
Appendix III

An Example of the Physics View The Generic Production Activity Model (GPAM) [38]

Working Group 1 (ISO/TC184/SC5/WG1 - Reference Model) has approached the modelling of those characteristics relevant to systems integration within the Factory Automation Model (FAM) through the concept of an *activity*. An activity can be considered an abstraction which performs defined *actions* within the set of constraints imposed by the activity's *subjects*. The action and subject of an activity are each subdivided into a number of parts which are considered generic across all levels of the FAM.

They have represented this whole assemblage in a Generic Production Activity Model (GPAM), which is illustrated in Figure AIII-1. It is generic in the sense that it can be applied to each level of the Factory Automation Model to depict the basic entities of that level related to standards. The internals of the GPAM represent an interrelated set of four actions, four activities, and four subjects (flows). The actions, subjects and activities are defined below:

FOUR ACTIONS

- (1) *Transform*: The act of changing information, material, or resources from one form to another form. This includes encoding or parsing information, decomposing commands, and cutting, forming, or assembling material.

- (2) *Transport*: The act of moving information, material or resources from one point in the enterprise to another.
- (3) *Verify*: The act of certifying the compliance of all transformed or transported information, material and resources to determine its conformance to a specification.
- (4) *Store*: The act of retaining information, material or resources at a specified location within the enterprise until it is required to be transported.

FOUR SUBJECTS (FLOWS)

- (1) *Information in/out*: The technological data (together with the meaning within the given context) required for, or resulting from, the performance of an activity.
- (2) *Material in/out*: The raw material and work-in-process or finished parts used by an activity and passed on for further use by other activities.
- (3) *Resources in/out*: The equipment, human, utility, etc., required by an activity to perform its functions.

- (4) *Command/Status*: The commands direct the performance of an activity, and the status indicates the evolution of an activity.

FOUR ACTIVITIES

- (1) *Processing* is an activity performed on material, information, or resources to achieve the stated objectives given by commands and status.
- (2) *Execution* is an activity on material (handling or processing) which produces desired parts and scrap.
- (3) *Support* is an activity provided by resources to assist manufacturing.
- (4) *Control* is the activity which coordinates the Transport, Transform, Verify and Store actions and the Processing, Execution and Support activities.

The dependency of material/resources (M/R) flow and related operations on the equivalent information flow emphasizes the key role of information in the integration process. Both information and material/resources enter (and leave) an activity. The M/R are transformed according to the appropriate information, and the information is itself transformed. Likewise, the modified M/R are then transported (and perhaps transformed several times), verified and stored while certain aspects of the accompanying information undergo analogous processing. The Control activity continually monitors the information and issues commands and status as appropriate.

REMARKS

This concept of a Generic Production Activity Model provides a simple, but versatile, means of representing the activities of a typical shop floor production facility. And it enables the Working Group to identify and classify standards suitable for systems integration.

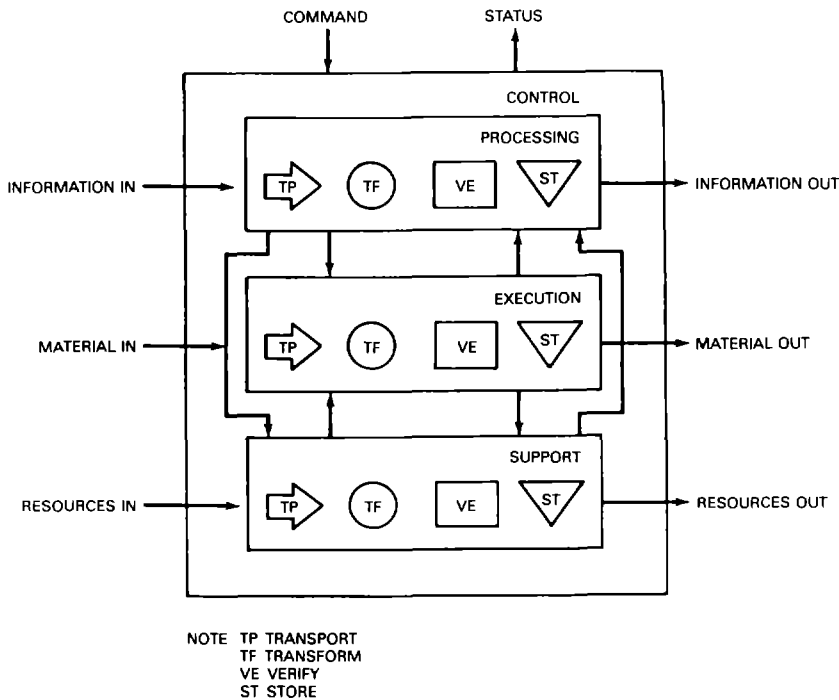


Figure All-1 Generic production activity model.

COMMENTS

Despite its importance as a source of information concerning needed standards, etc., the Physics View, as outlined here, is a broad generalization of the process to be addressed but appears to say

nothing about the nature of the Control and Information System involved. Since this latter is our main task in developing this CIM Reference Model, the Physics View will not be used further here.