Introduction

- Euclid Space Mission (ESA-M)
  - Extra galactic surveys (visible, infrared, spectroscopy)
- 10’s of PB data
- Collaborators all over the world
- Multiple Science Data Centers
- Multiple Use Cases - status of processing, data release etc.
Challenges

- Need a Distributed Visualization framework
- SDCs (heterogeneity)
- Network between SDCs - from 10s to several 100s Mbps
- Data availability/Progress according to Observation Plan
- Scalable, Flexible, Future proof framework

Two prong approach → reduce the data size (optional) and → enable distributed visualization
### Visualization Framework

**Demand**
- Real time, Interactive
- Desktop feel but no copy

**Visualization Software (Aladin)**

**Supply**
- SDC 1
- SDC 2
- SDC n

---

kaptyn astronomical institute

Omegacen
HiPS Survey

HiPS is a hierarchical tiling mechanism developed by CDS (P. Fernique et al, A&A 578, 114, 2015)

It enables multilayer visualization

- HiPS is the defacto standard for survey maps
- HiPS is http compliant
Visualization Framework with LAMP Stack

EUCLID Science Data Centers Spread Across Europe

kapteyn astronomical institute

OmegaCEN
Visualization Framework with LAMP Stack

Science Data Centers across Europe/world

kaptelyn astronomical institute

OmegaCEN
Visualization Framework with LAMP Stack

Euclid Front End Node / Load Balancer

EUCLID Science Data Centers Spread Across Europe
Visualization Framework with LAMP Stack

Euclid Front End Node / Load Balancer

Basic Files Linux OS

HttpServer Apache

Database MySQL

Server Scripts PHP

EUCLID Science Data Centers Spread Across Europe

EUCLID
Fully Distributed Visualization

ASTRONOMER’s Desktop

Request (HTTP) file/info → Send requested file/info → Find most app SDC

Send Redirect Message with appropriate info → Send Combined tile image

Is file Present on FEN → Yes → Get all the non unique tile images from SDCs

Is tile image unique → Yes → Locally Combine all non-unique tile images

Send Redirect Message with appropriate info → Send requested file/info

Receive file from app SDC

Request (HTTP) file from app SDC

MySQL-DB (File location info)

Euclid - FRONT-END cum LOAD Balancer Node

Port-D1 SDC-1
Port-D2 SDC-2
Port-D3 SDC-3
Port-DN SDC-N

EUCLID Science Data Centers Spread Across Europe
Virtual Machines as SDCs
Virtual Machines as SDCs

From Demo to Real Data

- KiDS DR 4
- 1.5TB (g band)
- On OmegaCen nodes
Conclusion & future steps

➔ Successfully developed and demonstrated distributed visualization framework for very large surveys
➔ Our framework works on heterogenous SDCs.
➔ Data size reduction using png instead of pure fits for hips survey generation has been explored
➔ It is also applicable to big, collaborative project like SKA
➔ It is being implemented on OmegaCen server nodes as SDCs
➔ Performance and Monitoring using ELK stack is in progress
➔ Further framework optimisation using caching and key value stores like cdb is being explored
➔ We are on our way to implement the framework for Aladinlite, as it works on the desktop version
Thank You!
Architecture

Distributed Network Mode

Reverse Proxy Network Mode
HiPS Survey

- HiPS is http compliant - allows it to be accessed via http server
- Simple Hierarchical Tree structure with directories and files
LAMP Stack

1. Linux → open source (free), reliable (virus free)
2. Apache → most popular, open source, reliable, secure, fast, http,
3. MySQL → simple, sql, open source
4. PHP → open source, server side (code executed on server side), scripting language, communicate with MySQL