

MONASH UNIVERSITY  
DEPARTMENT OF ELECTRICAL & COMPUTER SYSTEMS ENGINEERING  
**Performance of Telecommunication Networks**

**Warm-Up Experiment: Simulation of a Hypercube Interconnection Network  
Based Multiprocessor System**

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## 1 Aim

This lab will teach you how to import other projects into an existing workspace, and show you how the hypercube example works.

## 2 Hypercube Interconnection Networks

<sup>1</sup>In an MIMD (multiple instruction, multiple data) distributed memory computer with a hypercube system interconnection network, a processor and a memory module are placed at each vertex of the hypercube. The diameter of the system is the minimum number of steps it takes for one processor to send a message to the processor that is the farthest away. So, for example, the diameter of a 2-cube is 1.

In a hypercube system with eight processors and each processor and memory module being placed in the vertex of a cube, the diameter is 3. In general, a system that contains  $2^N$  processors with each processor directly connected to  $N$  other processors, the diameter of the system is  $N$ . One disadvantage of a hypercube system is that it must be configured in powers of two, so a machine must be built that could potentially have many more processors than is really needed for the application.

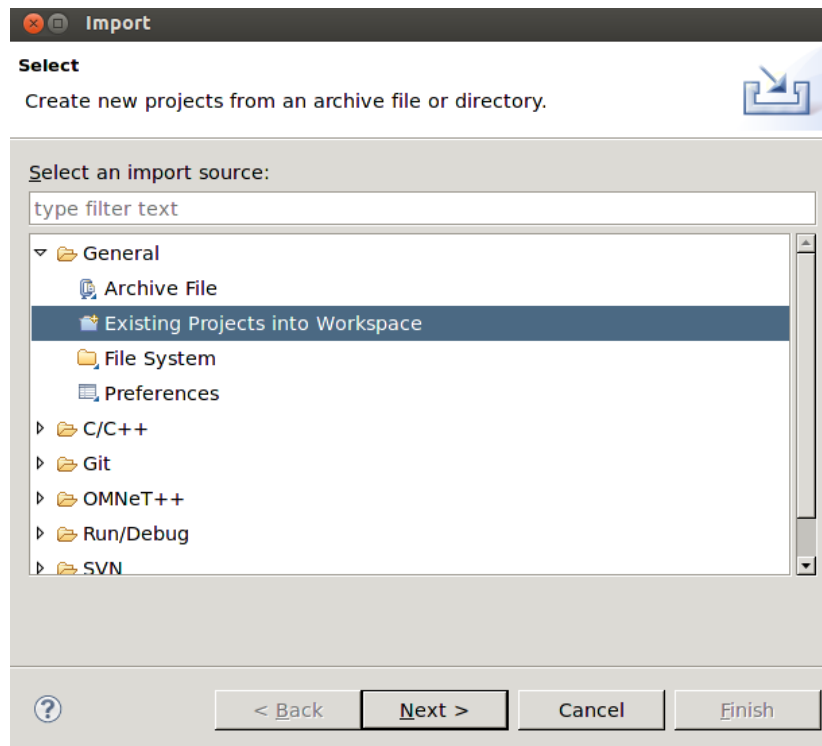
## 3 Procedure

1. Open the OMNeT++ IDE as usual<sup>2</sup>.
2. We will import an existing sample project. Go to the **File** menu, and click **Import**.
3. Select **General** → **Existing Projects into Workspace**., and click **Next**.

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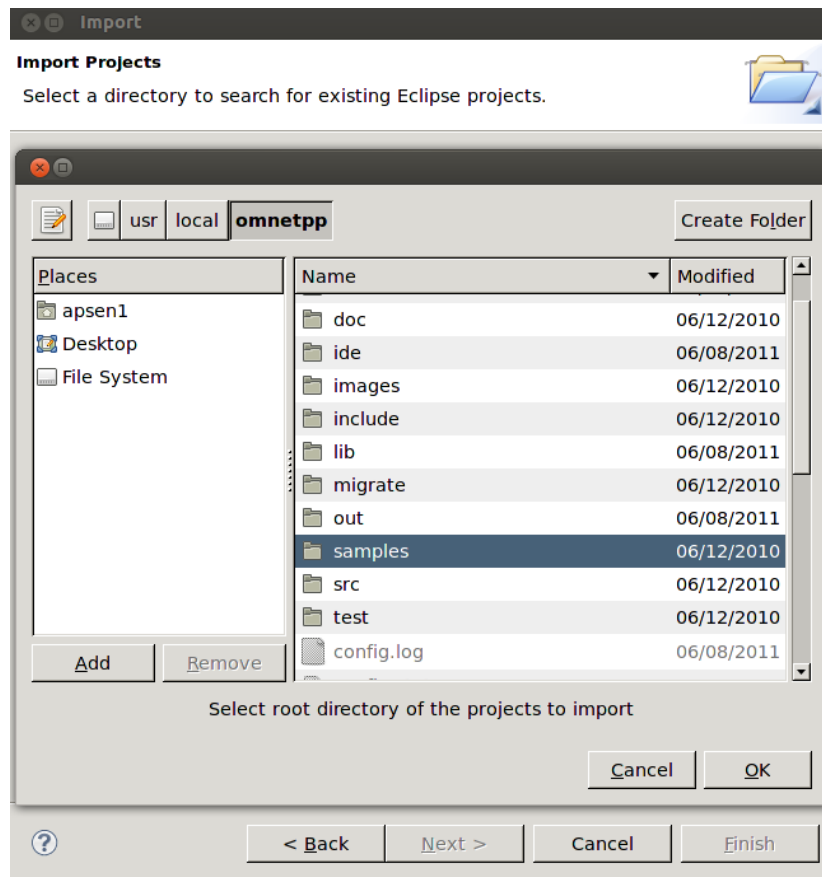
<sup>1</sup>Text source: <http://en.wikipedia.org/wiki/MIMD>

<sup>2</sup>The instructions are here: <http://titania.ctie.monash.edu.au/netperf/netperf-omnetpp-ide-getting-started.pdf>

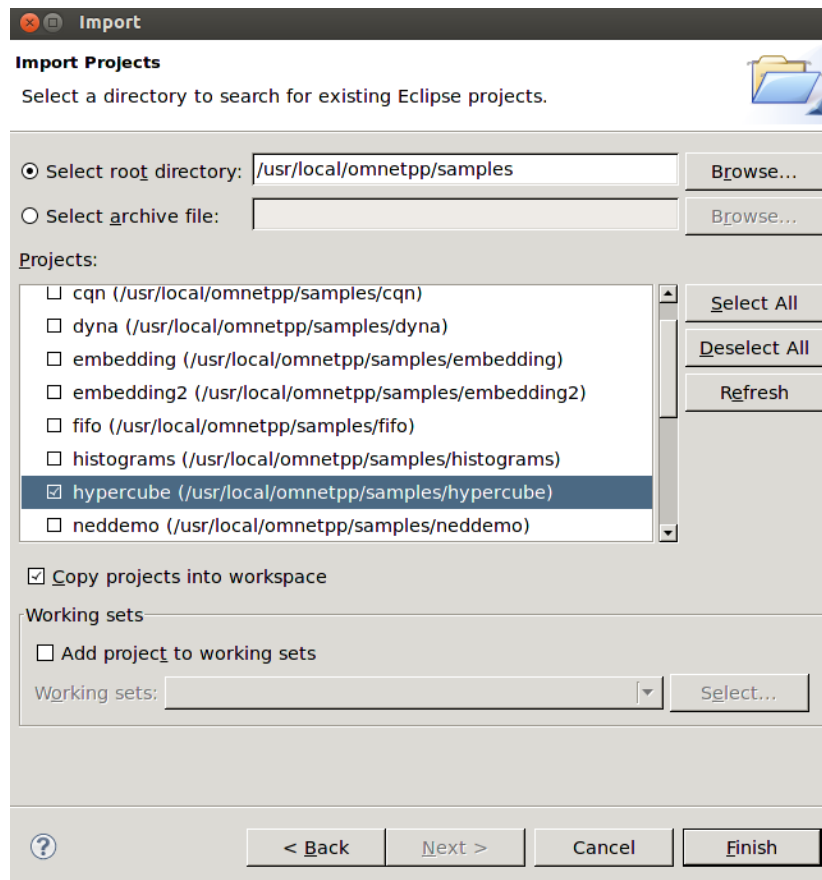


Make sure the **Select root directory** option is selected, and either:

- type in `/usr/local/omnetpp/samples` and click **Browse**; or
- click on **Browse**, select “File System” in the “Places” pane and navigate to that folder (note, do not double-click on it, just select it). Then click on **OK**.



You should see the window populate with projects; we just want the hypercube project, so **Deselect All** and reselect just that project. **IMPORTANT!** Make sure the **Copy projects into workspace** box is ticked!!! Then click on **Finish**.



The project should now be visible in the **Project Explorer** pane, and it should build automatically.

## 4 Exercise

The default configuration of the hypercube simulation creates a 2-dimensional multiprocessor communication network. Can you find where this parameter is set and can you change to run 3, 4 or higher dimensional hypercube structures? Investigate.