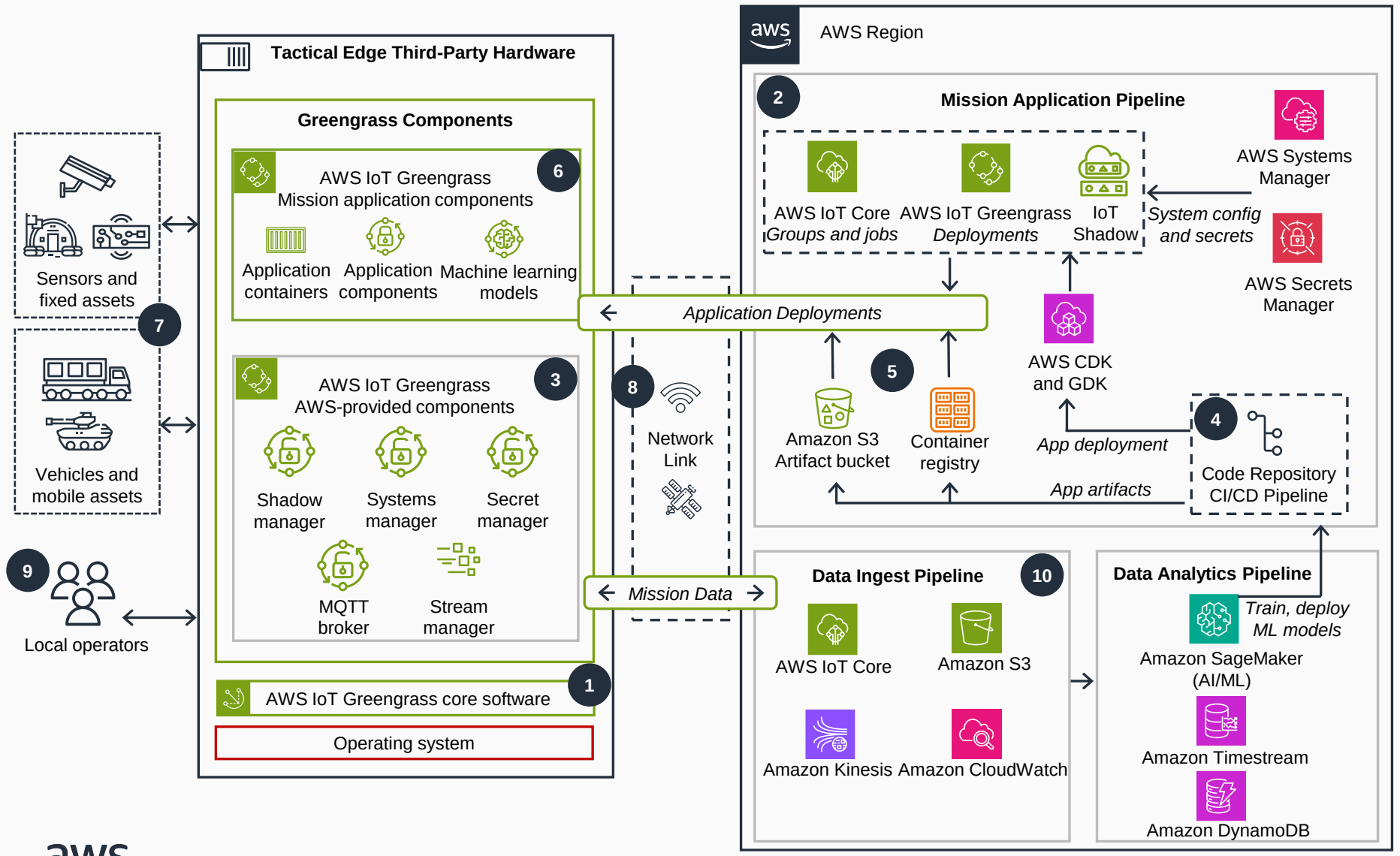
Guidance for Tactical Edge Application Deployment on AWS

Deploy applications onto third-party hardware

This architecture diagram shows how to deploy tactical edge applications from the cloud onto third-party edge hardware devices with AWS services. This slide shows steps 1-5, for steps 6-10, refer to the next slide.



1. **AWS IoT Greengrass core** software runs on compatible edge hardware devices and operating systems.
2. **AWS IoT Core** and **AWS IoT Greengrass** cloud services establish secure connections from edge devices to AWS using TLS and X.509 certificates, and orchestrate over-the-air (OTA) deployments.
3. The AWS-provided components are used to manage edge applications. This includes a local MQTT 5 broker, stream manager for data streaming, secret manager, and **AWS Systems Manager** for managing local secrets, patching, and SSH tunnels. It also includes a shadow manager for managing device and application state.
4. The mission application DevOps pipeline integrates with the cloud-to-edge deployment capabilities of **IoT Core** and **IoT Greengrass**, utilizing the **AWS Cloud Development Kit** (AWS CDK) and/or the **IoT Greengrass** Development Kit Command-Line Interface (GDK CLI) to configure and trigger **IoT Greengrass** deployments.
5. The edge application artifacts are built and staged in **Amazon Simple Storage Service (Amazon S3)** and/or a container registry. These artifacts are then deployed as **IoT Greengrass** components to the edge device through **IoT Greengrass** deployments.

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AWS Reference Architecture

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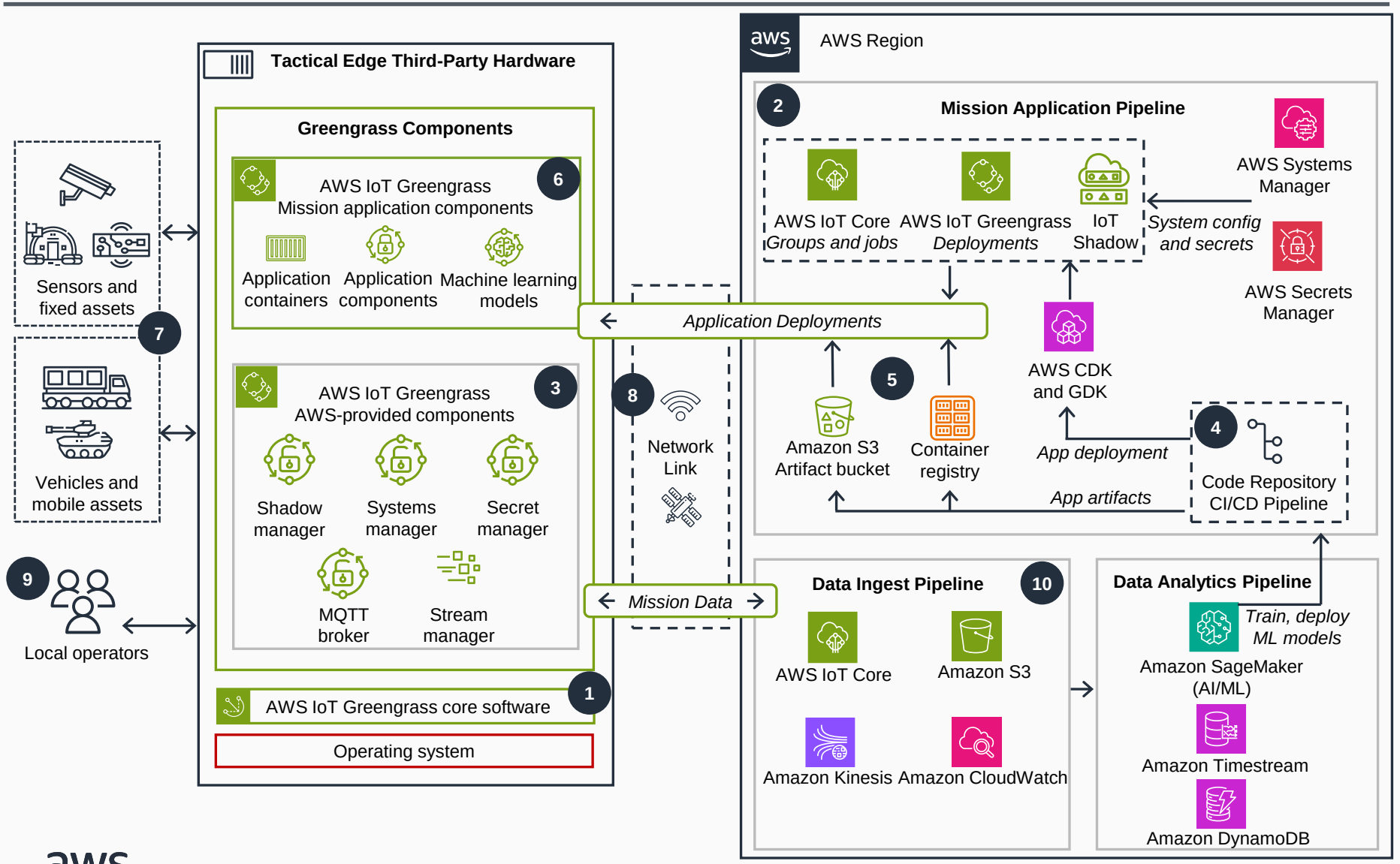
Steps 6-10



6 Mission-specific **IoT Greengrass** components and containers are used to execute the applications and machine learning (ML) models deployed from the mission application pipeline.

7 The mission applications communicatie with vehicles, sensors, and other fixed assets that are connected to the third-party hardware in the field. This communication can occur through either mission wireless networks or hardwired links to the connected assets.

8 Network connectivity is used for the initial deployment and edge-to-cloud data capture, if available during mission operations. However, the edge applications are designed to continue running even if the network is disrupted or becomes unavailable.

9 Operators interact with mission applications and the underlying system resources. Components can be deployed locally, if needed, through the **IoT Greengrass** CLI.

10 Data and analytics pipelines are utilized to process and store the mission data in the cloud. Furthermore, machine learning models can be trained on this data using **Amazon SageMaker**, and then staged for deployment through the mission application pipeline.

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AWS Reference Architecture

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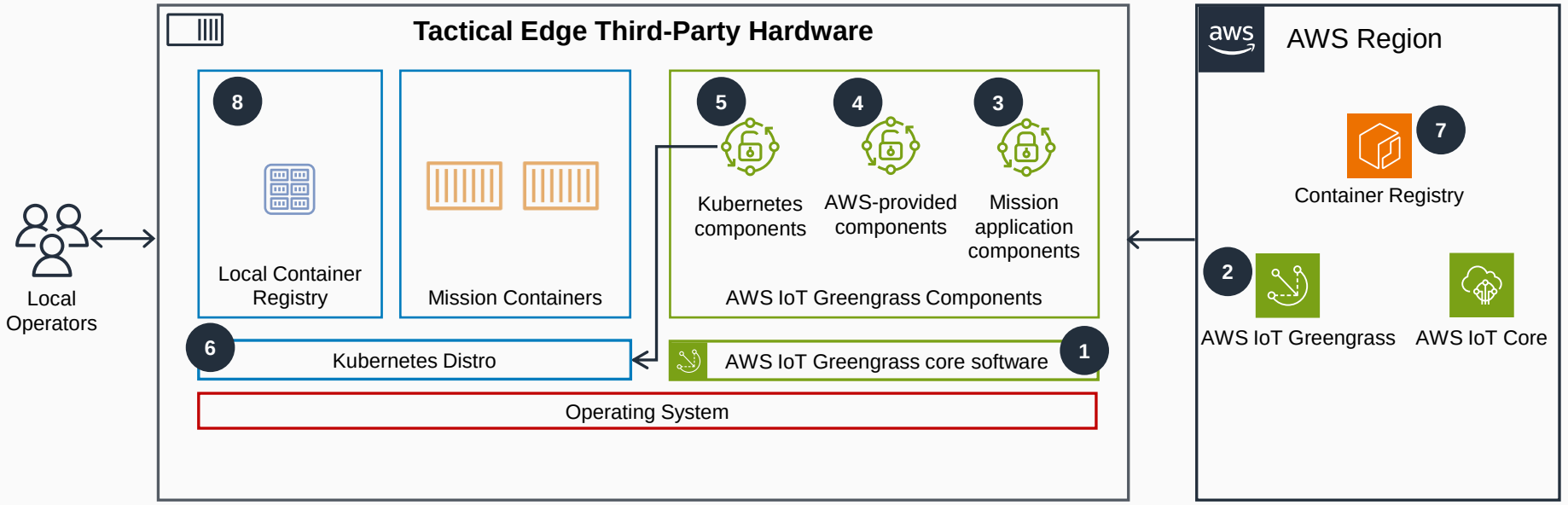
Kubernetes-based deployment

This architecture diagram shows how to extend the tactical edge application deployment on the third-party hardware architecture pattern to a single-node Kubernetes cluster on the third-party hardware.



1. **IoT Greengrass** core software runs on compatible edge hardware devices and operating systems.
2. **IoT Core** and **IoT Greengrass** cloud services establish secure connections from edge devices to AWS using TLS and X.509 certificates, and orchestrate over-the-air (OTA) deployments.
3. Non-containerized mission specific applications and ML models are deployed to the edge device as **IoT Greengrass** components.
4. The AWS-provided components are used to manage edge applications. This includes a local MQTT 5 broker, a stream manager for data streaming, a secret manager and **Systems Manager** for managing local secrets, patching, and SSH tunnels.
5. Custom Kubernetes components are responsible for configuring a single-node Kubernetes cluster on the edge device, and subsequently deploying containers to the cluster.
6. The Kubernetes cluster runs adjacent to the **IoT Greengrass** software on the operating system of the edge device. This Kubernetes cluster is responsible for running the mission containers, which are either deployed by the custom Kubernetes **IoT Greengrass** components or containers run by local operators.
7. The mission containers are built and staged in either a cloud-based container registry or **Amazon S3**. These containers are then deployed to the edge device through the custom Kubernetes components using **IoT Greengrass** deployments.
8. A local container registry can be deployed and configured by the Kubernetes components. The Kubernetes components can stage container images to the registry from the cloud as part of **IoT Greengrass** deployments.

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