

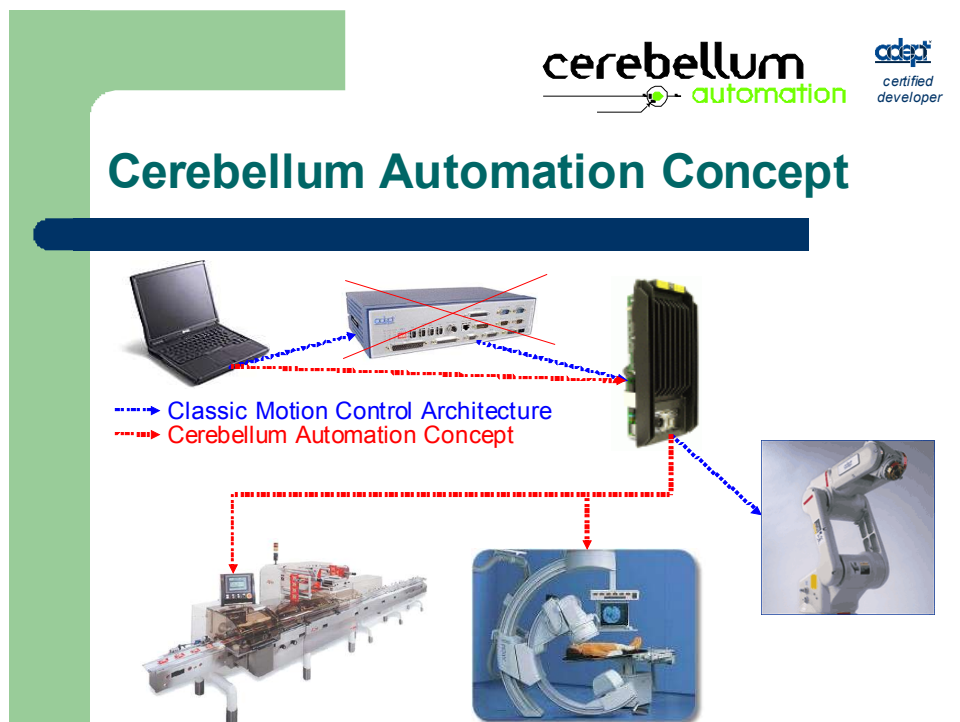
Custom motion control based on standard hardware.

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In the past years, robots have clearly evolved towards specialized arms: painting robots, welding robots, unloading robots ... However controllers remain very generic and therefore complex, expensive and difficult to use.

Cerebellum Automation addresses this issue by proposing **motion controllers dedicated to one type of application** (e.g. a motion controller for food packaging, another for medical imaging systems ...). Based on existing third party motion boards, *Cerebellum's* products are customized thanks to a license on the source code of the embedded software. The PC environment is also used extensively for all non-critical software (i.e. non real time, like configuration, diagnostic, program selection ...).



The choice of **standard motion boards** is consistent with the evolution of the industry, which increasingly favors software or programmable logic over hardware to implement new functionalities. The customized motion controllers thus offer the lower cost and superior quality of service typical of high-volume components. Cerebellum elected to use boards designed for distributed control over **FireWire** high-speed bus, one of the fastest developing field buses in the automation industry. Additional small form factor and high-integration criteria oriented the choice towards boards from Adept Technology, Inc, a leading robot and motion control manufacturer, and Cerebellum secured a partnership with them through the *Adept Certified Developer* program.

The **customization** consists in removing all features irrelevant to the target application and using the freed CPU time to add high level functionality usually programmed separately by each customer and even to run application code directly on servo boards. Such complete software integration has become possible thanks to the fast advance in processor technology these past few years; it enables dramatic improvements in **performance** and reaction times, for example recalculating the trajectory based on a sensor input in less than 125 μ s. Thanks to the solid experience in motion control of its engineers, Cerebellum Automation customizes the servo code using **advanced algorithms**, such as adaptive control, to compensate for the mechanic's dynamics, the gears' non-linearity, the motor's cogging etc.

Moreover, system level optimization allows implementing features that usually require additional hardware, directly on Cerebellum's product. A typical example is to use a cheap FireWire camera and run a vision library on Cerebellum's motion board, instead of an expensive smart camera or vision system. In essence, Cerebellum transfers variable hardware costs to fixed software costs, thus **lowering the total cost of ownership** for mid- and high-volume customers.

In keeping with its **open architecture** philosophy, Cerebellum Automation integrates its code with third party libraries or software (e.g. IEC 61131 PLC, Soft CNC ...) and designs systems that leverage other FireWire off the shelf products (e.g. remote IO). The last element of this open architecture strategy is of course the PC, which hosts the user interface, the diagnostic and configuration utilities and potentially some high level coordination among distributed components. The PC also serves as the gateway between the hard real time environment of the FireWire motion network and the Ethernet plant management system and its custom-made user interface is key to ease of use.

From a business point of view, Cerebellum Automation bridges the gap between motion control component manufacturers and integrators or machine builders. The focus is currently on packaging and medical imaging, but any other field with tight performance demands in robotics and/or motion control is investigated.

In a nutshell, smaller organizations like Cerebellum Automation, close to the final customer and highly reactive, provide a level of customization only reachable by internal departments, with the cost benefits of standard, high volume components.