

# RESEARCH BRIEF

2002/008

## Mapping of Industry Building Product Model for Detailed Thermal Simulation and Analysis

### SUMMARY

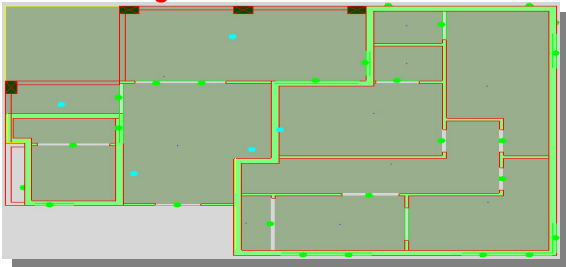
This research project involves an investigation of the feasibility of mapping the IFC compliant information model of ePlanCheck, developed by novaCITYNETS Pte Ltd, Singapore, with the Shared Object Model (SOM) of SEMPER-II to establish a seamless link between the information model of ePlanCheck and the Integrated Thermal Modeler (ITM) of SEMPER-II for detailed thermal simulation and analysis.

SEMPER-II is an Internet-based building design and simulation environment which provides dynamic performance prediction over the Internet for conducting virtual collaborative design, modeling and engineering processes. It has been developed by a team comprising researchers from the National University of Singapore, Temasek Polytechnic, Singapore and Carnegie Mellon University, USA.

novaCITYNETS, a developer and implementer of e-business solutions, has been commissioned by the Building and Construction Authority of Singapore (BCA) to develop the integrated Plan Checking System, (comprising the ePlanCheck and eSubmission applications), as part of the CORENET initiative.

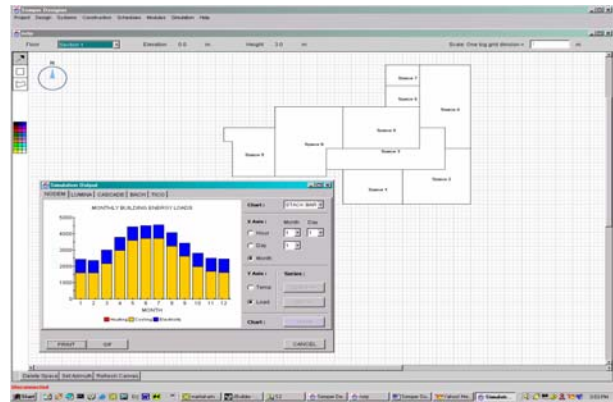
The project aims to create a bridge between the IFC compliant CAD model and the Shared Object Model of the SEMPER-II. A dedicated model mapping engine, which is based on the Java and XML technology, has been developed to accomplish the task of translating external CAD-generated model data into the SEMPER-II model for performing thermal and energy simulation. The project has achieved its objectives and has successfully implemented the following:

### CAD Drawing



### IFC XML Data

```
<?xml version="1.0" ?>
<Project Id="79712117" EIR="W" DES="" ?>
  <Site Id="79712108" EIR="W" DES="" ?>
    <Building Id="79712098" EIR="W" DES="" ?>
      <Geometry ?>
        <Loc Id="21857.000000" Y="7467.000000" Z="0.000000" ?>
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            <CD Id="0.000000" Y="0.000000" Z="1.000000" ?>
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```



### Shared Object Model for thermal and energy simulation

Figure 1. The linkage between CAD and the simulation engine through the XML data mapping

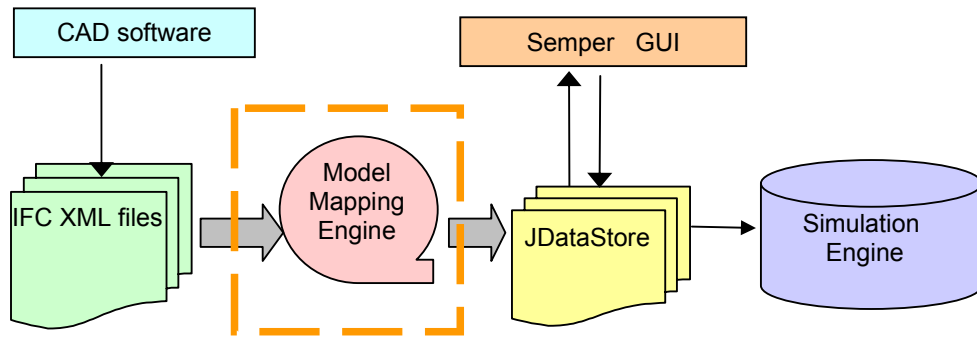


Figure 2. Data mapping flow

1. Mapping of novaSPRINT ePlanCheck Information Model and the Shared Object Model of SEMPER-II, thus enabling building performance simulation to be conducted, based on the geometry information extracted from the commercially available CAD drawings; and
2. Development of a front-end model mapping engine for the SEMPER-II SOM which provides a seamless link between the IFC compatible XML data and the SEMPER-II simulation environment.

This research and development work can be further expanded to address the issues of thermal zoning and setting of thermal design parameters, as well as incorporating material properties necessary for

conducting performance simulation, from within the IFC compliant CAD application. With these additional functionalities, this effort is envisaged to contribute to the BCA's intention to promote performance-based design, and focusing on energy performance and design analysis in the first instance.

**CONTACT DETAILS**

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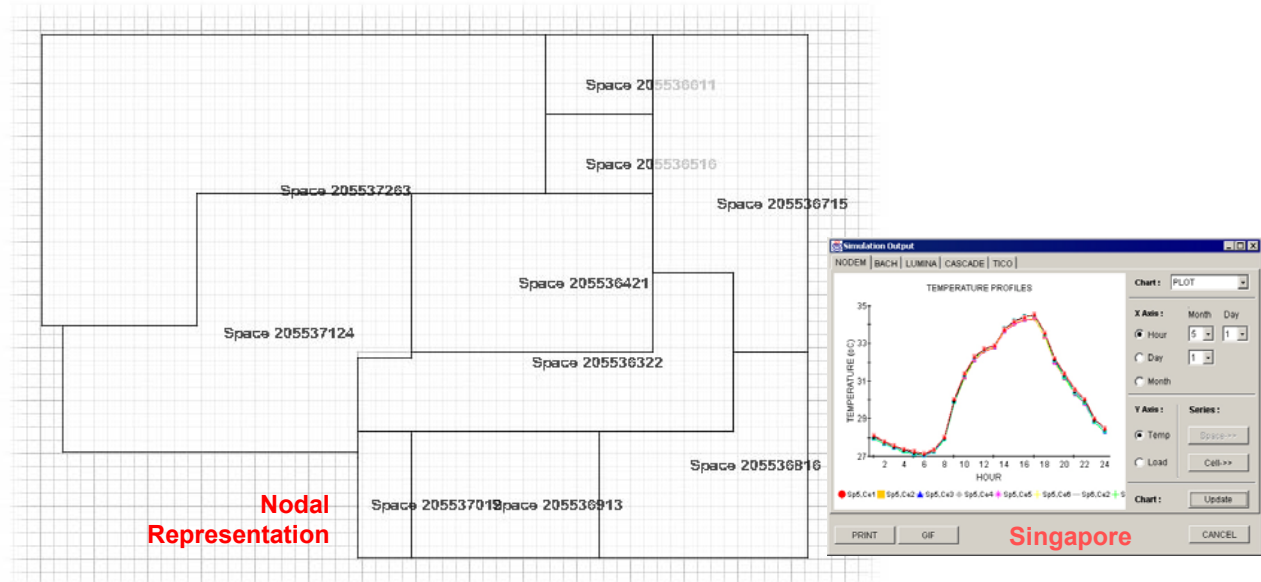


Figure 3. The nodal representation after the second phase of mapping the XML data and the simulation result