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# Lecture 2: IaaS Cloud and Amazon EC2

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Recap from Lecture 1

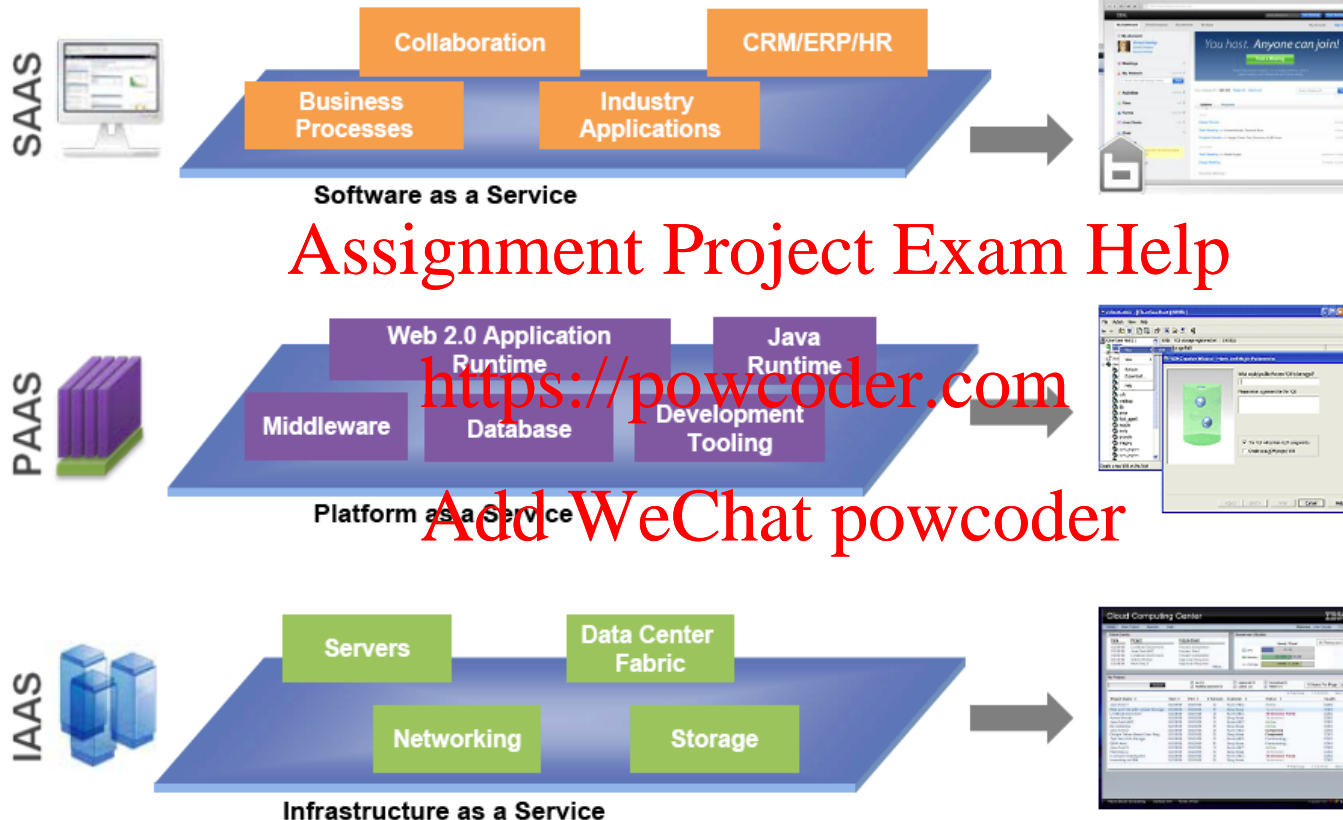
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# Different Cloud Offerings: A Layered Perspective

## The Layers of IT-as-a-Service



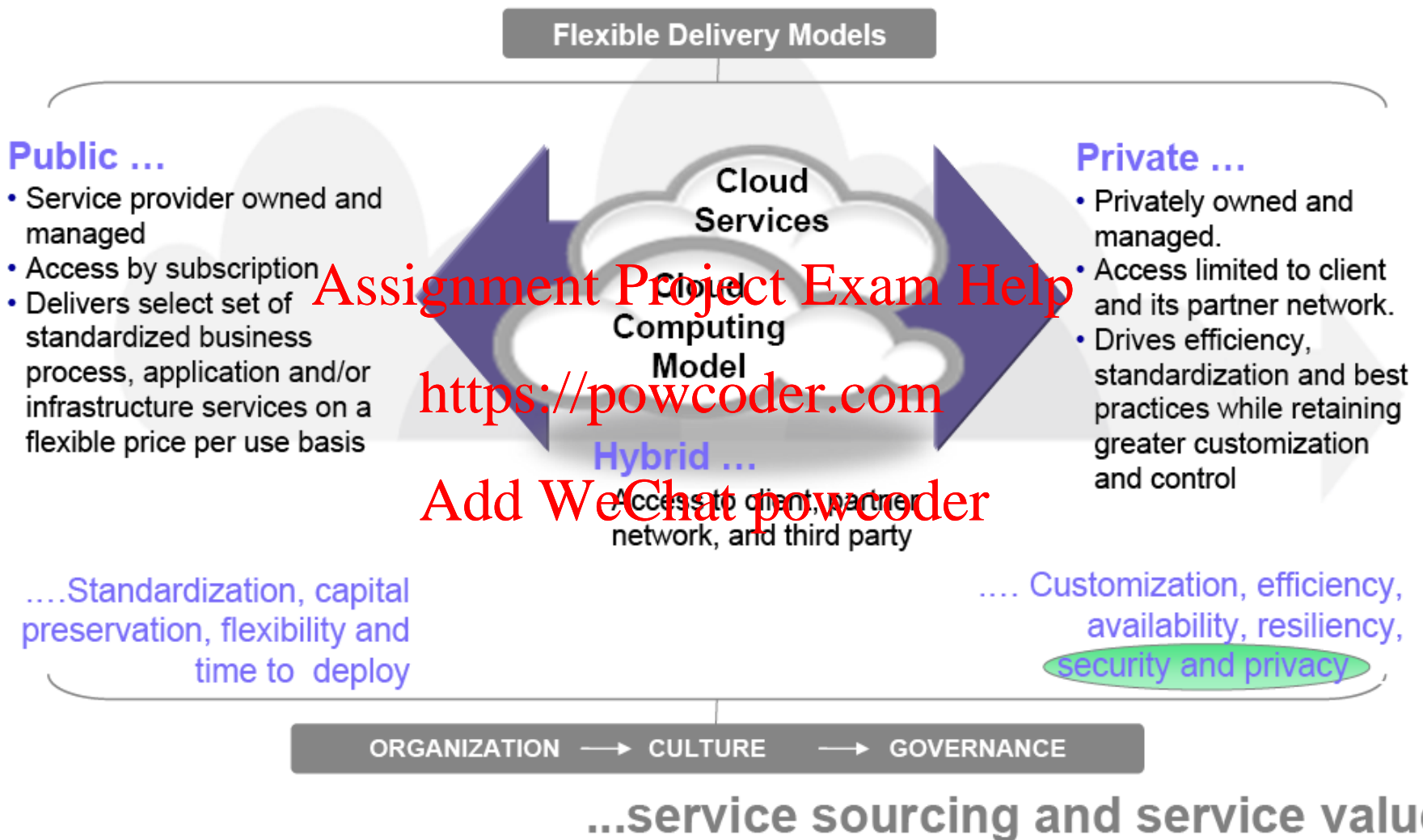
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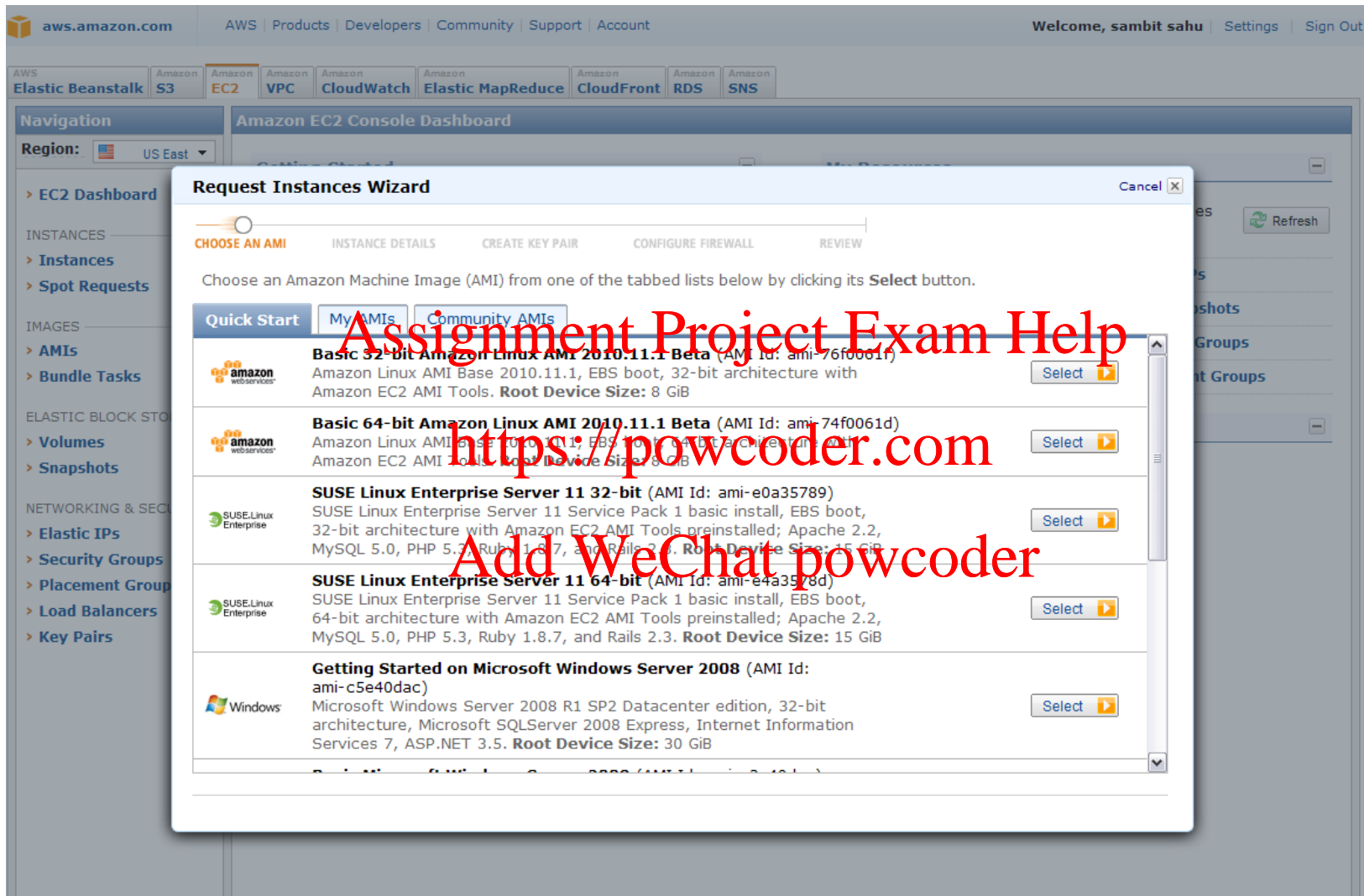
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- Higher the stack, less control but more automation for user
- Lower the stack, more control but more responsibility for user

# Cloud Computing Delivery Models



User launches request instance → a list of prebuilt stack is provided



- AWS shows a list of available pre-built base software stack (called **Virtual Appliances**) user may request to add to the machine

User can choose the resource size (CPU, mem choices)

**Request Instances Wizard**

**CHOOSE AN AMI** **INSTANCE DETAILS** CREATE KEY PAIR CONFIGURE FIREWALL REVIEW

Provide the details for your instance(s). You may also decide whether you want to launch your instances as "on-demand" or "spot" instances.

**Number of Instances:** 1 **Availability Zone:** No Preference

**Instance Type:**

Type	CPU Units	CPU Cores	Memory
Micro (t1.micro)	Up to 2 ECUs	1 Core	613 MB
Small (m1.small)	1 ECU	1 Core	1.7 GB
High-CPU Medium (m1.medium)	5 ECUs	2 Cores	1.7 GB

☒ Launch Instances  
EC2 Instances let you launch commonly large fixed capacity instances.

☐ Request Spot Instances

☐ Launch Instances Into Your Virtual Private Cloud

< Back Continue >

- Instance request wizard guides through resource choices

# User specifies security/access configurations

The screenshot displays the AWS Management Console interface. At the top, the navigation bar includes the AWS logo, the URL 'aws.amazon.com', and links for 'Products', 'Developers', 'Community', 'Support', and 'Account'. The user is logged in as 'sambit sahu'. Below the navigation bar, a horizontal menu lists various AWS services: Elastic Beanstalk, S3, EC2, VPC, CloudWatch, Elastic MapReduce, CloudFront, CloudFormation, RDS, SNS, and IAM. The left sidebar contains a 'Navigation' section with a 'Region' dropdown set to 'US East (Virginia)'. It lists categories like 'INSTANCES', 'IMAGES', 'ELASTIC BLOCK STORE', and 'NETWORKING & SECURITY', each with expandable sub-items. The main content area is titled 'Amazon EC2 Console Dashboard' and features a 'Getting Started' tab. A 'Request Instances Wizard' modal is open, showing the 'CREATE KEY PAIR' step. The wizard's progress bar indicates the current step. The text in the wizard explains that public/private key pairs are used for secure connection and provides instructions on how to create and download a key pair. It offers three options: 'Choose from your existing Key Pairs' (with a dropdown menu showing 'IM2011'), 'Create a new Key Pair', and 'Proceed without a Key Pair'. At the bottom of the wizard, there are '< Back' and 'Continue >' buttons. Overlaid on the image in large red text are the phrases 'Assignment Project Exam Help', 'https://powcoder.com', and 'Add WeChat powcoder'.



# AWS provisions an instance and returns user credentials

AWS Elastic Beanstalk S3 EC2 VPC CloudWatch Elastic MapReduce CloudFront CloudFormation RDS SNS IAM

Navigation  
Region: US East (Virginia)  
EC2 Dashboard  
INSTANCES  
Instances  
Spot Requests  
Reserved Instances  
IMAGES  
AMIs  
Bundle Tasks  
ELASTIC BLOCK STORE  
Volumes  
Snapshots  
NETWORKING & SECURITY  
Security Groups  
Elastic IPs  
Placement Groups  
Load Balancers  
Key Pairs

My Instances  
Launch Instance Instance Actions Show/Hide Refresh Help  
Viewing: All Instances All Instance Types 1 to 3 of 3 Instances

	Name	Instance	AMI ID	Root Device	Type	Status	Security Groups	Key Pair Name	Monitoring	Virtualization	Placement
<input type="checkbox"/>	empty	i-a1c318cf	ami-e4a3578d	ebs	t1.micro	running	IM2001	IM2011	basic	paravirtual	
<input type="checkbox"/>	MyFirstInstance	i-3b7aa155	ami-76f0061f	ebs	m1.small	terminated	default		basic	paravirtual	
<input checked="" type="checkbox"/>		i-6176ad0f	ami-e4a3578d	ebs	t1.micro	running	IM2001	IM2011	detailed	paravirtual	

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1 EC2 Instance selected  
EC2 Instance: i-6176ad0f

Description Monitoring Tags

AMI: sles-11-sp1-v1.00.x86\_64 (ami-e4a3578d) Zone: us-east-1c  
Security Groups: IM2001 Type: t1.micro  
Status: running Owner: 026317314573  
VPC ID: - Subnet ID: -  
Source/Dest. Check: - Virtualization: paravirtual  
Placement Group: - Reservation: r-ddfe6db1  
RAM Disk ID: - Platform: -  
Key Pair Name: IM2011 Kernel ID: aki-427d952b  
Monitoring: detailed AMI Launch Index: 0  
Elastic IP: - Root Device: sda1  
Root Device Type: ebs Tenancy: default  
Lifecycle: normal  
Block Devices: sda1  
Public DNS: ec2-50-16-69-93.compute-1.amazonaws.com  
Private DNS: ip-10-196-229-93.ec2.internal  
Private IP Address: 10.196.229.93  
Launch Time: 2011-05-26 10:45 EDT  
State Transition Reason:



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## This week: IaaS Cloud and Amazon EC2

- API and CLI based access
  - <http://docs.aws.amazon.com/cli/latest/userguide/cli-chap-welcome.html>
- AWS access using Java SDK and CLI
- Learn how to use EC2 and S3 as example services
- Breaking down the steps - how AWS provided on-demand resource
- Create a web server and deploy your web application using AWS
- How to use on-demand infrastructure for regular applications?

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# AWS CLI

## CLI Setup

- Allows you to interact with AWS Services/APIs using command line
- Install AWS CLI on your machine
  - Mac OS example: <https://docs.aws.amazon.com/cli/latest/userguide/cli-chap-install.html>

## Examples

- Create an AWS instance using CLI:  
<https://docs.aws.amazon.com/cli/latest/userguide/cli-chap-tutorial.html>
- S3 for backup: <https://aws.amazon.com/getting-started/tutorials/backup-to-s3-cli/>

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## Deploy Web App

- <https://docs.aws.amazon.com/gettingstarted/latest/deploy/awsgsg-deploy.pdf>
- Services you will use
  - Elastic Bean Stalk
  - DynamoDB
  - SNS
  - IAM
  - Node app

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## Amazon EC2 Programming

- Amazon EC2 SDK for java on Eclipse

- <https://docs.aws.amazon.com/toolkit-for-eclipse/v1/user-guide/setup-install.html>
- <http://aws.amazon.com/eclipse/>
- A simple tutorial <http://media.amazonwebservices.com/videos/eclipse-java-sdk-video.html>

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- AWS Python SDK: Boto3

- <https://boto3.amazonaws.com/v1/documentation/api/latest/guide/quickstart.html>

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## Reference Material

- Installing AWS SDK on Eclipse  
<http://d36cz9buwru1tt.cloudfront.net/videos/eclipse-java-sdk-video.html>
- Amazon Elastic Compute Cloud (EC2) Getting Started Guide
- Amazon Elastic Compute Cloud (EC2) User Guide
- Programming Amazon EC2

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# Deconstructing Amazon EC2 request machine API

- User goes to Amazon EC2 portal and specifies desired parameters for a machine
  - Resource: CPU, mem, disk
  - Stack: OS and possibly with additional software
- Amazon AWS Cloud manager (resource pool manager) provisions the user request
  - Finds appropriate physical resource
  - Dispatches the request to virtualization manager on the identified resource
  - Cloud Manager invokes EC2 API to provisions the request
- Virtualization manager on physical server
  - Copies the pre-built software stack (virtual appliance)
  - Provisions a guest VM and configures parameters (IP address, access rules,...) at run/boot time
- Cloud manager returns login credentials to user

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1. User requests a machine with a desired Software stack, access rules

2. Cloud manager processes request

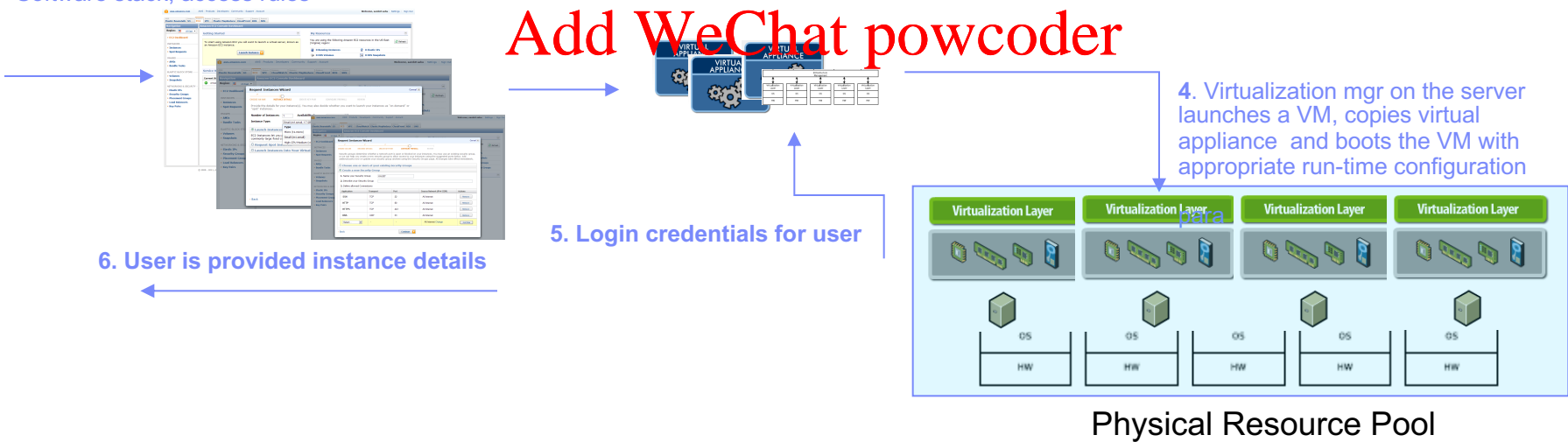
3. Identifies physical server where to instantiate

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4. Virtualization mgr on the server launches a VM, copies virtual appliance and boots the VM with appropriate run-time configuration

5. Login credentials for user

6. User is provided instance details



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## Papers for Next Week

- Reading List:
  - Google File System (GSF):  
<https://static.googleusercontent.com/media/research.google.com/en/archive/gfs-sosp2003.pdf>

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- Reference Materials
  - AWS in Action Chapter 3-6

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