



Automating
OpenStack® for
Private Cloud

SUPERMICRO EXPEDITES AND AUTOMATES PRIVATE CLOUD DEPLOYMENT

Supermicro X13 CloudDC Servers running open source Ansible Simplify and Automate OpenStack Setup

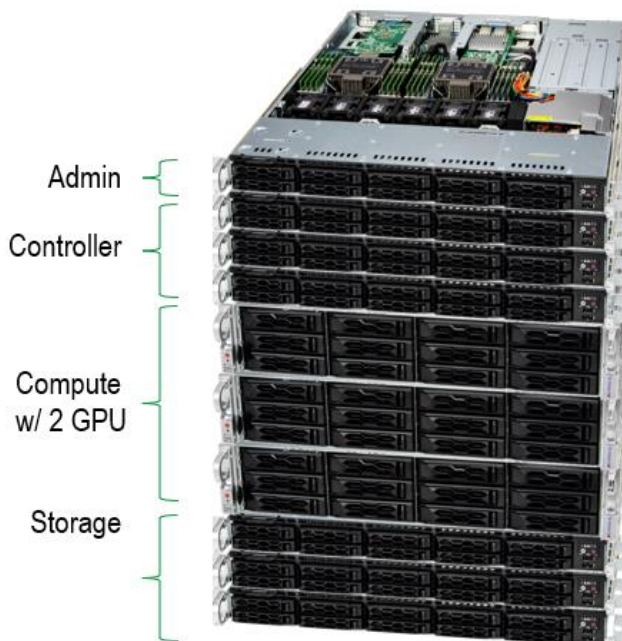


Figure 1. Cluster of X13 CloudDC servers, running OpenStack private cloud.

Executive Summary

The private cloud brings existing IT infrastructure forward while adding new systems technologies. New applications integrate with existing applications using virtualization and docker containers. Opensource OpenStack makes private cloud deployment easy.

OpenStack provides operational availability for applications with automatic scaling to support demand surges. This solution brief describes how Supermicro uses open source Ansible to quickly bring up an OpenStack infrastructure in a server cluster consisting of Supermicro X13 CloudDC servers.

OpenStack simplifies application scaling and high availability operations in the private cloud infrastructure. Open source Ansible simplifies and automates OpenStack setup in a cluster of server systems. The setup scales with minimal cost.

Private Cloud with OpenStack

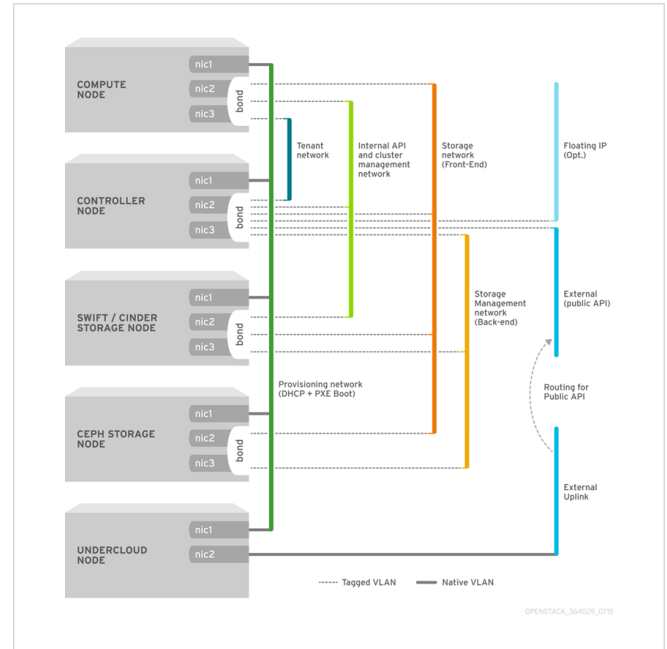
OpenStack provides all the necessary software to set up and run a private cloud in a scalable fashion that supports high application availability and responsiveness at a global scale. The same system hardware can be used as modular building blocks. High availability is provided by running each function on three or more servers. These servers are organized as follows:

- Admin server that administers the entire OpenStack system
- Controller servers that provide identity service, image service, management of Compute, and Networking
- Compute servers that run applications in virtual machines. Docker containers and Kubernetes orchestration can be installed on these virtual machines.
- Storage servers that provide a scalable and highly available storage platform

Creating a Private Cloud from Hardware

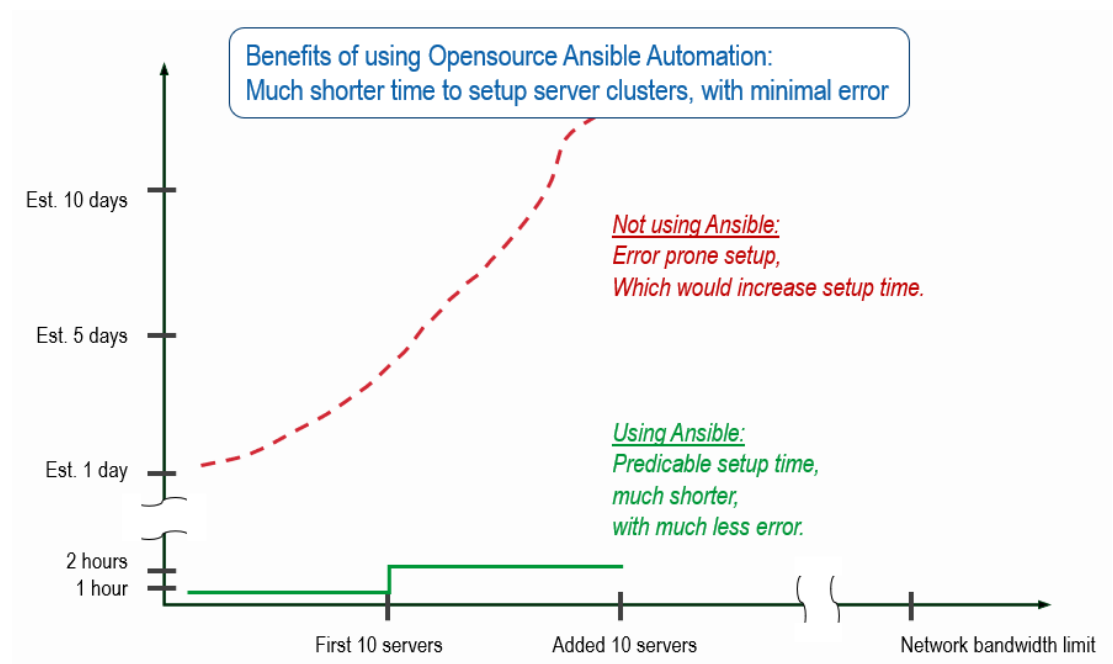
The steps to create a private cloud is as follows:

1. Set up Supermicro CloudDC systems in racks. A minimum of 10 servers are needed.
2. Network all the systems. Three networks are required:
 - Out-of-band management network
 - Internal data network
 - Internet facing data network
3. Setup IP addresses for all the systems
4. Use open source Ansible to perform the following steps automatically:
 - Open source Ansible automatically finds and takes inventory of all the hardware in the cluster.
 - Install Linux OS images in the systems. The OS image can be Red Hat, Ubuntu, or CentOS.
 - Prepare the administration server to install OpenStack on all the servers.
 - Run the OpenStack setup process in the administration server on the entire server cluster.
 - Open source Ansible makes this entire process fast, in hours rather than days. Adding one more server to the OpenStack cluster takes minutes.



Power of Open Source Ansible

Open source Ansible simplifies cluster setup with human readable automation, configuration and workflow orchestration, secure agentless architecture. The following table shows the time saving, after the servers have base OS setup, which could be done easily using SuperCloud Composer:



Opensource Ansible Features	Using Opensource Ansible	Not using Ansible
Human readable automation Configuration & workflow orchestration Secure agentless architecture Private cloud setup – OpenStack, Kubernetes Setup applications	10 servers in 1 hour	1 day or more days error-prone process
Manage cluster scaling	Add 1 or more servers, in 1 hour	1 or more day, error-prone process

Open Source Ansible Feature to Bring up OpenStack in a Server Cluster

Open source Ansible sets up clusters to run different applications. One feature is to set up a private cloud using OpenStack. Open source Ansible can also set up OpenStack across the cluster using an automated script delivered by Ansible. For this solution brief, Supermicro use open source Ansible to set up an OpenStack private cloud, a cluster of 10 CloudDC servers, in one hour, from bare metal to ready to operate the private cloud. DevOps administrators can then install users, virtual machines, software defined networks, network storage, and applications using the OpenStack interface.

Supermicro Data Center X13 CloudDC Servers

[Supermicro X13 CloudDC](#) is the all-in-one solution for data centers and cloud applications. It is cost optimized for large volume deployment, designed for convenient serviceability with tool-less brackets, hot-swap drive trays and redundant power supplies that ensure rapid deployment and more efficient maintenance. Ultimate flexibility on I/O is also one of the CloudDC’s highlights that enables highly customizable networking configurations for a wide range of workloads and maximum throughput. Its balanced architecture between CPUs is highly optimized for scalable compute, database, GPU, tiered storage and I/O intensive applications.

CloudDC is available in 1U or 2U, offering choice of 5th and 4th Gen Intel Xeon processors that support DDR-5 5600MHz memory and PCIe 5.0 I/O. The following server configurations are used to validate an OpenStack cloud cluster. The cluster consists of the following types of servers, which are also described in page 1 of this solution brief.

Administration Server (QTY 1), Controller Servers (QTY 3)	Components		Each
SYS-121C-TN10R	X13 CloudDC 1U, 10x 2.5", X13DDW-A, CSE-LB16TS-R0AWNP3		1
<i>Administration server runs the Ansible setup and monitoring. 3 controller servers ensure cluster high availability. If a controller server were to go out of service, another controller takes over immediately</i>	P4X-SPR6430-SRM7A-XCC	SPR 6430 2P 32C 2.1G 270W 60MB BI(1000) E5 4677 7yr	2
	MEM-DR532L-CL01-ER48	32GB DDR5 4800 ECC REG	16
	HDS-MUN-MTFDKCB960TFR1BC	960GB NVMe PCIe 4.0 3D TLC 7mm,1DWPD	2
	HDS-I2T0-SSDSC2KB076TZ	7.68TB SATA 6Gb/s 3D TLC 7.0mm, 2DWPD	1
	AOC-ATGC-i2TM-O	AIOM 2-port 10GBase-T RJ45	1
	AOC-A100G-m2CM-O	AIOM 2-port 100GbE QSFP28	1
	AOC-VROCSTNMOD	Intel VROC HW key (RSTe) standard module, RoHS	1

Compute Servers (QTY 3)	Components		Each
SYS-621C-TN12R	X13 CloudDC 2U, 12x 3.5", X13DDW-A, LA26AC12-R1K23AW2		1
<i>Compute servers (3 or more) run virtual machines and containers to provide the compute services in the cluster. The NVIDIA 100 GPUs are used in this configuration to do AI inference. Other GPUs could be deployed for other services.</i>	P4X-SPR6430-SRM7A-XCC	SPR 6430 2P 32C 2.1G 270W 60MB BI(1000) E5 4677 7yr	2
	MEM-DR564L-CL01-ER48	64GB DDR5 4800 ECC REG---MEM-DR564L-CL01-ER48	8
	HDS-I2T0-SSDSC2KB076TZ	7.68TB SATA 6Gb/s3D TLC 7.0mm, 2DWPD	2
	HDS-MMN-MTFDKBA960TFR1BC	960GB NVMe 4.0 M.2 22x80mm 3D TLC, 1DWPD	2
	AOC-A100G-b2CM-O	AIOM 2-port 100GbE QSFP28	1
	AOC-ATGC-i2TM-O	AIOM 2-port 10GBase-T RJ45	1
	GPU-NVH100-80	NVIDIA H100 80GB PCIe 5.0 x16 Passive Cooling	2
	AOC-VROCSTNMOD	Intel VROC HW key (RSTe) standard module, RoHS	1
	PWS-1K68A-1R	1U 1600W Redundant Titanium Power Supply	2

Storage Servers (QTY 3)	Components		Each
SYS-121C-TN10R	X13 CloudDC 1U, 10x 2.5", X13DDW-A, CSE-LB16TS-R0AWNP3		1
<i>Storage servers (3 or more) provide the highly available storage to the entire cluster</i>	P4X-SPR6430-SRM7A-XCC	SPR 6430 2P 32C 2.1G 270W 60MB BI(1000) E5 4677 7yr	2
	MEM-DR532L-CL01-ER48	32GB DDR5 4800 ECC REG	16
	HDS-MMN-MTFDKBA960TFR-15	960GB NVMe 4.0 M.2 22x80mm TCG Opal 2.0, 1DWPD	2
	HDS-I2T0-SSDSC2KB076TZ	7.68TB SATA 6Gb/s3D TLC 7.0mm, 2DWPD	4
	AOC-A100G-b2CM-O	AIOM 2-port 100GbE QSFP28	1
	AOC-ATGC-i2TM-O	AIOM 2-port 10GBase-T RJ45	1
	AOC-VROCSTNMOD	Intel VROC HW key (RSTe) standard module, RoHS	1

*Number of compute and storage servers, each server's configuration with memory, disks, network, GPU can be changed to meet customer requirements.

Conclusion

Supermicro uses open source Ansible to bring up an OpenStack private cloud in an hour on a cluster of Supermicro X13 CloudDC servers. This system provides a platform as a service with high availability and application scalability. Additional systems can be easily added to the cluster. Open source Ansible operates and runs the OpenStack cluster, providing reliable and scalable application services.

For more information:

[Supermicro CloudDC](#)

[Supermicro SuperCloud Composer](#)

[Open Source Ansible](#)

SUPERMICRO

As a global leader in high performance, high efficiency server technology and innovation, we develop and provide end-to-end green computing solutions to the data center, cloud computing, enterprise IT, big data, HPC, and embedded markets. Our Building Block Solutions® approach allows us to provide a broad range of SKUs, and enables us to build and deliver application-optimized solutions based upon your requirements.