



# LSST Science Platform

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## LSST Science Platform

### *Introduction*

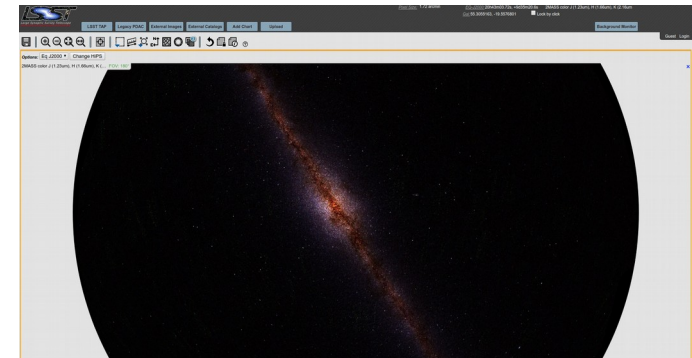
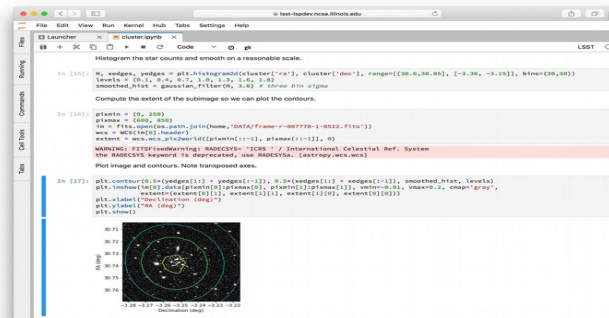
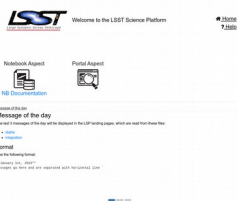
- LSP: A set of services that allow users to access and run analysis on but not limited to
  - LSST data
- The LSP architecture is aimed towards creating a reproducible, scalable and containerized environment
- Three aspects to the LSP environment:
  - **The Portal Aspect:**
    - a Web application with query and visualization tools for catalog and image data;
  - **The Notebook Aspect:**
    - a JupyterLab service for interactive Python coding, with access to the LSST data products
  - **The API Aspect:** a set of Web-based APIs (IVOA)



# LSST Science Platform

## Main Components

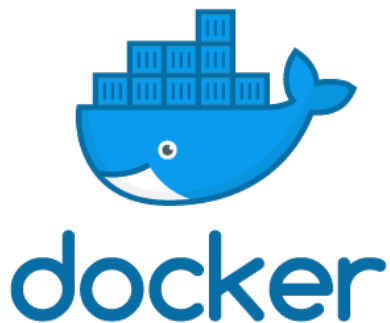
- **Landing page** - Simple web page to help users navigate to the different aspects of the Science Platform
- **Nublado** - Customized JupyterHub system to allow users to run notebooks next to the data
- **Firefly** - IPAC portal for in-browser data visualization
- **CADC's TAP service** - IVOA TAP service for Qserv
- **Fileserver** - NFS fileserver for persistent storage of notebooks and user data
- (Scripts also deploy a Qserv installation)



## LSST Science Platform

### *Key Technologies: Deployment*

- Kubernetes – Container-orchestration system
- Openstack – Open standard cloud computing platform
- Rancher – Cluster Orchestration Platform
- Helm – Package manager for Kubernetes
- Docker – Lightweight Executable Package of software





## LSST Science Platform

### *Pre-requisites*

- K8s Cluster on a Cloud Platform (Opentack, Google Cloud..) with Persistent Storage
- At least 1 Public IP (Preferably 2)
  - SSL certificate (letsencrypt.org)
  - DNS for the name on the certificate
- GitHub OAuth client id and secret





## LSST Science Platform

### *Pre-requisites*

- 1 Master Node ( $\geq 2$  Cores)
- 1 or more Worker Nodes ( $\geq 2$  Cores)
- 1 Gateway/Proxy Node
- 1 Admin Node (Preferable if deploying K8s with Rancher)

Host should have  $>100$ GB for Container images





## LSST Science Platform

### *Current Status*

- Initial Developments of deploying the LSP:UK in progress
  - Using an **Openstack** Cluster Instance at Edinburgh
- Current progress:
  - Prototype of Firefly ready to be deployed and tested with Edinburgh TAP services
    - First Evaluation will follow
  - Nublado Deployment in progress
  - CADC TAP service briefly tested with Sample data
- There are two instances of the LSP (stable / friendly) deployed at NCSA
  - Plan is to have multiple individual instances at different sites





## LSST Science Platform *Difficulties*

- Kubernetes on Openstack
  - Setting up persistent storage not obvious
  - Special configuration is needed for Openstack
  - Documentation is still a bit limited
- LSP Documentation
  - Documentation and notes targeted towards a deployment on Google Cloud
  - Requires changes for Openstack Deployment
  - Easy to run into compatibility issues between Rancher/K8s/Docker/Helm versions
  - Customized Applications (i.e. Firefly) require rebuilding Docker image from source
- Helm/K8s based deployments are very easy when things go right, but otherwise can get tricky







## LSST Science Platform

*Potential Lasair uses*

- Firefly as a potential GUI for Lasair?
  - Or take ideas & features and incorporate in existing Lasair GUI
- Compare Lasair JupyterHub instance with Nublado
  - Possible merge (i.e. use existing Jhub but add LSST Docker images)
- TAP Service for Lasair
  - CADC TAP which is part of LSP seems to run on top of a Qserv instance





## LSST Science Platform

### *Useful Links*

- <https://github.com/lstt-sqre/lsp-deploy> - LSP Deployment Scripts
- <https://github.com/lstt-sqre/charts> - LSST Helm Charts
- <https://github.com/lstt/suit> - Firefly Tools for LSST
- <https://github.com/Caltech-IPAC/firefly> - Firefly Github
- <https://github.com/lstt-sqre/lsp-deploy> - Notes on Deploying LSP:UK
- <https://arxiv.org/pdf/1911.06404.pdf> - LSP Paper
- <https://kubernetes.io/> - Kubernetes Website
- <https://rancher.com/> - Rancher Website
- <https://helm.sh/> - Helm Website
- <https://github.com/opencadc/tap> - CADC TAP Github

