Semantix
INFORMATION TECHNOLOGIES

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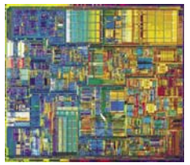
Drivers and Systems Software



Drivers and Systems Software

Device Drivers

Semantix has outstanding expertise in developing high speed device drivers for Windows NT, 2000, XP and Linux. Our history of kernel-mode software development includes provisioning of native access to specific chips, implementation of protocol stacks inside hybrid NDIS/native drivers, complex state-machines responding to hardware events in less than 30µs, kernel-mode DLLs, dynamic loading/unloading without OS reboots, overlapped DMA operations (asynchronous IRP handling) and more.

Semantix has developed real-time software for embedded systems to perform control, communications and monitoring tasks, device drivers for a variety of kernels and custom operating systems for limited-resource devices.

Semantix provides services for developing software to drive electronic and electrical devices in live environments using high performance assembly language programming, helps overcome timing issues and implements interworking between different component interfaces.

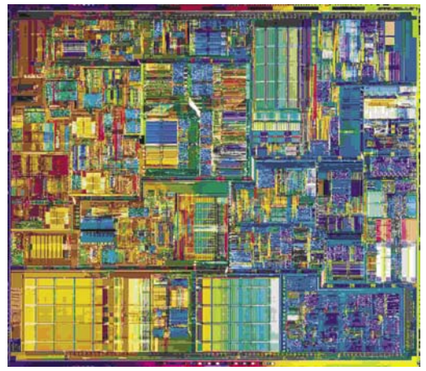
Intelligent CORBA Framework

For distributed client-server systems where maximum uptime is absolutely critical, SEMANTIX has developed an advanced topology-aware CORBA network, called ALIVE. Regardless of what the CORBA servers operate upon (protocol stacks, hardware devices or missing-critical software components) ALIVE is constantly monitoring them and automatically restarts them in case of process failure in a load-balanced and efficient way, according to specific scheduling algorithms than can be customised per project needs. Moreover, ALIVE runtime libraries shield the CORBA clients from ever knowing (or handling) the failure; the interrupted call is transparently resubmitted for completion, so as far as they are concerned, the failure never happened.

In the context of this automated "resurrection" of processes, the state of each CORBA server is preserved using memory preserving mechanisms that allow the server to continue from the state (registers and memory locations) it had when the failure happened. This is done through operating system built-in mechanisms, and is virtually cost-free.

Remote control and real-time operation is always a difficult balance to strike, so we always strive for optimal network utilization, using minimal-overhead ORBs (ACE/TAO) and real-time data compression with specific algorithms tailed to our datasets and not just generic methods.

Multithreading and multiprocessing, when applicable, is always taken into account during the design phases, in order to build up scalable and efficient architectures. We don't try to handle synchronization effects when it is too late; we take them into account while still in design space. Moreover, if real-time requirements dictate so, we can even resort to polling devices via a dedicated CPU, reaching response times in the order of micro seconds, as opposed to milliseconds (which is most OSes time quantum).



Drivers and Systems Software

Agent-Based Instrument Control Middleware

The Agent-Based Instrument Control Middleware (ABICOM) is a distributed software platform that is specifically designed and implemented to provide fault-tolerant distributed control over an array of various devices and instruments. It is well-suited to support real-time complex electronic systems which comprise a significant number of interworking devices and instruments and to integrate them into a unified control system.

ABICOM´s architecture is composed of four types of elements:

- The Real-Time Centralized Control Logic (RT-CCL). RT-CCL is the central process of ABICOM that manages and coordinates device agents, implements the system control logic as a whole and dispatches data between agents, graphical consoles and persistent store units.
- The Device Agents. These control individual devices or groups of devices via ethernet, serial or other kinds of interfaces. The agents provide a high level interface of control to the RT-CCL and exchange data as well as control information with it, in order to provide full access to the devices features.
- Graphical Consoles (GC). These are GUI applications that interact with the user and interface with the RT-CCL. They can reside anywhere on a LAN or a low-speed WAN and provide full system functionality to their user. Several GCs can run concurrently, collaboratively controlling or receiving data from the same devices. Resource conflicts and serialization of requests are handled transparently by the middleware.
- Persistent Store Units (PSU). Specially adapted database servers or other software-controlled digital storing media can serve as PSUs. A PSU stores data as it is acquired from the devices and makes it available to the GCs for further processing and offline monitoring.

ABICOM's elements communicate with each other through CORBA 2.2 interfaces. The ABICOM framework implements the core services of an architecture that is composed of the above elements. Such services are:

- Communication infrastructure among elements with predefined object-oriented high-level remote interfaces.
- Resource management and conflict resolution mechanisms.
- Agent Life-Cycle management with Intelligent Fault Recovery.
- RT-CCL Automatic Migration on System Faults. RT-CCL automatically launches itself on different nodes when a system crash or hardware failure occurs on the platform it runs on. Full process state (i.e. down to memory locations and machine registers) is preserved across consecutive launches resulting on a totally transparent continuation of operations even on the event of catastrophic crashes.
- Other services related to data management, configuration flexibility and monitoring procedures.

ABICOM is a software platform that can boost flexibility, reliability and distributiveness in real-time systems that orchestrate human interaction with arrays of electronic instruments and devices. ABICOM achieves this by embodying innovative features like self-healing mechanisms, fail-over procedures and real-time distribution of data and control information. ABICOM in conjuction with ALIVE framework, have been successfully applied in field-tested Electronic Warfare products.