In More Depth: Embedded Benchmarks

Benchmarks for embedded computing systems are in a far more nascent state than those for either desktop or server environments. In fact, many manufacturers quote Dhrystone performance, a benchmark that was criticized and given up by desktop systems more than 10 years ago! As mentioned earlier, the enormous variety in embedded applications, as well as differences in performance requirements (hard real-time, soft real-time, and overall cost-performance), make the use of a single set of benchmarks unrealistic. In practice, many designers of embedded systems devise benchmarks that reflect their application, either as kernels or as stand-alone versions of the entire application.

For those embedded applications that can be characterized well by kernel performance, the best standardized set of benchmarks appears to be a new benchmark set: the EDN Embedded Microprocessor Benchmark Consortium (or EEMBC, pronounced "embassy"). The EEMBC benchmarks fall into five classes: automotive/industrial, consumer, networking, office automation, and telecommunications. Figure 4.8.4 shows the five different application classes, which include 34 benchmarks.

Although many embedded applications are sensitive to the performance of small kernels, remember that often the overall performance of the entire application, which may be thousands of lines, is also critical. Thus, for many embedded systems, the EMBCC benchmarks can only be used to partially assess performance

EEMBC allows vendors to post results for both modified versions of the source code and for hand-coded versions of the applications. Obviously, the use of small kernels makes both processes easier.

4.33 [5] <§4.3> On the Texas Instruments TMS320C6203 running at 300 MHz, hand-coding the EEMBC telecommunications benchmarks results in a performance improvement of 10.1 times. If the reduction in CPI from hand-coding is 2.5, what is the reduction in instruction count?

Benchmark type	this type	Example benchmarks
Automotive/industrial	16	6 microbenchmarks (arithmetic operations, pointer chasing, memory performance, matrix arithmetic, table lookup, bit manipulation), 5 automobile control benchmarks, and 5 filter or FFT benchmarks
Consumer	5	5 multimedia benchmarks (JPEG compress/decompress, filtering, and RGB conversions)
Networking	3	Shortest-path calculation, IP routing, and packet flow operations
Office automation	4	Graphics and text benchmarks (Bezier curve calculation, dithering, image rotation, text processing)
Telecommunications	6	Filtering and DSP benchmarks (autocorrelation, FFT, decoder, and encoder)

FIGURE 4.8.4 The EEMBC benchmark suite, consisting of 34 kernels in five different classes.