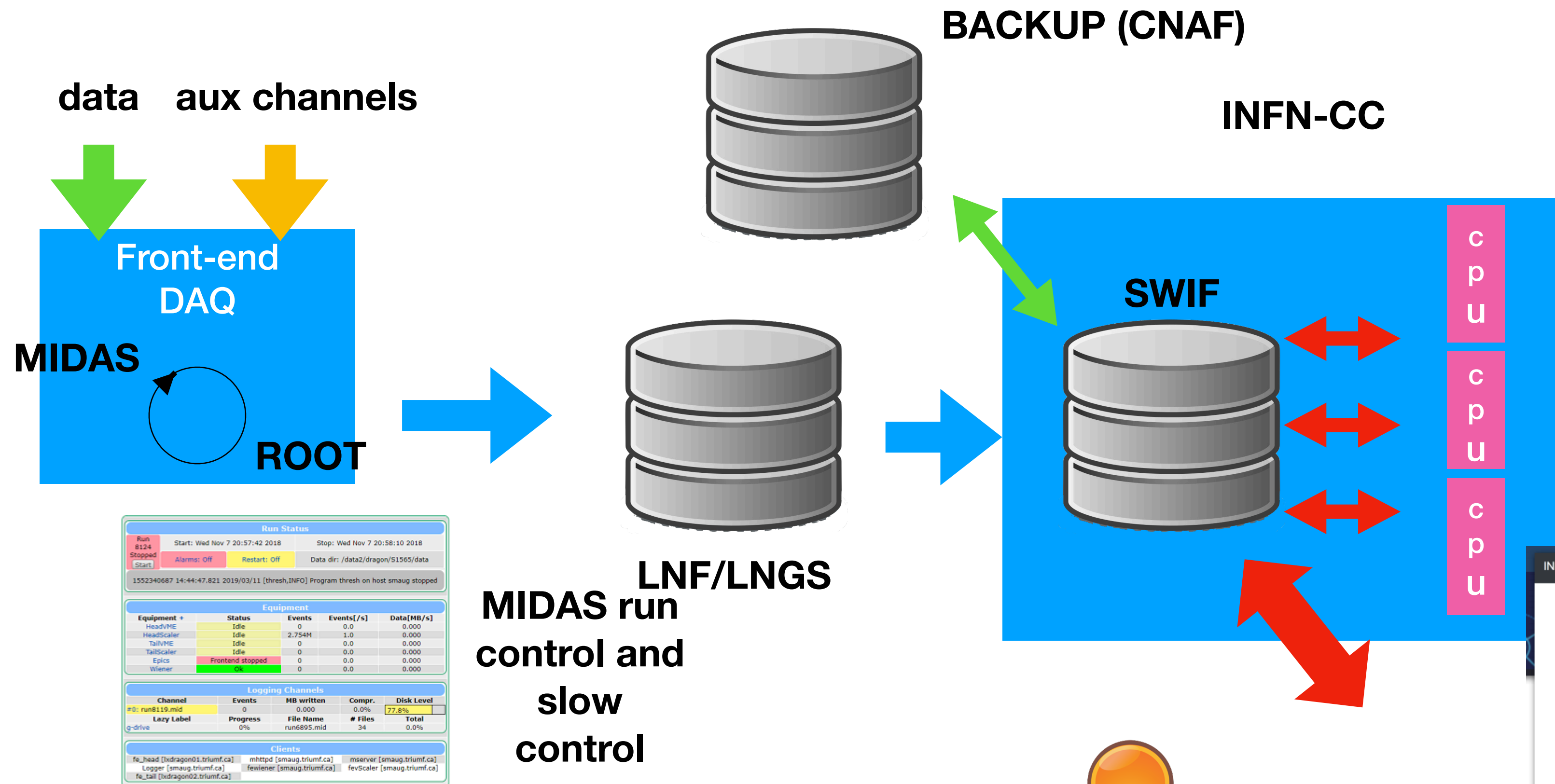


CYGNO @ Cloud (prototype of small CSN2 experiment)

INFN-CC @ LNGS-LNF

<https://notebook.cygno.cloud.infn.it/>

JupyterHUB notebook: Python3, PyROOT, ROOT

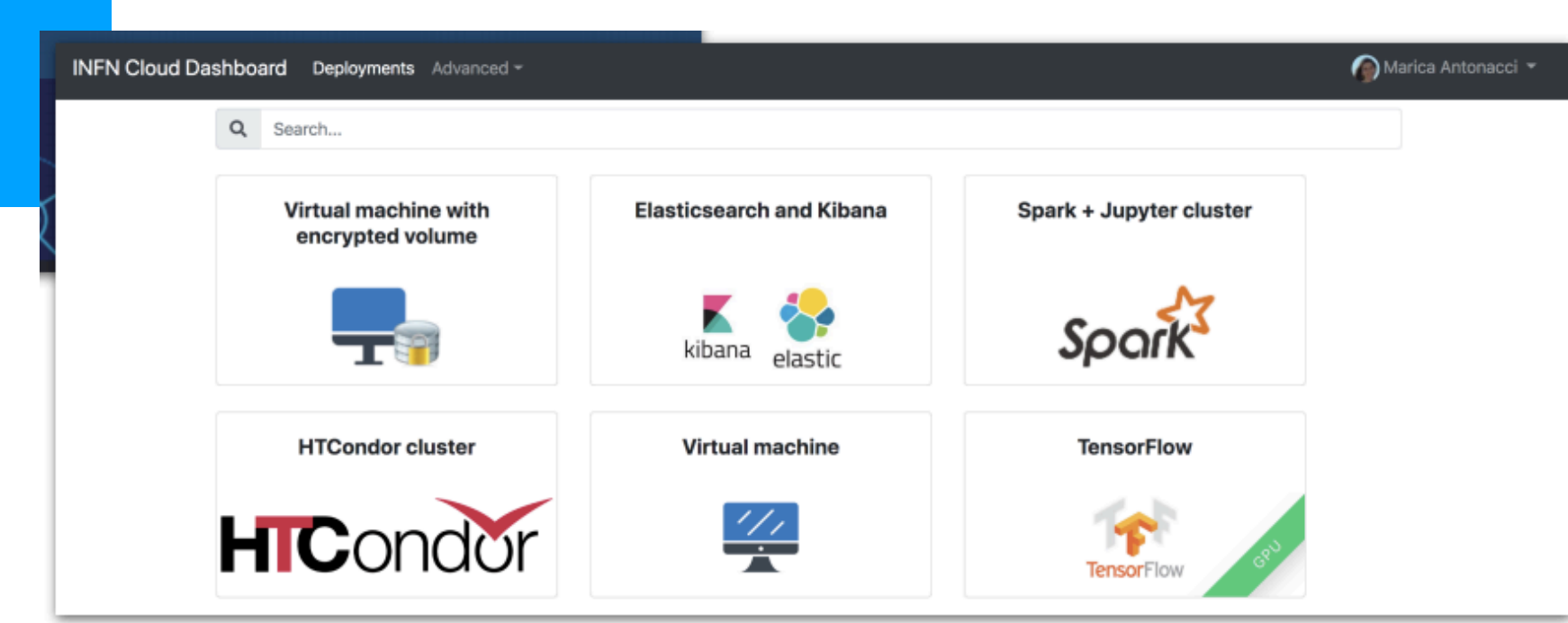


```

57
58 ellipse.set_transform(transf + ax.transData)
59 return ax.add_patch(ellipse)
60 def get_correlated_dataset(n, dependency, mu, scale):
61     latent = np.random.randn(n, 2)
62     dependent = latent.dot(dependency)
63     scaled = dependent * scale
64     scaled_with_offset = scaled + mu
65     # return x and y of the new, correlated dataset
66     return scaled_with_offset[:, 0], scaled_with_offset[:, 1]
67 np.random.seed(0)
68
69 PARAMETERS = {
70     'Positive correlation': np.array([10.85, 0.35]),
71     'Negative correlation': np.array([0.15, -0.45]),
72     'Weak correlation': np.array([0.1, -0.6]),
73     'Strong correlation': np.array([10, 0]),
74     'Weak correlation': np.array([0, 1]),
75 }
76
77 mu = 2, 4
78 scale = 3, 5
79
80 fig, axes = plt.subplots(1, 3, figsize=(9, 3))
81 for ax, (title, dependency) in zip(axes, PARAMETERS.items()):
82     x, y = get_correlated_dataset(800, dependency, mu, scale)
83     ax.scatter(x, y, s=0.5)
84
85     ax.axvline(c='grey', lw=1)
86     ax.axhline(c='grey', lw=1)
87
88     confidence_ellipse(x, y, ax, edgecolor='red')
89
90     ax.scatter(mu[0], mu[1], c='red', s=3)
91     ax.set_title(title)
92
93 plt.show()
94
In [70]:
1 def cluster_ellipse(points):
2     x0 = np.argmax(points[:,1])
3     x1 = points[x0][1]
4     x2 = np.argmax(points[:,1])
5     x3 = points[x1][1]

```

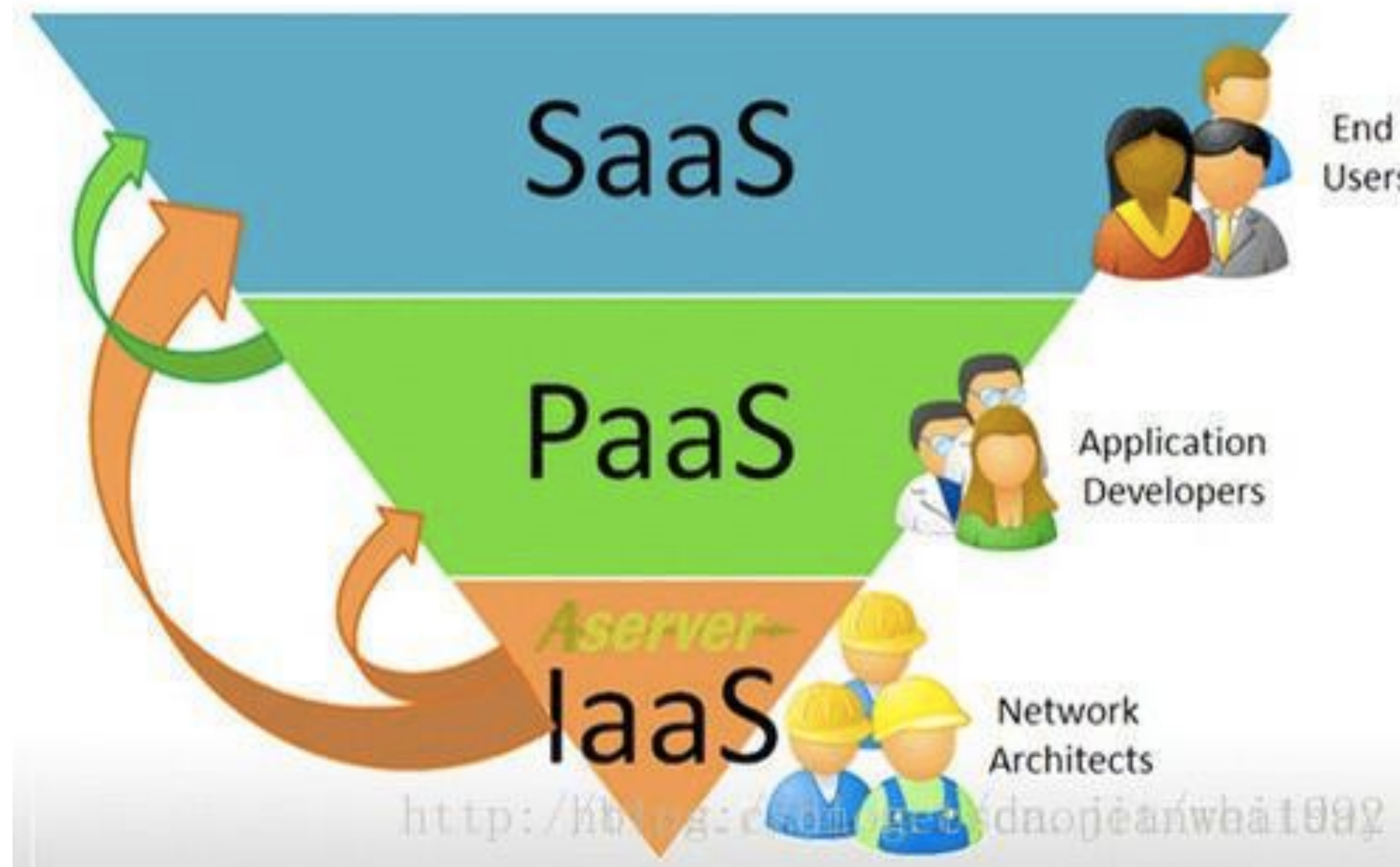
AAI users authentication



today throughput 10-100*16MB/s
tomorrow @LNGS 0.01*16MB/s

User HTTP queries

PaaS (CNAF) to SaaS (CMS, CYGNO ecc)



software, libraries, interfaces,
authentication...

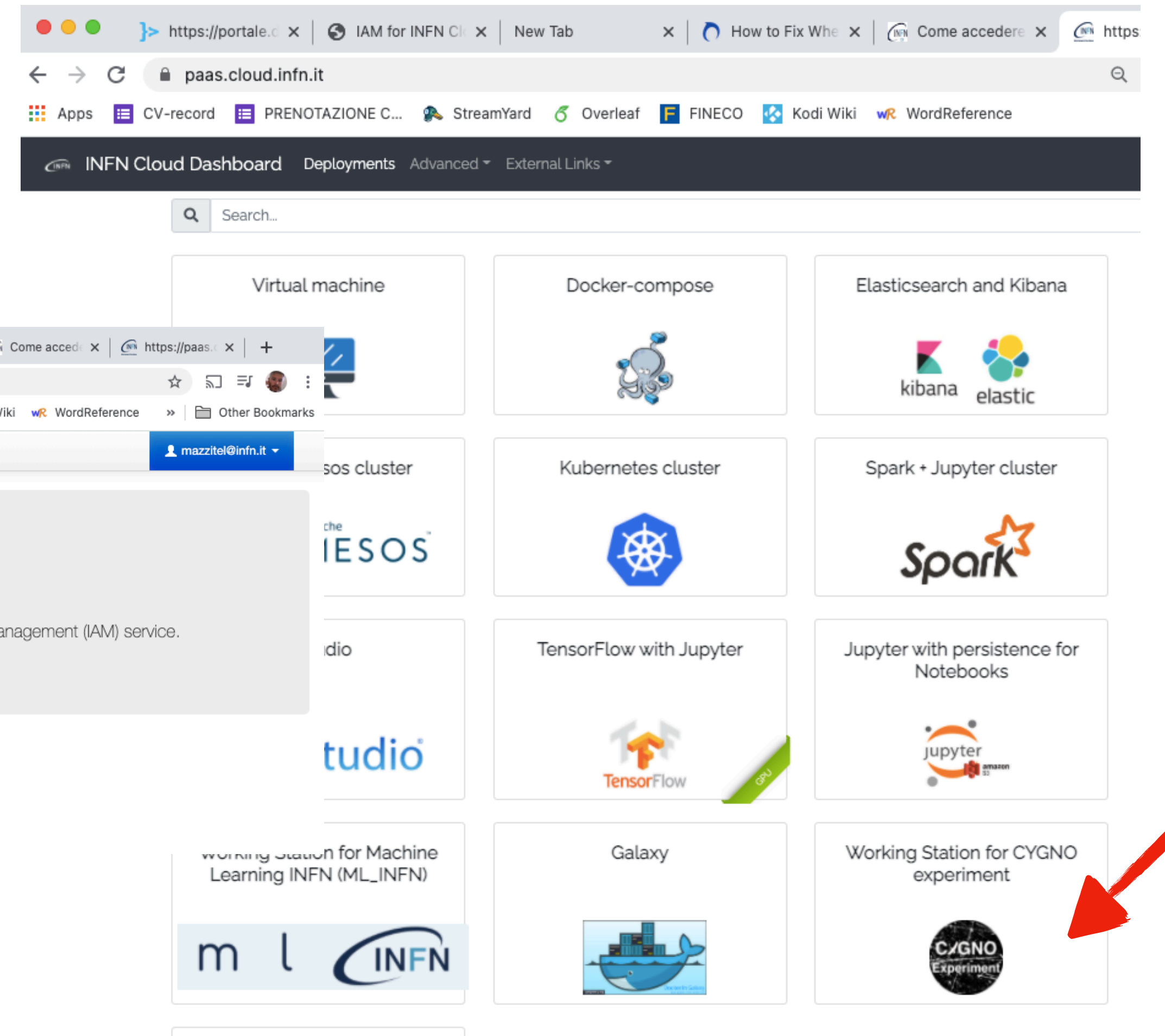
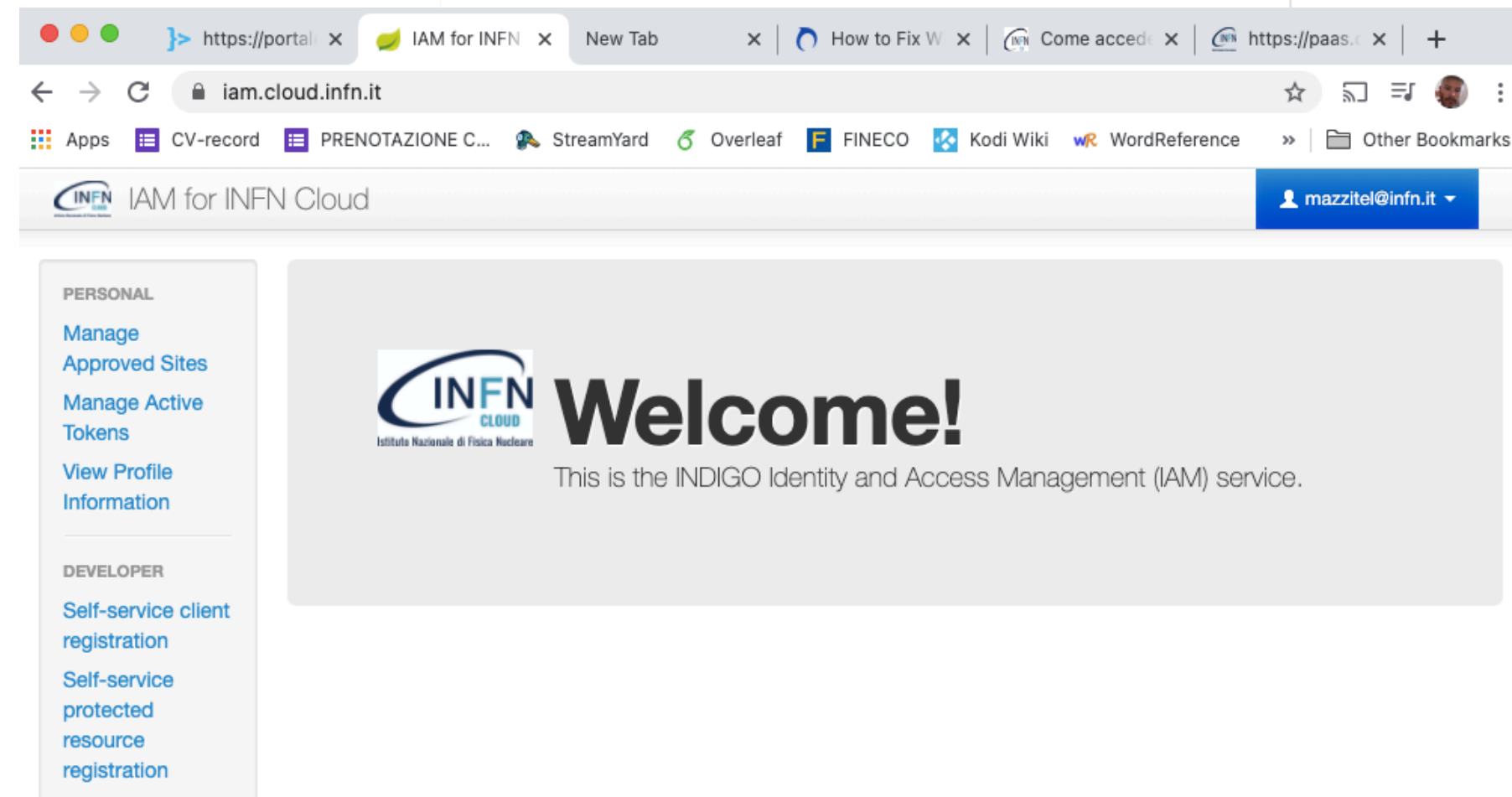
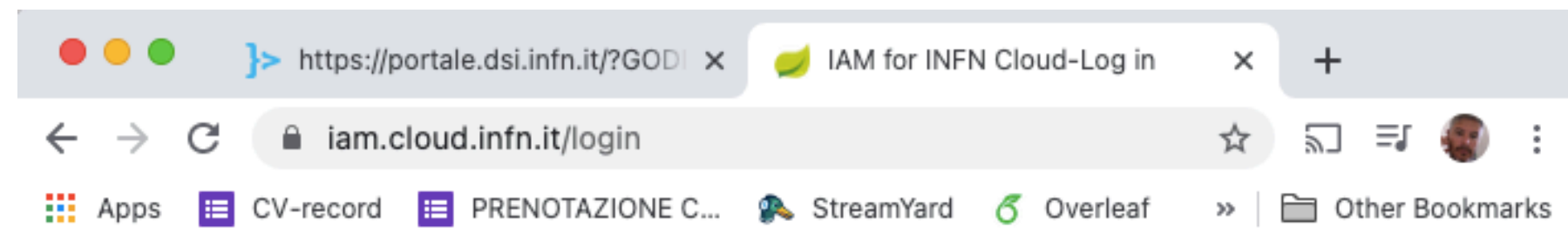
VM, containers, NAS, ecc

credits to:

Marica Antonacci e Daniele Spiga

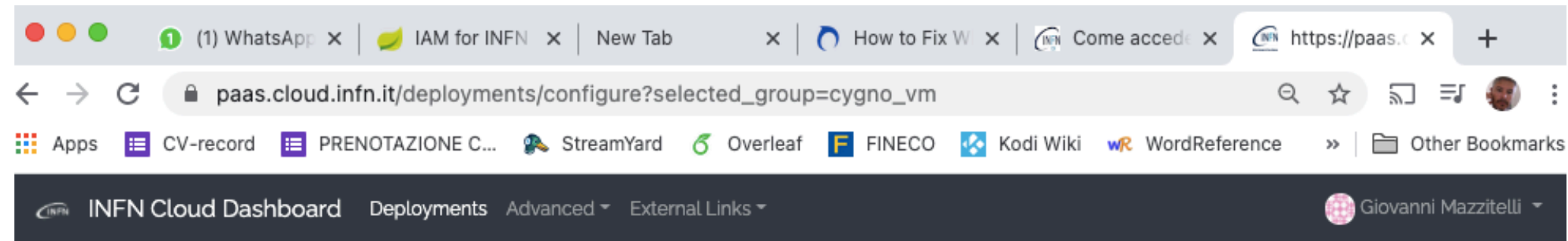
<https://confluence.infn.it/display/INFNCLLOUD/Come+accedere+alla+dashboard>

PaaS to SaaS



<https://confluence.infn.it/display/INFNCLLOUD/Come+accedere+alla+dashboard>

PaaS to SaaS



Working Station for CYGNO experiment

Description: Run a single VM with all the CYGNO environment exposing both ssh access and Jupyter

Deployment description

Configuration **Advanced**

num_cpus

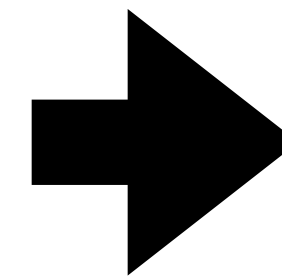
Number of VM vCPUs (int)

mem_size

VM Memory size (str)

jupyter_token

Token for Jupyter login (str)



VM, ecc but you have to manage it, ecc

<https://confluence.infn.it/display/INFNCLLOUD/Come+accedere+alla+dashboard>

SaaS

INFN CCR - AAI

INFN Identity Check

IT | EN

mazzitelme o e-mail

Password

LOGIN

REGISTRATI

Cambio o Rigenerazione Password -
Recupero Username

X.509 Certificate
Accesso tramite certificato
ACCEDE

Kerberos5 GSS-API
Accesso tramite Kerberos 5
ACCEDE

NON AGGIUNGERE QUESTA PAGINA AI PREFERITI! Dopo il login verrai rediretto a
<https://notebook.cygno.cloud.infn.it/Shibboleth.sso/SAML2/POST>

WhatsApp | R_th.ipynb - Colaboratory | My Drive - Google Drive | L'immaterialità della scienza - | Home

notebook.cygno.cloud.infn.it/user/mazzitel/tree?

CV-record | PRENOTAZIONE C... | StreamYard | Overleaf | FINECO | Kodi Wiki | WordReference | COVID form | DD | Wikisource

Jupyter

Quit | Logout | Control Panel

Files | Running | Clusters

Select items to perform actions on them.

| Item | Size | Last Modified |
|--------------------------------------|------|---------------|
| data | | |
| his2h5 | | |
| Analysis-Calibarion.ipynb | | |
| Analysis-Fe.ipynb | | |
| Analysis-Clustering-FixThSigma.ipynb | | |
| Analysis-Clustering.ipynb | | |
| Analysis-Clustering_2.7.ipynb | | |
| Analysis-Clustering_root.ipynb | | |
| Analysis-Clusteringb.ipynb | | |
| Analysis-pedestals.ipynb | | |
| Analysis_DS.ipynb | | |
| bitmap16bit.ipynb | | |
| colab_serch-and_display.ipynb | | |
| Discrimination.ipynb | | |
| Discrimination_root.ipynb | | |
| display_runs_from_file_name.ipynb | | |
| DownloadRun.ipynb | | |
| eLuceFu.ipynb | | |
| Events_Display.ipynb | | |

Context Menu Options:

- Notebook:
- Python 2
- Python 3
- ROOT C++
- Other:
- Text File
- Folder
- Terminal

<https://confluence.infn.it/display/INFN/CLOUD/Come+accedere+alla+dashboard>

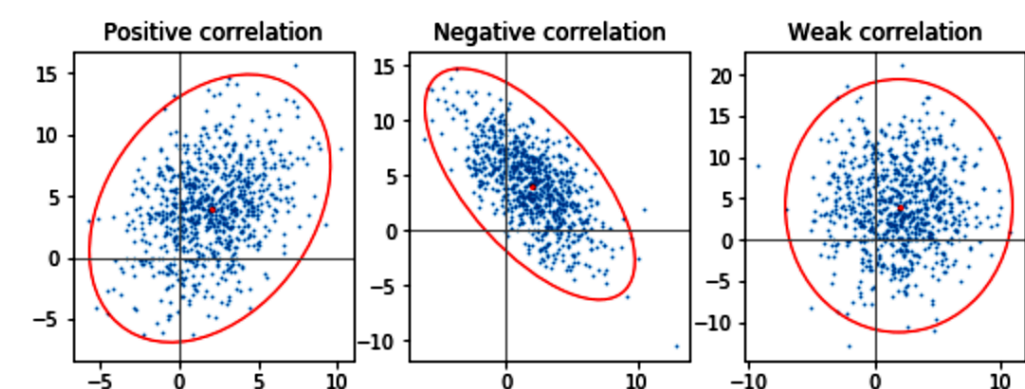
SaaS

Jupyter MLclusterTest Last Checkpoint: 29/05/2019 (autosaved)

File Edit View Insert Cell Kernel Widgets Help

Code

```
57
58 ellipse.set_transform(transf + ax.transData)
59 return ax.add_patch(ellipse)
60 def get_correlated_dataset(n, dependency, mu, scale):
61     latent = np.random.randn(n, 2)
62     dependent = latent.dot(dependency)
63     scaled = dependent * scale
64     scaled_with_offset = scaled + mu
65     # return x and y of the new, correlated dataset
66     return scaled_with_offset[:, 0], scaled_with_offset[:, 1]
67     np.random.seed(0)
68
69 PARAMETERS = {
70     'Positive correlation': np.array([[0.85, 0.35],
71                                     [0.15, -0.65]]),
72     'Negative correlation': np.array([[0.9, -0.4],
73                                     [0.1, -0.6]]),
74     'Weak correlation': np.array([[1, 0],
75                                  [0, 1]]),
76 }
77
78 mu = 2, 4
79 scale = 3, 5
80
81 fig, axs = plt.subplots(1, 3, figsize=(9, 3))
82 for ax, (title, dependency) in zip(axs, PARAMETERS.items()):
83     x, y = get_correlated_dataset(800, dependency, mu, scale)
84     ax.scatter(x, y, s=0.5)
85
86     ax.axvline(c='grey', lw=1)
87     ax.axhline(c='grey', lw=1)
88
89     confidence_ellipse(x, y, ax, edgecolor='red')
90
91     ax.scatter(mu[0], mu[1], c='red', s=3)
92     ax.set_title(title)
93
94 plt.show()
```



```
In [70]: 1 def cluster_elips(points):
2         x0i = np.argmin(points[:,1])
3         a0 = points[x0i][1]
4         x1i = np.argmax(points[:,1])
5         a1 = points[x1i][1]
6         x0j = np.argmin(points[:,0])
```

macmazzitelli.inf.infn.it:8999/notebooks/root_nb_example.ipynb

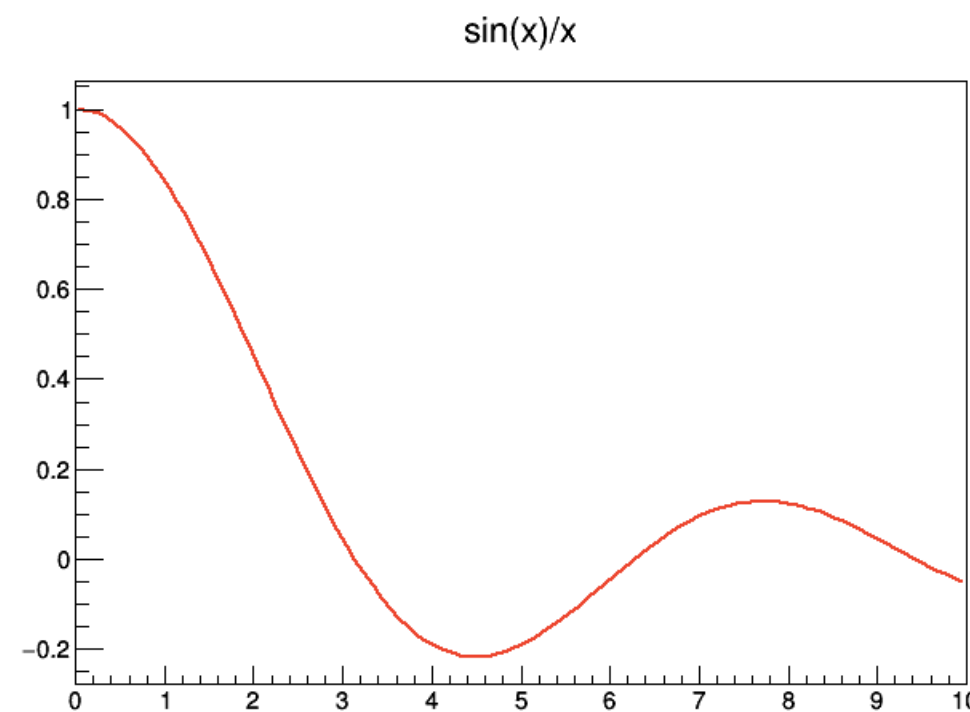
Jupyter root_nb_example Last Checkpoint: 20/06/2020 (autosaved)

File Edit View Insert Cell Kernel Widgets Help

Code

http://web.mit.edu/root_v6.12/ROOT-Primer.pdf

```
In [1]: 1 TCanvas canvas_2("c", "c");
2 TF1 f1("f1", "sin(x)/x", 0., 10.);
3 f1.Draw();
4 canvas_2.Draw();
```



IAM for IAM | New Tab | How to F | Come ac | https://p | Home | mazzitel | +

io.cloud.infn.it/user/mazzitel/terminals/2

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Logout Control Panel

```
new ~]$ lscpu
x86_64
32-bit, 64-bit
Little Endian
8
0-7
Thread(s) per core: 1
Core(s) per socket: 1
Socket(s): 8
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 61
Model name: Intel Core Processor (Broadwell)
Stepping: 2
CPU MHz: 2399.996
BogoMIPS: 4799.99
Virtualization: VT-x
Hypervisor vendor: KVM
Virtualization type: full
L1d cache: 32K
L1i cache: 32K
L2 cache: 4096K
L3 cache: 16384K
NUMA node0 CPU(s): 0-7
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush
h mmx fxsr sse sse2 ss syscall nx pdpe1gb rdtscp lm constant_tsc rep_good nopl xtopology eagerfpu pni
pclmulqdq vmx ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx
f16c rdrand hypervisor lahf_lm abm 3dnowprefetch invpcid_single tpr_shadow vnmi flexpriority ept vpi
d fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm rdseed adx smap xsaveopt arat
[mazzitel@cigno-new ~]$
```

<https://confluence.infn.it/display/INFN/CLOUD/Come+accedere+alla+dashboard>

SaaS

next step

- define further requirements (I copied the LNGS VM) for the beta
- test the next implementation of software as a service (authentication ecc)
- define final requirements for the v1 connect: scheduler, other software like GEANT ecc
- connect the resource to CNAF resources (not yet clear when this will be possible, anyhow will be the final solution for all the CNAF resources)
- generate a stable container (that you can run also on your PC etc)
- deploy all on the cloud and use it

Computing request to CNAF

- swift: DATA storage, what about reconstruction and simulation repository?
- 10 TB disk space at LNGS done (see previous question)
- Purchase of CPU and LAN switch for LNGS:
 - LAN: HPE 5700 40XG 2QSFP+ Euro 2.429,46, HPE X140 40G QSFP+ LC LR4 SM Euro 1.420,64, , HPE X120 1G SFP RJ45 Euro 57,16, HPE X120 1G SFP LC SX Euro 44,82
 - CPU: Dell EMC PowerEdge R7425 (1 AMD EPYC, 64GB RAM, 2x600GB 10K RPM SAS), Processore aggiuntivo AMD EPYC 7301 2.2GHz/2.7GHz, 16C/32T, 64M Cache (155W/170W) DDR4-2400/2666, Memoria aggiuntiva Dell 64GB - 4RX4 DDR4 LRDIMM 2666MHz, Scheda 10Gb/s QLogic 41112 Dual Port 10Gb SFP+ Adapter Low Profile, 2 dischi 960GB SSD SAS Read Intensive 12Gbps 2.5in Hot-plug Drive, estensione della garanzia di ulteriori 2 anni per un costo di circa 5KEuro + IVA.
- CNAF/CLOUD 2021: 100 CPUs + 3GB/CPU + 20 TB + tape
- ROOT/GEANT/GARFIELD/Notebook..., scheduler (CONDOR), DB SQL (reconstruction & simulation logbook), ...