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# Development of a virtual research environment for modeling of physical processes on the HybriLIT platform

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# Introduction



A **virtual research environment (VRE)** is an online system helping researchers collaborate. Features usually include collaboration support document hosting, and some discipline-specific tools, such as data analysis, visualization, or simulation management.

# VRE includes:

1

## Set of tools for modeling

Create models and save parameters in the database

2

## Computing

Algorithm calculations on the HybriLIT platform and the supercomputer "Govorun"

3

## Analysis of results

Viewing results files and plotting graphics



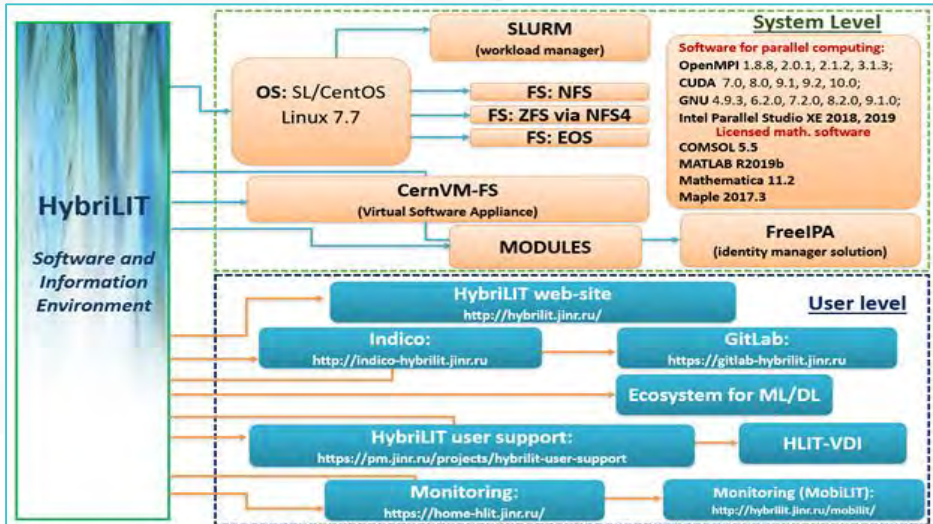
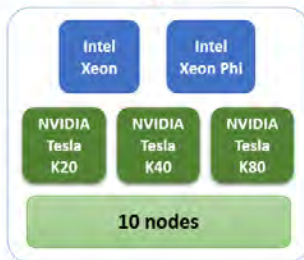
# HybriLIT platform

## Heterogeneous platform HybriLIT

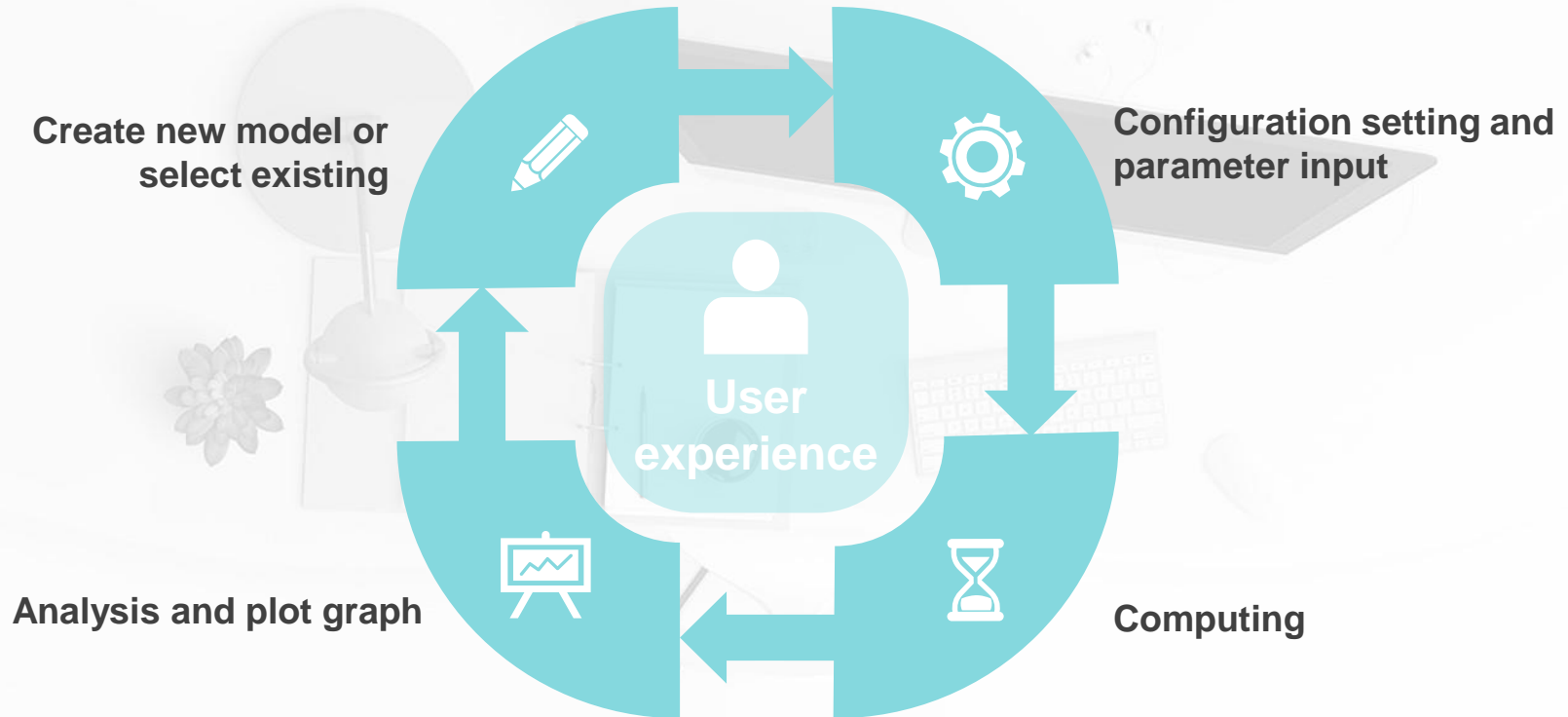
Software and Information Environment

Education and testing polygon  
«HybriLIT»

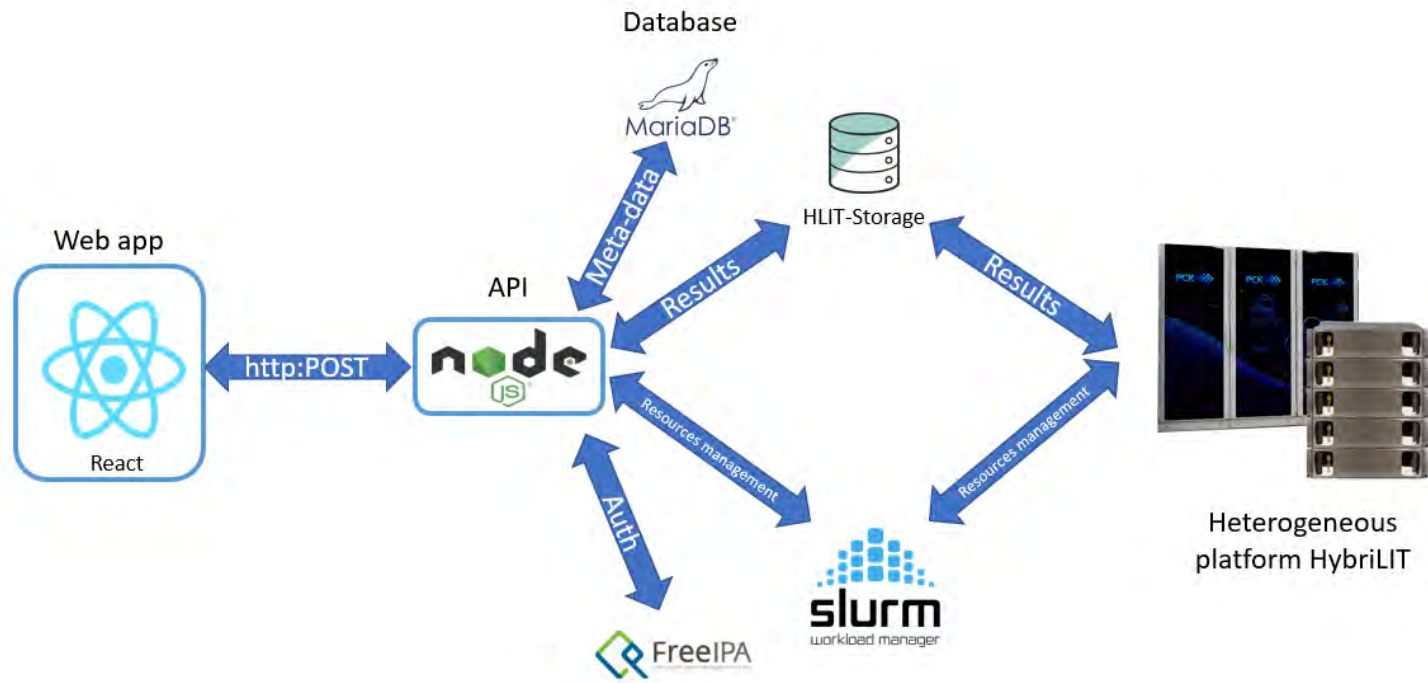
Supercomputer «Govorun»



# Interaction with VRE



# VRE architecture



# Frontend implementation tools

1. *HTML5, JS, SCSS*
2. *React.js, Redux+Redux Form*
3. *Cytoscape.js*
4. *Webpack*
5. *MaterialUI*
6. *Chart.js*



React



Redux



awesome  
webpack



# 1. Create model

Созданные схемы

Название	Действие
test test	<a href="#">Показать</a>
sfs time	<a href="#">Показать</a>
sfs param	<a href="#">Показать</a>

# 2. Panel for build scheme

test scheme

[СОХРАНИТЬ](#) [УДАЛИТЬ ЭЛЕМЕНТ](#) [ОЧИСТИТЬ ФОРМУ](#)

Элементы:

- SNS
- SFS

# 3. Input model parameters for computing

Выберите алгоритм:

Временная зависимость

Параметрическая зависимость

Form SFS

alpha

g

r

w

Form SFS

amin

amax

astep

gmin

gmax

gstep

r

# 4. Task status

[RUN CONFIG](#)

Статус задачи:

**Расчеты завершены**

ID задачи: 315215

[ОБНОВИТЬ](#) [РЕЗУЛЬТАТЫ](#)

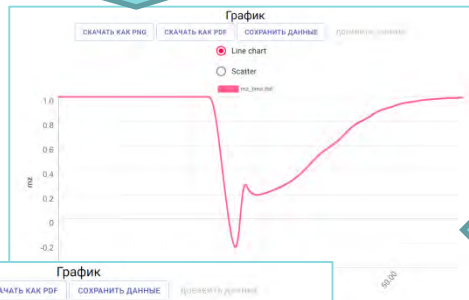
# 5. Select result file

## Полученные файлы:

Is\_time.dat  
Signal\_time.dat  
m\_time.dat  
mx\_time.dat  
my\_mx.dat  
my\_time.dat  
mz\_mx.dat  
mz\_my.dat  
mz\_time.dat  
ph\_time.dat  
points\_mz\_m1.dat  
points\_mz\_my\_m1.dat  
points\_mz\_p1.dat  
slurm-311118.out

[ВЫБРАТЬ ФАЙЛ](#)

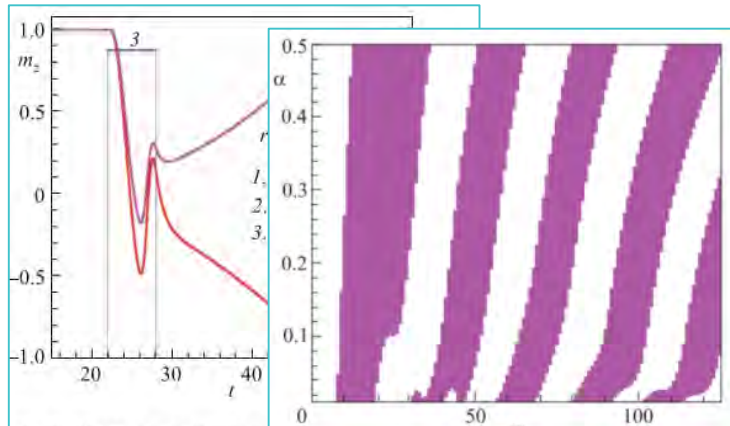
# 6. Graphics plot





# Multiple graphics

## Original graphics



**Fig. 2.** (Color online) Demonstration of the periodicity of the reversal intervals in the  $(G, \alpha)$  plane. The results were obtained with the steps  $\Delta G = 1$  and  $\Delta \alpha = 0.001$  and the parameters  $A_s = 1.5$ ,  $r = 0.1$ ,  $t_0 = 25$ ,  $\Delta t = 6$ , and  $\omega_F = 1$ .

**Fig. 3.** (Color online) Demonstration of the periodicity of reversal intervals in the  $(G, \alpha)$  plane. The results were obtained with the steps  $\Delta G = 1$  and  $\Delta \alpha = 0.001$  and the parameters  $A_s = 1.5$ ,  $r = 0.1$ ,  $t_0 = 25$ ,  $\Delta t = 6$ , and  $\omega_F = 1$ .

## Graphics in VRE



# In conclusion



The system architecture is developed



Web service on HybriLIT platform is deployed

- Ability to create and save models
- Launch of computational algorithms with different parameters
- Ability to analyze the results and plot them



Algorithm calculations are performed on the HybriLIT platform and the supercomputer "Govorun"





**Thanks for your  
attention!**