



## **The Other Side of Automation - BB (Boring)**

*IEC 61499 Function Blocks for Embedded and Distributed Control Systems Design* by Valeriy Vyatkin

Reviewed by Nick Sands

In 2005 the first two parts of the IEC standard on function blocks were issued and that has yet to translate into a change in the design of control systems. The first book to attempt an explanation is *IEC 61499 Function Blocks for Embedded and Distributed Control System Design* by Valeriy Vyatkin. Dr Vyatkin is a senior lecturer in Electrical and Computer Engineering at the University of Auckland. He has written many articles and papers on mechatronics and automation design. Vyatkin is a member of O3NEIDA, a network of networks focused on fostering distributed industrial automation based upon open standards. Other O3NEIDA members also contributed to this book.

Vyatkin introduces function blocks with an example used several times though the book, a simple set of flashing lights, configured in the software tool the exercises are based on, FBDK (Function Block Development Kit). Function blocks and other key terms like algorithms, states, events, resources, devices and applications are introduced. There is an outline of the development of control systems from hardwired circuits to early programmable controllers to reconfigurable systems to distributed systems to intelligent systems of the future. The flexibility of automation systems is linked to the development of open standards like IEC 61131 and now IEC 61499.

After the introductory chapters, the focus turns to functions blocks. The IEC 61499 function blocks look different from the IEC 61131 function blocks with a head, or top half, for event input and output connections. Rightly or wrongly, all 61499 function blocks are event driven. The bottom half has the inputs and outputs, of defined data types. Function blocks come in types; basic function blocks, composite function blocks, and service interface function blocks. The basic blocks have defined states and algorithms, coordinated by an execution control chart (ECC). Composite function blocks are encapsulated networks of interconnected event driven function blocks, no ECC is used. Applications are networks of interconnected function blocks that complete a desired functionality and that can be distributed across devices and resources.

Function blocks and applications can be mapped to resources. Service interface function blocks support the communication between resources, simplifying the connections and facilitating distribution. Resources reside in devices and have scheduling functions. Devices are grouped into functional classes based on capability. The visualization, or interface to the application, can also be encapsulated in function blocks specifically designed for this purpose, and mapped to appropriate devices.

A design pattern, called model/view/control, for the development of applications and the mapping to resources and devices is given in one of the later chapters. Finally, Vyatkin extrapolates the control paradigms of IEC 61499 to the future where autonomous agents are able to reconfigure systems based on clearly defined functionality.

The dull title, *IEC 61499 Function Blocks for Embedded and Distributed Control Systems Design*, provides some warning that this book is not an exciting read, but it masks the creativity and vision of Vyatkin and the O3NEIDA group. He paints a possible future of autonomous agents roaming control systems. As a guide to the standard though, this book only partially succeeds, and fits in the boring (BB) category. ISA members can purchase this book for \$79 at [ISA.org](http://ISA.org).