VelcoWare : A Warehouse Manager

1. Problem Statement

With the impressive evolution of telecommunications in the past few years and the variety of services telecommunications operators can actually offer to users and providers, electronic devices supporting such services have registered exponential growth rates and the *combination* of such devices to support personalized solutions is becoming difficult to manage and support.

VelcoWare is an application that has to deal with the management of a warehouse of electronic devices supporting telecommunications services. Management of such warehouse includes inventory control, automatic ordering of goods and a full computer support to optimize the usage of the warehouse space, based on different parameters. It should be possible to arrange the warehouse items according to different criteria (ex. price, kind, brand, color, or others) or, more important, according to one or a combination of different rules. For example, marketing rules: devices that are subject to ongoing promotions or are bundled in a same promotion must occupy adjacent positions. Other rules can be technical, for example, devices that are usually combined to support a specific technical solution are to be put together. The application should interface the following systems:

Marketing, from which it will receive updates on marketing strategies and ongoing promotions and requests of new products (Sales forwards these requests to Marketing) and can use such updates to reorganize the space;
Suppliers, towards which VelcoWare will issue orders when minimum edges are reached or when a predefined number of requests are received for a specific product not dealt with before;
Sales, through which it will receive updates on solutions to customers common problems and can reorganize the space accordingly.

As warehouses are local to stores, the system must be parameterized enough to allow the use of a combination of different rules aiming to optimize the support given to the warehouse workers and to considerably accelerate delivery of goods, specially for on-site customers.

Figure 1. VelcoWare Use Cases

2. VelcoWare Application

The business process of VelcoWare is distinguished into 3 different activities (see Figure 1): *Ordering*, *Space & Inventory Management* and *Inventory Control*. The following sections will respectively tackle each activity in detail.

2.1. Ordering

Ordering (see Figure 1) is started by the warehouse *Foreman* to create different product orders whenever predefined products availability edges are reached or when requests for new products (not dealt with before) are received from the *Marketing*. Once created, orders are to be stored and managed by the system. The *Foreman* can print out the created orders and forward them to *suppliers* by different means (fax or others). In this case the *Foreman* will update orders information, each time processing status changes, until fulfillment. Otherwise, the *Foreman* will be able to place orders, directly into the *suppliers* systems, in case such systems are integrated with VelcoWare or allow placing orders on a web site, in such case the system will automatically manage the workflow of exchanged events between both parties (client/supplier)[1]. O*rdering* activity correctly terminates when ordered products are actually accepted and delivered on–site.

2.2. Space & Inventory Management

The *Space and Inventory Management* activity (see Figure 1) is started upon the completion of products delivery (*Ordering* activity correct termination), products outgoing from the warehouse, or updates received from *Marketing* or *Sales* respectively on marketing strategies and ongoing promotions and on solutions to customers common problems and needs. The *Space & Inventory Management* activity, as the name suggests, is two fold: manage the warehouse space in an optimized manner according to one or a combination of different rules and manage product inventory consequently.

As for rules, these can be related to *Marketing* (Bundles and actual promotions), to technical solutions (products that constitutes together a particular solution to common customers needs, for example, a phone set purchased together with an answering and a fax machine), kind of items and brand (e.g. Philips TVs, Motorola Cellular phones, etc.). The system should suggest where to position items according to such rules and should be able to resolve conflicts that can arise between rules. For example, if two products are to be put in a same bundle according to a certain *Marketing* promotion but should belong to two different bundles of products according to a technical solution criteria. To resolve such conflict, rules are classified according to the following priority (decreasing) order: technical solutions, kind of item/brand, and marketing.

Once the preconditions for the *Space and Inventory Management* activity is reached, the system will process input data (incoming or outgoing products, new promotions or solutions) w.r.t. actual items positions and available space and will indicate where to position incoming items, or eventually, will suggest a better arrangement of items within the warehouse. The system will communicate such information to the *Foreman* that can position incoming items, or move already existing items from one position to another, according to the suggested information. The *Foreman* should be also able to decide to position items in a different way by means of a number of parameters aimed to augment the system flexibility (for example, if a promotion is valid for only few days and the system suggests an organization of the warehouse space accordingly, the *foreman* may decide not to take into consideration such suggestion and prefer to follow another criteria) . The *Foreman* will finally update Inventory information upon physical positioning of items within the warehouse space.

2.3. Inventory Control

Inventory Control (see Figure 1) can be activated any time during VelcoWare process, unless the warehouse is not empty (contains no items at all). The activity is started by the *Foreman* that enters the result of a manual inventory he performed on the warehouse contents into the system, the system compares such result with the actual stored inventory data and returns a confirmation of encountered inventory, or incongruency w.r.t stored data. The *Foreman* will eventually update data accordingly. It is worth mentioning that the foreman can perform the inventory control on the warehouse total content or only on a subset of the stored items, according to a certain criteria, precisely: by brand (e.g. *Philips*), kind (e.g. cellular phone), or item (e.g. *Nokia* 3310 cellular phone).

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[1] Although this last scenario of issuing orders is the most used actually, it can be left out of the scope of the design fest solution.