

A web portal for hydrodynamical, cosmological simulations

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The screenshot displays the 'Cosmological Web Portal' interface. The main view shows a simulated galaxy cluster with various parameters and controls. A 'PHOX' window is open on the left, and a 'Cluster Details' window is open in the center. A 'Choose Simulation/Snapshot' window is open on the right.

PHOX Window:

- Mode: ICM only
- Instrument: eROSITA (A=1000 FoV=60)
- T obs: 10000
- Image z size: 30500 [kpc]
- Simulate Instrument
- Execute PHOX
- Close

Cluster Details Window:

- M_{500c} : $1.44459e+14$ [M_{\odot}/h]
- T_{mw} : 3.1461 [KeV]
- L_X : $5.63708e+44$ [erg/s]
- f_{gas} : 0.01542 [%]
- f_{star} : 4.14694 [%]
- C_{shift} : 0.0264885
- M_{star}/M_{CD} : 0.0651468

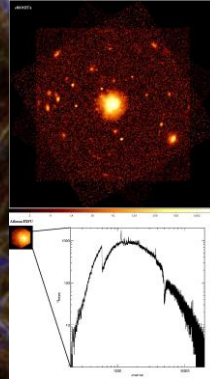
Choose Simulation/Snapshot Window:

- Selected 156 over 7428 clusters.
- M_{500c} : [Slider] [Log M_{\odot}]
- T: [Slider] [KeV]
- L_X : [Slider] [Log erg/s]
- f_{gas} : [Slider] [%]
- f_{star} : [Slider] [%]
- C_{shift} : [Slider]
- M_{star}/M_{CD} : [Slider]
- Compact groups:
- N galaxies: [Slider]
- Distance: 99.5 [kpc]
- Log10 of Mass ratio: [Slider]
- Download CSV table - View table
- Close

• Ragagnin, Dolag, Biffi, Cadolle Bel, Hammer, Krukau, Petkova & Steinborn 2017, A&C, 20, 52

https://www.youtube.com/watch?v=J_8hGaP0nr0

- running since Okt. 2016
- ca. 220 registered users
- different roles for users
- Low budget!
- Allows to: explore access post process appl. virt. telescopes to complex hydro sims

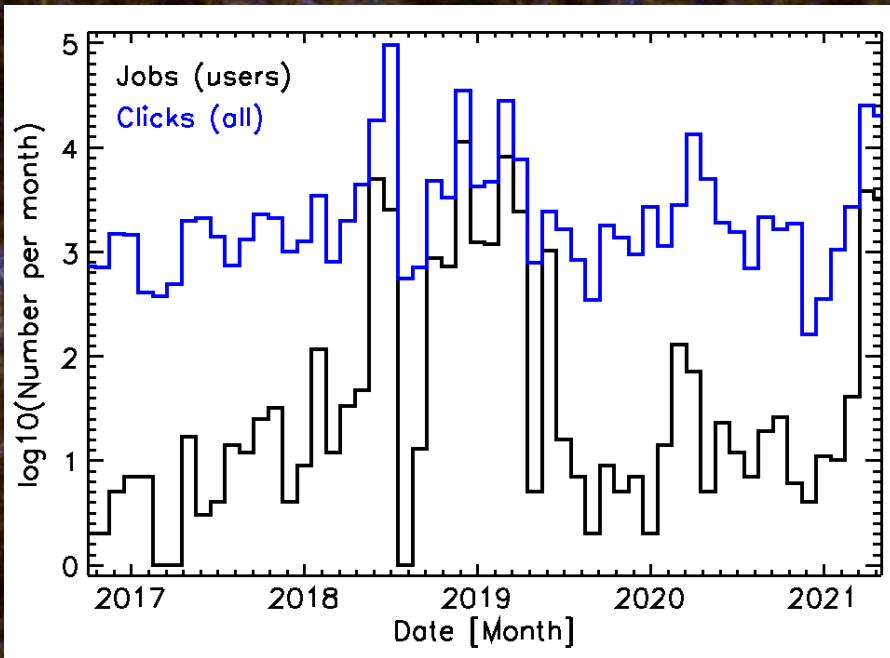


Cluster details

- M_{500c} : $1.36958e+14 [M_{\odot}]$
- R_{500c} : $687.06 [kpc-h]$
- T_{500c} : $2.65007 [keV]$
- L_X : $6.25262e+44 [ergs]$
- f_{gas} : $8.35786 [\%]$
- f_{star} : $3.43 [\%]$
- C_{gas} : 0.0188775
- Y_{500c} : 1.01833458
- M_{500}/M_{CD} : 0.0870967

alternative visuals

- Compton Y (millimetric)
- ICM(X-Ray)
- Spitzer/Turbulence



Choose Simulation and snapshot

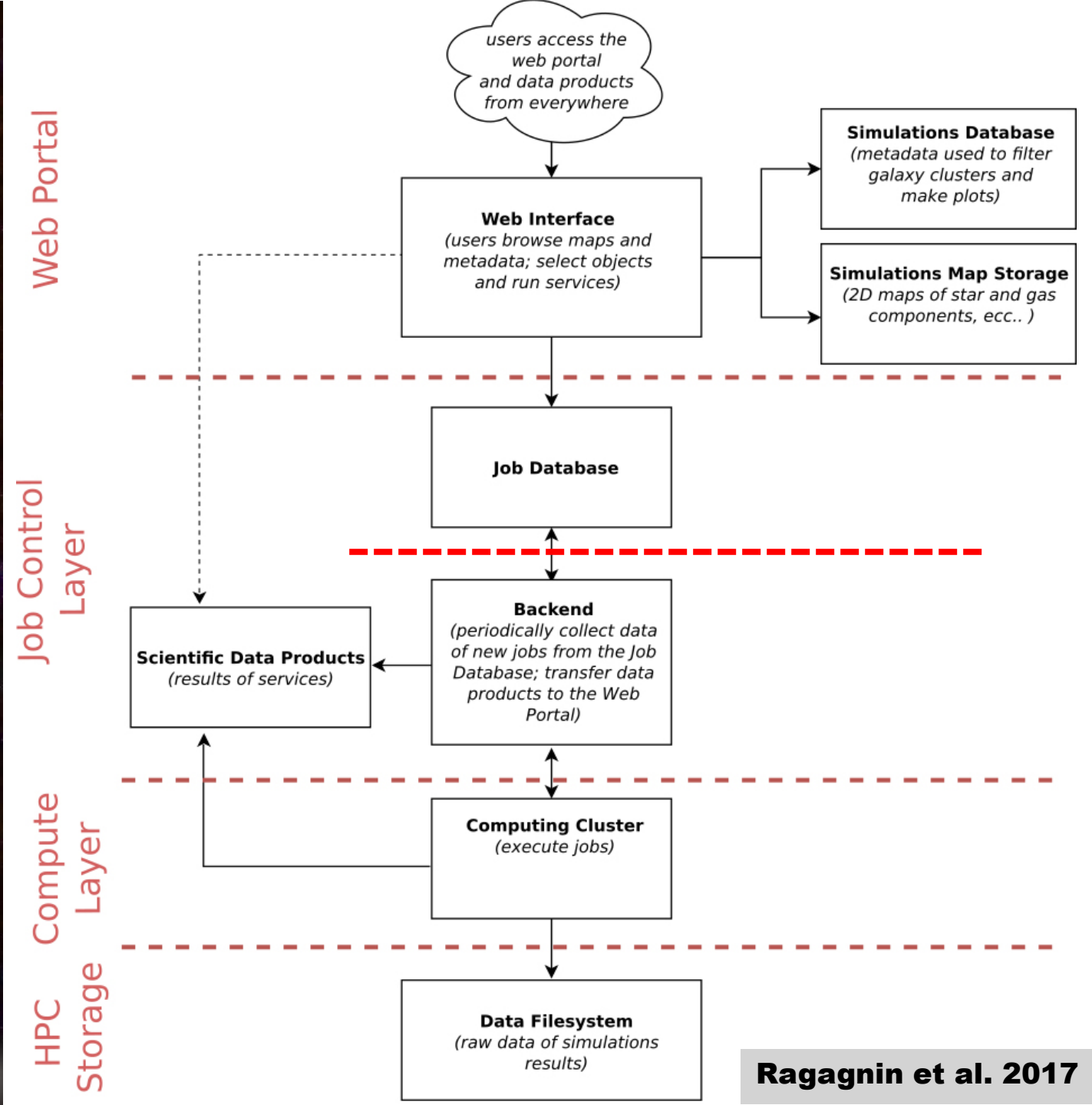
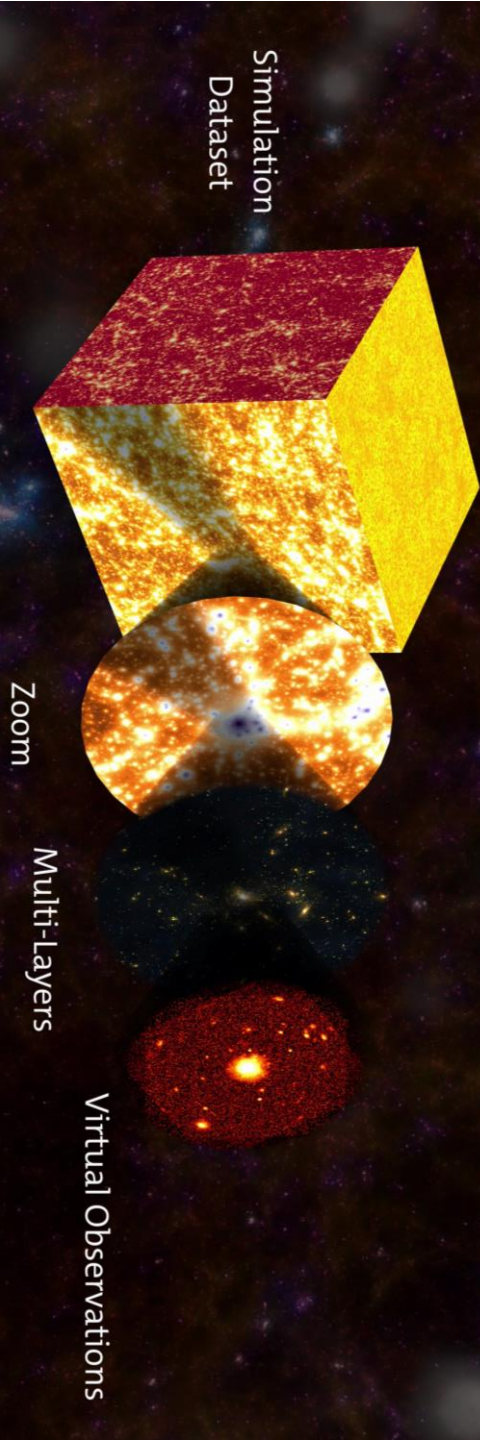
Table of properties of selected objects

Filter objects

	$L_X [ergs]$	M_{500_m50h}	$M_{500_M_CD}$	T_{500c}	Y_{500c}	C_{gas}	f_{gas}	f_{star}	C_{gas}	Y_{500c}	M_{500}/M_{CD}	mess	r_{500_kpc}	snap_id	Log
1	29.480	$1.05430e-15$	0.031	9.297	107.349	0.025	60.713	0.125	670971.000	$1.05430e-15$	1304.380	27.000	0.0		
2	20.954	$6.05990e-14$	0.160	7.280	66.706	0.067	50.471	0.119	670970.000	$6.05990e-14$	1084.330	27.000	0.0		
3	9.439	$5.87910e-14$	0.079	6.074	50.520	0.027	49.972	0.116	670974.000	$5.87910e-14$	1073.610	27.000	0.0		
4	9.152	$5.04455e-14$	0.114	5.695	47.210	0.014	47.485	0.115	670972.000	$5.04455e-14$	1020.190	27.000	0.0		
5	4.085	$4.52119e-14$	0.055	5.844	41.569	0.017	45.784	0.102	670970.000	$4.52119e-14$	963.634	27.000	0.0		
6	4.286	$4.23877e-14$	0.139	5.392	41.887	0.080	44.810	0.114	670977.000	$4.23877e-14$	962.715	27.000	0.0		
7	5.099	$4.06889e-14$	0.275	5.347	41.297	0.152	44.203	0.115	670986.000	$4.06889e-14$	949.683	27.000	0.0		
8	4.598	$3.84042e-14$	0.262	4.703	35.006	0.126	43.360	0.113	670997.000	$3.84042e-14$	931.590	27.000	0.0		
9	3.289	$3.81085e-14$	0.260	4.785	35.828	0.038	43.249	0.114	670973.000	$3.81085e-14$	929.175	27.000	0.0		
10	3.054	$3.80393e-14$	0.034	5.321	33.183	0.028	43.222	0.095	670981.000	$3.80393e-14$	928.395	27.000	0.0		
11	3.902	$3.71503e-14$	0.000	5.017	35.985	0.028	42.885	0.110	670991.000	$3.71503e-14$	921.358	27.000	0.0		
12	3.640	$3.68907e-14$	0.241	4.813	31.299	0.075	42.704	0.100	670982.000	$3.68907e-14$	917.463	27.000	0.0		
13	3.796	$3.62593e-14$	0.185	4.460	31.611	0.080	42.536	0.110	671001.000	$3.62593e-14$	913.862	27.000	0.0		
14	3.465	$3.50905e-14$	0.102	4.651	31.257	0.036	42.542	0.105	670996.000	$3.50905e-14$	910.507	27.000	0.0		

Make plots based on expressions on object properties

Apply complex queries (compactness and merging properties) to objects



Layout of the Web Portal

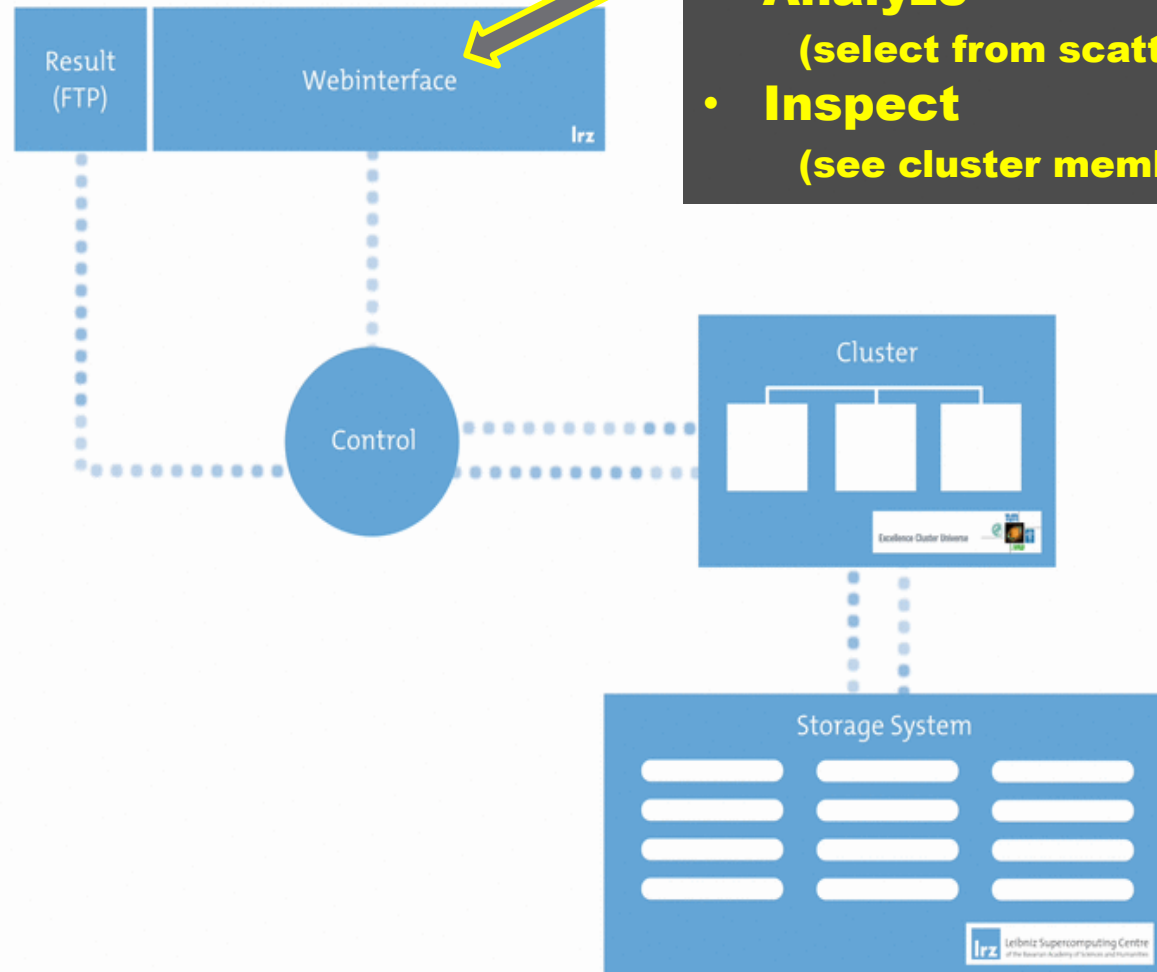
Visual inspection

Ragagnin et al. 2017

Web Portal

Job Control &
Compute Layer

HPC
Storage



- **Browse Simulations**
(select from image)
- **Restrict**
(select from table)
- **Analyze**
(select from scatter plots)
- **Inspect**
(see cluster members)

Layout of the Web Portal

Visual inspection

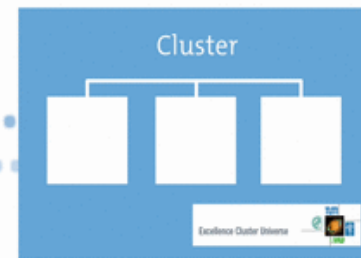
Ragagnin et al. 2017

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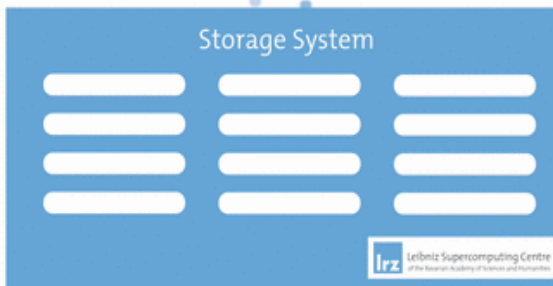
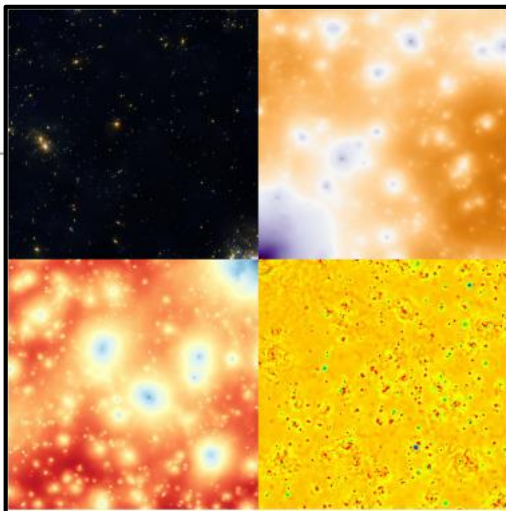
Web Portal



Job Control & Compute Layer



HPC Storage



Layout of the Web Portal

Visual inspection

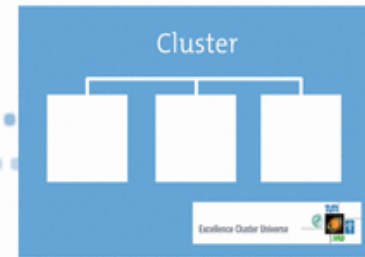
Ragagnin et al. 2017

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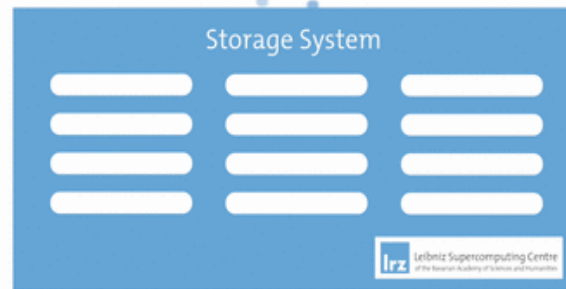
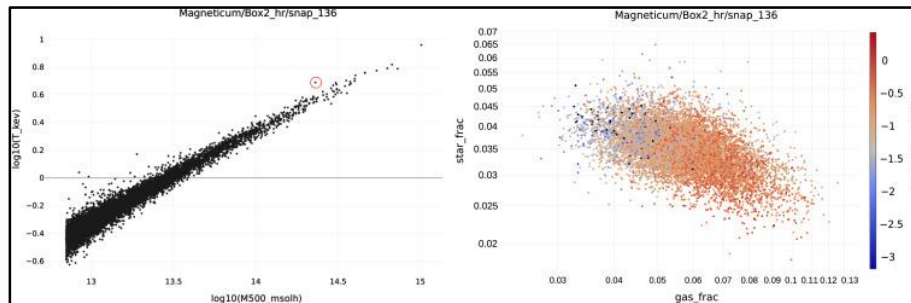
Web Portal



Job Control & Compute Layer



HPC Storage



Layout of the Web Portal

Executing services

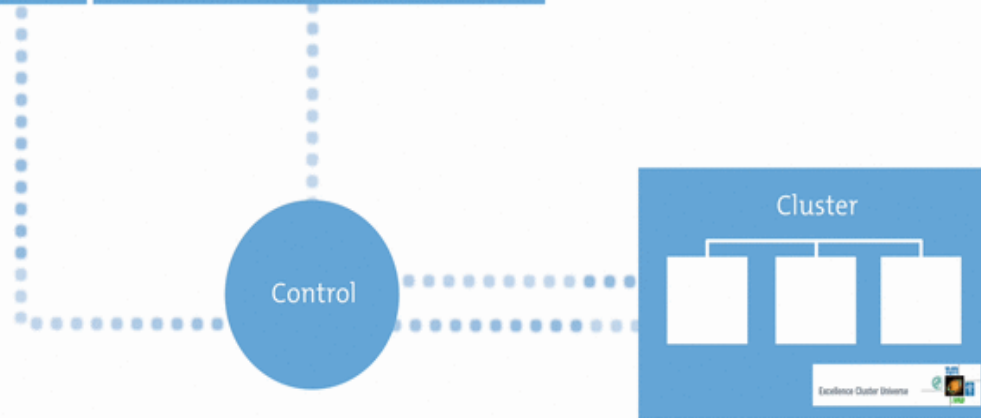
- **Create Maps**
(various quantities)
- **Simulate X-Ray**
(various instruments)
- **Extract Simulation**
(receive full hydro data)

Ragagnin et al. 2017

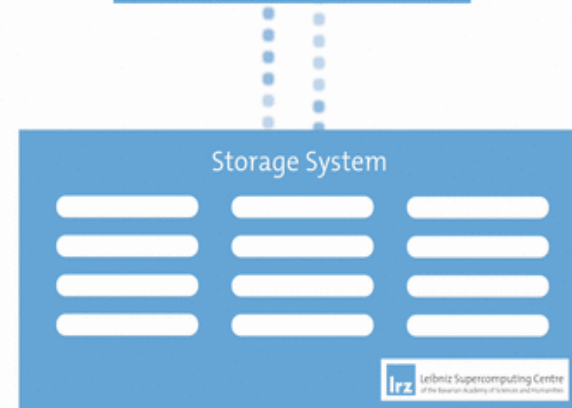
Web Portal



Job Control & Compute Layer



HPC Storage



Layout of the Web Portal

Executing services

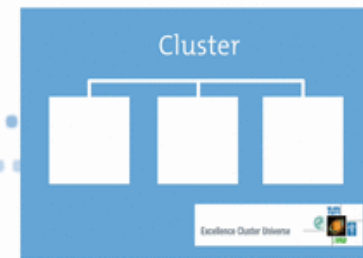
- **Create Maps**
(various quantities)
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(various instruments)
- **Extract Simulation**
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Ragagnin et al. 2017

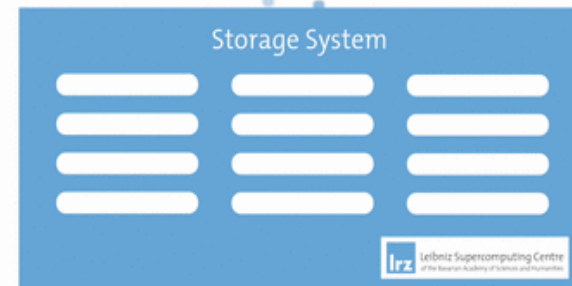
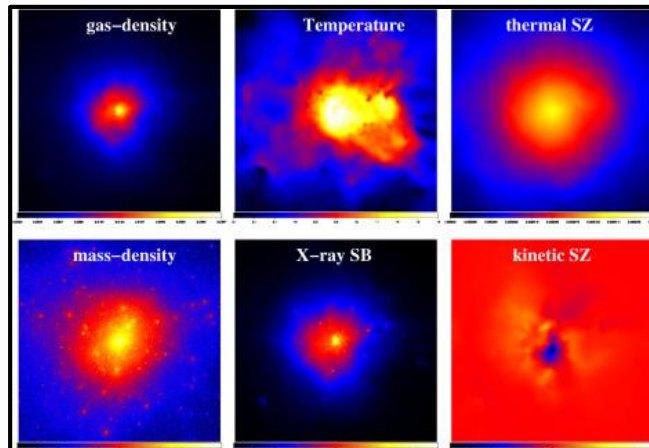
Web Portal



Job Control & Compute Layer



HPC Storage



Layout of the Web Portal

Executing services

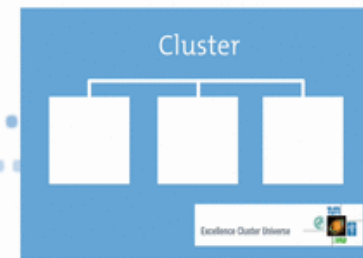
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Ragagnin et al. 2017

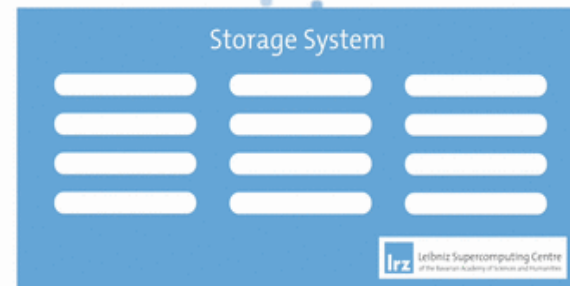
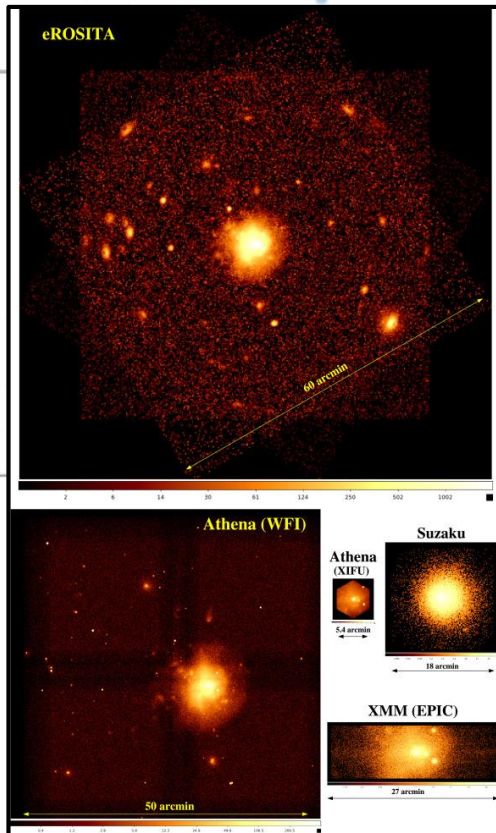
Web Portal



Job Control & Compute Layer



HPC Storage



Demo

Cosmological Web Portal Applications Jobs Admin Area Browse (public access) Credits dolag@usm.uni-muenchen.de Logout

PHOX

Magneticum/Box2_hr snap_124 (z=0.17) Stars Overlay ICM Cluster Restrict

Stars (optical)

selected cluster

layer-spy

restricted cluster

cluster info

alternative vizuals

Cluster details

M _{500c} :	1.36058e+14 [M _☉ /h]
R _{500c} :	687.06 [kpc/h]
T _{mw} :	2.65007 [KeV]
L _X :	6.25262e+44 [erg/s]
f _{gas} :	8.35786 [%]
f _{star} :	3.43 [%]
C _{shift} :	0.0188775
Y _{500c} :	10.813458
M _{sat} /M _{CD} :	0.0870667

ComptonY (millimetric)

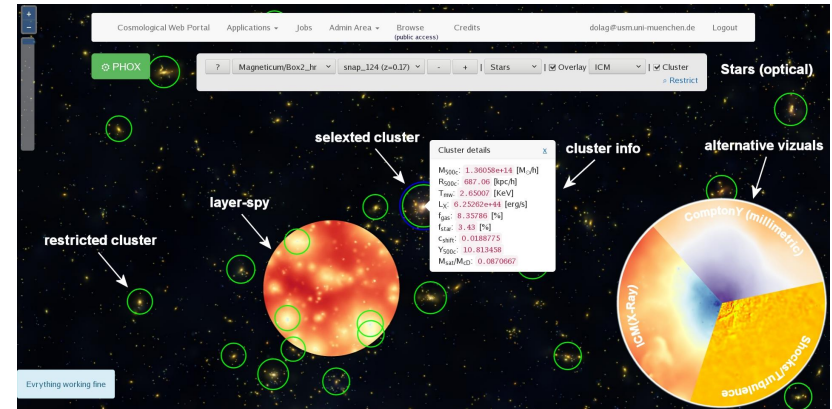
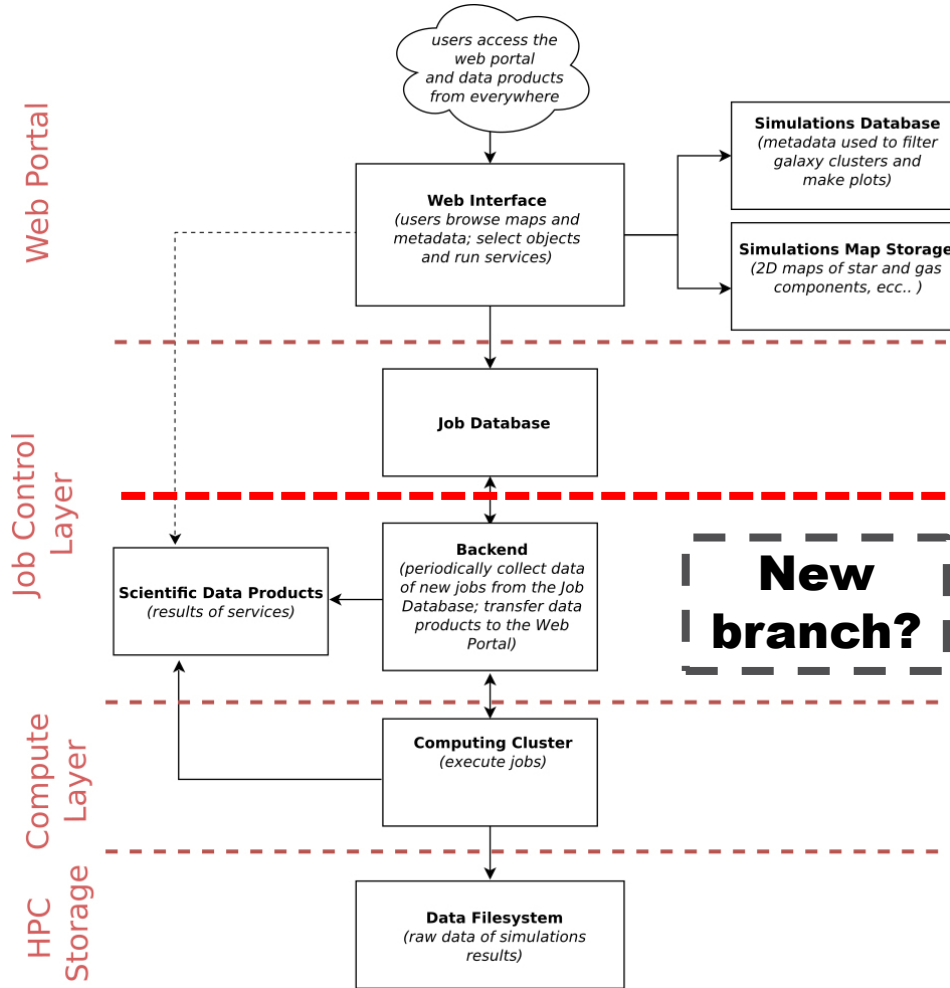
ICM(X-Ray)

Shocks/Turbulence

Everything working fine

Detailed description: The image shows a screenshot of the PHOX web portal. At the top, there is a navigation bar with links for 'Cosmological Web Portal', 'Applications', 'Jobs', 'Admin Area', 'Browse (public access)', 'Credits', and a user profile 'dolag@usm.uni-muenchen.de' with a 'Logout' button. Below the navigation bar, there is a search and filter area with a 'PHOX' button, a dropdown menu set to 'Magneticum/Box2_hr', another dropdown set to 'snap_124 (z=0.17)', and buttons for '+', '|', 'Stars', 'Overlay', 'ICM', and 'Cluster'. A 'Restrict' link is also present. The main view is a dark space filled with yellow and orange stars. A large, bright, reddish-orange circular region represents a galaxy cluster. Several smaller, bright yellow stars are circled in green. A 'layer-spy' tool is overlaid on the cluster, showing a detailed view of its internal structure. A 'restricted cluster' is also indicated by a green circle. A 'cluster info' panel is open, displaying various physical parameters for the cluster. To the right, an 'alternative vizuals' panel shows a circular visualization divided into three segments: 'ComptonY (millimetric)' in purple, 'ICM(X-Ray)' in orange, and 'Shocks/Turbulence' in yellow. A status bar at the bottom left says 'Everything working fine'.

Summary



www.magneticum.org
c2papcosmosim.srv.lrz.de

Once you have a list of clusters in your `dataset.csv`, you can run a batch of PHOX jobs via

```
python c2pap_batch.py -u 'your@email' -f dataset.csv -s PHOX -p mode='ICM only'
instrument='eROSITA (A=1000 FoV=60)' t_obs_input=1000 img_z_size=200 simulate=1
```

or to run SMAC:

```
python c2pap_batch.py -f dataset.csv -u 'your@email' -s SMAC -p content="bolometric x-ray
luminosity" IMG_SIZE=512 IMG_Z_SIZE=5000 PROJECT='along y, xz plane'
```

https://www.youtube.com/watch?v=J_8hGaP0nr0