

Software frameworks for crop model development and multi-purpose application

A. Topaj^a, S. Medvedev^a, V. Yakushev^a, A. Komarov^b, V. Shanin^b, V. Denisov^c

^aAgrophysical Research Institute, Saint-Petersburg, Russia

^bInstitute of Physicochemical and Biological Problems in Soil Sciences, Pushchino, Russia

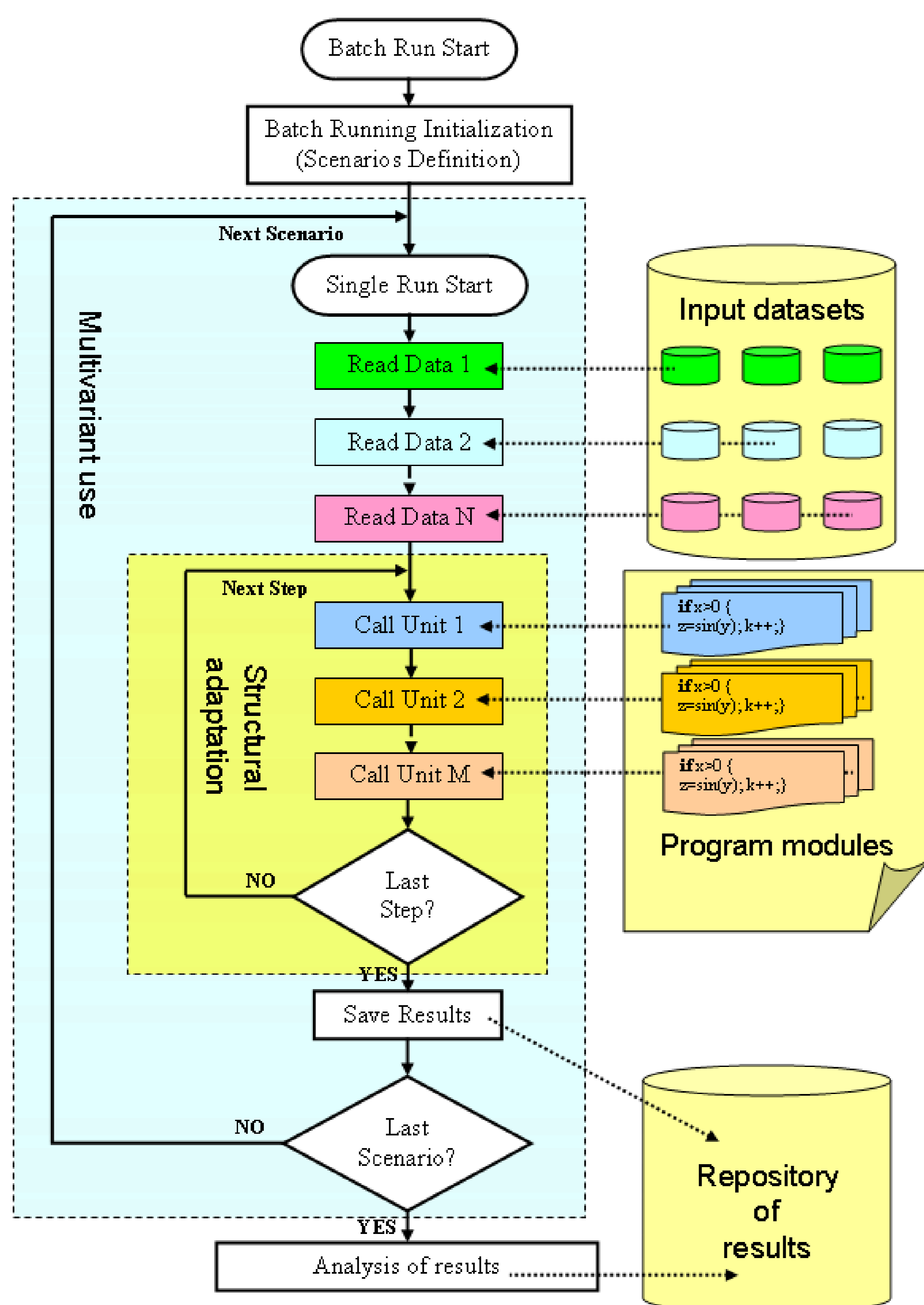
^cKlaipeda University, Klaipeda, Lithuania

Nowadays, there is an obvious need for multi-purpose applications of crop models and, therefore, the model as a software product should satisfy requirements of various groups of stakeholders. Main focus should be made on collaborative model development including model decomposition issues and implementation of generic frameworks for multi-variant model use. We define three main objectives for such kind of systems:

Multivariate simulation – run-time environment allowing the multiple running of the model with different input data in a batch mode.

Unified shell – generic user interface that allows running various models inside of a single application via standard forms and use cases.

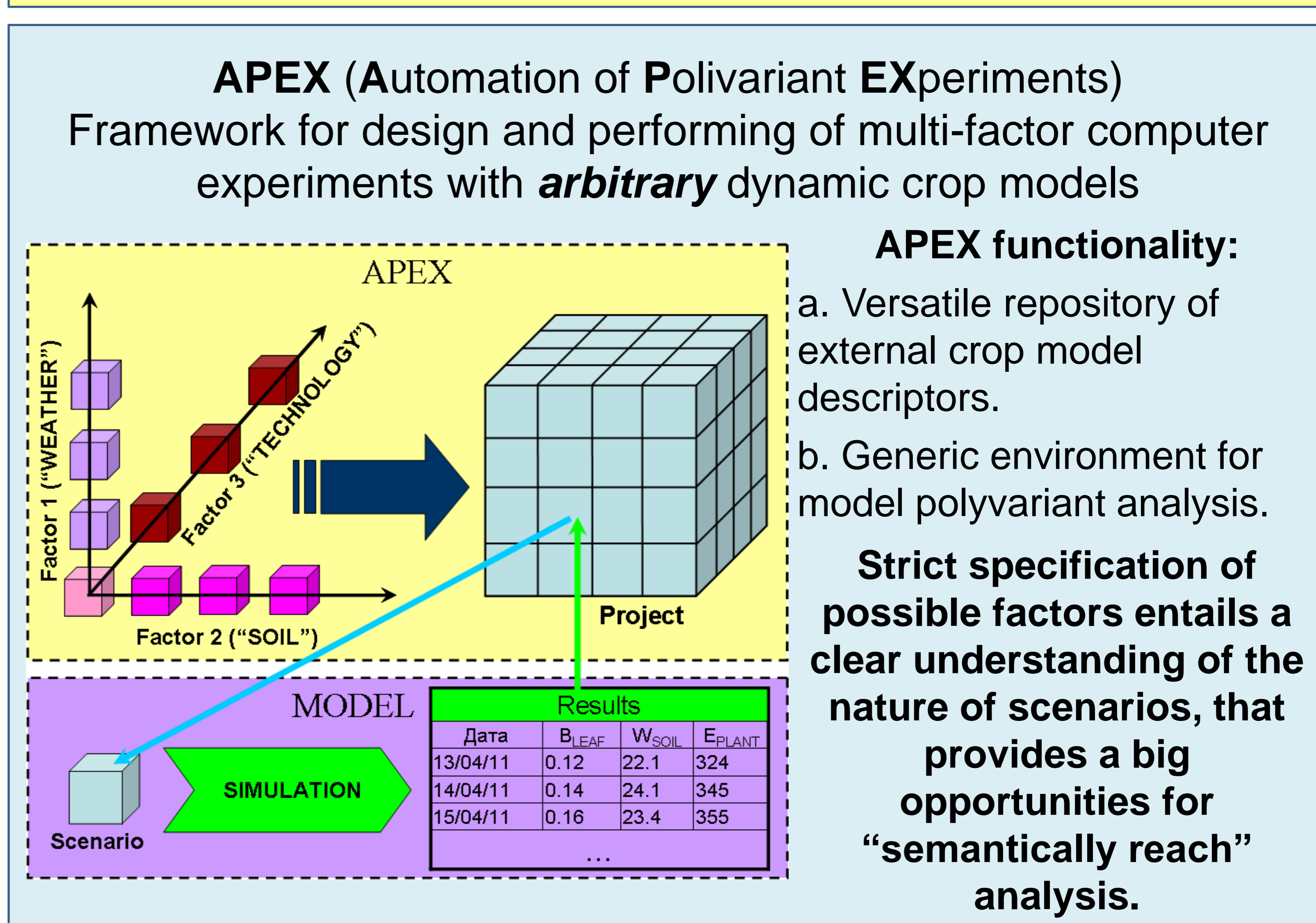
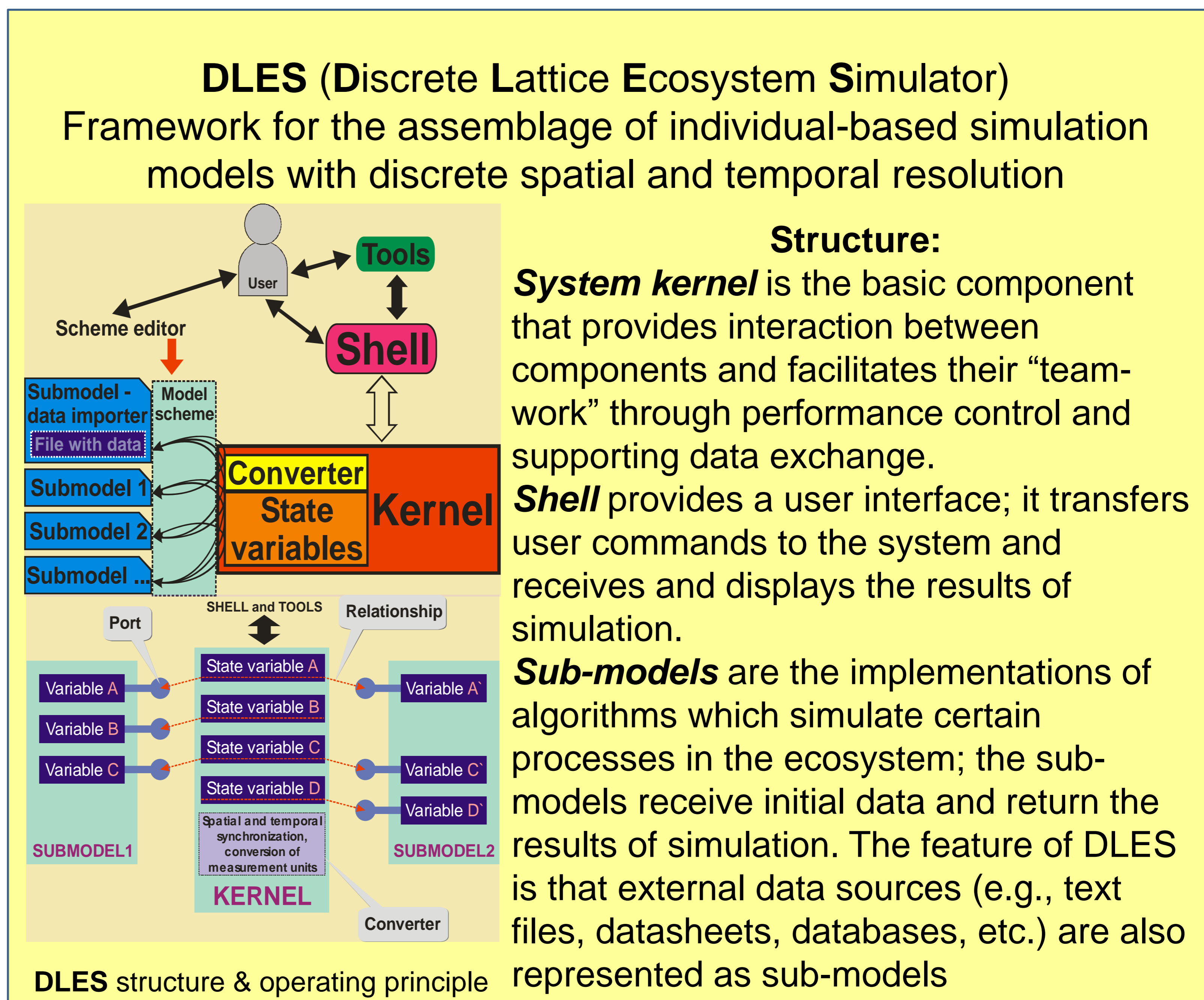
Structural adaptation – ability to assembly the current implementation of simulation algorithm from the set of alternative pre-designed modules without recompilation of whole model.



Multivariate use vs. structural adaptation

Problems requiring multivariate use of crop models

- Analysis and optimization of concurrent agro-technologies
- Modeling for forest management planning
- Assessment of climate change influence on agroecosystem dynamics
- Precision farming
- ...



Comparison of different frameworks for integrated modeling (• - implemented ° - limited abilities)

Frameworks	APEX (Medvedev, Topaj, 2011)	CAPSIS (Dufour-Kowalski et al., 2012)	DLES (Bezrukova et al., 2012)	DSSAT (Jones et al., 2003)	GUICS (Acock et al., 1999)	OpenMI (Gregersen et al., 2007)
Properties						
Multivariate computing	•	•	°	°	°	
Generic shell	•	°	°	•	•	°
Structural adaptation		•	•	°	°	•