

## Work flow tools

Morpheus has a number of nifty tools to optimize your work flow from model development to high performance computing.

Here, we present some use cases that use these features.

### Model development and testing

#### Copy / paste between models

Multiscale modeling often involves the integration of existing models. For example, combining an existing cell-based CPM model (CPM.xml) with an ODE model (ODE.xml) regulating, say, the cell cycle of each cell.

Morpheus lets you copy and paste parts of a model between different documents.

This allows you to copy the `System` from ODE.xml containing the ODE equations and parameters (right-click → Copy). And then paste it inside the `CellType` element in the CPM.xml document (right-click → Copy).

You can only paste elements in appropriate places, otherwise it will be greyed out. This ensures the validity of the model.

All copied elements are shown in the `Clipboard`.

#### Disable / enable

Testing models frequently involves **switch things on and off** to observe their effects. Morpheus allow you to do this without losing your contents by using Right-Click → Disable. The selected element and everything below it will be commented out in the XML file.

This mechanism also allows you to **compare submodels**. If you want to compare two versions of an ODE system, you can have both `System` elements in your model, with one disabled. Switching ODE systems then only involves enabling/disabling both. This provides a quick way to compare submodels within exactly the same context.

- Interactive mode

### Simulation and execution

- Image-based modeling
- Checkpointing
- In silico experiments

## Parameter exploration

- Spatial parameter sweep
- Parameter sweeps
- Analysis of parameter sweeps

## Analysis

- Logging and plotting raw data
- Frequency distributions / Histograms
- Colors / Labels / Arrows
- TIFF hyperstacks

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