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SEN3APP

Processing Lines And Operational Services Combining Sentinel And In-Situ Data For Terrestrial Cryosphere And Boreal Forest Zone

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Document Release Sheet

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Confidential, only for members of the consortium and for the Commission Services	

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Acronym:

API	Application programming interface
COSMO-SkyMed	COnstellation of small Satellites for the Mediterranean basin Observation
ESA	European Space Agency
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FMI	Finnish Meteorological Institute
FY-3	Fengyun 3
GeoTIFF	Geo Tagged Image File Format
GIS	Geographic Information System
GMES	Global Monitoring for Environment and Security
HDF	Hierarchical Data Format
H-SAF	Satellite Application Facility of Hydrology
MERSI	MEdium Resolution Spectral Imager
MODIS	Moderate-Resolution Imaging Spectroradiometer
NetCDF	Network Common Data Form
OGC	Open Geospatial Consortium
O3-SAF	Satellite Application Facility of Ozone
OMI	Ozone Monitoring Instrument
Suomi-NPP	Suomi National Polar-orbiting Partnership
VIIRS	Visible Infrared Imaging Radiometer Suite
WCS	Web Coverage Service
WMS	Web Map Service

1. Introduction

FMI has satellite receiving station and processing facilities in Sodankylä, Finland. Two X-band antennas are available. One is 2.4 m antenna provided by Seaspace and other 7.3 m antenna provided by Viasat. Current operations with larger antenna include receiving SAR data from COSMO-SkyMed cluster, FY-3 MERSI data and Suomi NPP VIIRS-data. Smaller antenna receives MODIS data from Terra, OMI data from Aqua and is also capable receiving VIIRS-data. Data processing activities include EUMETSAT H-SAF Snow products, ESA GlobSnow Snow products, and EUMETSAT O3-SAF products. In the future, Sodankylä site will provide ESA Sentinel data as a Collaborative Ground Segment. Data is stored either in a rolling archive (typical lifetime 2 weeks), on a dedicated disk or on StorNext system comprising of disk and tape. Currently data is disseminated either through dedicated web page or FTP account.

Open Geospatial Consortium (OGC) [1] has defined standards such as Web Map Service (WMS) and Web Coverage Service (WCS) to better disseminate geospatial content and GIS data. These services give more freedom to end user to select projection, area and temporal coverage of data than traditional way of providing pre-determined raster data. In general OGC web interfaces are more intuitive to end user than complicated download interfaces on www. The challenge for FMI is to provide OGC standard based services for data that is freely distributable (excluding only COSMO-SkyMed data). Especially if Sodankylä site will serve as National Satellite Data Center providing easy to use data portal is a necessity.

2. Proposed system

FMI has existing IT-infrastructure consisting of virtual server environment (processors, memory and disk), StorNext archive and 1 Gigabyte internet connections. In this proposal existing infrastructure will be applied. All processing nodes will be virtual servers excluding StorNext.

EoxServer [2] is an open source software based on open source technologies such as Python, Django, Postgresql, PostGIS, Mapserver and others. EoxServer provides WCS and WMS APIs and web based interface (Fig. 1) for user to browse geospatial data. System is capable of syncing local and remote datasets to database and serve them through the interfaces. While sync is run as a cronjob adding and removing data is as easy as making files available or to delete them. Currently best input data format for EoxServer is geoTIFF which is supported by most of GIS software. Output can be for example geoTIFF, HDF and netCDF.

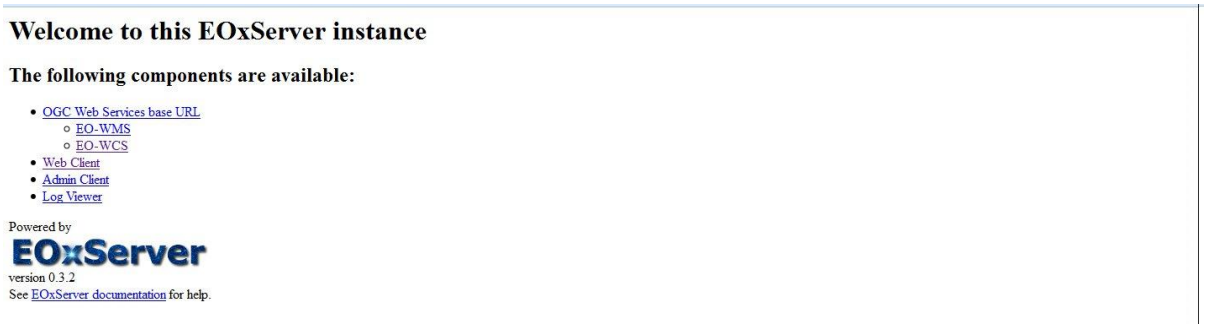

Figure 1. EOxServer user view including links to WMS and WCS and Web Client

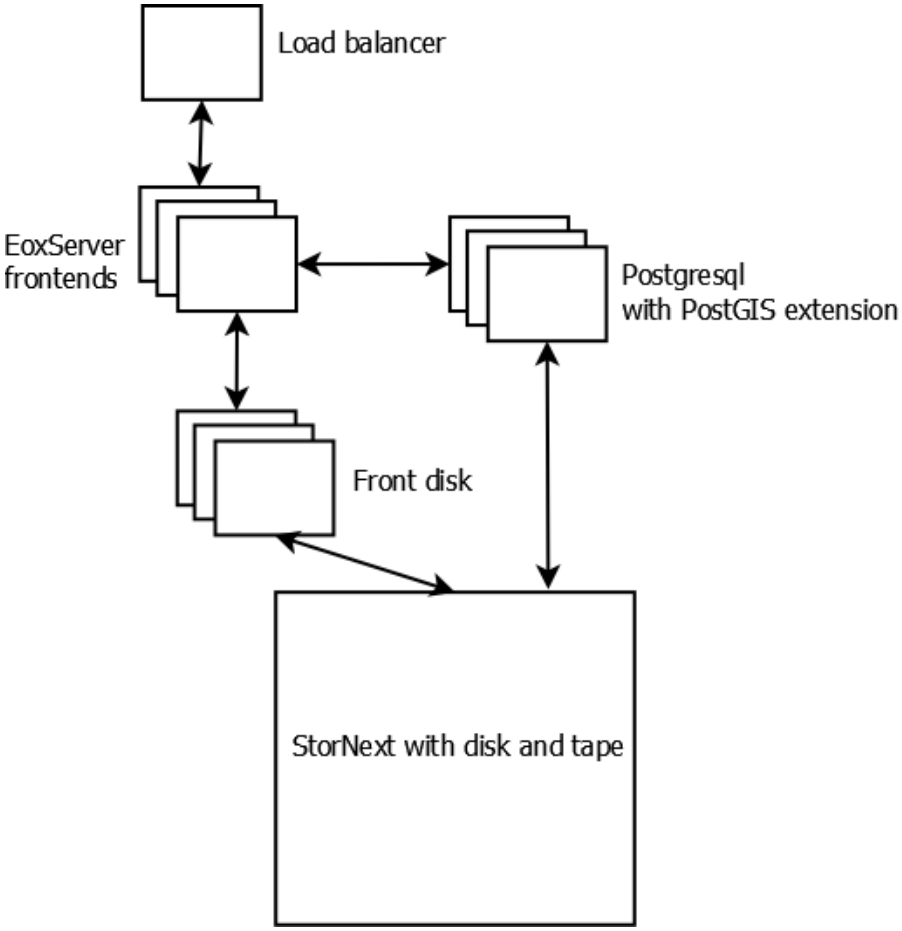

Figure 2. Block diagram of the system

The proposed system (Fig. 2) is designed to be scalable in both terms of web frontends and database. A simple load balancer can be a http server [3] with round robin, least-connected or ip-hash algorithm to assign requests. EoxServer frontends are easy to clone and thus adding new interfaces is simple. FMI Production systems for weather services unit has lot of experience with large scale databases and thus scalability issues with Postgresql probably won't arise.

Applicability of direct usage of StorNext system with EoxServer frontends is currently unclear. Even though datasets are visible to frontends in a single file system the physical location of data can be on tapes or StorNext disks depending on configuration settings. EoxServer needs to have read access to data and thus syncing or data fetching process can trigger a complicated workflow of reading multiple tapes and long service delays. If these actions take place many times it might lead to denial service or hardware problems. StorNext system has also disk space so most probably data needs to be made available to EoxServer on disk only. With StorNext internal commands fetching data sets from tape can be made in preplanned and secure manner. One option is to have completely separate front disk that will exclusively serve EoxServer farm and have minimal access to StorNext system.

Figure 3. Example of EOxServer Web Client with VIIRS RGB-images from FMI processing chain

Preoperational setup of EoxServer will be set up in Sodankylä consisting of EoxServer frontend and running local Postresql instance on the same node. Snow data will be made available in this context. Preoperational setup will give chance to experiment with different access options to data including access to StorNext or utilizing separate disk space.

3. References

[1] Open Geospatial Consortium: http://www.opengeospatial.org/
[2] EoxServer website: http://eoxserver.org/
[3] Nginx as load balancer: http://nginx.org/en/docs/http/load_balancing.html