Learn about Keystone

Keystone

NetApp
June 28, 2024

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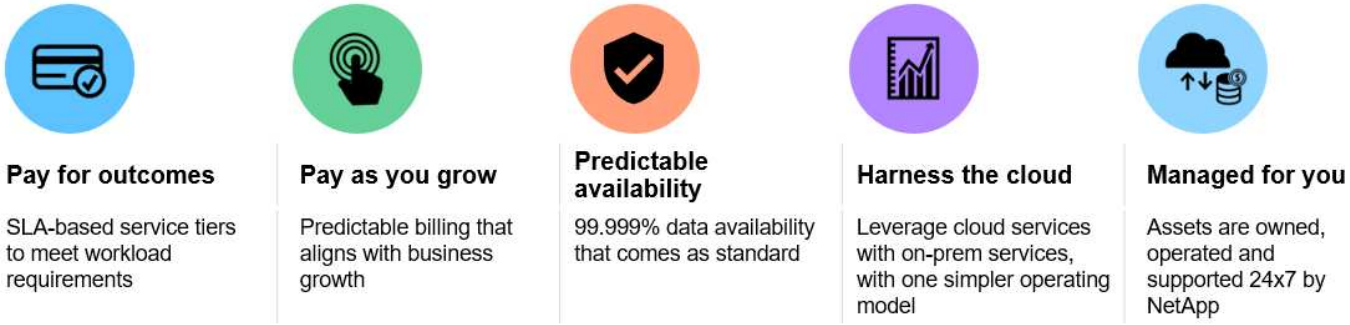
NetApp Keystone (Keystone) is a pay-as-you-grow, subscription-based service model that delivers seamless hybrid cloud experience for businesses preferring OpEx consumption models to upfront CapEx or leasing.

Keystone enables customers to accelerate time to value by reducing the hurdles in managing unpredictable capacity growth and complex procurement cycles. Keystone allows customers to align economics and operations to their business priorities.



Keystone provides storage capacity at predefined service levels for block, file, and object data types that can be deployed on-premises and operated by NetApp, a partner, or the customer. Keystone can be used in association with NetApp cloud services, such as Cloud Volumes ONTAP that can be deployed on a hyperscalar environment of your choice.

A Keystone subscription is associated with rate plans. There can be multiple rate plans attached to a single subscription.

Keystone Storage-as-a-Service (STaaS)

Storage-as-a-service (STaaS) offerings aim to deliver a public cloud-like model for the procurement, deployment, and management of storage infrastructure. While the majority of enterprises are still working on their strategy for hybrid cloud, you, as a customer, can opt for an OpEx-based *pay-per-use* consumption model. You might have a mandate to move all your workloads to cloud eventually, and yet not have a clear plan or schedule to migrate specific portions or all of your workloads over to the cloud. Keystone STaaS provides you with the flexibility to start with on-premises services and decide later on the right workloads and point in time to move to the cloud. Keystone STaaS provides commitment protection across deployment models. Instead of paying more for cloud services, you, as an on-premises customer, can reallocate your on-premises spending to add cloud services and essentially pay the same monthly bill that was committed prior to this reallocation.

Related information

- Keystone pricing
- Add-on services in Keystone STaaS
- Service levels in Keystone
- Keystone infrastructure

- Operational models in Keystone

Keystone infrastructure

This section describes the NetApp Keystone STaaS infrastructure, architecture, and management application for the NetApp and customer-operated environments.

Keystone infrastructure, design, choice of technology, and component products reside solely with NetApp. NetApp reserves the rights to take the following actions:

- Select, substitute, or repurpose products.
- Refresh products with new technology when deemed appropriate.
- Increase or decrease capacity of the products to meet service requirements.
- Modify architecture, technology, and/or products to meet service requirements.

The Keystone infrastructure includes multiple components, such as the following, among others:

- The Keystone infrastructure, including storage controllers.
- Tools to manage and operate the service such as AIOPs solution, Active IQ, and Active IQ Unified Manager.

Storage Platforms

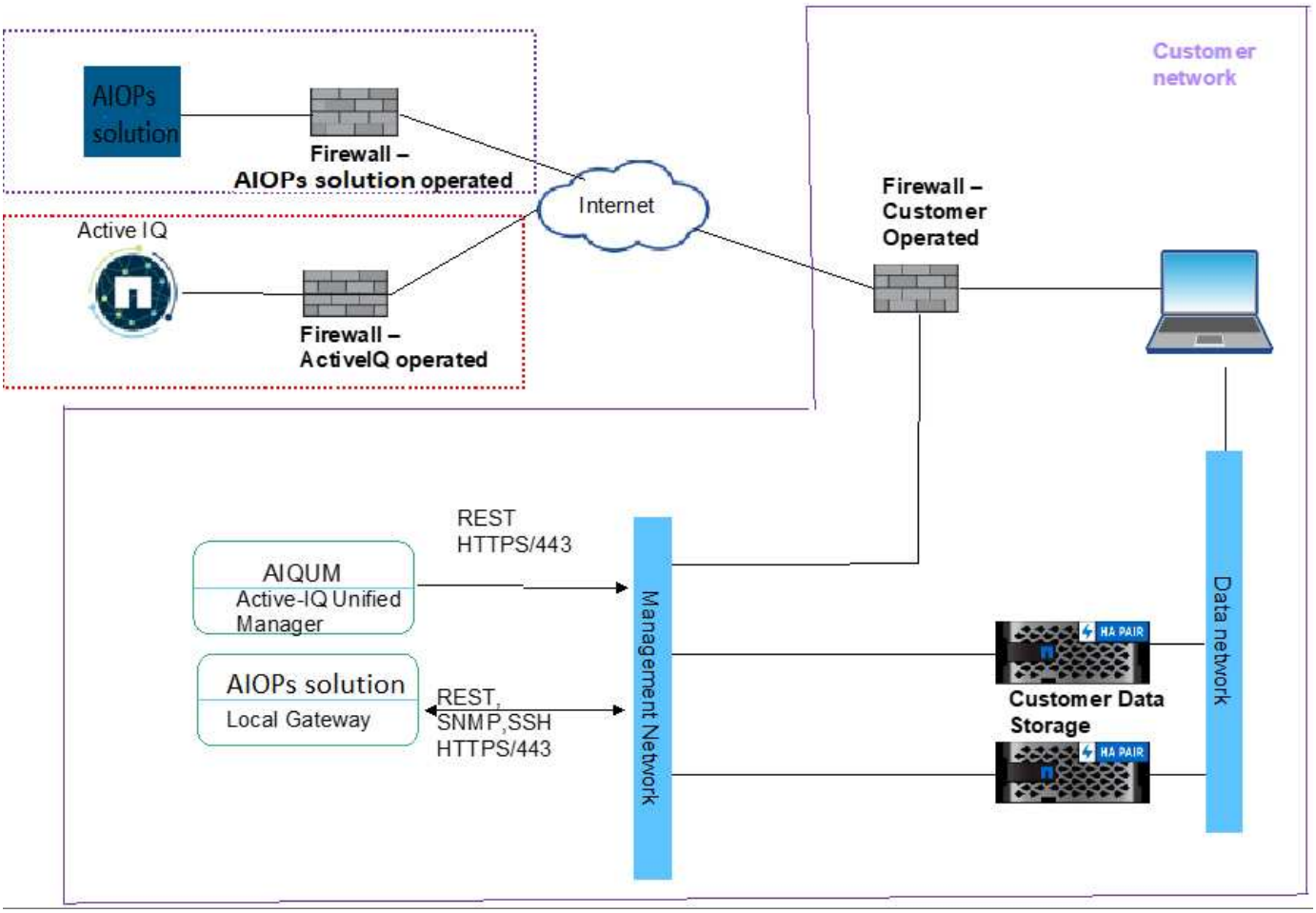
Enterprise applications need storage platforms to support fast provisioning-workflows, maintain continuous availability, sustain high workloads with low latency, deliver higher performance, and support integration with major cloud providers. NetApp has several products and technologies for supporting these requirements. For Keystone service, NetApp uses AFF and StorageGRID platforms.

Monitoring tools

In a Keystone customer-operated service, storage infrastructure and monitoring tools are installed at your site. The storage infrastructure consists of the required storage hardware needed to support your initial order, with the provision to order more storage later.

In addition to the storage equipment, two monitoring tools are provisioned for storage and consumption monitoring.

- AIOPs solution local gateway: A cloud-based application used to monitor your network. It has built-in integrations with NetApp storage platforms to collect environmental data and monitor the network. This service is enabled with the help of using a local gateway installed at your site that communicates with the cloud portal.
- Keystone Data Collector: Keystone Collector provides billing services to Keystone customers. This application is bundled with Active IQ Unified Manager. It collects data from ONTAP and StorageGRID controllers at an interval of five minutes. The data is processed, and metadata is sent to the centralized Active IQ data lake through the AutoSupport mechanism, which is used for billing data generation. Active IQ data lake processes the billing data and sends it to Zuora for billing.




```
Digital Advisor enables you to log in and view the subscription and
consumption details for your Keystone subscriptions. For more information
about Keystone reporting on the Digital Advisor dashboard, see
xref:{relative_path}../integrations/keystone-aiq.html[Keystone and Digital
Advisor].
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Components for deployment

This section lists the components required to enable NetApp Keystone STaaS services in your environment.

Site requirements

There are some site-specific requirements, such as space, racks, PDUs, power, and cooling, with additional network and security requirements discussed here.

Space

Floor space to host the Keystone infrastructure equipment (to be provided by customers). NetApp provides the weight specifications based on the final configuration.

Racks

Four post racks in the customer-operated offering (to be provided by customers). In the NetApp-operated offering, either NetApp or the customer can provide the racks, depending on requirements. NetApp provides 42 deep racks.

PDUs

You should provide the power distribution units (PDUs), connected to two separate, protected circuits with sufficient C13 outlets. In the customer-operated offering, in some cases, C19 outlets are required. In the NetApp-operated offering, either NetApp or the customer can provide the PDUs, depending on requirements.

Power

You should provide the required power. NetApp will provide the power requirement specifications based on 200V rating (Typical A, Max A, Typical W, Max W, Power cord type, and quantity), based on the final configuration. All components have redundant power supplies. NetApp will provide the in-cabinet power cords.

Cooling

NetApp can provide the cooling requirement specifications (Typical BTU, Max BTU), based on the final configuration and requirement.

Storage virtual machines

A storage virtual machine (storage VM) is required for the deployment of the Keystone Collector and the AIOPs solution gateway. The prerequisites for installing Keystone Collector are available here: Installation guide for Keystone Collector. The other requirements are shared during deployment.

Deployment Options

The Keystone Collector can be deployed through the following methods:

- VMware OVA template (VMware vCenter Server 6.7 or later is required)
- Customer provides Red Hat Enterprise Linux 7 or 8 or CentOS 7 Linux server. The Keystone software is installed via `.rpm` installation process.

AIOPs solution gateway is deployed on the following configuration:

- VMware OVA template (VMware vCenter Server 6.7 or later is required)
- Bootable .iso installer for
  - Citrix XenServer
  - Microsoft Hyper-V
  - Kernel-based Virtual Machine (Linux KVM)

Networking

Outbound access is required to the following services for operations and maintenance of the Keystone Collector and AIOPs solution gateway:

- support.netapp.com (usage data upload)
- keystone.netapp.com (software updates)

- Hub.Docker.io (software updates)

Depending on customer requirements and the storage controllers used, NetApp can provide 10 GB, 40 GB, and 100 GB connectivity at the customer's site.

NetApp provides the required transceivers for NetApp-provided infrastructure devices only. You should supply transceivers required for customer devices and cabling to the NetApp-provided Keystone infrastructure devices.

Remote access requirement

Network connectivity is required between the storage infrastructure installed at the customer data center or customer owned co-located services, and Keystone operations center. The customer is responsible for providing the compute and virtual machines, and the internet services. The network design should be over a secured protocol and firewall policies will be approved by both NetApp and customers.

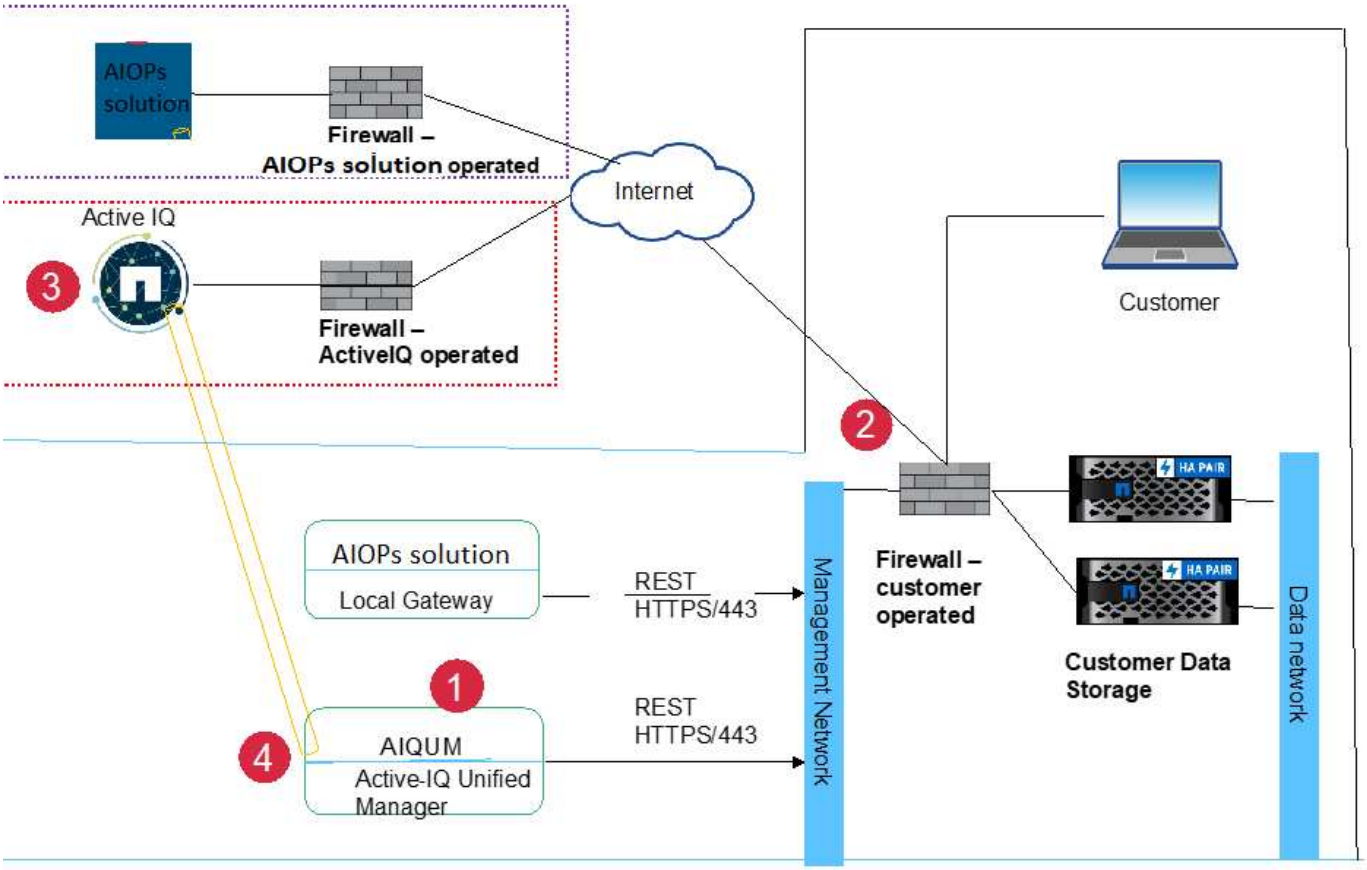
NetApp needs to access the hardware and software components installed for monitoring and management to provide services such as monitoring and billing to Keystone customers. The most common method is to establish a virtual private network (VPN) connection to the customer network and access the required data. To overcome any operational complexity perceived by customers to arise from opening firewall ports to new services, the monitoring tools initiate an external connection. NetApp cloud applications, such as AIOPs solution and Zuora, use this connection to perform their respective services. This method meets the customer requirement of not opening firewall ports though providing access to the monitoring components that are part of this service.

Keystone data flow

The data in Keystone STaaS systems flows through Keystone Collector and the associated monitoring system, the AIOPs solution tool.

Keystone Collector data flow

Keystone Collector initiates REST API calls to the storage controllers and obtains usage details of the controllers periodically, as indicated in this flow diagram:

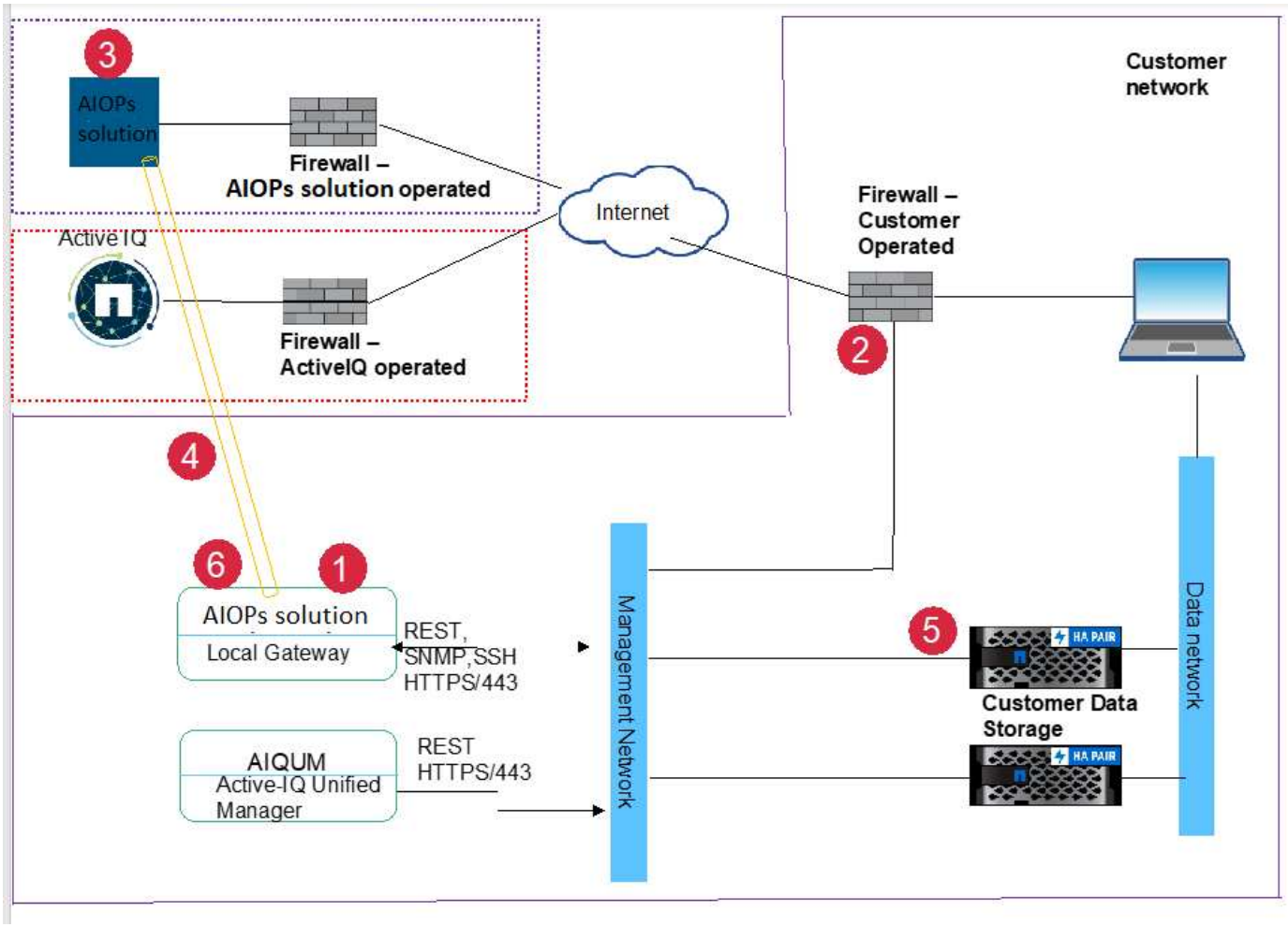


Legend

1. NetApp Collector initiates an HTTPS session to the Active-IQ cloud portal.
2. The firewall operated by the customer allows the connection.
3. The Active IQ cloud portal accepts the connection and establishes a tunnel to the NetApp Collector.
4. The NetApp collector establishes a REST API session to the management connection of the storage controller, obtains environmental data, and sends it to the Active IQ portal.

Monitoring data flows

Monitoring the health of the storage infrastructure continuously is one of the most important features of Keystone service. For monitoring and reporting, Keystone uses AIOPs solution, which needs remote access to customer's network. The following image describes how remote access to the customer location is secured by the AIOPs solution tool.



Legend

1. The AIOPs solution gateway initiates a TLS session to the cloud portal.
2. The firewall operated by the customer allows the connection.
3. The AIOPs solution server in the cloud accepts the connection.
4. A TLS tunnel is established between the cloud portal and the local gateway.
5. The NetApp controllers send alerts using SNMP protocol or respond to API requests to the local gateway.
6. The local gateway sends these alerts to its cloud portal using the TLS session, which was established before.

Operational models in Keystone

NetApp Keystone STaaS offers two operational models for service delivery: partner-operated model and customer-operated model.

- **Partner-operated model**: A partner or service provider operates the services for their end customers. For NetApp, the partner is the referenced contracted party. Tenants are customers of partners and have no billing relationship with NetApp. A partner-operated model has a multi-tenant environment where tenants and end customers/subtenants have their own subscriptions that are billed by the partner. The partner administrator performs the administrative tasks for all the tenants.
- **Customer-operated model**: As a customer, you can subscribe to Keystone services according to your selected service levels and storage. NetApp defines the architecture and products, and deploys Keystone

at your premises. You need to manage the infrastructure through your storage and IT resources. As a customer, you are the tenant or subtenant to NetApp or a partner/service provider. Based on your contract, you can raise service requests to be addressed by NetApp or your service provider. An administrator from your end can perform the administrative tasks at your site (environment). These tasks are tied to the users in your environment.

Roles and responsibilities across the service lifecycle

- **Partner-operated model**: The share of roles and responsibilities depends on the SLA between you and the service provider or partner. Contact your service provider for information.
- **Customer-operated model**: The following table summarizes the overall service lifecycle model and the roles and responsibilities associated with them in a customer-operated environment.

Task	NetApp	Customer
Installation and related tasks • Install • Configure • Deploy • Onboard	✓	None
Administration and monitoring • Monitor • Report • Perform administrative tasks • Alert	None	✓
Operations and optimization • Manage capacity • Manage performance • Manage SLA	None	✓
Support • Support customer • Hardware break fix • Software support • Upgrades and patches	✓	None

For more information on deployment, see Keystone infrastructure and Components for deployment.

Keystone Collector overview

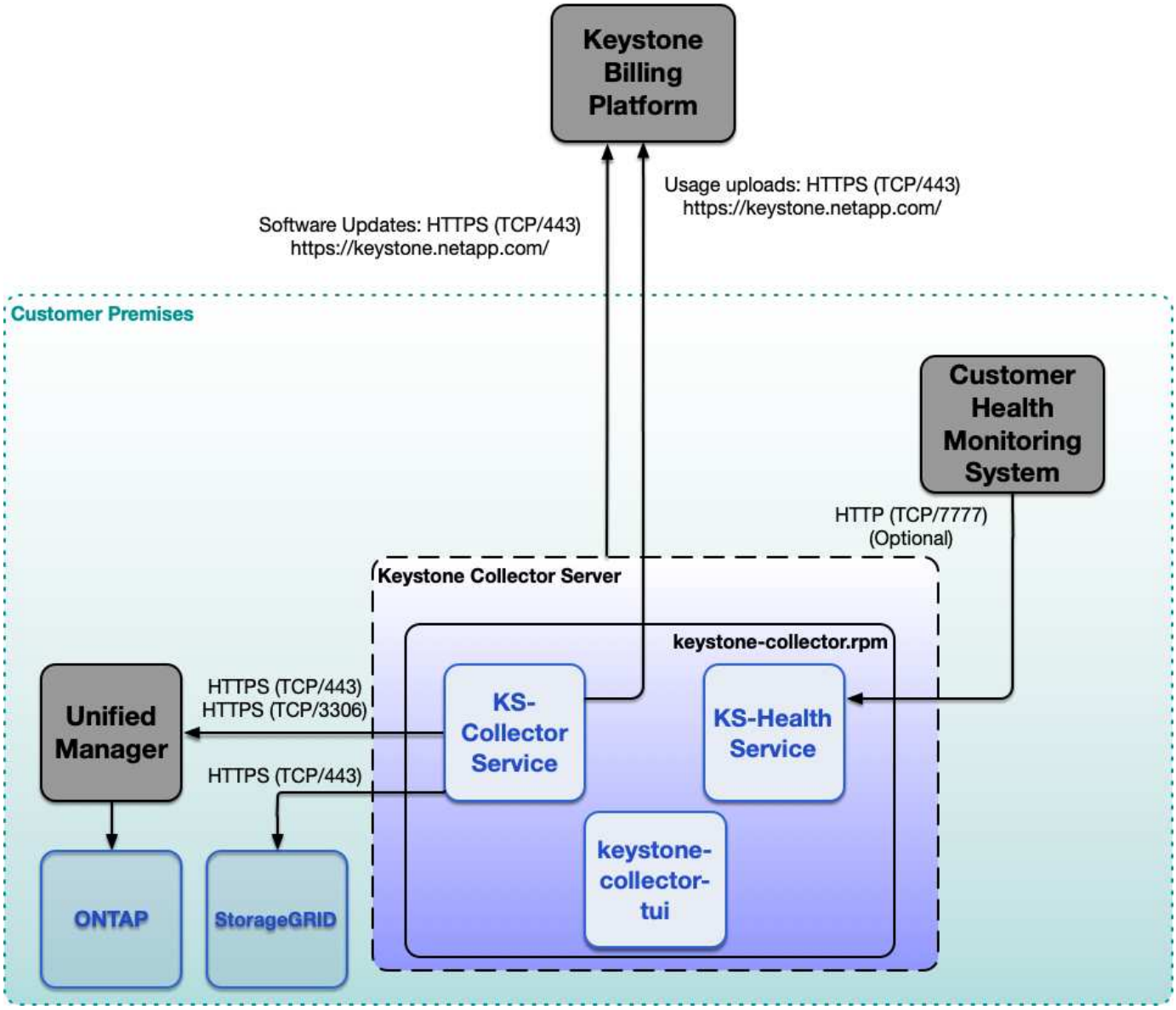
For availing your Keystone services and viewing your usage data, you should install Keystone Collector on a VMware vSphere or Linux system at your site.

> Keystone Collector represents the standard approach of collecting usage data for Keystone systems. If your environment cannot support Keystone Collector, you can seek authorization from Keystone Product Management to use AutoSupport telemetry mechanism as an alternative. For information about AutoSupport, see AutoSupport. For information about configuring AutoSupport for Keystone, see Configure AutoSupport for Keystone.

Keystone Collector is the usage acquisition component of the Keystone billing platform that leverages Active IQ Unified Manager and other applications to connect to ONTAP and StorageGRID systems to collect metadata required for usage and SLA performance metering of your Keystone subscriptions. It provides you with the ability to monitor system health, while sending your billing data for reporting.

> The installation and configuration information available here is applicable for ONTAP and StorageGRID. The requirements and procedures are generic to both ONTAP and StorageGRID, with exceptions pointed out.

This architecture diagram outlines the constituent components and their connectivity in a typical Keystone environment.


Keystone Billing Platform
Usage uploads: HTTPS (TCP/443)
https://keystone.netapp.com/
Software Updates: HTTPS (TCP/443)
https://keystone.netapp.com/
Customer Premises
Customer Health Monitoring System
HTTP (TCP/7777)
(Optional)
Keystone Collector Server
keystone-collector.rpm
Unified Manager
HTTPS (TCP/443)
HTTPS (TCP/3306)
KS-Collector Service
KS-Health Service
HTTPS (TCP/443)
keystone-collector-tui
ONTAP
StorageGRID

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