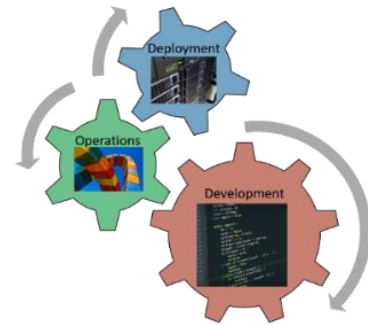


Application Run-time for zApps

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Some questions for you

- How do you deploy multiple zComponents or zApps from different developers into one zero defects-oriented platform?
- How do you manage these deployments and configurations during development?
- Where should you go to get your Zero-Defect Solutions?



Making a multi-authored platform

ZDMP is a platform created by a consortium of different companies, from large tech companies through to SME's to Academic partners. Not forgetting the use-case partners coming from four manufacturing domains: Automotive, electrical, machine tools and construction. Creating a solid environment for these diverse partners to work on is key to a successful cooperation. For this reason, the Application Runtime component is designed to bring deployment, management, and operations under one roof for the InCloud/OnPremise installation of ZDMP.

Application Run-time

Application Runtime is a component to deploy and manage multiple application from various developers. This complicated mixture is simplified by the standardised usage of "Docker"[1] containers. However, to manage these a container orchestration tool is needed, in the case of ZDMP it is "Kubernetes"[2]. The containers are configured for Kubernetes using the package management tool Helm[3]. In turn, a Kubernetes' cluster is managed by an open-source tool called "Rancher"[4]. Ansible [5] is responsible for repeatable deployment. Details about technical solutions used are listed below:

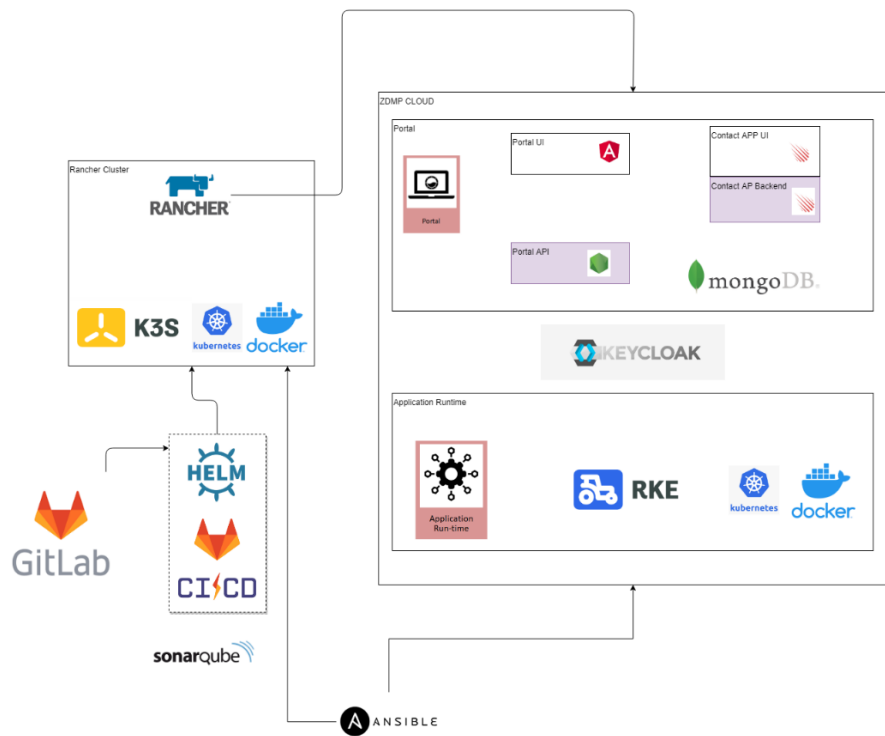
- **Docker**[1] is the bedrock of the project's integration and platform approach. It supplies isolated containerised environments so that interactions between components can be certain. Docker is the leading software provider of containerisation technology. This containerisation allows developers to work in a language of their preference. It also allows the re-use of legacy code within the distinct separate deployed environments. It allows for a modular design with inter-module communication through Rest API and/or Message Bus connectivity. This helps in managing the complex interconnectivity between the various moving parts of ZDMP
- **Kubernetes**[2] is a container orchestration tool used to manage the deployment and operations of the containers created by Docker. Kubernetes runs the docker images and controls them in a production environment. It allows for scaling of containers, network connectivity and service discovery along with a wide range of features needed to run complicated containerised architectures. It also allows multiple machines to be connected together into a "Kubernetes Cluster".
- **Helm**[3] is the package management tool for Kubernetes. ZDMP uses Helm to create deployment charts for each zComponent / zApp. These charts container references to the images of Docker containers, which allows for the establishment of a self-contained package ready for deployment on any Kubernetes cluster, either private, public cloud or OnPremise.
- **Rancher**[4] is a tool that helps manage the Kubernetes cluster and the applications deployed within it. It provides several support features to manage the complexities within Kubernetes, for example, Rancher Charts which add a UI element to the installation process, as well as integration with other tools such as Longhorn for storage. Moreover, it also provides ways to deploy a Kubernetes cluster to Amazon's Elastic Kubernetes Service [5] and to register already created clusters to be managed via Rancher.
- **Ansible**[6] is a scripting tool used to deliver the Application Runtime stack of technologies in either InCloud OnPremise settings. It is a lightweight tool that allows for re-usable modules and "playbooks" to help manage infrastructure level deployments.

ZDMP Integration

The core components of ZDMP will be deployed together including the application runtime, security components, and other components deemed essential for the platform use. The platform can be deployed OnPremise or in private cloud, as well as ZDMP managing a public cloud instance for companies to join and collaborate as they go through an open welcoming digitising process with ZDMP.

These core components are supplemented with additional components, services and zApps. Each of these needs to be conformant to a set of standards (eg security, deployment mechanisms) for automatic

installation on the platform. For the application runtime, the ZDMP components need to be deployed using a Helm chart and their endpoint configured for connections within the platform. The dependencies also need to be managed with the Helm chart specification to govern the chain of interaction between the components, for example, the Data Harmonisation component is dependent on the Service and Message Bus component to pass data to other components.



ZDMP InCloud

ZDMP is working on the public instance of the platform for open trials and it is deployed on a Virtual Private Server as a Kubernetes distribution. This open and accessible platform will allow a space for companies to buy, sell, run, analyse, zero defects functionality, within an integrated InCloud platform. The platform will be secured using five main security components (Security Authentication and Authorisation, Secure Communication, Secure Installation, Security Designer, and an additional Security Information and Event Management system), and available to process manufacturing data to create business value by removing defects.

ZDMP OnPremise/Private Cloud

ZDMP will be available as an installable system, using Ansible automation tool, the application can be deployed into a private cloud or OnPremise servers. OnPremise can give a level of control for larger customers, as well as some performance improvements by minimising network traffic.

What will ZDMP Achieve?

ZDMP will achieve a platform that can be deployed to both InCloud and OnPremise. The platform is deployed initially as the Application Runtime component using Ansible scripts. All other components are deployed to this platform using a standardised system of Docker containers orchestrated by Kubernetes and packaged using Helm. The whole platform can be administrated using the Rancher tool.

ZDMP Links

• Architecture Component	Application Runtime
• Work Package	WP6 – ZDMP Platform Building
• Tasks	T6.4 – Platform Integration and Federation

References

- [1] Docker <https://www.docker.com/>
- [2] Kubernetes <https://kubernetes.io/>
- [3] Helm <https://helm.sh/>

- [4] Rancher <https://rancher.com/products/rancher/>
- [5] Amazon Elastic Kubernetes Service <https://aws.amazon.com/eks/>
- [6] Ansible <https://www.ansible.com/>