# Modelica3D -
# Platform Independent Simulation Visualization

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## Abstract

Modelica3D is a platform-independent, free Modelica library for 3D visualization. Its implementation is based on a message-passing architecture. Through its loosely-coupled architecture, Modelica3D can be combined with different rendering-tools. It is also highly extensible and scalable.

Visualisation of simulation results usually yields two-dimensional plots. For increased accessability (e.g. to easily identify critical patterns between multiple system-states), they might also be embedded into a three-dimensional scene. Modelica3D provides the means to do so in an innovative way:

Models visualised with Modelica3D have complete control over the animated scene. Visualisation is not done by post-processing the result data, but via the exchange of *messages*, which are directly composed during the simulation. This procedural design distinguishes Modelica3D from earlier declarative approaches as discussed in [1] or [2]. Messages are encoded and sent via dbus ([3]) and can thus be recieved on many different platforms and programming languages.

The loose coupling between simulation and visualisation backend yields several advantages:

- Backends can be implemented for different tools by providing a dbus-server object. We demonstrate this with a Blender-based ([5]) backend for high quality, but slow rendering and a real-time capable implementation based on OpenScene-Graph [4].

- Extension of the 3D-API is easy. New messages (and different parameters) can be added in pure Modelica.

- Simulation and visualisation might be computed on different physical hosts (or at different times) since dbus-messages can be sent over the network (or cached on disc).

- Even variable-structure systems can be visualised by simply keeping the rendering server running between different modes.

## References

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