

Run-Time Royalties: To Pay or Not to Pay?

by

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Commercial real time operating systems (RTOS) used in embedded processor applications enjoy increasingly widespread use. Overall, industry revenues are projected to grow at an annual rate of 20.5% to over \$1.5 billion by 2005. However, revenue derived from run-time royalties is expected to slow to an annual growth rate of only 5.9% over the same period. Run-time royalty revenues are forecasted to increase only gradually through 2004 and to actually decline starting in 2005. Market forces from embedded operating system vendors offering royalty-free solutions are fueling the trend away from royalties.(1)

Perhaps the most powerful force driving the trend towards the royalty-free RTOS model is the relentless convergence of the wireless communications market and the Internet intersecting with nearly every aspect of business and consumer markets. For instance, Internet traffic doubles every 100 days and cellular phone usage is forecasted to grow at a 37.7% compound annual growth rate (CAGR) through 2003. These high-growth forces have spawned and will continue to spawn a much broader consumer and business demand for mass-produced products based on embedded processors.

According to Markus Levy, Senior Analyst at the Microprocessor Report, "Every level of society is adopting Internet access for home and business. Combined with the wireless revolution, these two trends have triggered a rapidly broadening market for high-volume consumer and business products. Examples include everything from cell phones to DVDs, PDAs, digital cameras, DSL modems, and printers."

At the heart of most of these high-volume electronic products is an embedded processor. Today, most OEM product designs that incorporate an embedded processor also include a Real-Time Operating System (RTOS). Product manufacturers and designers either purchase their RTOS from a commercial vendor or develop one in-house. Commercial RTOS vendors offer a full range of products from basic kernels to top-of-the-line, full featured operating systems.

Another of the trends driving OEMs to increased reliance on commercial RTOS solutions is shorter product design cycles. The "first-to-market" reaps the rewards of manufacturing efficiencies, market share, and higher margins. To meet ever shorter

design cycles, in some cases as little as three to six months, OEMs are increasingly turning to proven, reliable, well-supported commercial RTOS solutions. When they do, they must confront the issue of run-time royalties.

Run-Time Royalties

Traditional RTOS solutions originally embraced a royalty revenue model under which the OEM product manufacturer paid a per unit fee, called a run-time royalty, to use the RTOS on each end product sold. At that time, both processors and the memory devices were expensive and royalties weren't a significant part of the cost of unit. Now with declining memory and processor costs, run-time royalty costs stick out like a sore thumb. This per unit payment adds no benefit, but simply drains margin. Eliminating run-time royalties provides a big boost to competitiveness for products that incorporate a commercial RTOS.

In this vein, Levy notes that, "Royalty payments for use of a vendor-supplied RTOS become a significant issue for high-volume consumer and business products. The overriding issue for product producers is to reduce the unit cost. For a high-volume product, it makes sense to eliminate run-time royalties without increasing up front costs. Doing so eliminates per unit royalty payments and lowers the cost per unit."

Royalties have no real inherent cost to the vendor – they're pure profit. In a competitive marketplace, the laws of economics state that competition will drive prices down until they approach absolute cost. In the case of run-time royalties, that absolute cost is zero.

The Trend Toward Royalty-Free

In February 2001, Hewlett Packard selected software development tools and an RTOS from Green Hills Software for their inkjet printers and all-in-one devices. The company produces four of the top five selling printers in the world. The ThreadX RTOS provides a small footprint, fast response, and low cost solution for HP's line of consumer and business printer products. The MULTI IDE development environment increases programmer productivity during software development for 32-bit and 64-bit processors.

According to Phil McCoog, engineer scientist at HP's Vancouver Division, "We selected Green Hills Software's MULTI IDE and the ThreadX RTOS because the solution supports multiple CPUs and host environments. Additionally, the MULTI IDE provides advanced debug capabilities that greatly simplify the development process." The new solution replaces HP's prior traditional RTOS and eliminates run-time royalties, enhancing HP's competitiveness in the printer marketplace.

Source Code

Traditional RTOS vendors do not make the source code available to their customers, or if they do, they charge a large fee for it. However, vendors of royalty-free RTOS solutions provide the source code at no additional cost. Large OEMs particularly want the RTOS

source code because they want to see and resolve their own application bugs as they occur. Without the source code, the OEM’s product design team is forced to rely on the traditional RTOS vendor’s documentation and support staff.

Comparison

The following chart (Fig. 1) compares the costs and usage factors that an OEM experiences when using a commercially available RTOS. The chart makes a crucial point that both traditional and royalty-free RTOS vendors have up-front and ongoing costs. These costs include an up-front RTOS license, per user development tool license, and ongoing tech support/maintenance.

Royalty-Free RTOS	Cost & Usage Factors	Traditional RTOS
Yes	Up-Front RTOS License	Yes
Yes	Per-User Development Tool License	Yes
Yes	Tech Support/Maintenance	Yes
NO	Run-Time Royalty	YES
No Additional Cost	Source Code Available	Expensive or Not Available

Fig. 1: Compares cost and usage factors for traditional vs. royalty-free RTOS solutions. Note that both options have the same up front and ongoing user fee structures, but only the traditional RTOS model includes run-time royalties.

In some cases, the up front fees charged by traditional RTOS vendors are even higher than those charged by royalty-free RTOS vendors. Of course, the big difference is run-time royalties. By definition, royalty-free vendors charge no run-time royalties while traditional RTOS vendors continue to do so. The graph below (Fig. 2) illustrates how cost accelerates for an OEM running a traditional RTOS on an embedded application. Note how the cost remains fixed regardless of unit volume with a royalty-free RTOS. The graph assumes that both RTOS revenue models begin with the same up front costs noted in Fig. 1 above. Actual costs may vary by vendor.

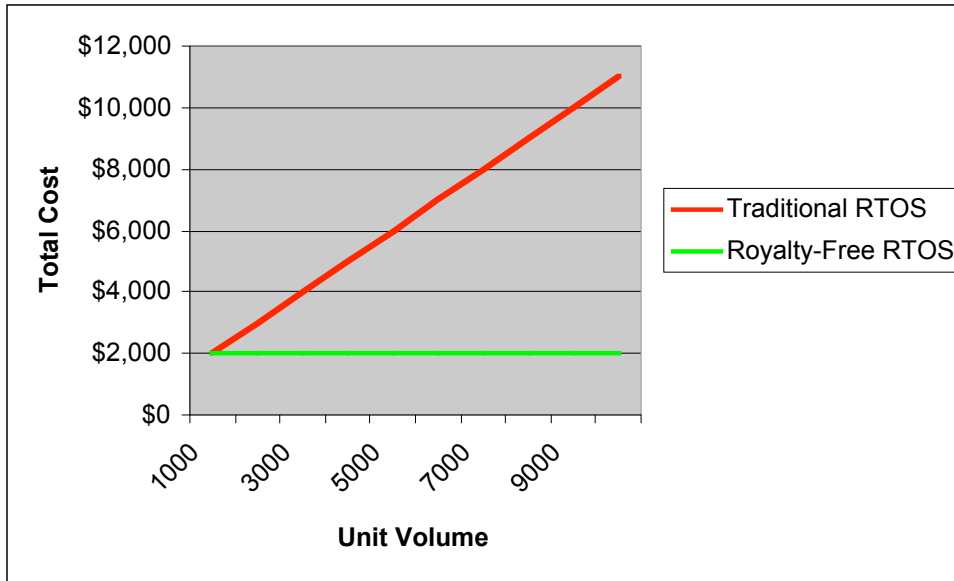


Fig. 2: The royalty-free RTOS solution incurs no run-time royalty costs regardless of how many units an OEM produces. With a traditional RTOS, total costs continue to rise in direct relationship to the run-time royalty per unit. For high-volume OEM manufacturers, the run-time royalty stream may amount to millions of dollars per year.

Levy concludes that, “For virtually all high-volume producers with an embedded RTOS, the royalty-free route will certainly be evaluated.”

Summary

Commercial RTOS solutions offer OEMs proven performance with reliable, well-supported products. Commercial RTOS solutions provide OEM’s an accelerated time-to-market opportunity versus developing an in-house solution. OEMs now have the clear choice of using a commercial operating system from a traditional RTOS vendor that includes a run-time royalty or selecting a royalty-free RTOS vendor.

The royalty-free choice eliminates the drain on margins imposed by a run-time royalty. In addition, depending on RTOS vendors, up front costs for the operating system license, development environment license, and maintenance/support are usually similar. The choice thus seems clear. The embedded market will continue to grow at a rapid annual rate, but the days of the run-time royalty are numbered.

- (1) Venture Development Corporation, World Market for Embedded Operating Systems, p. 37.