

EOSC Technical Specification

Machine Learning/Deep Learning data analytics services

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DELIVERY SLIP

Date	Name	Partner/Activity
From:	Álvaro López García	IFCA CSIC
Moderated by:	Marcin Plociennik	PSNC
Reviewed by:	Pavel Weber, Giacinto Donvito	KIT, INFN
Approved by:	TCOM	

DOCUMENT LOG

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5	15.04.2020	Adjusting to the official template	Marcin Plociennik

TERMINOLOGY

Terminology/Acronym	Definition
SQA	Service Quality Assurance
AAI	Authorisation and Authentication Infrastructure
ML	Machine Learning
DL	Deep Learning
CLI	Command Line Interface
SDK	Software Development Kit
TOSCA	Topology and Orchestration Specification for Cloud Applications

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Introduction

The data analytics service should provide with the required tools and mechanisms to build, encapsulate and execute Artificial Intelligence, Machine Learning and Deep Learning applications across different platforms, covering the whole development life-cycle. This cycle comprises the phases of model creation, training, test and evaluation, as well as model publication, serving (as a service) and sharing.

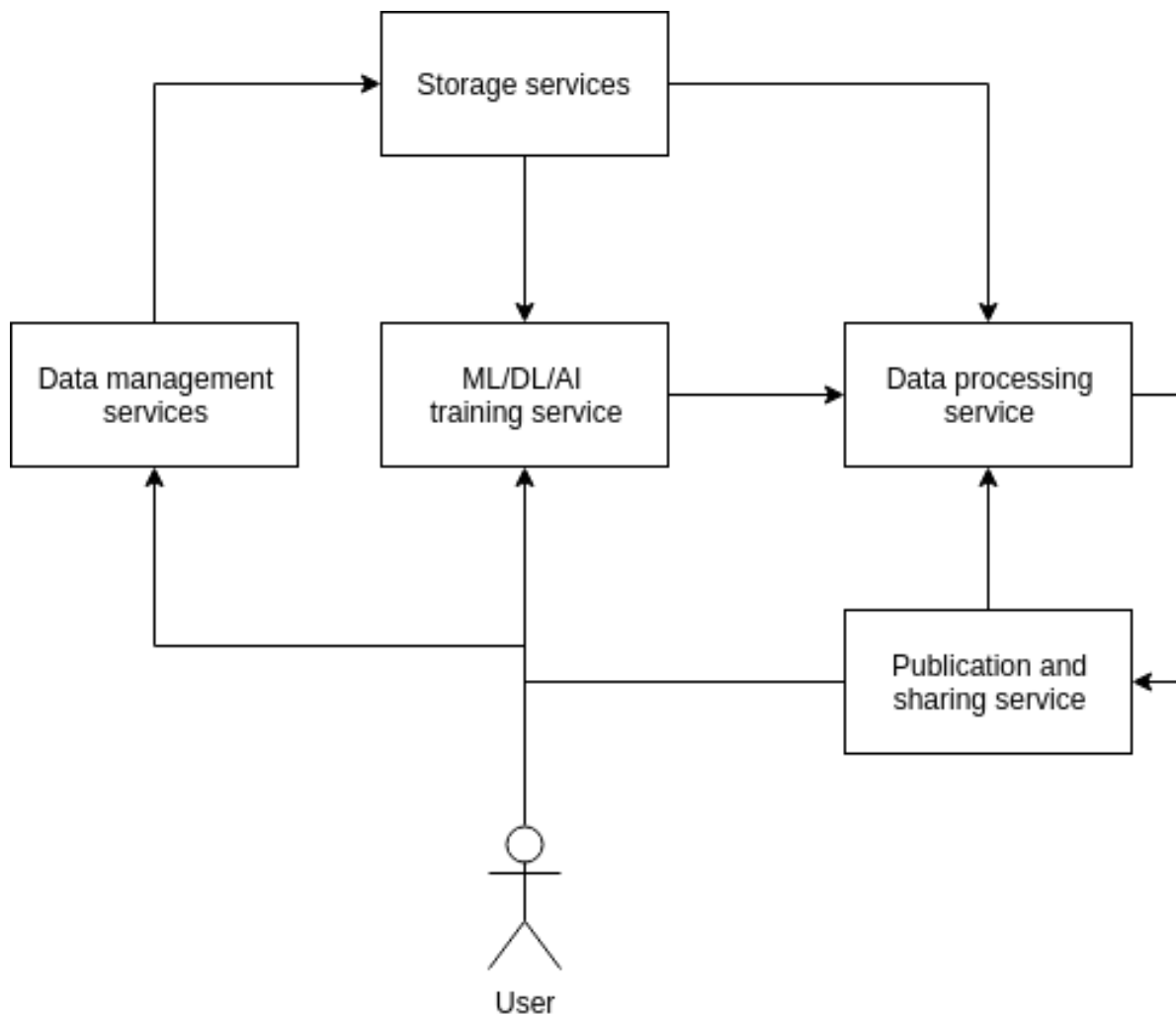
It should include both CLI libraries as well as a SDK for developers to ease building and composing application architectures to be deployed on the Cloud. It should provide links to the existing storage and data management solutions, in order to provide efficient data access to the required data sets. Standards and best practises should be encouraged for the whole process, in order to ensure interoperability across the served applications and models. A model exchange should be desirable, in order to publish and share, with common metadata schemas, the built applications.

Adopted standards

Standard	Short description	References
TOSCA	<p>OASIS Topology and Orchestration Specification for Cloud Applications is a standard to describe application topologies of cloud services and applications, comprising its components, dependencies, relationships and other details.</p> <p>TOSCA can be used to provide a standard way to deploy a given service over different resource providers and e-Infrastructures</p>	http://docs.oasis-open.org/tosca/TOSCA/v1.0/os/TOSCA-v1.0-os.html
OPEN API SPECIFICATIONS	OpenAPI is a specification that allows programmers to define standard REST interfaces, machine discoverable and interoperable.	http://spec.openapis.org/oas/v3.0.2

Protocol/API	Short description	References
OpenID Connect	OpenID Connect is an authentication layer on top of OAuth 2.0, an authorization framework. The standard is controlled by the OpenID Foundation.	"OpenID Connect Core 1.0", https://openid.net/specs/openid-connect-core-1_0.html
OAuth2	OAuth2 is the standard in which OpenID Connect is based, used for authorization.	"The OAuth 2.0 Authorization Framework", RFC 6749, https://www.rfc-editor.org/info/rfc6749
REST APIs	RESTful services are a must. APIs for this service should be machine-discoverable.	

High-level Service Architecture



The service can be divided into the following specialized components:

- ML/DL/AI training service providing the basis for building, training, testing and validating a model, with access to hardware accelerators like GPUs.
- Data processing (prediction or inference) as a service based on a developed and trained model, providing advanced functionalities like continuous delivery of models, automatic data processing (event-driven), etc.
- Model publication, sharing and reuse service, providing social-like features to ease the collaboration between researchers.
- Storage services (not part of the analytics service), needed to store and retrieve the datasets to analyze, the results and any other assets produced or required by the framework.
- Data management services (not part of the analytics service) to orchestrate the required data transfer and data movement tasks.

Interoperability guidelines

Technical interoperability guidelines

Public interfaces for published models offered as a service should follow a common API, in order to provide a coherent and homogeneous access to the exposed functionality. Open standards, if existing, should be implemented. In the lack of existing standards for the field, open specifications like OpenAPI should be followed, in order to provide developers and consumers with machine-readable interface files for describing, producing, consuming, and visualizing RESTful web services.

Regarding authentication and authorization, the AARC-II blueprint should be followed. OpenID Connect support usage should be encouraged.

Regarding the underlying and infrastructure technologies being used, it should be desirable to leverage Docker containers to encapsulate the user applications, due to its widespread usage. However, any relevant initiatives could also be explored. Whenever Docker containers could not be used, Virtual Machines following existing standards should be provided.

Examples of solutions implementing this specification

- ModelHub.ai, **not covering all the ML lifecycle phases** <http://modelhub.ai/>
- DEEP-Hybrid-DataCloud services, **covering all the ML lifecycle phases** <https://deep-hybrid-datacloud.eu>
- Kipoi, focused only on genomics <http://kipoi.org/>

Procedure to integrate a service with the EOSC Hub ML/DL data analytic services

- *Integration of services at AAI level.*
- *Enforcing SQA processes on developed software.*
- *Integration of data management and storage services.*
- *Marketplace integration.*
- *Development of monitoring probes.*
- *Helpdesk integration.*