Motherboards move from ‘compromise fit’ to ‘perfect fit’

Creating a customized board for your OEM needs, can be as easy as ordering a standard mother board from a supplier’s catalog.

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In the hunt for an embedded motherboard, the commercial off-the-shelf (COTS) market can often provide a fit that is good enough. However, it is rarely a perfect fit. Certain classes of design requirement are not well served by these standard boards. These designs fall into four categories:

- **Outliers**: design projects with uncommon requirements. The limited demand means it’s not economical for embedded board manufacturers to make a standard product.
- **Long-lived platform products**: it is difficult to maintain uniformity of board specifications over time and over multiple product variants when sourcing from board manufacturers’ COTS products, since the specifications of these COTS offerings changes frequently to keep pace with changes in technology and customer demand.
- **Volume products**: customized designs can often yield lower product costs over the life of the product by precisely matching required features with market requirements.
- **Differentiated products**: choosing a COTS motherboard design that is also readily available to your competition inevitably leads to cost pressures and a greater challenge to add additional value in your design.

Unfortunately, the alternative – commissioning a unique, custom board – has in the past been commercially unattractive for many projects. Customization services have been slow, inflexible, burdened with complex legal provisions and, above all, expensive. (See Figure 1) Original equipment manufacturers (OEMs) have learned to work around the potentially large number of design compromises that go along with accepting a COTS motherboard with a good enough fit.

What OEMs really need, however is a way to create truly optimized board designs when no COTS board is suitable. Now Emerson Network Power has introduced a rapid board customization service that allows OEMs to specify processor, I/O, connector and other options within a standard or custom board form factor. Called the RapiDex™ service, this capability is available for boards using Intel® embedded processors (see Figure 2).

Unlike the usual, custom board procedure, this service is fast and straightforward for the customer to use: no special contracts, no statements of work and no project supervision are required. And unlike conventional customization...

Figure 1: Solving the customization puzzle takes well thought out tools and processes.

Figure 2: Examples of RapiDex™ boards in which the OEM specified processor, I/O, connector and other options were selected within a standard or custom board form factor.
engagements, the customer need make no commitment on production volume numbers, and the minimum first order quantity is merely 100 units.

The service is also attractively priced to offer a low cost path to designing a differentiated product versus a COTS design that offers no competitive advantage: the customer pays a flat production setup fee, no non-recurring engineering (NRE) fees, and unit costs per board shipped are comparable to the price of a standard COTS embedded motherboard.

This new service is the result of innovative developments in design and manufacturing automation pioneered by our company (see Figure 3), and it brings the advantages of board customization to a far wider range of embedded OEMs than could previously benefit from it.

Technology developed by our company has enabled the service to be automated at every point, eliminating the delay, cost, and risk of error or inconsistency associated with human involvement in processes.

Crucial to the implementation of this chain of processes is a modular implementation of board functions; the design rules developed by our company enable these functions to be integrated, using advanced design software, into tens of thousands of configurations of processors, I/Os, peripherals and connectors.

Together, this combination of technology and process innovations enables a capability that is faster, more responsive, scalable and more cost effective than any other board customization service.

By choosing our customizationservice, OEMs gain:

**Optimized design**

Using an embedded Intel processor, you can specify a choice of I/O configurations, memory specifications and peripheral capabilities (such as wireless communications) in any rectangular form factor. We will design and produce a planar board to your specification with a performance and cost-optimized, as well as competitively differentiated, board layout.

**Fast turnaround**

The innovative design of our customization process has also produced an accelerated delivery schedule: after defining the board specification from a menu of options, the unit price quotation is delivered to the customer within two working days. From the date on which the customer places its order, we can produce first article boards (1-12 units) within four to eight weeks. Volume orders (minimum order quantity: 100 units) follow industry-standard turnaround times, with forecasted orders fulfilled within eight weeks or less of order date.

**Low costs**

Customers of this service pay no NRE fees. A flat production setup fee plus unit costs pays for the first sample boards (1-12 units). In volume production, the customer simply pays the unit price as quoted at the start of the customer engagement. Unit prices are very competitive, and are comparable with the prices of equivalent standard COTS products.

**Straightforward terms**

Since the customer does not pay NRE charges as a part of this design service, it is not required to negotiate the complex legal provisions that normally occur in custom board engagements. Using our customizationservice is a simple two-step process:

1. **Step 1:** The customer issues a purchase order for the service, based on the customer’s choice from a menu of processor, memory, I/O and peripheral options, at a flat cost which includes the price of the first agreed number of boards.
2. **Step 2:** If the customer decides to pursue a production run (minimum order quantity: 100 units), they simply issue a purchase order. There is no need for a complex contract, a statement of work, provision for penalties or clawback.

Benefits for platform products

OEMs developing a long life cycle common computing platform for multiple products can use our service to define the requirements for the platform, specifying common features (connectors, I/O, peripherals) and dropping in processor variants to a common board design. Upgrading to an enhanced processor can be accommodated within the board design, with the ability to maintain uniformity of outline and profile across all future variants.

What a servicelike ours offers the OEM:

- Lower materials costs
- Improved form factor – a planar design that eliminates the high-profile daughtercards
- Improved reliability – the use of surface mount technology (SMT) components eliminates the vulnerable connectors to plug-in daughtercards
- Improved supply chain – the complete solution is now available from a single vendor

**Figure 3:** The specially designed RapiDex production lines enable OEMs to enjoy great flexibility and affordability in their choice of customized boards.
arrangements in case production volumes fall short of expectations.

The two steps are not legally coupled: a customer who takes shipment of the first boards has no obligation to order production volumes. The first boards are full production quality, not prototypes or samples.

**Which projects can benefit from using a truly designed for the user customization process such as our RapiDex service?**

A design team should ask the following three questions:

- Will the design functionality or competitiveness be significantly compromised by the selection of a standard COTS embedded motherboard?
- Could these design constraints be eliminated with an optimal selection of memory, I/O, peripheral and connector specifications? Or by specifying a custom form factor?
- Is the design based on a current Intel® embedded processor, such as the Intel Atom™ or another processor that Emerson Network Power supports?

If the answer to all three questions is ‘Yes’, then consider a motherboard sourced through a OEM-friendly process like the RapiDex service.

**How to specify an optimized embedded motherboard through our service**

The process of engaging with our service for the supply of an optimized embedded motherboard has been designed for speed and simplicity (see Figure 4).

**Within two business days**, you will receive a comprehensive quotation package. As well as stating the guaranteed unit price for your required production volume, the package includes a datasheet, a user manual and a 3D rendering of the proposed board configuration. This quotation package confirms the specifications of the board that we will manufacture.

**Within four to eight weeks** of receiving your purchase order, our service will ship first article boards (1-12 units) to you. These boards are produced according to the specific specifications identified in the quotation package.

**Within another eight weeks** of receiving a forecasted volume order, we will begin production shipments. (Volume orders follow our company’s standard turnaround time.)

To meet OEM expectations, the process of any customization process should be simple and fast. As you can see, our procedures are similar to the process of ordering a standard embedded motherboard from a supplier’s catalog.

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