Open, Secure, Efficient, Smart
InCloud OpenStack – Inspur Cloud Operating System

The adoption rate for cloud computing technology by industries is rising rapidly as the technology matures and customer acceptance increases. Many traditional industries, including those in financial services, telecommunications, large and medium-sized manufacturing, as well as small and medium-sized trade companies, are starting to look at the feasibility of using a cloud architecture based on virtual computing and storage to support their day-to-day business. Cloud technology can bring the users higher efficiency and improve resource utilization, but it also creates new challenges.

InCloud OpenStack 5.0 is a smart cloud operating system designed for the next generation of cloud data centers and cloud-native applications. It is a comprehensive cloud-based supporting platform from Inspur geared for critical, smart and scientific computing for the future. InCloud OpenStack 5.0 is a continuous innovation built on OpenStack. Based on the principles of openness, integration and security, it consolidates heterogeneous and hybrid resource managers to support an extensive cloud service directory, and provides a complete security protection system to realize automatic recognition of user businesses, intelligent resource management and automatic service delivery. It is tightly woven into OpenStack in areas like operation and maintenance, configuration management, in-depth monitoring and optimization for large data centers, thereby accelerating the smart-cloud evolution of large data centers.
InCloud OpenStack 5.0 is comprised mainly of a cloud management platform, InCloud OpenStack Core (main cloud platform), InCloud Sphere, InCloud Storage, InCloud Network, and InCloud Security.

- **Cloud Management Platform:** Based on OpenStack, this is responsible for the O&M and business management of computing, storage, network, and security resources, such as billing, automated scheduling for the services, logs and application delivery. It provides the corresponding services to administrators, operations and maintenance staff and service tenants via a unified self-service portal.

- **InCloud OpenStack Core:** This is the resource management scheduling layer for the cloud operating system. With the InCloud OpenStack Core, the platform can consolidate scheduling management for computing, storage, and network resources, as well as use its open architecture to provide compatibility support for heterogeneous hardware devices and software platforms.

- **InCloud Sphere:** The InCloud Sphere from Inspur is a key component in the cloud-based platform. Using virtualization technology built on a bare metal architecture, it consolidates the management, scheduling and allocation of logical resources derived from abstractions of the physical server's resources like CPU, memory, and I/O resources. With these logical resources, it creates a virtual operating environment where several virtual machines (VM) instances can run at the same time and be mutually isolated from one another on a single physical server.

- **InCloud Network:** The InCloud Network is the SDN network component for the cloud-based platform, and an overlay network virtualization solution. Based on Hypervisor software, it uses a distributed architecture to allow users to easily and flexibly build and manage virtual networks. It provides L2-L7 virtual network functional support such as switch, rout VXLAN, BGP, NAT, and DHCP to offer extensive network support services for service deployment.

- **InCloud Storage:** The InCloud Storage from Inspur is the SDS storage component for the cloud-based platform. A distributed storage software that is deployed in x86 general servers, it uses all the local disks on the server to form a virtual storage resource pool to provide an external storage function.

- **InCloud Security:** InCloud Security from Inspur is the security component for the cloud-based platform. Starting from the tenant at the top down to physical security at the lowest level, it encompasses user security, service security, operating security, and more comprehensive system security solutions.

### Product Features

**Functionality**

The InCloud OpenStack 5.0 cloud operating system is a continuous innovation built on OpenStack, and comes with strong resource abstraction and presentation capabilities.

- Able to unify heterogeneous resource managers to support virtualization software from multiple vendors, and consolidate resource management in a bare metal architecture.
- An extensive cloud service directory that can provide computing, storage, networking, security, and application type of resources to support cloud hosting, cloud drive, cloud firewall, cloud load balancing, and cloud networking.
- Includes a comprehensive security protection system that not only provides security protection vertically from the hardware, virtualization layer all the way to the business layer, but also across many dimensions with user management, access control, monitoring and audit, and data protection to achieve a reinforced and secure environment.
- Tightly woven into OpenStack in areas like operation and maintenance, configuration management, in-depth monitoring and optimization for large data centers.

**Availability**

InCloud OpenStack 5.0 cloud operating system provides a multi-dimensional high availability solution design using hardware stacks, as well as high availability architecture, controller, virtual machines, and services to make sure that the platform is stable.

- Uses stacks and redundancy design at the hardware layer to ensure high availability of the physical infrastructure.
- Achieves disaster recovery and backup for the businesses using solutions like "dual-locations, three-centers" at the architecture layer, or multiple live data centers.
- Live migration at the virtualization and platform layers allows system upgrades, routine service maintenance, and automatic resource expansion to be carried out easily.
- Ensures the high availability of the tenant's business by providing functions like High Availability, and Fault Tolerance at the virtualization layer.

**Security**

InCloud OpenStack 5.0 release made several significant improvements on the native OpenStack in terms of data security with functions like trusted computing, non-proxy antivirus, and data protection to make sure that the business data is secure, and to prevent data theft.

- Combines with mainstream antivirus software to eliminate both agent and non-agent-based malware on the virtual machines.
- Encrypted information transmission between virtual machines, and each OpenStack component.
- Optional encryption for cloud drive data for storage and complete data cleanup when the cloud drive is destroyed.
- Integrates with SSR products from Inspur to form a complete nationwide cloud security solution.
Key Advantages

Based on OpenStack

The core of InCloud OpenStack 5.0 cloud operating system is the mainstream OpenStack platform. Designed based on the deep understanding that Inspur has on customers' needs, it uses core OpenStack components like Nova (Computing), Cinder (Block Storage), Swift (Object Storage), Neutron (Network), and Glance (Image) to carry out significant optimization and development to build an open ecosystem, and establish a comprehensive product layout to create a better experience for cloud users.

Modular Design

A hierarchical and modular architecture is adopted to reduce the software complexity using decoupling between the modules while making sure that the functions are complete. InCloud OpenStack 5.0 uses a three-layer architecture design. At the top, the cloud management platform uses standard OpenStack APIs to manage the InCloud OpenStack Core which is the resource scheduling management layer. The virtualization management layer is the lowest layer and includes four virtualization modules for computing, storage, networking, and security.

Heterogeneous Virtualization Compatibility

The extended InCloud OpenStack 5.0 platform is compatible with many virtualization technologies, and supports many enterprise grade virtualization technologies like VMware, Hyper-V, and PowerVM in addition to KVM, and Xen. While it protects the customers' investments, it also encapsulates the differences of heterogeneous virtualization platforms in order to provide the same cloud hosting service for the customers even when there are multiple virtualization platforms.

Comprehensive Service Catalog

InCloud OpenStack 5.0 provides customers with an extensive service catalog to consolidate resource delivery, and services include cloud hosting, cloud physical machine, cloud drive, cloud firewall, cloud network, cloud load balancing, and cloud monitoring.

Intelligent Automated Operations

InCloud OpenStack 5.0 cloud operating system offers cloud data center administrators powerful operation and maintenance capabilities. Other than cloud resource distribution using the cloud operating system, administrators can also manage the network, server, storage, and other hardware devices, business applications and equipment room infrastructure for a one-stop operation and maintenance experience.

Visual Management

The entire network environment can be visualized using a visual topology to provide better user experience for administrators and users. This comes with drag-and-drop interactive operations to allow the users to quickly and easily add virtual rout, switch computing and storage resources, and this simplifies the management to improve management efficiency.

Seconds-Based Billing

InCloud OpenStack 5.0 comes with a millisecond cloud resource sampling system, which can measure and deduct the fees based in seconds to provide an on-demand pay-per-use structure. It also comes with a flexible pricing strategy where customers can set pricing strategies for different resources in different regions, and independently customize multiple prices for a single resource.

High Availability Architecture

A high-availability and reliable cloud computing resource pool is created using high-availability technologies that include integrating local computing and storage resources into a single computer, storage resource pool, network path redundancies, network planar design, multiple storage instances, IO consolidation, and automatic load balancing.

Toolchain

InCloud OpenStack 5.0 makes use of many best industry practices accumulated to date to create a complete day-to-day automated operations and maintenance tool system that includes installation, deployment, system maintenance, alarm monitoring, log management, and 3D equipment rooms. In terms of alarm system, smart monitoring and optimization, it has achieved some progress in making these processes more intelligent.

• The InCloud OpenStack container installation and deployment tool from Inspur is based on the kolla project
• The open-source ELK box is used in Inspur cloud platform for log collection, analysis, and storage to provide the basis for an intelligent alarm system
• Hardware information search and collection, resource self-service and alarms are implemented using zabbix with various agents
High Availability Controller

The high availability controller is implemented at the software and hardware level. The software level is mainly achieved by synchronizing software at the lower level and the load balancing cluster. High availability controller at higher layers is implemented using a hardware-based fault-tolerant technology to achieve “seconds-based” switching.

High Availability Virtual Machine

High availability virtual machine is mainly achieved using the virtualization function provided by KVM in order to cope with the demand shift when a fault occurs at a physical node. Depending on the type of migration, the pool of computing resources based on the KVM mode is able to support planned live migration and planned external migration (HA).

High Availability Storage

With the distributed file system in the integrated architecture, the system provides the mechanism to replicate cross-server data instances. When a small number of nodes fail, this helps to ensure that data is not lost, and can be automatically recovered in a relatively short period of time. It permits the percentage of failed nodes to vary with the number of redundant instances.

High Availability Service

Services in the virtual machines can recover when there is a fault if virtualization products from Inspur are included in the solution. These products eliminate the need for manual inspection and start, and greatly enhance the service reliability and availability, as well as shorten the service interruption time due to the fault in the virtual machine.

Standard Open Cloud Interface

InCloud OpenStack 5.0 cloud operating system can provide open, standard protocol interfaces, making it easier for the cloud management platform to connect to the third party management platform, and at the same time, facilitate the user in developing a second system based on the cloud operating system.

Reinforced Security

InCloud OpenStack 5.0 uses a layered reinforced security design to enforce the security for the virtual machine, hypervisor and physical host under the cloud platform respectively. Working with mainstream antivirus software vendors, a non-pagentantivirus solution is implemented on the cloud platform. An independent nationwide reinforced security scheme can be created when this is combined with the SSR/SSA products from Inspur.

Application Scenarios

- New data center, private cloud, industry cloud, hybrid cloud
- Cloud transformation for data center provides resources and services within and outside the organization
- Cross-regional cloud infrastructure allows multiple data centers to be collaboratively managed

Customer Value

- Simplifies the complex IT environment, and injects flexibility into the enterprise IT system for a revolutionary upgrade of enterprise IT infrastructure
- Transforming a traditional data center into a cloud-based data center increases the ease of use of data centers, and their scalability, and objectiveness in order to respond to the changing needs of users and markets
- Supports automatic operation and maintenance to improve operation and maintenance efficiency by up to 70%, and greatly reduces operation and maintenance costs