Cloud Computing and Software Development at INCDTIM

Felix Farcas, Radu Trusca, Cristian Lupse

speaker: Dr. Eng. Felix Farcas

National Institute for Research and Development for Isotopic and Molecular Technologies I.N.C.D.T.I.M. (INCDTIM or ITIM)

Research departments and teams

- 11 teams, 4 departments, 1 research center,
- Physics of Nanostructured Systems (2)
  - *Nanocomposite Materials with Adjustable Properties
  - *Multifunctional Materials and Biologically Active Compounds
- Physics and Technology of Isotopes (1)
  - Isotopic Separation and Labeled Compounds
- Mass spectrometry, chromatography and ion physics (2)
  - Isotopic, Elemental and Molecular Fingerprinting
  - Porous materials and Carbon Nanostructures
- Molecular and Biomolecular physics (3)
  - *Complex Molecular and Biomolecular Systems
  - *Molecular and Biomolecular Technologies
  - Laser Induced Processes
- "The Fortress" (CETATE) Research Center (3)
  - Alternative Energies (http://en.itim-cj.ro/research/research-teams/alternative-energies/)
  - **Hi-Tech Engineering and Advanced Technologies**
  - *Quantum Engineering (http://en.itim-cj.ro/research/research-teams/quantum-engineering/)

INCDTIM

Team

Hi-Tech Engineering and Advanced Technologies

- Is responsible with the IT and CERN collaboration
- We have
  - The RO-14-ITIM Grid site
  - A HPC system - IBM System **iDataPlex dx360 M4 – 7 TFlops**
- 2021 implementing a cloud site through project: "Development of the INCDTIM DATA CENTER for the realization of a CLOUD platform, integrated in European CDI networks *(CloudITIM)*"

Project and financial data (CloudITIM)

- Priority Axis 1: Research, Technological Development and Innovation (RDI) in support of economic competitiveness and business development
- ***Cod MySMIS: 124698***
- ***Contract Nr: 348/390024/08.09.2021***
- **Total value : 4.187.199 lei**,
- 84% The project is co-financed by the **European Regional Development Fund (ERDF) through the Competitiveness Operational Programme (OP)**: 3.538.282,25 lei
- Romania through national budget :
- 624.402,75 lei

General Objectives (3)

- 01. **Increase the research and innovation capacity** at INCDTIM level by developing the existing **Data Centre and creating a CLOUD platform for** integration into specialised European networks.
- **O2.** Increase the **involvement of Romanian researchers** in **international research networks** by increasing the level of scientific competitiveness at national and international level.
- **O3. Training** of specialists **in Cloud Computing** and **Massive Data Infrastructures**

Scope of the project (4)

1. Increasing the **processing power** and **data storage** capacities of the Data Center at INCDTIM;
2. Creation of a **CLOUD-type platform** dedicated to scientific activity generating large volumes of data;
3. **Creating the premises** for the **integration** the created platform in national and international CLOUD-type networks and in **EOSC**;
4. **Expanding the collective** and increasing the skills of the staff who deserve Data Center of INCDTIM.

Cloud access Protocols

- through the project we have to support processing power and storage to 5 internal and 5 external teams
- The implementation is based on a team decision if we accept his request
- The key point on the request are:
  - science or project experiment
  - processing power and storage capacity
  - real id card or passport
  - application in which it is described what they intend to do
- if all points are checked the team/person get an account

Computing system configuration

- 27 blade computing nodes with (2 x 16 Core CPU (+ HT), 128 GB RAM, 1.2 TB HDD) arranged in 4 chassis
- 2 Computing nodes with **GPU** equipped with **3 NVIDia A100 GPU** cards with 40 GB VRAM;
- - 1 computing node with **FPGA** (2 x 16 Core CPU (+ HT), 128 GB RAM, 1.2 TB HDD) equipped with 1 Xilinx Alveo FPGA board;
- The computing system **provides**
  - a minimum of **960 CPU cores**,
  - **41.000 GPU cores** (with a total performance of 120 Tflops) and **12.200 DS cores** (FPGA),
  - memory capacity totalling **4000 GB RAM**.
- Used Brand: Cisco

Project team

Project manager:
Fărcaș Felix

Public relation:
Szabo Izabella

Technical manager:
Trușcă Radu

Financial manager:
Nicoară Diana

Programing and Cloud implementation:
Lupșe Cristian

Scientific responsible:
Gabriel Popeneciu

Implementation and testing results

Software implementation

INCDTIM

- **Web portal** – in house solution for the moment, will be online in August
- **Intersight** - Management Platform for Cloud Hardware Configuration from Cisco
- **Openstack**
  - software combine with in house programing solution
  - All services are installed
- **Database for big data** implementation 90% ready
- **Solution for link testing** between 2 Institute Bucharest-Cluj (IFIN-HH and INCDTIM)

Navigation bar of web portal

http://www.itim-cj.ro/poc/clouditim/

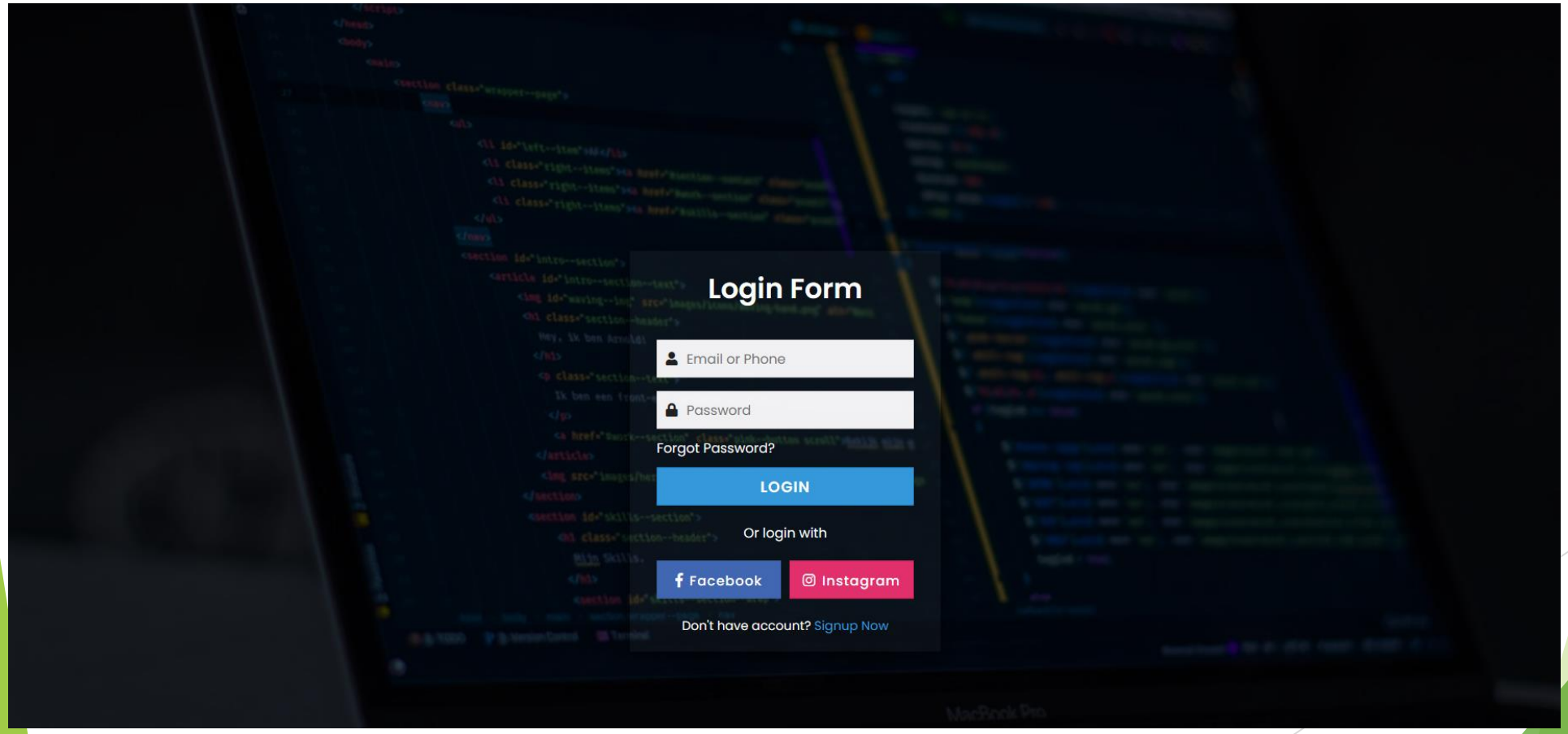
Title: Development of the INCDTIM DATA CENTER for the realization of a CLOUD platform, integrated in European CDI networks

PERIOD: 8 september 2021 – 31 august 2023

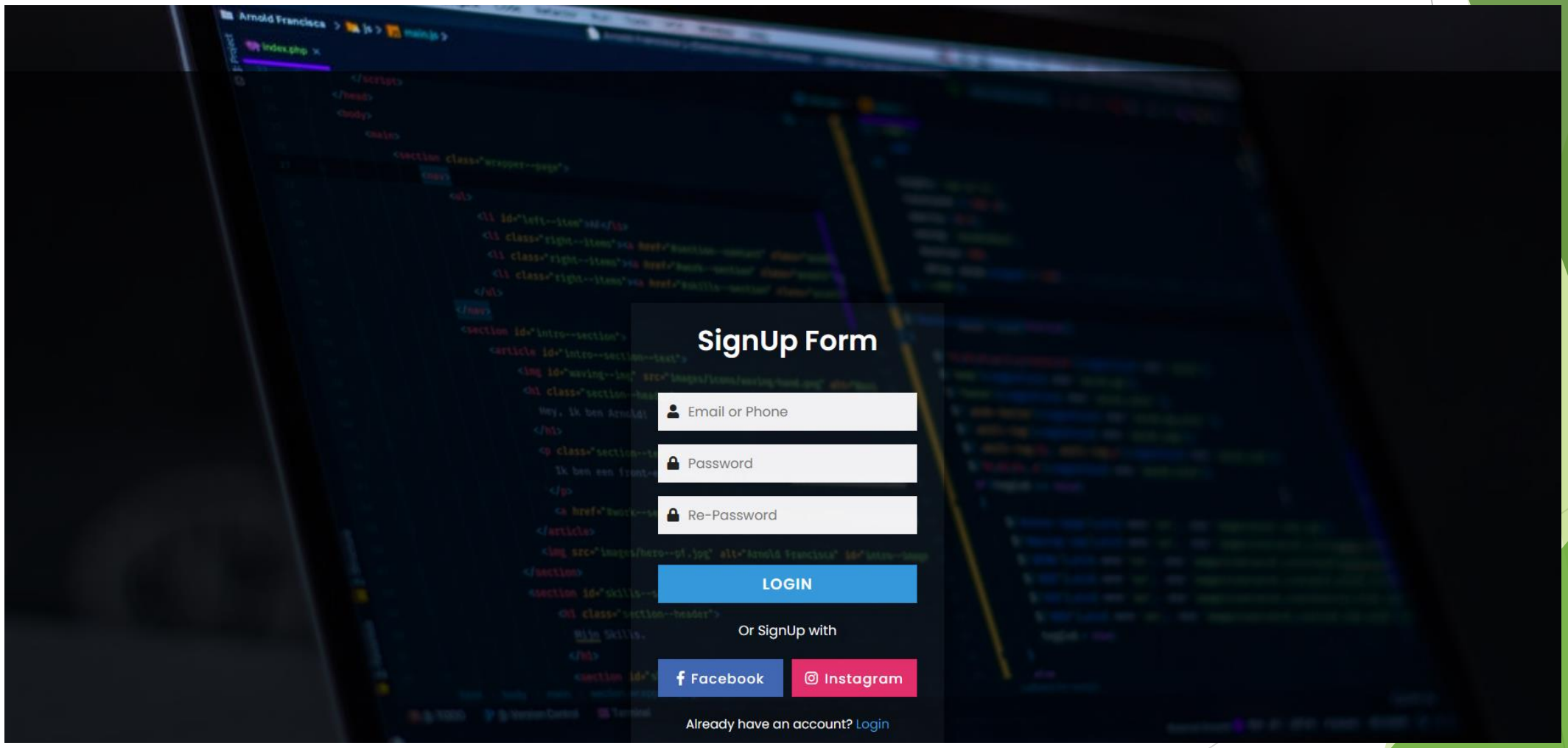
COD SMIS: 2014+: 124698

CONTRACT NO.: 348/390024/08.09.2021

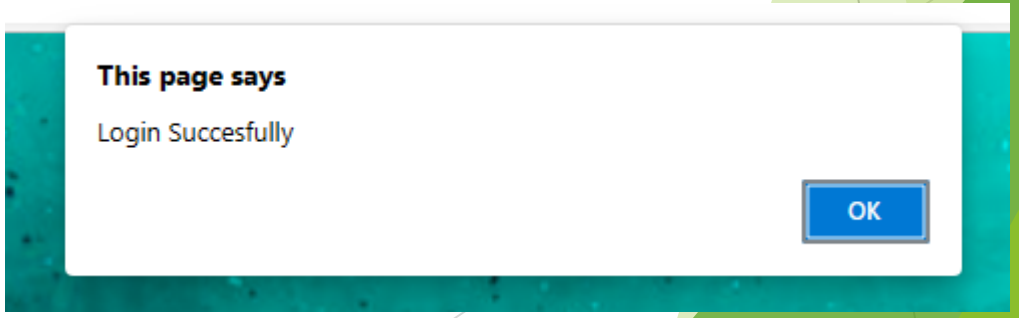
Web interface / login panel



Web interface / sign up panel

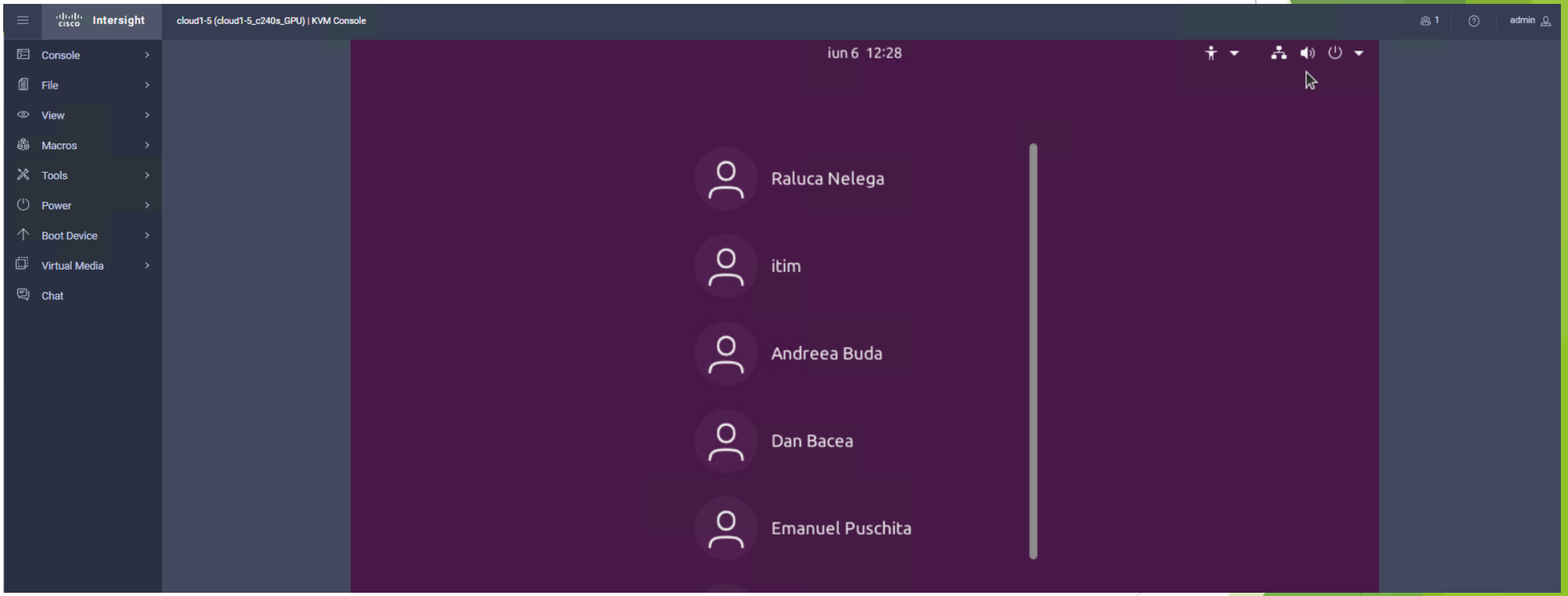


Failed login vs Successful login



Intersight: As admin we can see all user accounts

INCDTIM



Intersight: Cloud hardware configuration interface

INCDTIM

Intersight

OPERATE > Servers

admin

MONITOR

OPERATE

Servers

Chassis

Fabric Interconnects

HyperFlex Clusters

CONFIGURE

Profiles

Templates

Policies

Pools

ADMIN

Targets

Software Repository

Tech Support Bundles

All Servers

OperPowerState on | Add Filter

Export | 9 items found | 17 per page | 1 of 1

Health: 9 — Critical 1, Healthy 8

Power: On 9

HCL Status: Incomplete 33

Models: 9 — C240 M6L 3, C240 M6S 3, UCSX 210C-M6 3

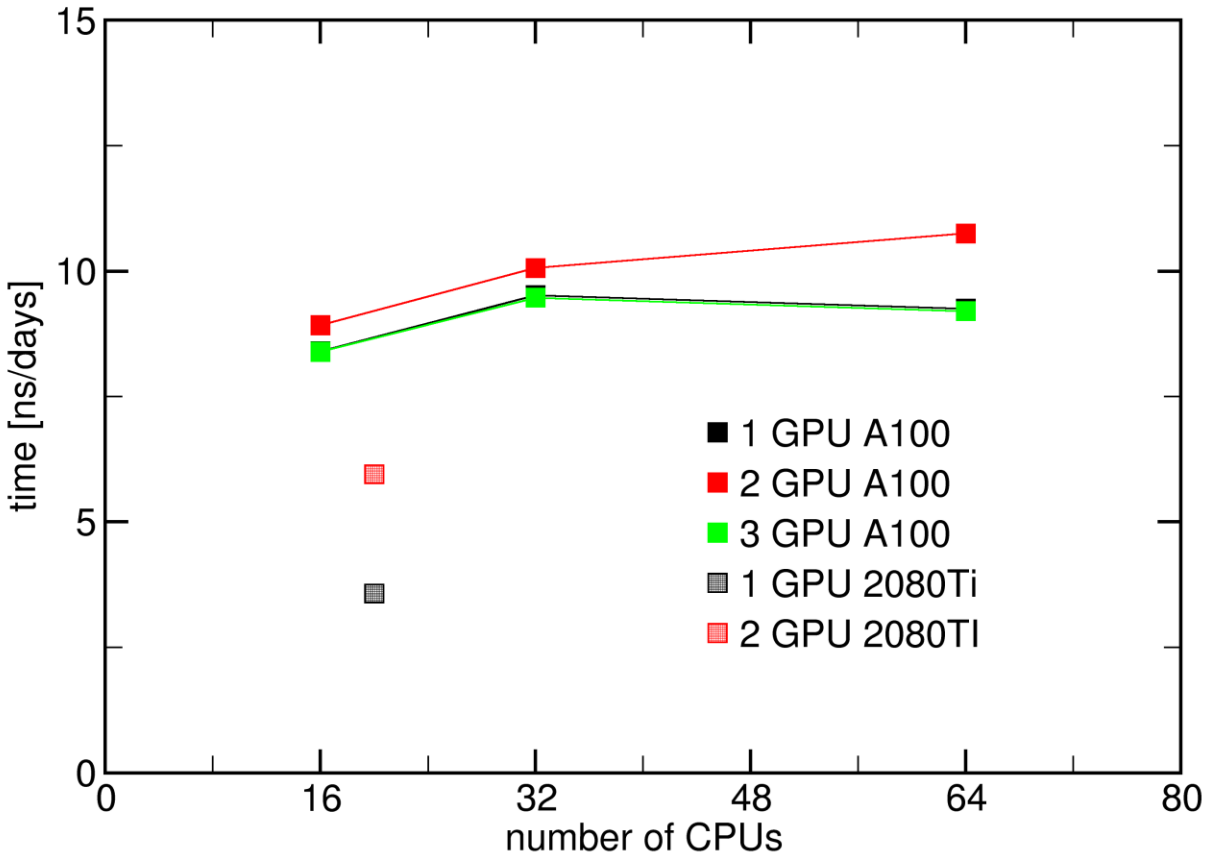
Profile Status: 10 — Not Deployed Changes 3, Not Assigned 1, OK 6

Requests (La... NO REQUESTS

Name	Health	Management IP	Model	CPU Capa...	Memory Capac...	UCS Domain	HX Cluster	Server Profile	Utility Storage	Firmware Version
cloud1-1-1	Healthy	172.27.100.75	UCSX-210C-M6	92.8	256.0	cloud1		cloud1-1-1_Controler		5.0(2b)
cloud1-2-1	Healthy	172.27.100.66	UCSX-210C-M6	92.8	256.0	cloud1		cloud1-sasiu2-server11		5.0(2b)
cloud1-1-2	Healthy	172.27.100.76	UCSX-210C-M6	92.8	128.0	cloud1		cloud1-1-2_Compute		5.0(2b)
cloud1-1	Healthy	172.27.100.67	UCSC-C240-M6L	128.0	128.0	cloud1		cloud1-1_c240L_Storage		4.2(1f)
cloud1-2	Healthy	172.27.100.71	UCSC-C240-M6L	128.0	128.0	cloud1		cloud1-2_c240L_Storage		4.2(1f)
cloud1-3	Critical	172.27.100.70	UCSC-C240-M6L	128.0	128.0	cloud1		cloud1-3_c240L_Storage		4.2(1f)
cloud1-4	Healthy	172.27.100.74	UCSC-C240-M6S	128.0	128.0	cloud1		cloud1-4_c240s_FPGA		4.2(1f)
cloud1-5	Healthy	172.27.100.73	UCSC-C240-M6S	128.0	128.0	cloud1		cloud1-5_c240s_GPU		4.2(1f)
cloud1-6	Healthy	172.27.100.72	UCSC-C240-M6S	128.0	128.0	cloud1		cloud1-6_c240s_GPU		4.2(1f)

1 of 1

Results:
Comparison testing 2 GPU TI 2080 vs 2 GPU A100 (project)



Future work

- Learning the best way to administer/use/develop the cloud system
- Including a part of the Grid site in cloud computing
- Developing the database for internal and external use for big data
- Offering processing power for scientific experiments
- Looking for future collaboration
- Publishing articles about our work
- Would like to be part of EOSC! How can we access the cloud?

Instead of conclusion there is an invitation

INCDTIM

INCDTIM

Any Questions?

Please don't feel afraid to ask.