From virtual cell to virtual human and virtual patient

General concept of the project
BioUML platform

- BioUML is an open source integrated platform for systems biology that spans the comprehensive range of capabilities including access to databases with experimental data, tools for formalized description, visual modeling and analyses of complex biological systems.
- Due to scripts (R, JavaScript) and workflow support it provides powerful possibilities for analyses of high-throughput data.
- Plug-in based architecture (Eclipse run time from IBM is used) allows to add new functionality using plug-ins.

BioUML platform consists from 3 parts:
- BioUML server – provides access to biological databases;
- BioUML workbench – standalone application.
- BioUML web edition – web interface based on AJAX technology;
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BioUML ecosystem

**Developers**
- plug-ins: methods, visualization, etc.
- databases

**Users**
- subscriptions
- collaborative & reproducible research

**Experts**
- services for data analysis
- on-line consultations

provide tools and databases  use  provide services
BioUML

Institute of Systems Biology

Biodatomatics
BioUML platform
- data access and integration
- visual modeling, simulation, parameters fitting
- data analyses (integration with R, scripts, workflows)

Database “Virtual human” modules
- metabolic pathways
- gene regulation
- signal transduction
- physiology
(heart, lungs, kidney, liver, blood system, etc.)

assemblies
different variants of virtual human
for different purposes

experimental data
- biochemical constants
- physiological parameters
(intervals for normal and pathological states)

Researchers (no personal data)

Database “Trials”
- depersonalised samples
- results of statistical analyses
- analyses scripts and workflows

Knowledge database “Personalized medicine”
- personalization module (adaptation of model of virtual human for the patient using his genetical, biochemical, and physiological data)
- optimal treatment (drug and dose)
- prognosis (metastasis, chemotherapy, etc.)

Physicians (personal data)

Database “Patients”
- personal data
- questionnaires
- quality of life
- diagnosis
- treatment, surgery
- laboratory data

Other databases
Ensembl, UniProt, ChEBI, KEGG, Reactome, ...

Biostore – collaborative research