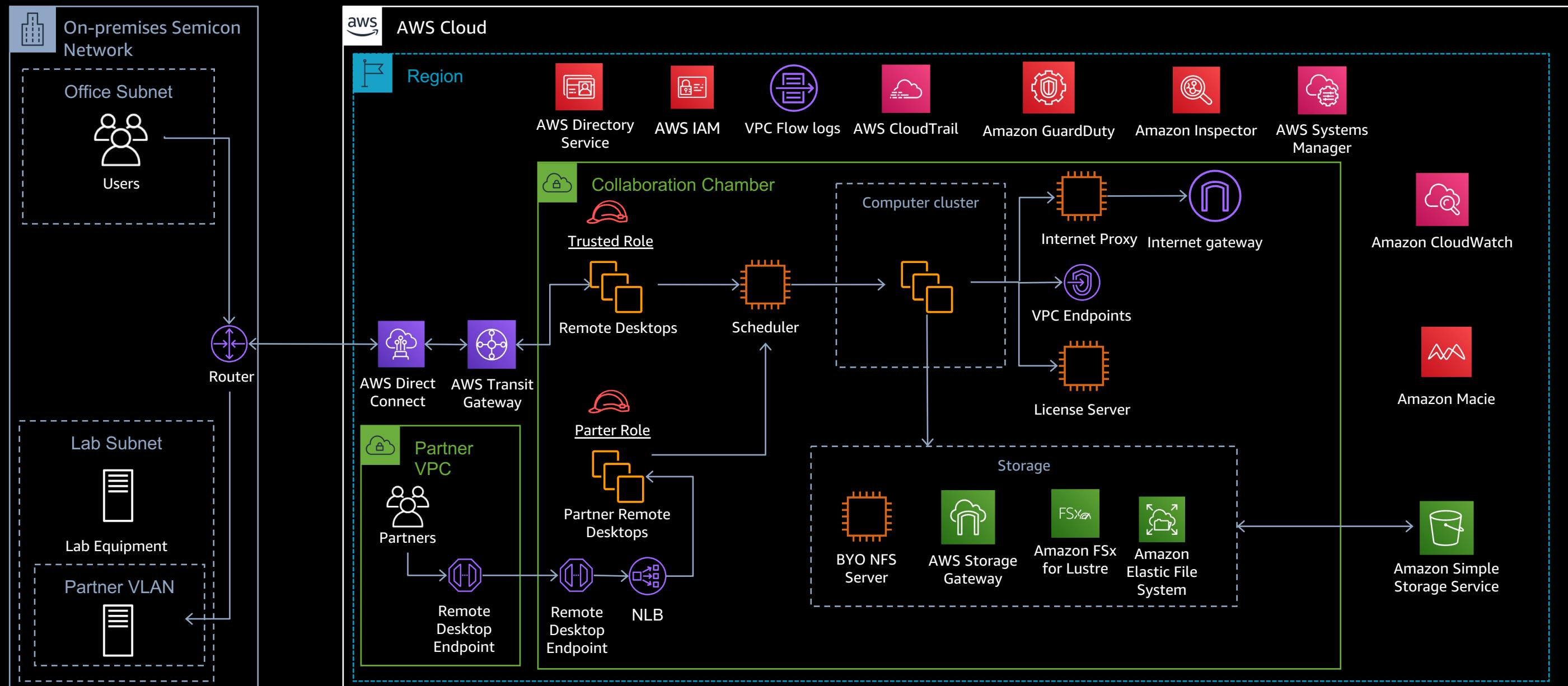


Secure silicon design environment

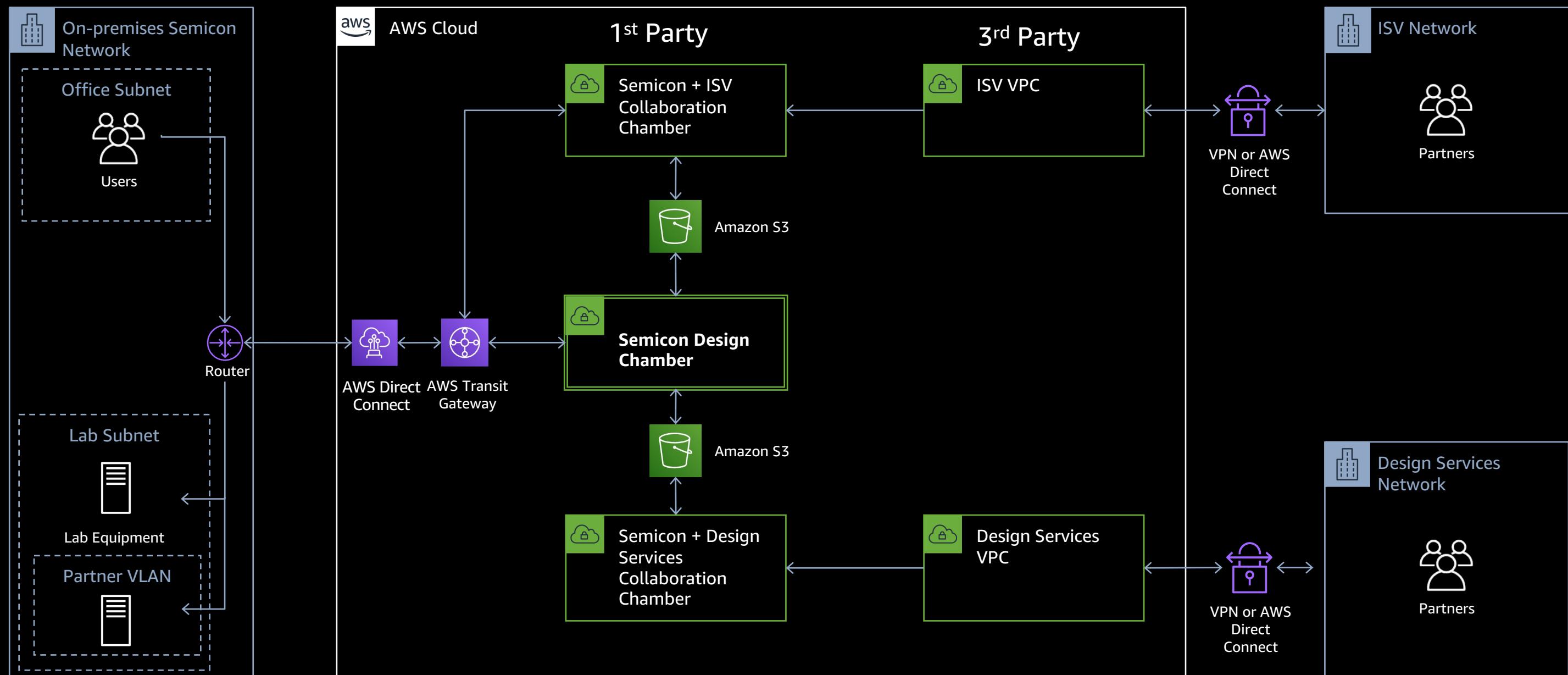
1st Party



Collaboration chamber



Secure collaboration



Scale-out computing on AWS

aws.amazon.com/solutions/scale-out-computing-on-aws

Framework behind Amazon Devices Lab126 HPC environment

Enables engineers/scientists with
minimal cloud and/or Linux
experience

Official AWS Solution:

“Vetted, technical reference
implementations designed to help
you solve common problems and
build faster”

The image shows two side-by-side screenshots of the AWS Scale-Out Computing solution. On the left is the 'admin's dashboard' with a dark blue sidebar containing links for 'ACCESS CLUSTER' (SSH access, Graphical Access, Transfer Files (SFTP)), 'JOB MANAGEMENT' (Submit my first job, My Job Queue, Create my queue), 'ANALYTICS' (Dashboard), 'BUDGET' (Cost Management), and 'ADMIN SECTION' (User Management). On the right is the 'Scale-Out Computing on AWS' user interface, featuring a header with 'Source Code', 'Help and Support', 'Documentation', and 'Logout'. The main content area has a title 'Welcome to your Scale-Out Computing on AWS HPC cluster' and a sub-section 'Access the Cluster' with 'SSH access' and 'Remote Desktop' options. Below this are sections for 'Job Management', 'Analytics and Budget', 'Launch your job', 'Check your queue', and 'Create a new queue'.