Dealing with Component EOL

How Application Ready Subsystems Lower Lifecycle Cost

Whitepaper

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Abstract

If Product Lifecycle Cost is a DIME, that DIME has four components; **D**esign, **I**ntroduction, **M**aintenance and **E**nd of Life Considerations. The EOL event is costly, and often triggers the entire cycle to start anew.

More and more, product EOL and redesign is being forced by component obsolescence, forcing recovery of the design and introduction cost over a shorted product lifetime. This whitepaper will show how by using application ready subsystems, the OEM can insulate his product from component side obsolescence and maintain continuity of supply to his market for a decade and more.

Managing component side EOL is important. In business, we see the collision between the irresistible force of the technology wave and the immovable rock of commercial product lifecycle inertia. The way this wave and this rock resolve themselves will say a lot about the 'always connected, everywhere, from everything' world so many of us expect. The companies that learn to surf this wave without getting smashed on the rocks of customer expectations will live to see how this tension resolves. This paper proposes a solution to rapid obsolescence: OEM's should design their "Application Specific" products around "Application Ready" embedded systems.

Introduction

Here is the problem. The chips and technologies we want to embed into our OEM products represent a 'wave of technology' driven by the 'winds of change' "Wind" from Moore's Law and other forces piles up huge swells in the sub-micron ocean of silicon fabs and communication labs. These waves form symmetric, surfable breakers on the island beaches of consumer products. As individual island consumers, we adapt easily to trading in this years cell phone or PDA for the next years model. Indeed, we relish the fashion of change.

Modern components have lifecycles longer than fruit flies but shorter than hamsters. The OEM with a commercial product must adapt.

But in the deep bays, fiords and harbors of commercial business to business markets, the hydrodynamics are quite different. These markets are dominated by multi-year purchase and supply commitments between cust0omers and OEM's, five year construction programs, bond funding and 10 year depreciation schedules. These markets demand very long product life and longer product availability. In fact, long term availability is a cornerstone assumption. In this portion of the market, waves of technology can lift everyone's boat, and then, if you are not prepared, smash it on the rocks.

We All Face the Technology Wave

At a recent industry meeting, a couple of dozen leading embedded system consultants were invited by a leading OS vendor to share thoughts and recommendations on important design issues of the future. In the course of discussion these consultants, who advise perhaps 100 companies between them, realized their clients had all faced the same problem. Many of their OEM clients had completed an embedded system product just in time to see the chips go "End of Life" and become obsolete. Only rarely had a product development ever been completed before the OS revision upgraded. Past this unsatisfactory development experience lays the more serious problem. The successful OEM product developments were built and introduced to commercial markets where the end users buying them assumed an availability of years or even decades. The disappointment of these end users is as yet unrealized. Eventually, to maintain customers, the OEM Company, must undertake costly redesign or 'end of life' buys. These real and inevitable costs are an unrealized financial liability to the OEM's balance sheets.

Table 1 on the next page indicates, side by side, the expected lifetime of various OEM devices, and the same for the PDA's and Cell Phones that pace the underlying chip technologies and software technologies. The problem is intensified because the technology powerhouses- the companies that develop the hottest chips and the most advanced software- also obsolete themselves faster than their competitive laggards or niche players. Further, the successful niche players on the edge of technology are not an island of stability in a roaring sea of change. Rather, they introduce even riskier instability in another way. There are many examples of great chips and technology available at low cost because some auto company or cell phone manufacturer is buying these chips by the millions. The problem is the demand is narrow- often one or two customers. And with next years car (or next seasons model in the case of cell phones) the chip may vanish from distributors shelves without even a warning.

	Typical Product Life		Market Inertia		Comment
	Spares/ Service Commitment	Product Market Life Lifecycle	Months for external approvals	Months to reach Full Sales Rate	
Machine Tool Controller	10 years	15 years	1	36	Tools are often purchased as part of a multi-year long program. Market slow to adapt
Long-Haul Truck AVL/Data-Logger	10 years	4 years	1	12	Fleets are developed over decades. Fleet compatibility important
Farm Equipment Precision Farming System	15 years	10 years	1	24	Biggest single investment on the farm expected to last
Medical Device For Patient Care	5 years	10 years	24	24	Approval cycles, for finished device, can take 2 years
Industrial Controller For PLC or Similar Applications	10 years	20 years	4	36	Controllers are often purchased as part of a multi-year long program. Market slow to adapt
PDA	1 year	6 months	1	1	Rapid development, approvals often in-house
Cell Phone	2 years	3 months	1	1	These are becoming a fashion item. Marketable lifetime is measured in seasons or weeks.

Table 1- Typical Product Lifetimes

Defining the Problem

So- the problem of the technology wave in the 'breadth' of general OEM applications is big. OEM's are designing, and the economy is buying devices on the assumption they will enjoy product lifetimes of many years. The underlying technology just will not support this. Exactly what are the elements of the problem and how can it be mitigated?

However, it is possible to identify exactly where this problem occurs and then devise a product development plant to mitigate it. The general problem is shown in Figure 1 below.

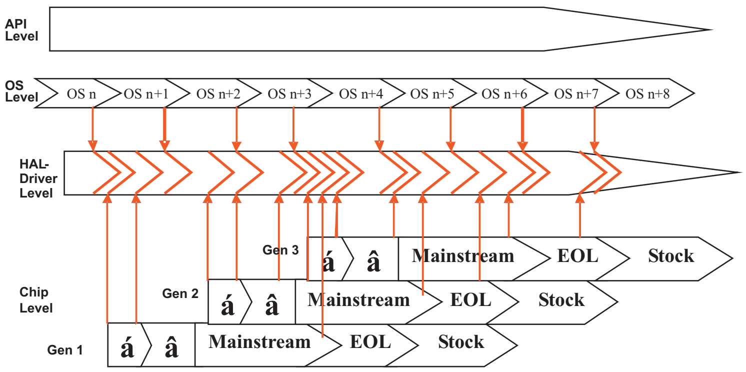

Figure 1- Lifecycle Changes to the Product

Figure 1 shows how changes are driven into an OEM system whose ten year market life might span three generations of CPU chip and nine revision/updates of operating system. You can see that all technology changes to OS and chip drive to the same place: the core "Hardware Abstraction Layer" where code meets chip register address and GPIO line. The engineers who work here are constantly called into service not only to design for the 'next generation' chip or OS, but to qualify, test and adapt alternate suppliers as designs one or two generations old pass into EOL and then "Stockroom only" status.

Figure 1 is actually an optimistic simplification, the real situation demands even more driver/hardware level software work. The CPU chips are only one major component with short life. Other high-performance/short life subsystems include the LCD, the touch screen controller, communication and coprocessor chips, Flash and DRAM memory, CPLD's and more. All of these have lifetimes as short as, or shorter than the CPU and all require the same driver-level software work as they pass into EOL.

Lifetime Extension or Prolonging the Agony?

To some extent the problem can be mitigated by 'stretching' generations- getting in early and staying late. Both actions are costly. To get in early the OEM needs to undertake active Beta and Alpha programs for both hardware and OS. The benefit to the OEM is that once he has helped the supplier work out his production problems, the OEM can perhaps be in the market on day one of product release. The OEM can then 'stay late' and extend his time in the market by affecting 'End of Life" buys for selected components. By spending on bleeding edge engineering to 'get in early' and spending on large lifetime buys of EOL chips to 'stay late', the OEM can perhaps skip a generation and reduce his overall lifecycle cost. But at best, this is a costly, risky attempt at remediation; it does not eliminate the problem.

The best way for an OEM to "get in early and stay late' is to partner with a supplier. The supplier is probably already committed to this difficult process. Alpha and Beta software is hard to work with. But the OEM can share this cost across multiple programs. In the end, the OEM will save money.

The Solution: Application Ready Subsystems

The real solution for most OEM's is to recognize the OS API level remains quite static for years, even decades. The POSIX API of Linux or the Win32 API of Windows CE have each been in place for more than a decade. Items have been added and the programming environment has been enhanced, but code that ran five or ten years ago still runs. The way to keep costs low is to use "Application Ready" 32 bit subsystems in connection with "Application Specific" hardware, connected by a simple header plug. Figure 2 is a rendition of a OEM product so configured.

The OEM can engineer an effective solution with a "Application Board" which typically contains plugs, connectors, sensors, backlight inverter for the LCD/Flatpanel, batteries, special bus interfaces and peripherals. In short

Figure 2- OEM with "Application" board and "System

the Application Board contains all the key features that make the device a turn-key, "Application Specific" product.

A set of header connectors is placed on this board and an "application Ready" system board, complete with OS and BSP, is added. With addition of application software and plastic or sheet metal enclosure, the system is ready. The OEM can negotiate long term supply agreements with his System Board supplier and enjoy a recitative unperturbed product lifecycle as the System Board suppliers copes with changes to chips, OS, flatpanel interfaces, etc.

Building the OEM device this way offers many advantages:

- The Application software can be written starting "Project Day 1" using 'off-the-shelf' system boards.

- The Application Board is unusually pretty straightforward technology with two or four layers, perhaps even with thru hole manufacture. This allows it to be assembled in small lots, and in different configurations for different OEM applications without tying up inventory and manufacturing resource.

- All of the long lead-time parts with short product lifetimes are encapsulated on the “System Board” and managed by the OEM’s outsourced supplier as a unit, collapsing 500 troublesome BOM parts to one.

- Manufacturing lot sizes and on-hand inventory can drop.

- All schedule and cost risk associated with the “System Board” is not only offloaded to the supplier, it is eliminated from the project where that suppliers has a standard COTS solution.

It should be easy for the OEM to reach agreement with an integrated design/build System Board supplier because System Board supplier has the same goals as the OEM. The System Board supplier wants a stable, long term customer relationship for all the reasons the OEM wants a stable relationship. It is to the interest of the System Board supplier to manage chip and OS EOL issues without troubling the OEM, and to keep the product flowing smoothly.

OEM / Supplier Relationship: Partnership or Pillage?

There are strong motives for the OEM to engage a COTS board supplier who undertakes the principal or total design effort on his own, with hope to recoup margins based on product or design license sales later. This sort of relationship makes the supplier a partner, linked to the same goals as the OEM.

Notice that the System Board suppliers motives are exactly contrary to a separate “design” supplier who lets others build, either the OEM or a Contract Manufacturer retained by the OEM. While a company that just sells design service can help get the OEM to market quickly with an application-specific product, the design-services firm has no motivation to keep the OEM in the market. In fact, he has every motivation to exaggerate and amplify any small EOL issue in order to garner larger design fees.

Shared Margin or Shared Savings?

Obviously, any OEM looking at outsourcing so many chips and components must consider how this will affect the products margins and profitability. On one hand the outsourcing model provides cost and risk containment, on the other it suggests the OEM has ‘margin’ that can be ‘captured’. In reality what is shared is savings. Few OEM’s can buy and build in the volumes required to get costs down. Few OEM’s deal repetitively with the perils of EOL components, and even fewer are in a position to manage the EOL of key components by redesign and second sourcing options.

Again and again the advantage has gone to companies that can from long term partnerships work together to enhance value. We see a natural partnership between companies that are close to the customer and need to focus on defining and developing their applications, and companies that are close to computer technology who define and develop better platforms. Together they can share the savings that come from focus, and develop a better solution for end users.

Summary

We all see the advantages of advanced technology. Over the next Decade these will multiply as communication, semiconductor, display and software technology become available. The trick for the niched OEM supplier is to surf the wave without being pulled out by the under tow of EOL. Getting on the wave, and staying on it, is perhaps a task best done on a tandem surf-board. The OEM forward, to steer towards the best application, the System Board Supplier in back, looking out for the curl of the wave.