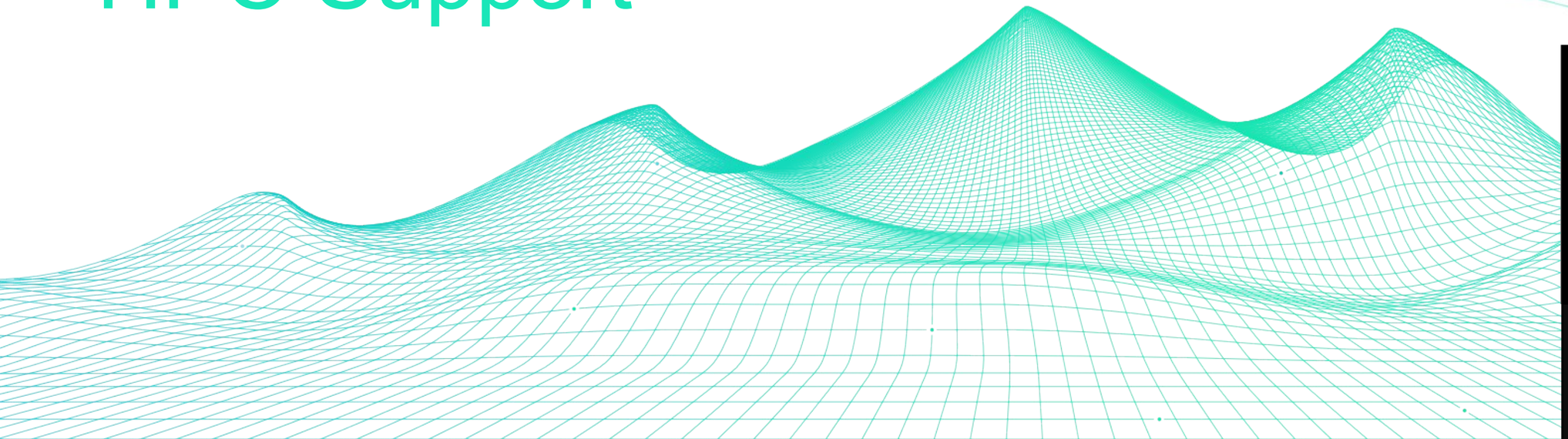
EPICURE

Unlocking European-level HPC Support



VEGA

Žiga Zebec
Teo Prica
Samo Miklavc

IZUM - Institute of Information Science

Co-funded by the European Union

EuroHPC Joint Undertaking

This project has received funding from the European High-Performance Computing Joint Undertaking under grant agreement No.101139786.

Introduction

- Public institution, approx. 120 employees (7 dedicated to HPC)
- Library automation information system
- Slovenian Current Research Information System
- UNESCO Regional Category II Centre

- Operation & Consortium
- HPC RIVR <-> SLING
- HPC experts from Slovenia

IZUM
Institute of Information Science, Maribor, Slovenia

COBISS.net

COBISS

SICRIS

UNESCO
United Nations
Educational, Scientific and
Cultural Organization

Regional Centre for
Library Information Systems and
Current Research Information Systems
Regionalni center za knjižnične
informacijske sisteme in informacijske
sisteme o raziskovalni dejavnosti

IZUM

SLING

arnes

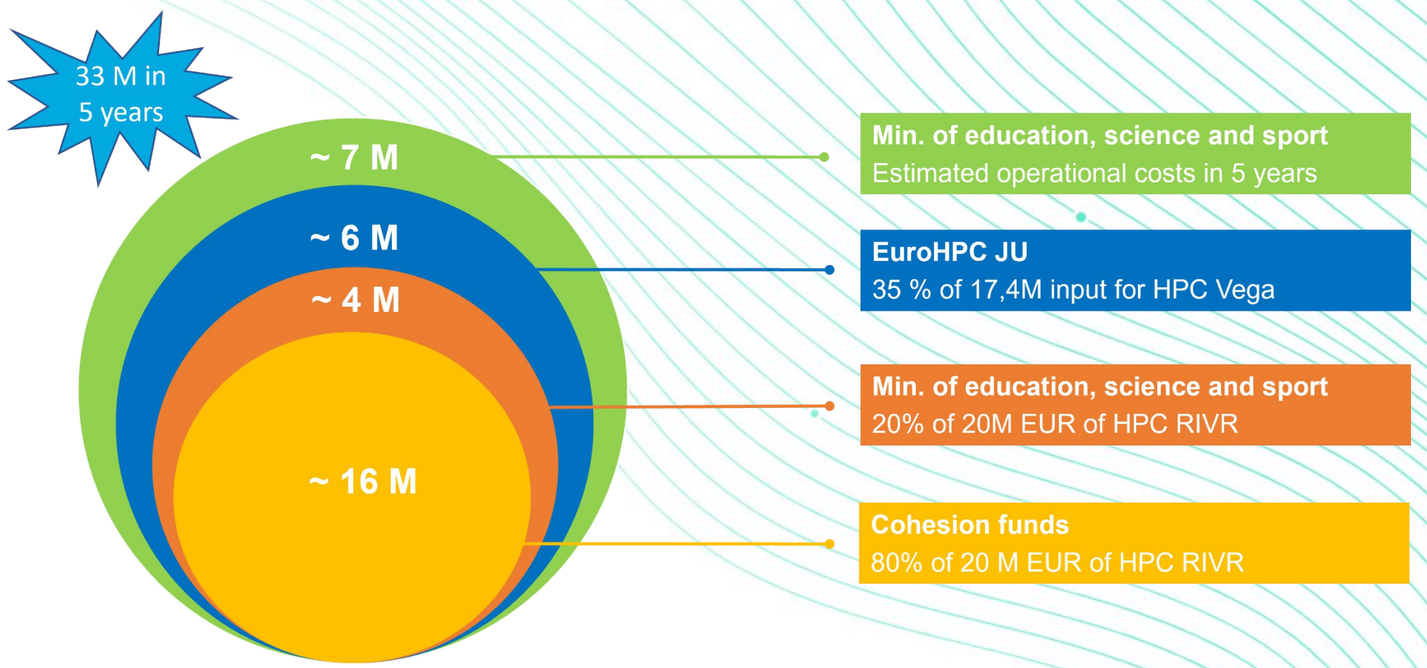
VEGA

Jožef
Stefan
Institute

HPC Vega quick facts

- 1st operational EuroHPC JU system
- In production since April 2021
- Performance 6.9 PFLOPS
- Atos Sequana XH2000

- 1020 Compute nodes
- 18 PB Large Capacity Storage Ceph
- 1 PB High Performance Storage Lustre



EuroHPC Joint Undertaking

REPUBLIC OF SLOVENIA
MINISTRY OF EDUCATION, SCIENCE AND SPORT

EUROPEAN UNION
COHESION FUND

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EuroHPC Joint Undertaking

Consortium consists of 16 partners from 14 countries (IZUM & IJS).

Project budget of €10 million

Duration of project is **4 years.**
Kick-off Meeting in February 2024, Porto.

Establish distributed Application Support Teams (ASTs) to improve user support services (2nd and 3rd level).

First project for level 2 support; collaboration with Jülich.

How to apply?

https://pracecalls.eu/

Computing Joint Undertaking under grant agreement No.101139786.

More at: https://eurohpc-ju.europa.eu/epicure-new-ri-project-launched-eurohpc-ju-2024-02-07_en

1. Context
2. Mission
3. Main Goals
4. Expected Outcomes
5. Support Services
6. Access the Resources
7. Consortium

Context

HPC has enabled technologies with a positive impact on society

- More precise climate and weather modelling
- Reduced healthcare research costs through simulation
- Planning and yield prediction of renewable energy resources
- Train larger and more complex Artificial Intelligence models
- …

Installation of supercomputers in multiple countries reflects a commitment to HPC's technological potential

- EuroHPC JU has been instrumental in elevating European supercomputing

Context

3
Pre-Exascale

LEONARDO

LUMI

MARE NOSTRUM 5

5
Petascale

KAROLINA

VEGA

MELUXINA

DISCOVERER

DEUCALION

2
Future Exascale

JUPITER

JULIO VERNE

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Mission

EPICURE utilizes the experience and knowledge of the current and future EuroHPC hosting organisations to provide better user support

- Adequate code installation and porting to different architectures (Level 2)
- Intra- and inter-node optimisation, focusing on accelerators and scalability (Level 3)

Knowledge exchange through the organisation of hardware-specific training, hackathons, webinars, and workshops in several EU countries

- Promotes sharing of expertise among hosting organisations
- Provides users with a wide pool of knowledge

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Main Goals

- To establish a four-year operation bringing together Application Support Teams (ASTs) of EuroHPC JU family and offer EU wide support;
- To reach a large pool of users;
- To develop a European HPC Application Support portal;
- To contribute to the development and improvement of the European HPC Application Support Service;
- To collaborate with the Centers of Excellence to develop an HPC-skilled workforce.

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Expected Outcomes

- Publish best practice guidelines on how to code applications that use supercomputers adequately;
- Create a knowledge pool of publicly available training and webinar activities;
- Provide the community with optimised codes for various scientific domains;
- Foster an educated HPC user community;
- Provide a wide range of support services across all EuroHPC JU centers.

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Services NOT provided by EPICURE

- **First level support for EuroHPC Vega is provided by** SLING

support@sling.si

  - General information: how to generate a SSH key, etc.
  - Help with login and access to HPC Vega
  - Help setting up an environment
  - Preparation of workflows
    - Software
    - Building containers (Singularity/Apptainer)
  - Help to set up SBATCH scripts
  - Help to submit jobs

Support Services

Meet our Support Services

Code enablement and scaling

Support for enabling and increase the scalability of user codes to EuroHPC supercomputers

Performance Analysis

Performance analysis for HPC codes

Benchmarking

Our service focuses on developing a benchmarking suite to evaluate the performance of EuroHPC machines.

Code refactoring

This service involves restructuring or rewriting parts of an application code to improve it maintainability but without changing its function.

Code optimization

Our service aims at improving the efficiency and performance of the software such that it consumes fewer resources

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Access the Resources

https://access.eurohpc-ju.europa.eu/

1. **Access to EuroHPC JU supercomputers through open calls**
   - Development, Regular, Extreme Scale, and AI call
   - Accepted projects are matched to adequate supercomputers

1. **Accepted projects get access to EPICURE support**
   - Users choose the level of support needed
   - A team of experts will work closely with users to achieve set goals

[1] https://eurohpc-ju.europa.eu/access-our-supercomputers/eurohpc-access-calls_en

Project overview

- Simulation of oceans and marine ecosystems
  - GETM-ERSEM stack is used
- GETM - ocean circulation module
- ERSEM - marine biogeochemical module
- MPI & Fortran 90
- Plenty of input and output files are need

Actions performed

- Testing default example Sylt
- Working on real-life example
  - Sbatch script refactoring
  - Hardware binding
  - Different compilers & flags
  - Score-p analysis (I. Zhukov)

```
165     #for phas in `seq $firstphase $lastphase` ; do
166   make namelist #only included to test for problems of getm.inp
167   mv getm.inp getm.inp_start0
168
169       export ticphase=`date +%s`
170       phase=`printf %02d $phas`
171       nowdate=`date`
172       echo "$nowdate: Doing phase $phase"
173       #
174       # Common stuff:
175       export bdy3d_vel=False #True
176       export bdy2d=True
177       export bdy3d=True
178       export timestep=12
```

```
263   #for phas in `seq $firstphase $lastphase` ; do
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271   #
272   # Common stuff:
273   export bdy3d_vel=False #True
274   export bdy2d=True
275   export bdy3d=True
276   export timestep=12
```

Results

- The optimization was achieved by experimenting with various pinning options provided by Slurm.

	CPU -Cores	Memory - quiet	Job distribution - plane size 4
Speedup (%)	**3.96**	**7.12**	**6.05**
Speedup w/o outliers (%)	**4.43**	**7.26**	**6.01**

export SLURM_MEM_BIND=quiet

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Consortium


CSC


BSC
Barcelona
Supercomputing
Center
Centro Nacional de Supercomputación


CINECA


VSB TECHNICAL
UNIVERSITY
OF OSTRAVA
IT4INNOVATIONS
NATIONAL SUPERCOMPUTING
CENTER


IZUM
Institute of Information Science, Maribor, Slovenia


LUX
PROVIDE
NEXT-LEVEL INSIGHTS WITH
SUPERCOMPUTING


INESCTEC


SOFIA
TECH


Universiteit
Antwerpen

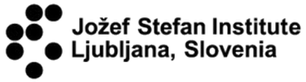

KTH
VETENSKAP
OCH KONST


CYFRONET


DTU
Technical University
of Denmark

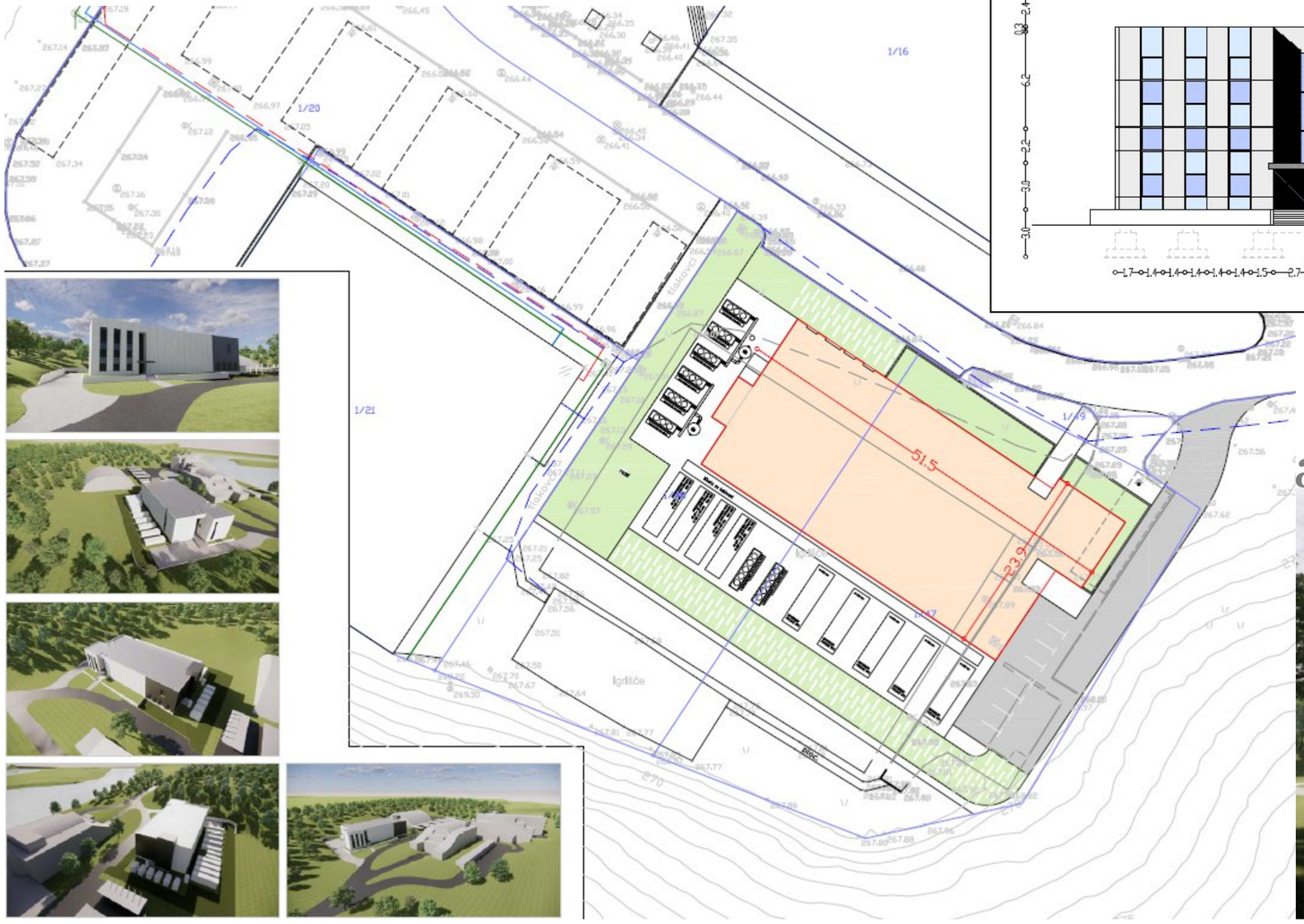

JÜLICH
Forschungszentrum

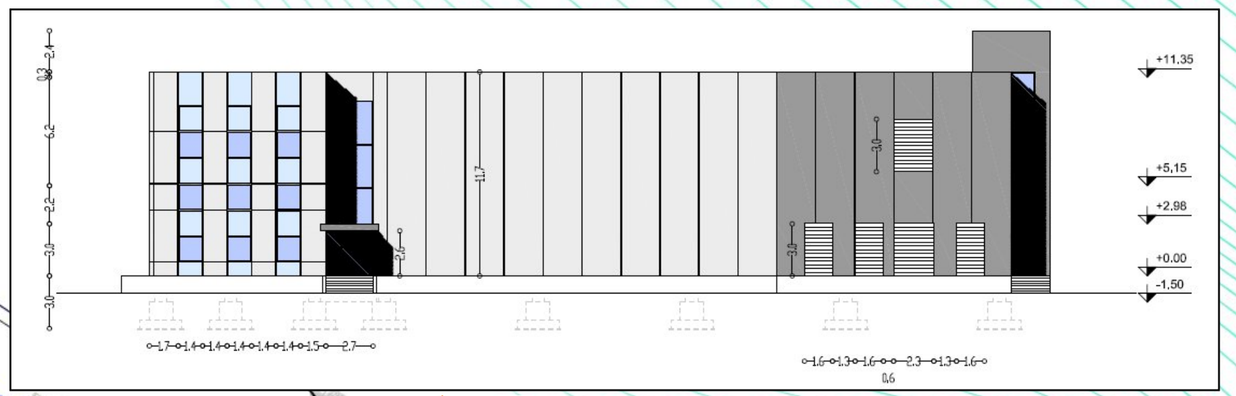

GENCI
HPC at the service of knowledge


Jožef Stefan Institute
Ljubljana, Slovenia


INES

Outlook: new data center





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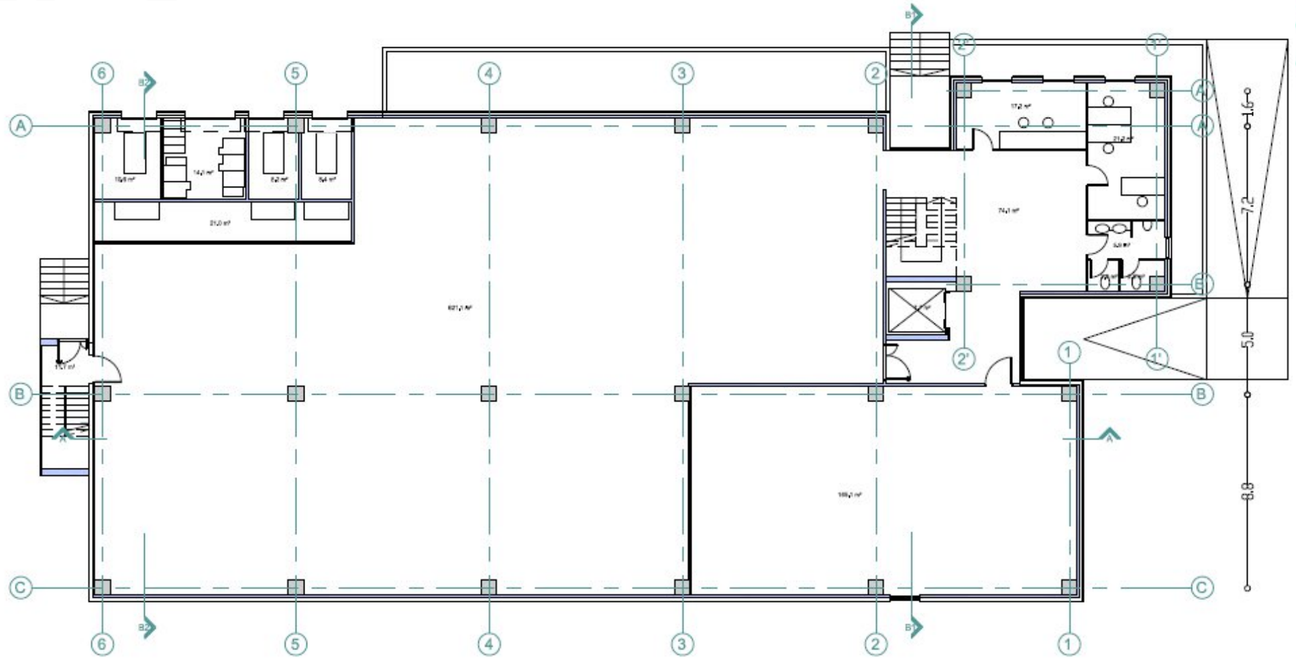
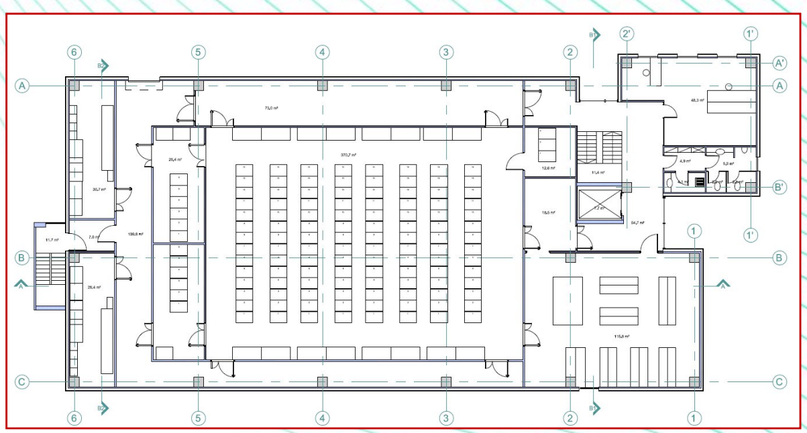
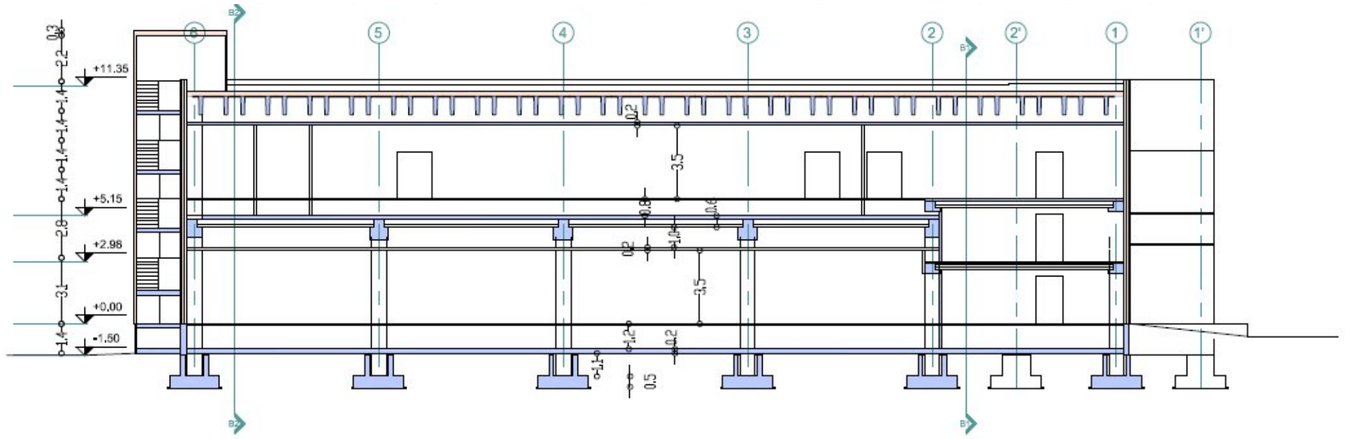
Lower floor dedicated for the HPC







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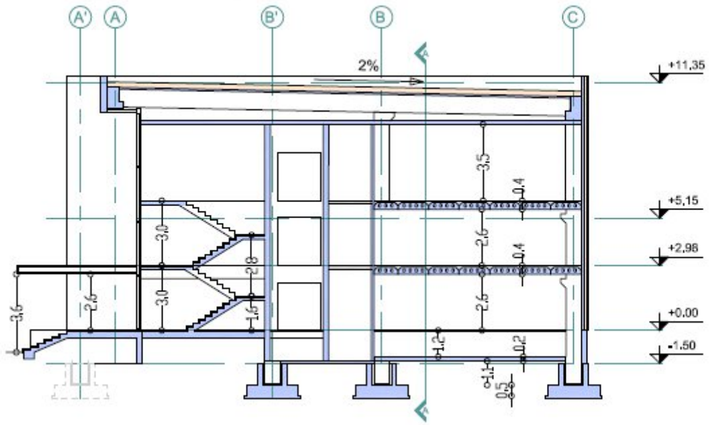

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Thank you!

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