An OO Solution of ARGESIM Comparison C14 'Supply Chain Management' with eM-Plant

P. Schmidt, G. Groß, Tecnomatix GmbH;
guido.gross@tecnomatix.com

Simulator. eM-Plant (www.emplant.com) is an object-oriented discrete event-driven simulation tool. It is a tool for all kinds of engineering tasks applied in industry, research and education. Features of eM-Plant are: object-oriented, easy-to-use, 2D and 3D modeling capabilities.

Model. The Supply Chain Management is modeled only by information flow without any material flow objects. Three class objects, the Factory, the Distributor and the Wholesaler, are build up in the class library and instantiated in the simulation model

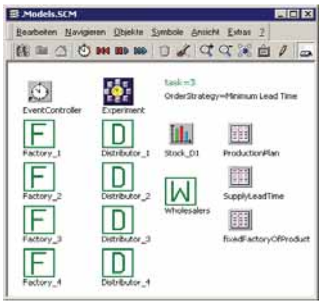

Figure 1: Model layout of the Supply Chain in eM-Plant

Each of the object instances has its own random number stream to avoid dependencies between the objects. Three tables store the input values and the variable "task" defines the task (a, b, c) to be executed. This allows to switch the task

```
inspect root.task
when 1,2 then
    result := ~.fixedFactoryOfProduct[current.name,part];

when 3 then -- collect all possible suppliers
    suppliers.create: pp := ~.ProductionPlan;
    pp.setCursor(1,1);
    while pp.find(part) loop
        suppliers.append(pp[pp.CursorX, 0]);-- add Factory
    end;
    supplier := suppliers.read(1);
    supplyTime := ~.SupplyLeadTime[supplier, current.name];
    for i:= 2 to suppliers.dim loop
        if ~.SupplyLeadTime[suppliers.read(i), current.name]<supplyTime then
            supplier := suppliers.read(i);
            supplyTime := ~.SupplyLeadTime[supplier, current.name];
        end;
    next;
    result := supplier;
end;
```

Figure 2: Section of the method getFactoryOfProduct

with the experiment manager and to reference the value in different methods representinbg different strategies. In figure 2 a section of method **getFactoryOfProduct** of the distributor object is shown, referencing the variable task. The eM-Plant experiment manager allows to define the three experiments and executes 100 simulation runs for each experiment.

The random number streams assigned to model components will also be controlled by the experiment manager. The values of interest are defined in the output value list of the experiment manager. For each value the statistical analysis is calculated.

Task a - Simple Order Strategy. This strategy leads to an incremental stock for each distributor as expected. The stock of Distributor_1 is shown in Fig. 3 employing the Chart-object of eM-Plant.

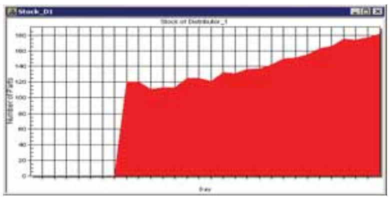

Fig. 3: Stock of Distributor D1 using the Simple Order Strategy

Task a	**min**	**max**	**mean**	**Dev**
C	30.782	37.875	34.609,53	1.397,24
N	192	249	216,97	12,569
R	142,65	176,68	159,79	6,94

Task b - On Demand Order Strategy. This strategy results in a nearly constant stock and therefore decreasing costs compared to task a.

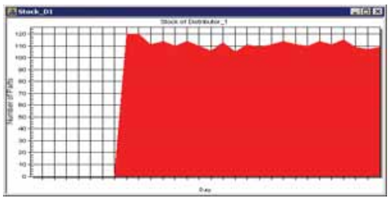

Fig. 4: Stock of Distributor D1 using Demand Order Strategy

Task b	min	max	mean	Dev
C	33.208	36.449	33.207,5	1.280,49
N	192	249	216,97	12,57
R	138,03	168,33	153,31	6,11

Task c - Minimal Supply Time Strategy. This strategy results in further lowering of costs as shown in the following table

Task c	min	max	Mean	Dev
C	26.526	31.761	29.200,58	1.063,69
N	192	249	216,97	12,57
R	122,08	144,67	134,83	5,41

Caused by the high starting order the stocks of the distributors never run out. Therefore the number of parts only depends on the number of orders.

C14 Classification: OO Process Flow Approach

Simulator: eM-Plant 7.0.5