Initial Development of Indonesian National Oceanographic Data Center

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Abstract

Considering the importance of data for ocean development and growth of ocean-based economy, Indonesia—the biggest archipelagic state in the world—needs a National Oceanographic Data Center for data collection and to support the International Decade on Ocean Science towards Sustainable Development. This data center is designed to query, extract, and display ocean data with support for spatial and temporal data. We use combinations of open-source programs (GeoNode, PostgreSQL/PostGIS and InfluxDB) to improve system scalability. These programs are installed in a microservice architecture and developed using the DevOps methodology to ensure stability and reliability of the system. Indonesian NODC (InaNODC) is designed to be a national oceanographic data hub as a part of IODE-UNESCO in compliance with international standards.

Objectives

- Data repository with contributors from universities and governmental institutions.
- InaNODC accommodates re-use of oceanographic geospatial data by many stakeholders.
- A robust and load-balanced platform with possibility for incremental feature upgrades.

Methodology

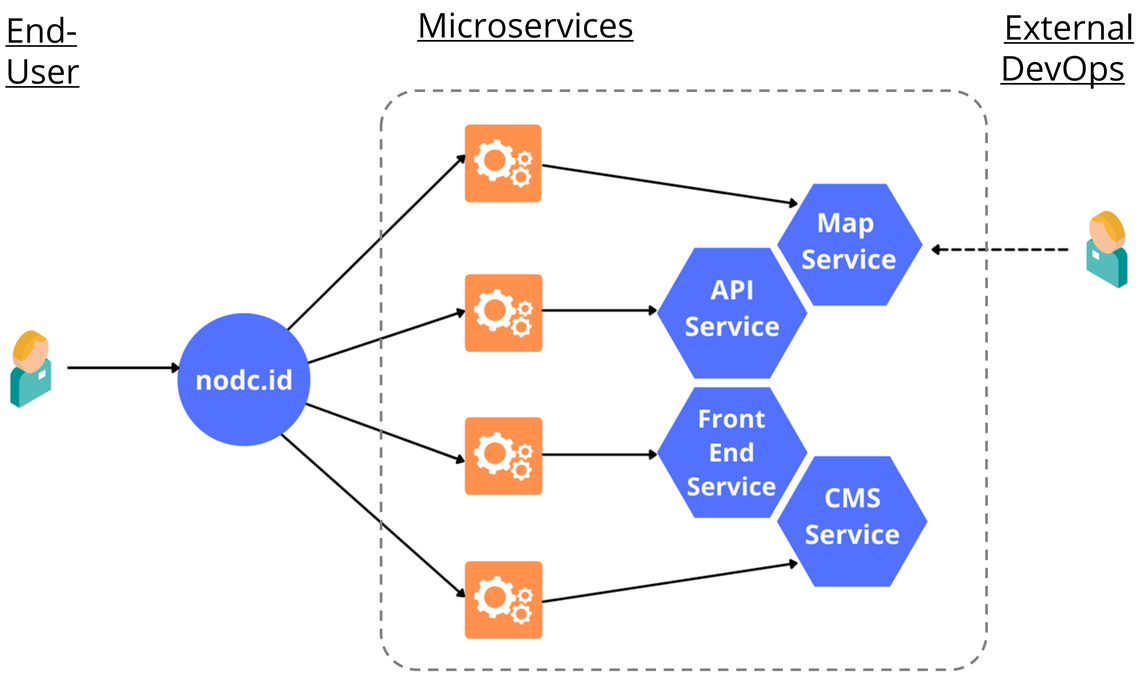
- InaNODC is the "oceanographic elements" of an Spatial Data Infrastructure (SDI) which can be broken down to four basic components, while this work highlights the Information Communication Technology and Content.
- Open-source and proprietary geographical information systems are used by the private and public sector.
- DevOps and Agile methodology can be used to implement these features and add incremental changes during the development.

Result

This platform will act as a data hub—from siloed data contributors. We need to provide a way to manage and store the data so it can be shared among the stakeholders. Data visualization and map viewers will help these end-users to gain quick insights and access the data for further research.

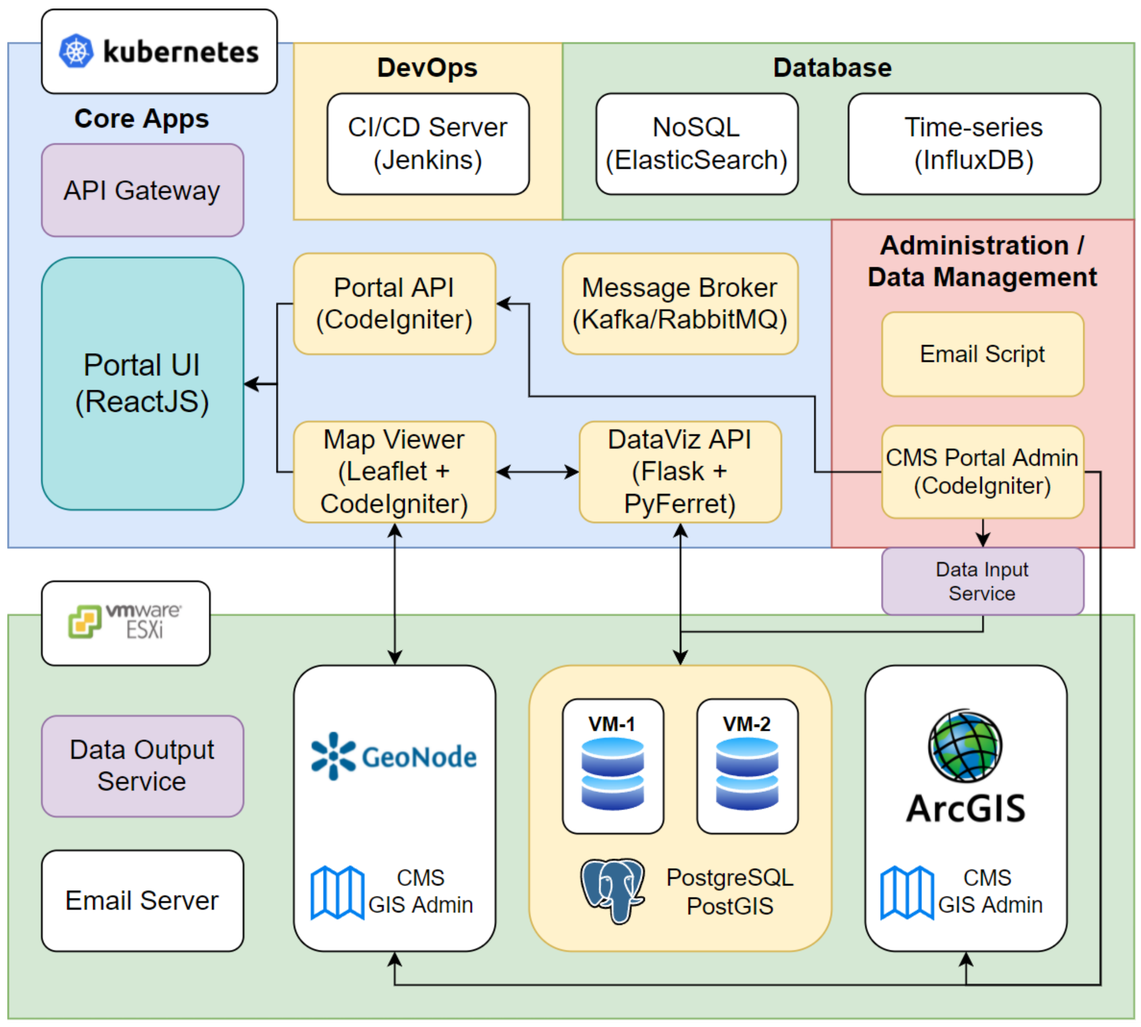
Microservice Environment

InaNODC used the microservices approach to develop data collection, data management, and data visualization features separately. Each service communicates through an application programming interface (API) implemented using message queue brokers (e.g., RabbitMQ). An end-user will be able to view the main web-application (Portal) to contribute data, manage, and visualize existing data. Using an API, external developers may access the mapping services to create their own applications.



Container Technology

✓ High Availability ✓ Load Balancing ✓ Scalability
✓ Auto-healing ✓ Replication ✓ Increase Resources



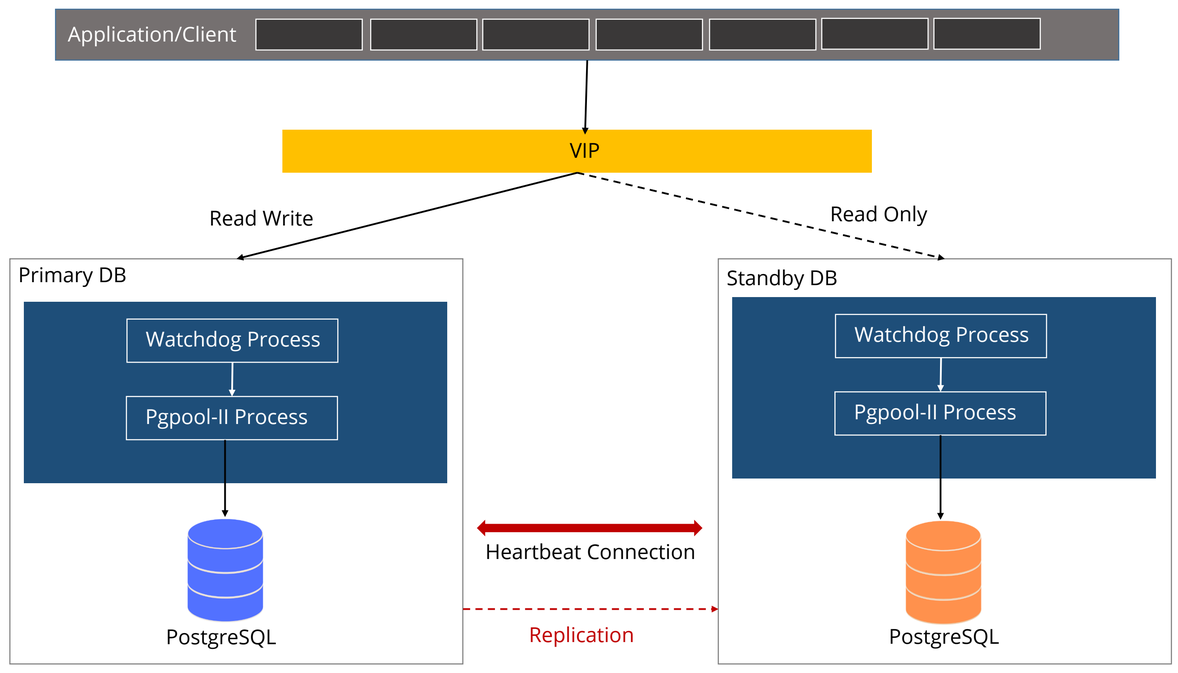
To accommodate different needs from the stakeholders, we use two data interoperability layer using both proprietary (ArcGIS) and open-source (GeoNode + PostgreSQL/PostGIS) solutions.

Throughout its development, we use DevOps tools such as Docker and Kubernetes with CI/CD—providing a way to add incremental updates while maintaining the integrity of the core applications.

A content management system (CMS) manages content creation, data contribution, data access/privacy management, and third-party application management. This CMS is also implemented by using an API.

Database

We use PostgreSQL database which supports real-time data replication using Pgpool-II. Two databases are used: a primary database for read-write purposes and a standby database for read-only.



The platform is accessible from https://nodc.id.

Acknowledgements

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