

Improving Hardware Acceptance in the OEM Marketplace

*Providing device-centric software and
expanded customer support
through technology partnering*

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Obstacles to Hardware Acceptance

In today's marketplace, removing all potential objections to accepting hardware solutions is critical. Designers are under increasing pressure to develop products faster and cheaper. Potential customers are increasingly demanding complete solutions to their problems. Hardware alone is rarely the answer.

In order to provide a more complete solution to customers, significant software support including software drivers, network protocol support, configuration, management and control applications, reference software, or development tools are needed to improve the ability of a customer to successfully move beyond just a device to a real solution.

In many situations, software can be the differentiating factor in making a component choice. According to a recent study by Hearst Electronics Group, publishers of *Electronics Products* and *EEM*, over 80% of design engineers look to the device manufacturer first for detailed design support such as reference software. If appropriate support is not readily available or less complete than competing alternatives, design engineers may choose other components at critical, early stages of design.

Providing a complete solution addressing these requirements allows:

- *Rapid acceptance of solutions:* By providing all the software components necessary for completely supporting a hardware device, the time to adopt the hardware is shortened, requiring less investment by potential customers to accept the solution and reducing time to market.
- *Entry to new markets:* Software support for a variety of network and operating environments insures that no barriers to particular markets exist.
- *Positioning as a technology leader:* A hardware provider can position itself as a technology leader by demonstrating commitment to providing complete support, including high quality software solutions for a variety of environments and addressing as many customer concerns as possible.

Unfortunately, providing software for complete solutions is often problematic. In most cases, the supporting software must be made available simultaneously with the hardware in order to create a fully saleable solution for potential customers. Even if sufficient resources are available to commit to software development, the expertise is difficult to acquire and often distracts from the core capabilities and mission of hardware providers.

Even in situations where the software can be developed or is readily available, customers require additional assistance and services to port, integrate, and otherwise adapt this software to their devices, environments, and markets. In today's difficult business environment, hardware providers can offer this software and associated support to only their very highest volume customers. While these high volume customers justify the additional effort due to their purchasing power, there is a significant gap in support for mid-tier or smaller customers.

Technology Partners

By teaming with a partner focused on providing this type of technology and support, a much more complete solution can be offered to a broader range of the potential customers. This greatly increases design wins for the hardware manufacturer and reduces the time required to integrate the device for the customer.

Partnering provides significant advantages:

- *Access to specialized expertise:* Software development is an increasingly complex discipline and systems level, device oriented development even more so. Expert software engineering skills are very valuable and increasingly rare.
- *Single source for broad based experience:* Because a partner may have experience providing software for a variety of markets, technologies, or environments, they can become a single source for a hardware provider. Experience in multiple areas can speed design, delivery and quality of software solutions.
- *Improved utilization of internal resources:* No additional internal resources need be committed to developing and supporting software. No specialized engineering skills to resolve complex software issues need be developed reducing the overhead required in the areas of specialized software development and support.
- *No distraction from core mission:* Hardware providers are free to focus on the things they do best while still providing first-class software solutions to support and promote their technologies.

Technology partners offer a wide variety of ways to bring more cost effective, complete solutions to market. By partnering with specialists with a proven record of successful project execution, hardware developers can retain their focus on their core competencies such as device design, fabrication, and marketing while insuring success in delivering a complete solution. Establishing the right partner relationship can mean the difference between success or failure in the OEM marketplace.

Software Technologies Group

Software Technologies Group (STG) works with a variety of manufacturers in the electronic OEM marketplace to develop device-specific software. By building on many years of experience in device interfacing and control, operating system internals, network protocols and related software services, we help our customers sell more hardware, enter new markets faster and get their products more easily specified, used, and purchased by OEM customers.

STG provides a wide range of services for leading edge hardware vendors to help support their products in a variety of environments on a broad range of platforms. With experience ranging from embedded environments to the full range of commercial operating systems, STG operates as a key partner in providing crucial support software in a variety of markets.

Software

Current device trends are moving towards ever more powerful and complex devices. Supporting increased device functionality and intelligence is becoming the norm. While devices are becoming more complex, the software environments in which they must operate are increasing in complexity at an equal, if not greater, rate.

One example is a device driver. The effort required to develop only the skeleton of a fully compliant software driver for a modern operating system like Microsoft Windows XP can entail many hundreds of lines of code. This amount of code doesn't even begin to address the requirements to actually manage or control the device, implement the protocols needed to communicate with it, or a myriad of other support software requirements.

The environments in which devices operate are another concern. For example, the considerations of integrating devices into a typical real time operating system require not just device knowledge, but an in-depth understanding of real time environments, constraints, and programming practices.

The development of device support software is a complex endeavor requiring knowledge of device communication, hardware integration details and the target operating environment. This demands significant software engineering skills and resources. STG can provide this software to our device partners by utilizing pre-existing technology frameworks to speed driver development in a wide range of environments and by our vast experience developing dozens of software implementations for dozens of devices.

Teaming with a software-specific development partner like STG can help extend the reach and applicability of devices into new markets and towards new customers without a corresponding increase in staffing and costs.

Porting and Integration

One of the most significant problems in addressing customer integration lies in the vast range of potential client platforms. This includes various hardware platforms such as embedded devices, handhelds, PC-like platforms, server systems and many more. In addition, the problems multiply even further when the full range of operating environments are taken into account such as Real Time Operating Systems (RTOSes), commercial operating systems such as Windows (with variants including WinCE and other embedded versions), Linux, UNIX, PalmOS, Java and others. In many cases, the development effort needed to address these potential platforms significantly impacts overall cost and time to market, as well as stretching product development staff beyond the breaking point.

The problem can be reduced if the hardware manufacturers significantly limit the number of platforms and operating systems to be supported. Unfortunately, there is a corresponding reduction in the potential market. Even if a decision is made to reduce the number of platforms supported, development and ongoing support requirements are significant and often difficult to meet when considering the focus of many hardware manufacturers. Since most product groups are built around and specifically focused on the development of their own device or technology, there are frequently no appropriate resources available to reliably

address customer needs for integration, development, pre-sales support, customization or the development of OEM variants.

STG can address porting and integration needs by providing the specialized expertise needed to smoothly integrate specific device support into designs on a variety of platforms. With STG's extensive multi-environment experience, a full spectrum of environments can be addressed broadening the base of potential customers and applicable markets. STG is organized specifically to deliver these types of projects with unique expertise and efficiency.

Support

Even in cases where appropriate device-specific software is available and the customer chooses to perform their own software integration, the need for customer assistance may not end. Customers often require some level of support to address specific software integration and porting issues, software fixes or detailed assistance with device-specific software questions. Most device manufacturers do not have the engineering resources available to provide these support services to their mid-tier and smaller customers without significant impact on other engineering activities, and ultimately, profits. In many cases, these services cannot be made available under *any* circumstances due to financial, engineering, or other limitations.

By providing both contract support services and on-demand software support, STG can reduce the impact of support requirements on hardware manufacturers.

Project Management

Possibly the most important ingredient in successful development and support organizations is project management. Developing software and providing closely coupled services are substantially different activities from hardware engineering. Without a management group focused and experienced in delivering these services on a project basis, providing customer satisfaction in this area is expensive, painful and, ultimately, unprofitable.

With experience delivering hundreds of projects for a wide range of customers, STG has created and finely tuned a proven project management methodology. This methodology is optimized for successful software development, customization services and seamless customer support/handoff of the resulting work.

This methodology includes:

- Functional and Design Specifications to ensure functional and design issues are understood before the software implementation phase begins
- Prototyping to obtain early feedback and to validate and demonstrate important or potentially risky project features or requirements
- Regular status reports and meetings providing up-to-date information on project status
- Project change control mechanisms that allow the project to respond to the real world without getting out of control
- Source code and design change control systems to ensure that project modifications, revisions, enhancements, and releases are tracked
- Test plans and automated test suites where applicable to validate the final product deliverable operate as intended in their target environments

- Definitive acceptance criteria to let all participants measure the quality of the deliverables against specific and objective criteria
- Detailed customer hand off, with full ramp up training and ongoing support provided by STG as desired.

Successes and Examples

STG has had many successful technology development and partnering efforts. Listed below are just a few examples of successful partnering between device manufacturers and STG.

USB Chipset Support

STG developed one of the first commercially shipping USB 2.0 (Hi-speed Universal Serial Bus) protocol stacks which is currently shipping in two commercial operating systems and is planned to ship with a third by the end of 2004.

In addition to this protocol stack implementation, STG has a formal partnership with a leading USB chipset manufacturer to offer software licensing of their protocol implementation (including USB On-the-Go support), customer integration and porting services, and development of custom class drivers for a wide range of devices ranging from medical equipment, to data processing systems, to consumer electronic devices.

STG is also an active member of the [USB Implementers Forum](#).

Wireless

STG has provided device drivers and support software for the full range of consumer operating systems for several major wireless chipset vendors in the IEEE 802.11 market. In addition to the Wi-Fi marketplace, STG has also worked with several vendors of RFID reader devices to develop custom drivers and support software for industrial and commercial applications.

STG is also actively developing technologies relating to the [IEEE 802.15.4](#) and [ZigBee](#) standards, short range, low power wireless standards intended for control, sensing, and other low data rate wireless applications. STG is working with vendors of 802.15.4 and ZigBee components and is developing reference Zigbee to IP router and bridging technologies for manufacturers and resellers of ZigBee products as well as other gatewaying and network integration technologies targeting the industrial networking market. In addition to developing the ZigBee to IP gatewaying technology, STG is also actively seeking additional partners in this area to speed the acceptance and deployment of 802.15.4 and ZigBee-based technology. STG is an active member of the [ZigBee Alliance](#).

Network Interface Components

STG has developed device drivers for most major commercial operating systems including Windows, Unix and Linux in addition to real time environments for several NIC manufacturers. By providing their customers with reference drivers and closely coupled customization and branding services, these vendors were able to greatly speed customer acceptance of their chipsets as well as help their customers move their end products to the marketplace quickly and effectively.

Ethernet to ISDN Reference Router Implementation

STG developed a complete software reference implementation for a manufacturer of networking interconnection chipsets to allow customers to quickly build fully functional routers using the vendor-supplied reference designs. In addition to developing and supporting the software reference implementation, STG also assisted customers with porting the reference code into existing device and software frameworks as well as performing value-added software customization.

Conclusion

As devices grow in complexity and markets continue to grow and diversify, the requirement to offer a more complete solution grows, as does the difficulty of providing that solution.

Many of today's devices are of little or limited use without the appropriate software which has elevated the need to address this component on par with the effort dedicated to the hardware itself. Add to this the growing complexity and number of potential operating environments and platforms plus the associated support demands, it becomes clear that a "go it alone" strategy can be inefficient. By teaming with partners who specialize in complementary areas, the ability to provide more complete solutions grows, time to market for customers shrinks, all without adding additional staff and overhead.

Through STG's specialized capabilities in this area, device manufacturers can partner with an effective and reliable teammate to grow their business, respond to customer needs and requests and leverage sales opportunities more completely. We have helped device manufacturers save money, grow their markets, speed the acceptance of their products and increase customer satisfaction. We welcome the chance to discuss how we could work with you to grow your market share and help ensure the successful rollout of your next device.

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