

Smaller OEMs Keep Pace with new trends in software



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Today, the cost of developing and maintaining software is rising faster than other costs associated with semiconductor equipment design, largely due to an increased emphasis on automation and process control. Because most problems with equipment reliability can be traced back to software, equipment companies are looking for ways to contain software lifecycle costs, especially for routine requirements like automation.

While both small and large OEMs are driven by the same fab automation and productivity requirements, platform cost control is especially difficult for smaller OEMs because they have fewer tool shipments in which to amortize their software-engineering overhead. However, with today's new software development technologies and an improving base of suppliers, OEMs with small software teams can more effectively compete in the global marketplace.

Since the 1970s, OEMs have been purchasing an increasing number of equipment components. Even for parts close to the process or measurement chamber, OEMs are leveraging suppliers and outsourcing more design and development, resulting in a huge supplier base of high quality hardware components. This "commoditization" of hardware components improves performance and drives down costs.

The commoditization of software in semiconductor tool development has been adopted at a much slower rate, however. The basic problem is that, unlike hardware, it's more difficult to partition software into components that can be licensed or outsourced. Until recently, component-based software architectures required significant R&D investment, which naturally favored large OEMs. Some of these tier 1 OEMs have established off-shore programming offices, initially providing maintenance of existing legacy products, and more recently for new equipment platform development.

Small and medium OEMs, however, typically do not have the critical mass of legacy software to justify the contract management overhead of off-shore programming. Nor have they been able to afford the investment in a component architecture that facilitates the partitioning of the software. Without a component-based architecture, it is very expensive to integrate third-party software products into the equipment control system (ECS). The cost of integrating a licensed product often exceeds the development effort, so OEMs just continue to write most of their software themselves, while the software supplier base remains relatively fragmented. But new software development technologies available today can enable even the smallest OEMs to develop cost-effective component-based control systems.

Windows has become the dominant operating system for semiconductor equipment control systems. In spite of the availability of Microsoft's Component -

Object Model (COM) technology for more than 10 years now, component architectures have not been easy to create within Windows.

Several years ago, Microsoft developed a new technology called ".NET" that makes component software design easier. The .NET technology has many advantages over COM; it's easier to develop software components that are more extensible (i.e., you can add features), scalable, flexible, and reliable. What's more, COM-based software can co-exist with .NET so most companies can choose to migrate their control system over several years.

Equipment automation provides a good starting point for software-architecture migration because it can be easily separated from the equipment-control system (ECS) and can even run on a different computer. In addition, virtually every 300mm tool requires an equipment front-end module (EFEM), and third-party applications are readily available for automation- the most common example being SECS/GEM connectivity, which is licensed by virtually all OEMs. New applications such as EFEM control software have recently become popular.

OEMs building architectures that adopt .NET for automation are seeing tremendous improvements in speed of configuration, fab acceptance, and software reliability. Many of these OEMs have started to migrate their entire ECS to .NET with a compelling return on investment.

As these new component architectures become more common, software commoditization will increase. OEMs will be able to easily integrate third-party products, strengthening the burgeoning semiconductor-specific software supplier base as well as opening up the use of well established process control and diagnostic technology from other industries. This software commoditization will drive down the costs of standards compliance and routine features, a huge benefit to small- and mid-sized OEMs who will be able to compete more effectively. End users will enjoy higher performance and more reliable equipment as well as a more competitive and innovative supplier base. ■

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