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Kubernetes on-premise cluster concept from GEM System

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Motivation for Kubernetescluster on-premise

The motivation to consider deploying a container platform and Kubernetes cluster on-premise is the implementation of new enterprise applications using the „CloudReady“ microservices concept. The goal then is not only to enable applications to migrate to the public cloud, but also to automate load balancing of internal infrastructure and automate a number of processes for deploying new versions of applications.

Briefly about Kubernetes

Kubernetes is an open system for orchestrating virtualization at the operating system level. It was originally developed by Google and supports tools such as Docker as children. We can also talk about virtual containerization at the OS level.

kubernetes

The benefits of Kubernetes are as follows:

1 ORCHESTRATION

- Ability to autoscale according to load.
- Width scaling options by adding additional worker-nodes to the Kubernetes cluster.
- HA configuration – in case of a worker-node crash, automatic migration of pods (i.e. Kubernetes containerv) to another worker-node.
- Health-check and self-healing – orchestrate allows you to set up health-check mechanisms for startup runs.
- Traffic routing and load-balancing – redefine the application as a service; it is deployed using orchestration in Kubernetes. As part of the service definition define the number of replicas. Communication with services is done by defining so-called Ingresses – i.e. entry points to the service. Kubernetes then routes the requests within its network.
- Automated roll-outs and roll-backs, where individual pods carrying the application can be „upgraded“ incrementally so that there is no downtime for the user.
- Canary deployments – the ability to test a new version of the production system alongside the original version, and then simply switch over.
- The ability to quickly build and unbuild any service using Kubernetes orchestration.

— *Automated deployment using the CI/CD pipeline - there are CI/CD tools that can connect directly to the Kubernetes API and deploy to them using the orchestration configuration files of the new version of docker images.*

— *Application to „service“ transformation.*

— *Preparing for later migration to outsourced cloud services (AWS, MS Azure, Google cloud).*

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2 KUBERNETES CLUSTER IMPLEMENTATION – KUBERNETESCLUSTER CAN BE IMPLEMENTED IN SEVERAL WAYS:

- Kubernetes in the cloud (MS Azure, AWS, Google Cloud, etc.) – we do not manage the platform, but we pay for it.
- Plain Kubernetes on Bare-metal is a clean installation, on the contrary, Docker Engine is a rather demanding platform implementation and also involves less trivial management in practice.
- Pre-built distributions containing Kubernetes and supporting infrastructure (Red Hat OpenShift, Rancher, Kubespray, MetalK8s ...) – easier to implement and manage, but only payments for some of the distributions listed.
- There are also minidistributions that fulfill 100% of the functionality of Kubernetes, but at the same time they can be run with minimal hardware requirements – suitable for developers if they want to develop on their workstations/laptops – e.g. minikube.

3 TYPICAL CLUSTER ARCHITECTURE

- **Front reverse proxy** (if using Nodeport),or for running in DMZ -> routes requests from the Internet/Intranet to the Kubernetes cluster. It is possible to use any software proxy (Apache HTTPServer, Nginx, HAProxy) or dedicated network proxy (F5 Networks, Cisco, etc.).
- **Kubernetes cluster** – master servers running basic Kubernetes services (kubeproxy, etcd- key/value database for Kubernetes configuration).
- **Kubernetes cluster** – worker-nodes, on these servers run individual workloads, i.e. individual application pods.
- **Storage** – either hardware storage cooperating with Kubernetes using APIs, or software-defined storage (NFS, GlusterFS) and a storage-backend (disk array).
- **Auxiliary systems** – Monitoring and Logcollection – Prometheus, Elastic Stack and others.
- **CI/CD platform** – Atlassian tools, GitLab, Stack and others.

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