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An Embedded Solution Partners White Paper

A New Model for the Embedded Industry

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November 18, 2002

Executive Summary

Developing embedded devices has never been more challenging than it is today. Device manufacturers, or OEMs, face a plethora of technical and business-related issues that are only increasing in magnitude. At the same time, the hundreds of companies that supply embedded software to these manufacturers face major hurdles in getting their products to market in an efficient and cost-effective manner. Taken as a whole, these issues have led to a highly fragmented, and even unprofitable, embedded software industry. The authors believe that the time is right for a new model in the embedded industry, a model which will help better serve device manufactures, software suppliers and the industry at large.

The Embedded Development Challenge

Completing a new project on time and on budget is one of the most difficult challenges an embedded device manufacturer faces today. According to the industry analyst, Embedded Market Forecasters, over half of embedded development projects come in behind schedule and over budget. Part of the challenge is that in the last ten years we've seen embedded devices go from relatively simple, standalone products with well understood software requirements, to highly complex, networked devices with huge demands placed on the needs of the embedded software. In the early 90's, a simple real-time kernel with some facility for I/O was typically a sufficient starting point for most applications. Now, these devices require very sophisticated software features, such as full-featured memory protected operating systems, complex communications protocols, distributed data management, advanced security, and network management, just to name a few. This dramatic increase in device complexity has spawned a large number of suppliers who develop commercial embedded software products that implement many of these necessary capabilities and which are available for license by device manufacturers.

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>
> – Electronic Market Forecasters

This steady climb up the complexity curve has also changed the way OEMs must approach a new project. Whereas at one time, manufacturers could be confident of the software feature set and their ability to implement it primarily with internal resources, now they have to deal with an ever-expanding demand for new features (many of which are driven by evolving standards) along with a challenging set of technical issues such as device reliability, security, remote device management, and interoperability. It is now nearly universally accepted that the only way to keep pace with these demands is by licensing some of these software components from third-party suppliers. However, this practice has given rise to a whole new set of challenges: How does a manufacturer come to understand which vendors, from the hundreds that exist, offer products with the features they are looking for? Once a set of vendors has been selected, how do they engage these companies? And, most challenging of all, once the complex licensing and business terms have been negotiated with each of the many suppliers, how does the OEM ensure the interoperability and integration of both the products that have been licensed, and the software that has been developed internally, all on their own custom hardware platform? This is a daunting task that is facing both the technical and business teams responsible for on-cost and on-time products.

Significant New Forces

As if all of this weren't enough, two major new forces have emerged to magnify the situation several times over. The first is the economy. Far from a short-term phenomenon, the current economic crisis has forever changed how companies must evaluate their approach to resource allocation. During the go-go late 90's, many companies turned a blind eye towards the measurement of the return on internal development investments, seemingly spending money on virtually any new product or technology that promised "faster time-to-market". This swan song is clearly over as companies have learned that to be successful in this economy they must focus on their core competencies and seriously consider outsourcing everything else; using sound economic judgment rather than emotion as the decision criterion. This applies directly to embedded development. The right approach is for companies to determine their core software value-add, implement those features with internal engineering resources, and look to third-party suppliers for the remaining software functionality.

> **swan song** \SWAHN-SONG\, *noun*:
> 1. A beautiful legendary song said to be sung by a dying swan.
> 2. A final or farewell appearance, action, or pronouncement.
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> - www.dictionary.com

The other major force which has altered the embedded landscape is the open source movement. Significant software functionality is now available through the open source community. However, it is far from clear how open source software can be successfully utilized in a commercial embedded device. This first question is: Does the open source software meet the technical requirements of the application? Since most open source software was originally intended for desktop or enterprise use, what compromises must be made in adapting it for use in embedded devices? As most embedded devices exhibit much higher standards than their enterprise cousins in terms of continuous and secure operation, the issues to contemplate include: performance, real-time capability, footprint, portability, security, and reliability.

The next sets of considerations are the business and legal concerns. Taking the business side first, there are two very different approaches to using open source software. The first is to go to the Internet, download the pieces of interest, and cobble together your own system. This approach constitutes, in effect, a decision to develop the software internally with the attendant economic drawbacks. Many would consider this a direct violation of the "core competency maxim" described above. In addition, recent experience has taught that this approach, in the long run, ends up being just as expensive as developing the software yourself from scratch.

The other approach is to work with one of the commercial vendors who have created a business of providing and supporting open source software. While a number of these vendors exist, and even appear to be doing reasonably well, the viability of their business models is as yet unproven, and prudent manufacturers should consider the long term financial wherewithal of their suppliers as a key decision criterion for technology selection.

The most vexing issue of all when it comes to open source software is the legal issue. Much of the available open source software, including Linux, is licensed under the GNU General Public License, or GPL. A seemingly simple, three page agreement, there are probably as many interpretations of the GPL as there are intellectual property lawyers. But the fact remains, that to date, the GPL has never been litigated in a court of law, and therefore, the intellectual property implications of using open source code licensed under the GPL remain unclear. For OEMs, it means at a minimum, carefully considering all the open source licensing issues before heading down this path.

What about Embedded Software Suppliers?

So far, the discussion has centered on embedded device manufacturers, but equally important in the equation is their counterparts, the embedded software makers who supply the wide variety of third-party products used in the development of today's embedded devices. The suppliers' challenges are something of the mirror image of those faced by OEMs and include the difficulty of getting their product to the customer in a cost effective manner. Many of these companies have developed compelling technologies, which offer the potential for future growth, but are held back by their modest sales and marketing presence in the industry. An especially limiting factor to their future growth is their typically small number of direct sales people who tend to also have to cover large geographic areas. Because of the highly technical nature of their products, many companies also couple a field technical resource with each sales rep, further adding to their sales cost. Given that sales cycles can easily run several months and involve multiple face-to-face meetings, it's not hard to understand the financial burden this direct selling model imposes on many smaller embedded software suppliers. Under this model, when the economy hits even a minor speed bump, cost of sales can easily get out of hand.

The struggle for an efficient selling model isn't purely an economic issue. In many ways, it relates back to the issue of core competency. Most embedded software companies are founded and run by extremely talented technical people, who are also usually quick to point out, that marketing, and even more so sales, are not among their areas of core competence. It's simply hard for small companies with highly focused product offerings to attract the top sales and marketing professionals, who often prefer to work for higher profile organizations with broad product lines.

Finally, sometimes just offering a single point product, or even a single product line, carries an additional frustration for these vendors. A common complaint heard among embedded software suppliers is that they find it difficult to engage with OEMs at the beginning of the latter's development cycle. It is not untypical that by the time they do get a chance to tell their story, an earlier decision, often technical in nature – such as choice of hardware or operating system - has rendered their selling efforts much more difficult.

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Taken as a whole, it is clear that the current model for the embedded industry has not served the community of device manufacturers and software suppliers as optimally as is possible. Even during the best of times, the industry has struggled with profitability, an untenable situation over the long term. So where does the industry go from here?

For a while, it appeared that the community of embedded software suppliers was consolidating. A number of acquisitions occurred, and it looked like we would see a small number of large companies who could meet the vast majority of an OEMs needs. More recently, it looks like that trend is reversing itself. Acquisitions are non-existent, and judging by recent studies, RTOS market share, which is a reasonable leading indicator, suggests that the supplier base is becoming more fragmented, not less so. If the trend toward fragmentation continues, it only seems logical that the challenges described above will increase in severity, and if so, it may well be time that the industry considers a new model. But before proposing such a model, it would be useful to describe what the ideal benefits a new model would deliver to both OEMs and embedded software suppliers.

Benefits of a New Model

For OEMs, an ideal model would entail several key benefits. The first is that they would get technical advice from an industry expert who isn't biased by a particular product agenda. This advice would involve everything from recommendations on technical features to make vs. buy decisions for certain software functionality. In addition, they would get comprehensive insight into hundreds of embedded software suppliers, helping them understand what products are offered, reputation for software quality, reliability of support, and so on.

Once a set of suppliers was selected, it would be useful if those companies could be engaged efficiently; any consolidation that could be achieved around licensing and business terms would be an obvious benefit. It would also be enormously beneficial if device makers could get assistance with the extremely challenging step of integrating these third-party products into their development environment, on to their choice of embedded operating system, such as Embedded Linux or VxWorks®, and up and running on their custom hardware. This integration phase is always one of the most notoriously difficult steps in developing any embedded device. Finally, it would be great if the OEM could call on a single technical resource to help answer questions, coordinate their more difficult problems amongst multiple software suppliers, and which could provide some level of local onsite support.

An acceptable model must, of course, provide benefits to embedded software suppliers as well. First and foremost, an ideal model would allow these companies to continue to focus on their core technical competencies, but also provide them with an effective channel into their market. They would also get some degree of independence from fluctuations in the economy; more of the selling expense would be tied to actual sales rather than fixed overhead. Finally, a model which allowed these suppliers to maximize the value of their customer relationships would represent an added bonus.

About Embedded Solution Partners

These are the ideas that lead to the creation of Embedded Solution Partners. This new company consists of a geographically disperse team of highly experienced technical and business professionals from the embedded industry that offer a truly new model for the embedded software business.

For OEMs, Embedded Solution Partners serves as a consultant who can provide expert advice on business and technical issues; can offer deep insight into the industry's product offerings; helps with tricky make vs. buy decisions; and offers a set of highly complementary, best-in-class software products from the industry's leading suppliers.

For embedded software suppliers, Embedded Solution Partners provides an effective and cost efficient channel, one which can combine their products in innovative ways with those of other best-in-class suppliers to deliver a solution customized to each device manufacturer's unique requirements.

The professionals at Embedded Solution Partners are excited to bring a fresh new approach to the embedded industry; one which we are confident will serve device manufacturers and embedded software suppliers alike, and one which will help to launch the industry down a new path toward success and profitability.

To learn more, please visit us at www.esolpartners.com.