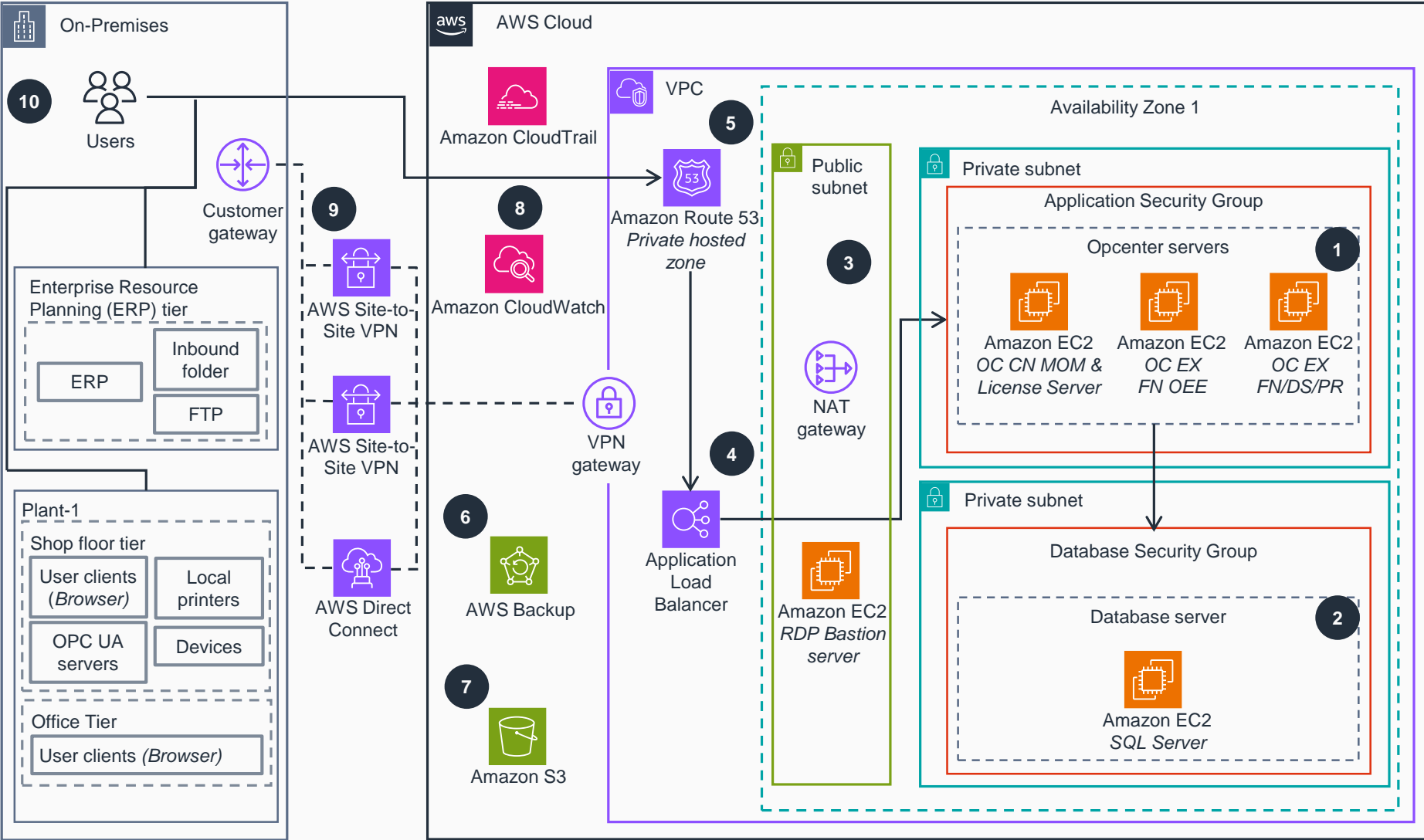


Guidance for Deploying Siemens Opcenter Execution Foundation on AWS

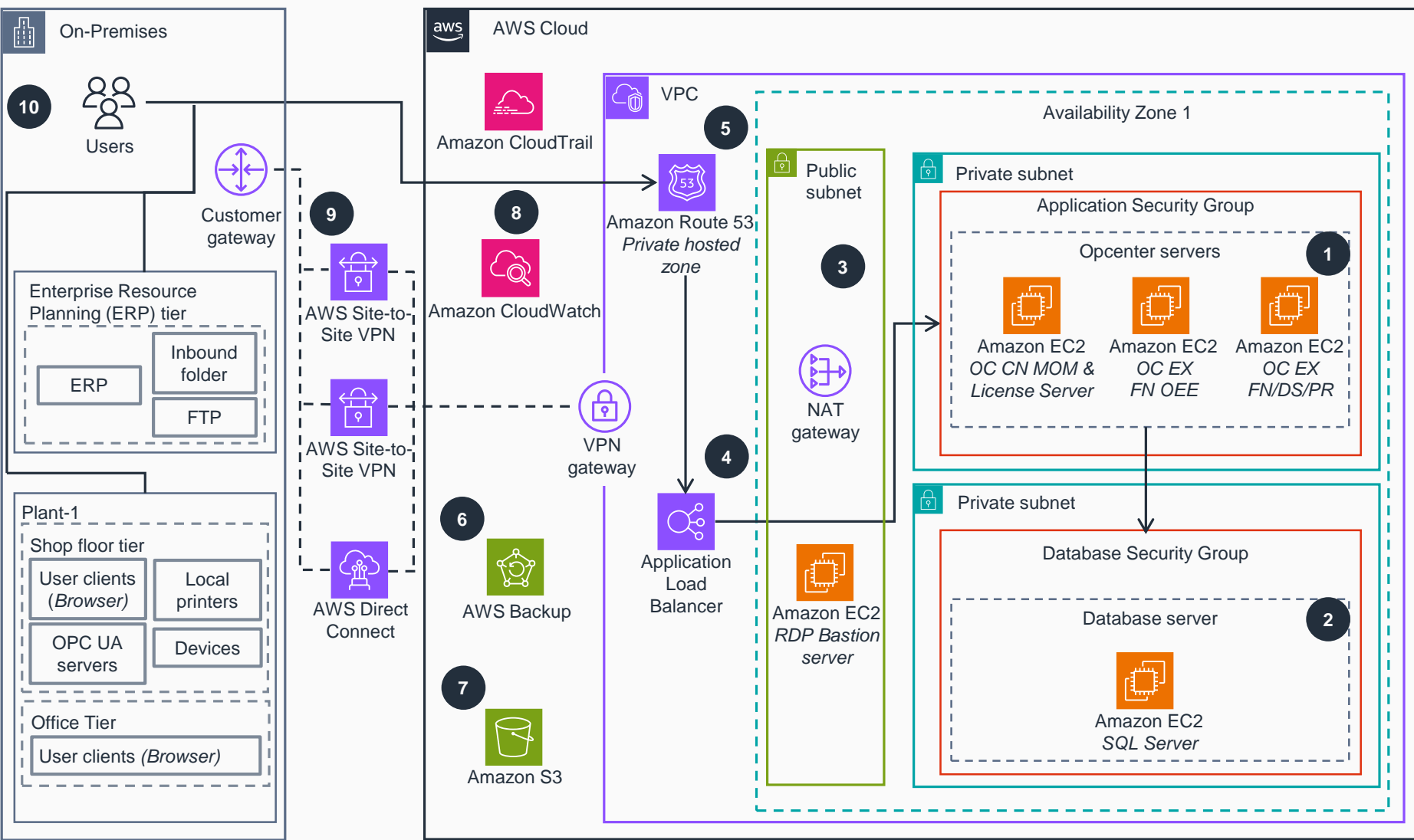
Overview architecture: This architecture diagram is a broad overview showing the minimal deployment of Siemens Opcenter Execution Foundation on AWS, a manufacturing execution system (MES) designed for orchestration of visibility, control, and optimization of production and processes. Steps 1-8 are outlined on this slide; steps 9-10 are outlined on the next slide.



- 1 Siemens Opcenter Execution is a manufacturing execution system (MES) used to orchestrate and monitor production processes. For this minimal architecture option, the primary Opcenter Execution Foundation/Discrete/Process (OC EX FN/DS/PR) application is deployed on **Amazon Elastic Compute Cloud (Amazon EC2)** in a private subnet. It is deployed with the supporting Opcenter Connect Manufacturing Operations Management (OC CN MOM) and licensing applications on another **Amazon EC2** instance. Another supporting application of Opcenter Execution Foundation Overall Equipment Efficiency (OC EX FN OEE) is deployed on a separate **Amazon EC2** instance.
- 2 A Microsoft SQL Server database is deployed on **Amazon EC2** in a private subnet for use by Opcenter servers as the primary data store.
- 3 A NAT gateway in the public subnet allows application and database servers to reach the internet, while a RDP Bastion server hosted on **Amazon EC2** allows access to servers in the private subnet.
- 4 The Application Load Balancer (ALB) serves as an entry point to access the MES application.
- 5 **Amazon Route 53** in a private hosted zone is used for routing to the ALB.
- 6 **AWS Backup** centralizes and automates data protection for all **Amazon EC2** instances.
- 7 **Amazon Simple Storage Service (Amazon S3)** stores files for the Opcenter Connect MOM application.
- 8 **Amazon CloudWatch** monitors the health of the workload and the infrastructure. **AWS CloudTrail** collects the audit logs for these workloads.

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Steps 8-10



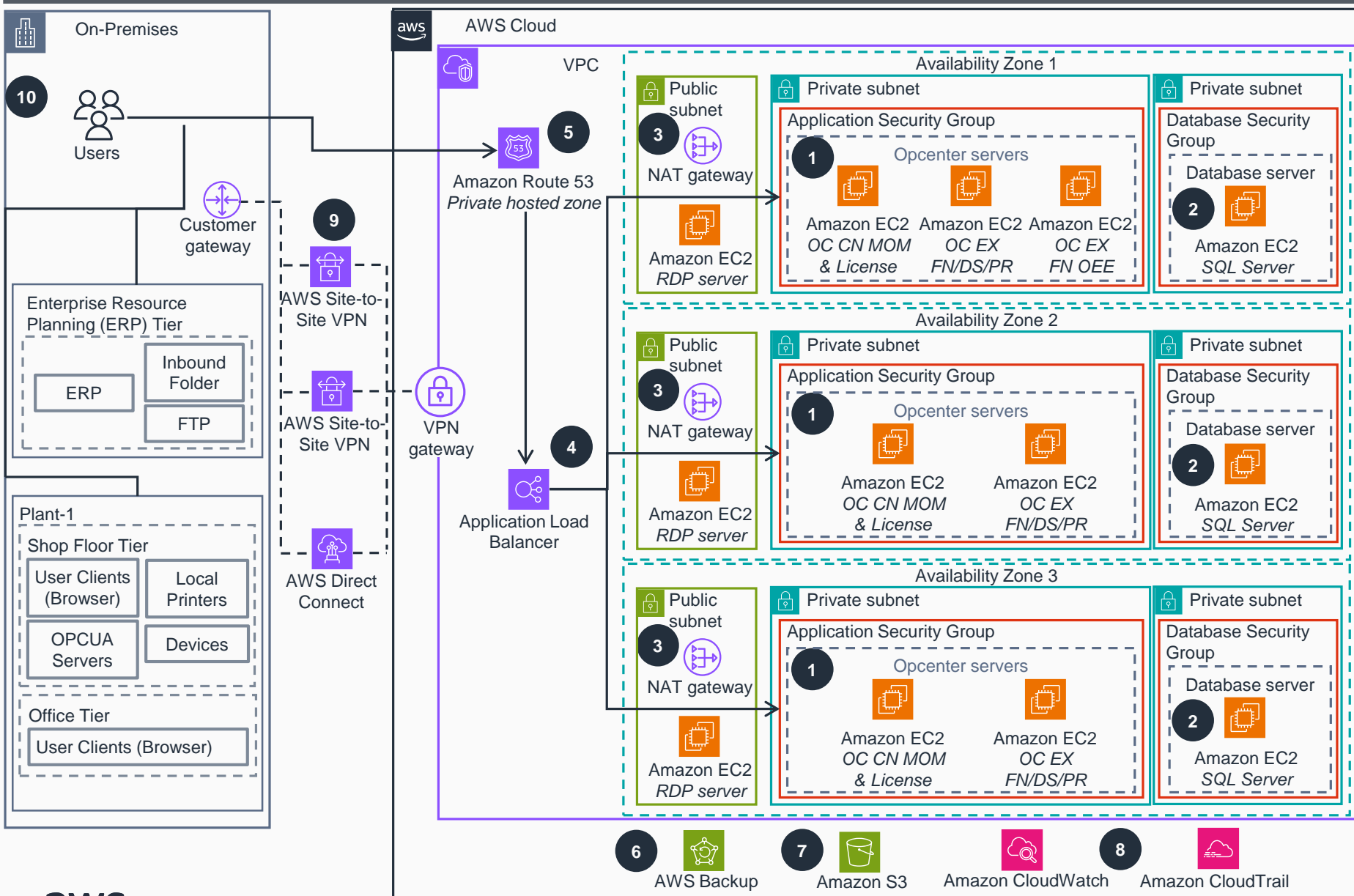
9 The network connectivity to the on-premises manufacturing and enterprise network is enabled by connecting the customer gateway and the VPN gateway through **AWS Site-to-Site VPN** or **AWS Direct Connect**.

10 To enable the visibility of manufacturing operations, the industrial machines in the shop floor tier can connect and send data to the MES application through the Open Platform Communications–Unified Architecture (OPC UA) communication servers. Operators in the shop floor tier orchestrate the production process by accessing the MES application through browser clients (laptops, PCs). The integration with the enterprise resource planning (ERP) application in the enterprise tier can connect with the MES application through file folders and FTP transfers. Other office users at the on-premises location can access the MES application through a web browser, enabling wider visibility into the manufacturing process.



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This architecture diagram shows core, critical OEE applications deployed in multiple availability zones for high availability. Steps 1-6 are outlined on this slide; steps 7-10 are outlined on the next slide.

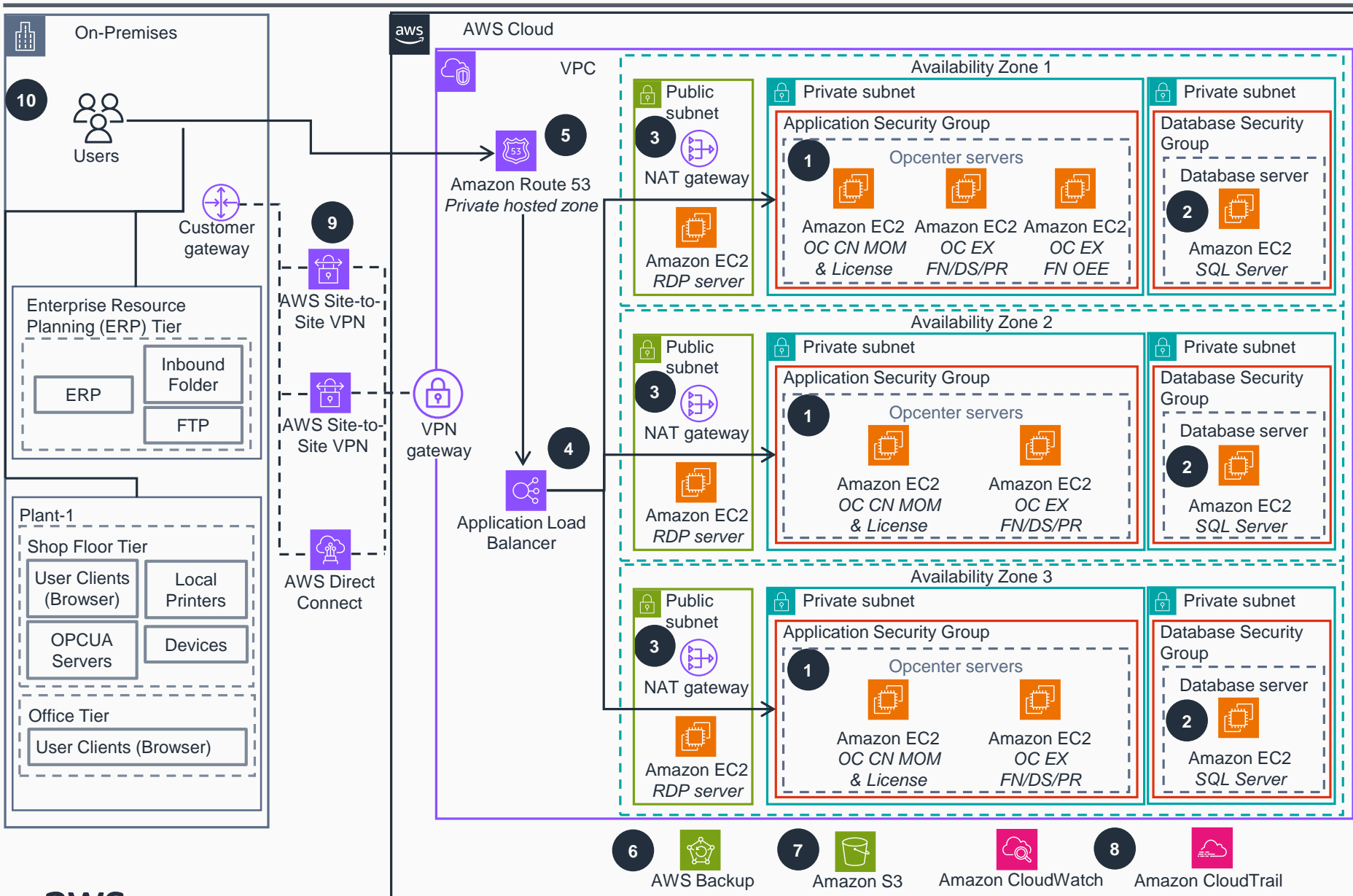


- For this highly available architecture option, the Opcenter Execution Foundation/Discrete/Process (OC EX FN/DS/PR) application is deployed on **Amazon EC2** in a private subnet. It is deployed with the supporting Opcenter Connect Manufacturing Operations Management (OC CN MOM) and licensing applications on another **Amazon EC2** instance. These core applications are deployed in multiple Availability Zones for high availability. Non-critical applications, such as the Opcenter Execution Foundation Overall Equipment Efficiency (OC EX FN OEE) application, are deployed on an **Amazon EC2** instance in a single Availability Zone.
- The Microsoft SQL Server database is deployed in a high availability configuration on **Amazon EC2** instances in a private subnet in multiple Availability Zones for use by the Opcenter servers as the data store.
- The **NAT gateways** configured in multiple Availability Zones allow the application and database servers to reach the internet. The RDP Bastion server, hosted on **Amazon EC2** in multiple Availability Zones, allows access to servers in the private subnet.
- The ALB serves as the entry point to access the MES application.
- Route 53** in a private hosted zone is used for routing to the ALB.
- AWS Backup** centralizes and automates data protection for all **Amazon EC2** instances.



Guidance for Deploying Siemens Opcenter Execution Foundation on AWS

Steps 7-10

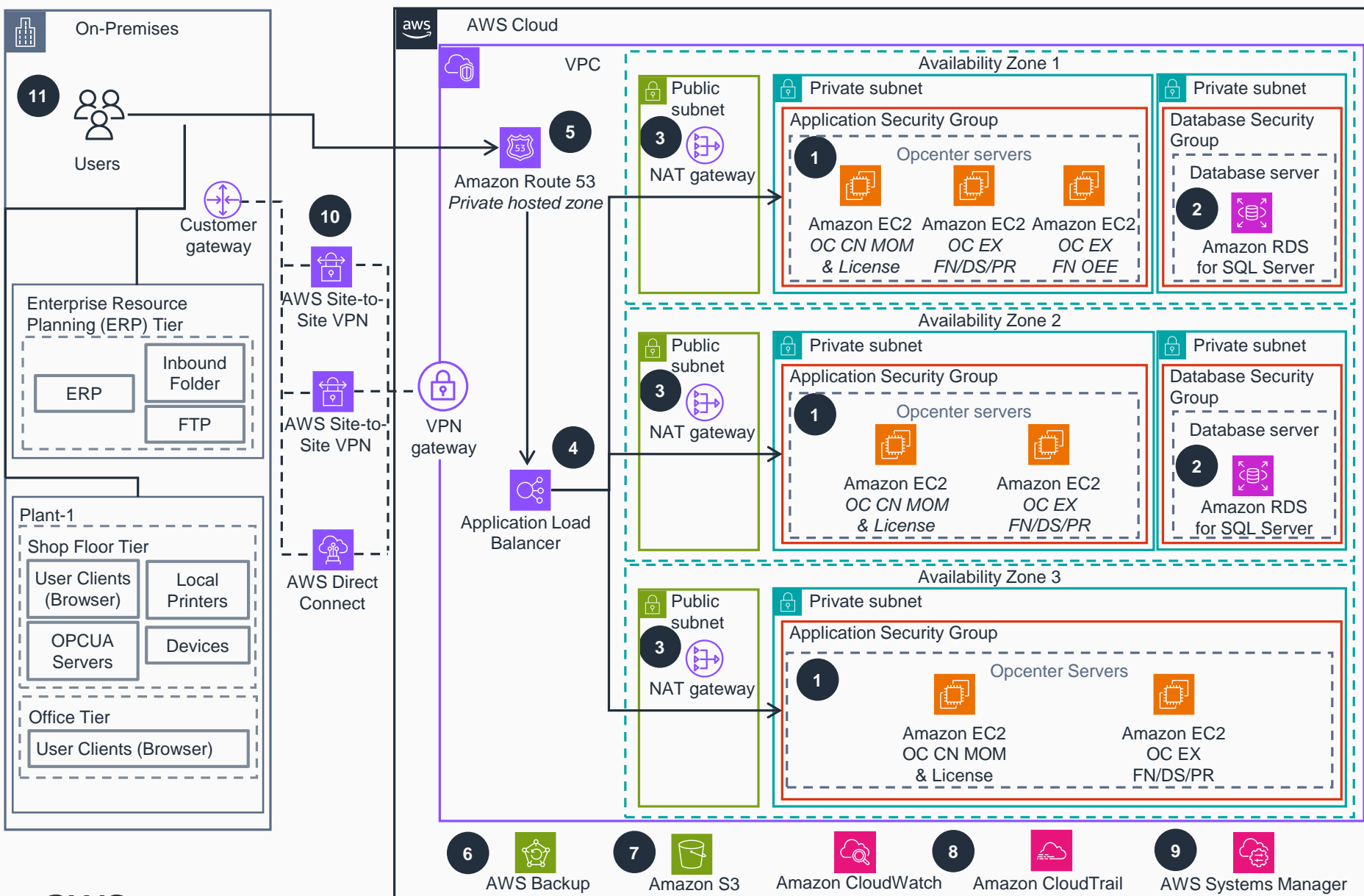


- 7 **Amazon S3** stores files for the Opcenter Connect MOM application.
- 8 **CloudWatch** monitors the health of the workload and the infrastructure. **CloudTrail** collects audit logs for these workloads.
- 9 The network connectivity to the on-premises manufacturing and enterprise networks is enabled by connecting the customer gateway and VPN gateway through **Site-to-Site VPN** or **Direct Connect**.
- 10 To enable the visibility of manufacturing operations, the industrial machines in the shop floor tier can connect and send data to the MES application through the OPC UA communication servers. Operators in the shop floor tier orchestrate the production process by accessing the MES application through browser clients. Local printers and devices are connected through local clients (laptops, PCs). The integration with the ERP application in the enterprise tier can connect with the MES application through file folders and FTP transfers. Other office users at the on-premises location can access the MES application through a web browser, enabling wider visibility into the manufacturing process.



Guidance for Deploying Siemens Opcenter Execution Foundation on AWS

This architecture diagram shows how AWS Managed Services can be configured to deploy OEE applications in multiple availability zones for high availability. Steps 1-7 are outlined on this slide; steps 8-11 are outlined on the next slide.

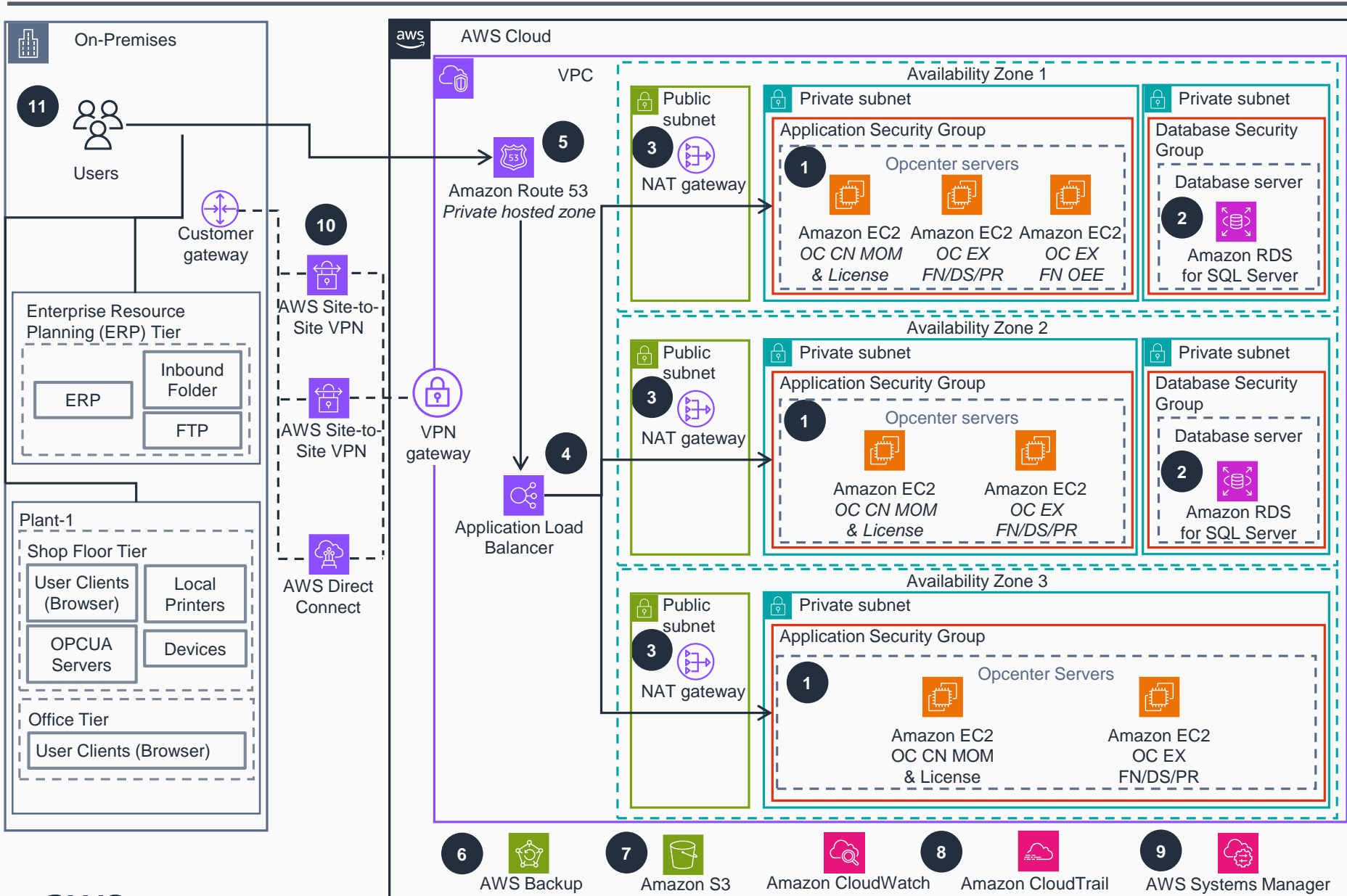


- For this highly available architecture with the AWS Managed Services option, the Opcenter Execution Foundation/Discrete/Process (OC EX FN/DS/PR) application is deployed on **Amazon EC2** in a private subnet. It is deployed with the supporting Opcenter Connect Manufacturing Operations Management (OC CN MOM) and licensing applications on another **Amazon EC2** instance. These core applications are deployed in multiple Availability Zones for high availability. Non-critical applications, such as the Opcenter Execution Foundation Overall Equipment Efficiency (OC EX FN OEE) application, are deployed on an **Amazon EC2** instance in a single Availability Zone.
- Amazon RDS for SQL Server** is deployed in a high availability configuration in a private subnet for use by Opcenter servers as the data store. If OC EX FN OEE is deployed, then **RDS Custom for SQL Server** should be deployed instead.
- The **NAT gateway** configured in multiple Availability Zones allows applications and database servers to reach the internet.
- The ALB serves as the entry point to access the MES application.
- Route 53** in a private hosted zone is used for routing to the ALB.
- AWS Backup** centralizes and automates data protection for all **Amazon EC2** instances.
- Amazon S3** stores files for the Opcenter Connect MOM application.



Guidance for Deploying Siemens Opcenter Execution Foundation on AWS

Steps 8-11

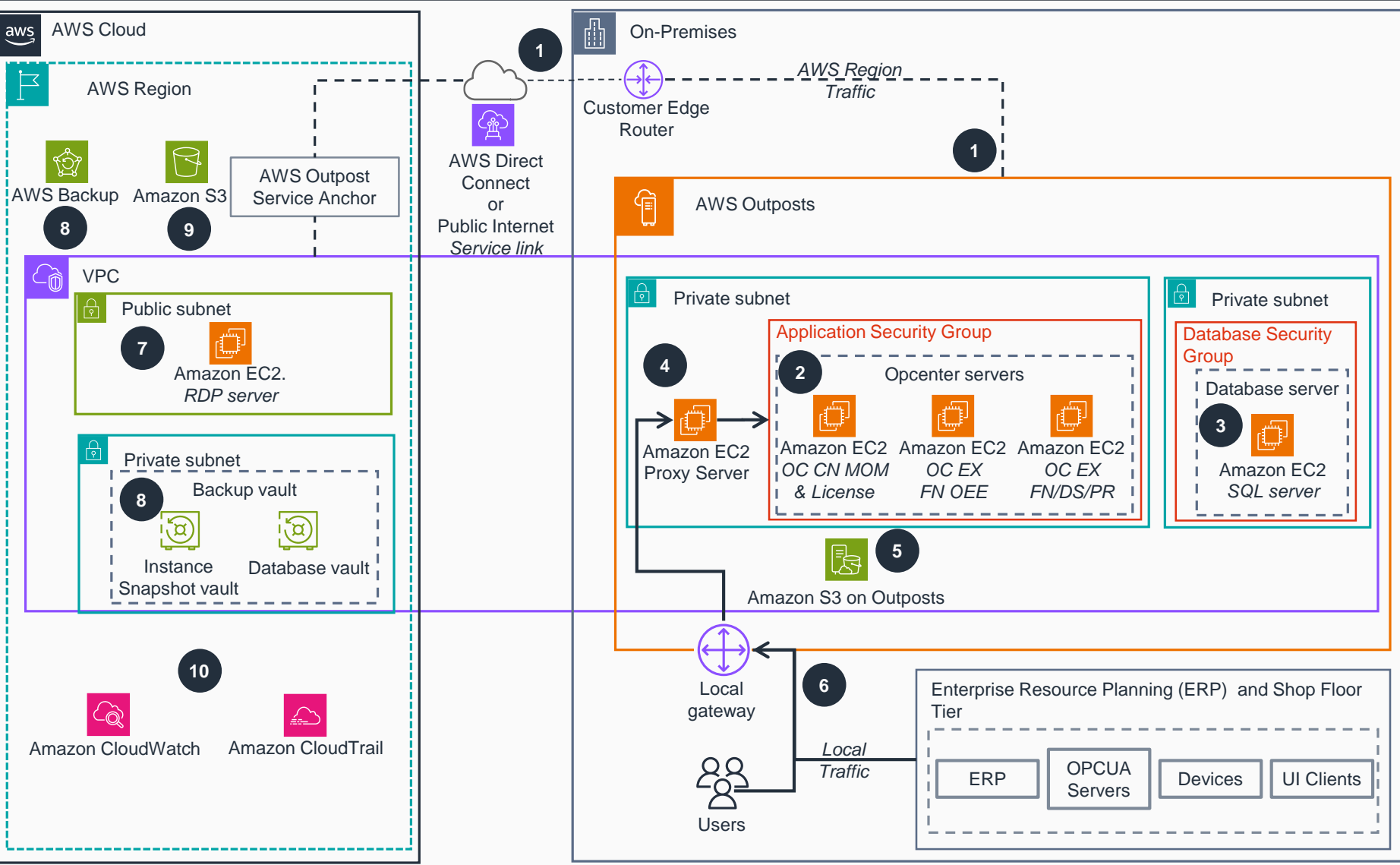


- 8 **CloudWatch** monitors the health of the workload and the infrastructure. **CloudTrail** collects audit logs for these workloads.
- 9 **AWS Systems Manager** is used to manage and access Opcenter application servers in the private subnet.
- 10 The network connectivity to the on-premises manufacturing and enterprise networks is enabled by connecting the customer gateway and VPN gateway through **Site-to-Site VPN** or **Direct Connect**.
- 11 To enable the visibility of manufacturing operations, the industrial machines in the shop floor tier can connect and send data to the MES application through the OPC UA communication servers. Operators in the shop floor tier orchestrate the production process by accessing the MES application through browser clients. Local printers and devices are connected through local clients (laptops, PCs). The integration with the ERP application in the enterprise tier can connect with the MES application through file folders and FTP transfers. Other office users at the on-premises location can access the MES application through a web browser, enabling wider visibility into the manufacturing process.



Guidance for Deploying Siemens Opcenter Execution Foundation on AWS

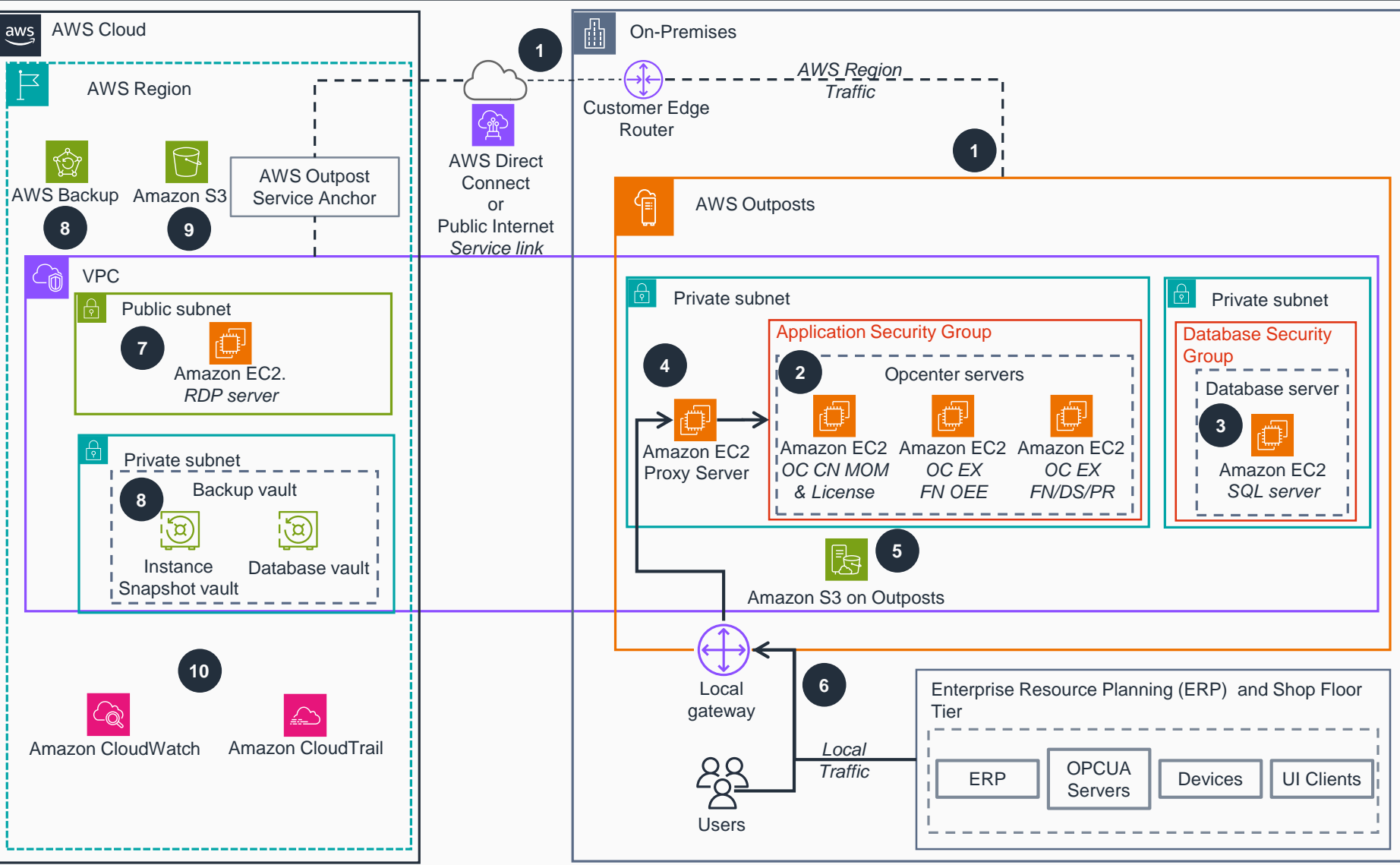
This architecture diagram shows how AWS Outposts is deployed on-premises, and connectivity to the AWS Region is established through an edge router connecting the Outposts service. Steps 1-5 are outlined on this slide; steps 6-10 are outlined on the next slide.



- 1 For this **AWS Outposts** option, **Outposts** is deployed on-premises, and connectivity to the AWS Region is established through an edge router connecting to the **Outposts** service anchor through the public internet or **Direct Connect**.
- 2 The primary Opcenter Execution Foundation/Discrete/ Process (OC EX FN/DS/PR) application is deployed on **Amazon EC2** instance in a private subnet on **Outposts**. It is deployed with the supporting Opcenter Connect Manufacturing Operations Management (OC CN MOM) and licensing applications on another **Amazon EC2** instance. Another supporting application of Opcenter Execution Foundation Overall Equipment Efficiency (OC EX FN OEE) is deployed on a separate **Amazon EC2** instance.
- 3 The Microsoft SQL Server database is deployed on **Amazon EC2** in a private subnet on **Outposts** for use by the Opcenter servers as the data store.
- 4 A proxy server is deployed on **Amazon EC2** instances in a private subnet on **Outposts** to allow access to the Opcenter application servers and the MES application.
- 5 **Amazon S3** on **Outposts** is used as file storage for the Opcenter Connect MOM application.

Guidance for Deploying Siemens Opcenter Execution Foundation on AWS

Steps 6-10



- 6 The local gateway on **Outposts** is used for network connectivity to the enterprise and shop floor tiers, so applications (like ERP) can connect with the MES application. The plant operators can connect to the MES application through browser clients. Industrial machines can connect and send data to the MES through OP CUA servers. Other devices are connected through local UI clients (laptops, PCs).
- 7 The RDP Bastion server is deployed on an **Amazon EC2** instance in a public subnet in an AWS Region. This allows the server access to the servers in the private subnet on **Outposts**.
- 8 **AWS Backup** is used to centralize and automate data protection for all **Amazon EC2** instances on **Outposts**. Backups are stored in secured vaults in an AWS Region to restore instances in case of disaster recovery.
- 9 An **Amazon S3** bucket in the Region is used as a backup for the **Amazon S3** bucket on **Outposts**.
- 10 **CloudWatch** is used to monitor the health of the workloads running on **Outposts** and in AWS Regions. **CloudTrail** is used to collect audit logs for these workloads.