

# What to Expect from RISC Vendors in 1993

## Lots of New SPARC Chips and New Low-Cost RISC Processors

By Linley Gwennap

As RISC vendors become more eager to discuss their future product plans, it becomes easier for us to predict what new products will be coming out in the next year or so. Here is a summary of forthcoming RISC microprocessors expected to make their first shipments in 1993. Some have been announced, some have been "disclosed," and a few have only been speculated about.

### High-End SPARC Chips

There will be a flood of new SPARC chips coming to market this year. The inability of the old 40-MHz SPARC2 (7C601) chips to keep up with the HPs and IBMs of the world spurred several vendors to start SPARC designs. TI's problems getting SuperSPARC to yield at 40 MHz have put blood in the water, and the sharks have redoubled their efforts.

The first to reach the market will be Cypress' hyperSPARC. Expected to ship around April, the 66-MHz CPU should beat the performance of a 40-MHz SuperSPARC, particularly on floating-point applications. Cypress also hopes to boost the clock rate to 80 MHz simply by binning its fastest chips, while TI will have to modify its SuperSPARC design to increase its frequency. Cypress is quoting \$700 for a complete 55-MHz MBus module with external cache, while TI is quoting \$1200 for a 36-MHz SuperSPARC, which doesn't even include the secondary-cache controller and cache RAMs needed to achieve comparable performance. This price/performance advantage should make hyperSPARC popular with SPARC system vendors. Sun itself is certainly paying much less than \$1200 for TI's chips, so the cost advantage to Sun is less clear, but it may ultimately buy chips from Cypress as well.

Another potential SPARC option may come from the Thunder project from Metaflow and its partner Hyundai. Originally called Lightning and backed by LSI Logic, the project was revamped after LSI decided to drop it. The new design continues with the original dataflow architecture that Metaflow believes will outperform all other SPARC chips, but the company has spent years trying to get it to market. Although Metaflow has not made any more specific public statements, it is rumored to be nearing first silicon; if all goes well, Thunder could be shipping by the end of the year. Like Cypress, Metaflow is dependent on Sun to generate any real volume for its chip set.

Another contender is the HaL chip, which will be

the first to implement the 64-bit SPARC version 9 architecture. HaL Computer Systems, a Fujitsu-backed startup led by former IBMer Andy Heller, is aiming its first products, primarily servers, at the commercial market, an area that Sun has neglected until recently. HaL expects these systems to be available by the end of the year, but the company does not plan to sell its processor chips on the open market.

### Other New High-End Processors

Other RISC vendors will also offer new high-end chips, although it appears that most will be upgrades to current designs. The first will be MIPS' R4400, a 150-MHz upgrade to the R4000 with twice the on-chip cache of its predecessor. The new chip should offer better integer performance than a 150-MHz Alpha, or anything else currently shipping from other vendors. By using an advanced 0.6-micron manufacturing process, the new chip includes the larger caches within the same die size as the 0.8-micron R4000. MIPS has already announced the R4400 and its semiconductor partners expect to ship it in 2Q93.

Another new MIPS chip set that may appear late this year is code-named TFP. Started by Silicon Graphics before the MIPS acquisition, it is intended to offer much higher floating-point performance than the relatively anemic R4000 family. TFP is rumored to be highly superscalar and can issue up to two floating-point instructions per cycle on a sustained basis. In order to achieve a new level of floating-point performance, however, TFP will have to overcome the clock-frequency limitations seen in other highly-complex processors such as SuperSPARC and IBM's POWER chips. The design encompasses multiple chips and will probably surpass all current RISC chips in price as well as performance. TFP will be too expensive to replace the R4400 but rather will be used mainly in niche applications requiring high floating-point performance.

DEC plans to ship a 200-MHz Alpha chip in its own high-end systems by March and to make volume shipments of that chip in 3Q93. The company does not expect to have an all-new high-end design until late 1994. HP, which has had the fastest desktop workstation for over 18 months running, will have to find a way to speed up its PA7100 by mid-year to avoid being surpassed by the 200-MHz DEC chip. Based on HP's usual 15-month product cycle, a new high-end PA-RISC design is not expected until 4Q93. HP has been typically mum about any details on such a new chip.

## Low-End RISC Chips

TI's microSPARC could remain the only low-cost SPARC offering, although there may be some new derivatives of that design. The current version is limited in speed not by the CPU core but by its SBus interface; SBus is limited to 25 MHz and the CPU uses a fixed 2:1 frequency ratio for its clock. By modifying the design to allow a 3:1 ratio, the chip could probably be bumped up to 60 MHz using the current 0.8-micron process. If this modification is made, it could be in production by mid-year. A redesign for a 0.6-micron process that would shrink the die and increase the CPU clock to 75 MHz could be available by the end of the year. Fujitsu is also rumored to be developing a similar chip aimed at higher performance levels.

The first and most potent microSPARC competitor will be the PowerPC 601 from IBM and Motorola. At 66 MHz, the 601 should provide about twice the integer performance of a 50-MHz microSPARC and do even better on floating-point code. Furthermore, microSPARC is currently about twice the die size of the IBM chip. Although the 601 uses a more expensive manufacturing process, it will still have a tremendous price/performance advantage over microSPARC. IBM expects that the PowerPC chip will be available around mid-year in IBM products as well as on the open market.

HP will weigh in with its own highly-integrated chip, the PA7100LC. Despite its name, the new chip is not simply a stripped-down version of the current PA7100. Instead, it reduces system cost by including a memory controller and simplifying the cache and bus interfaces from its older brother. The 7100LC also includes an improved superscalar integer unit and offers a little-endian mode, sparking unconfirmed rumors of a Windows NT port. Due to be shipped this fall, the 7100LC could outperform even the 601 if it can reach its target frequency of 75 MHz. Its much larger die, however, will make it more expensive to build than the IBM chip. HP has announced no plans to market the 7100LC to other companies.

DEC, on the other hand, will sell its low-end 21066 chip, due in 4Q93, on the open market. Like other Alpha chips, the 21066 will have a high clock rate of up to 150 MHz, and it should match the performance of the 7100LC. It is also much larger than the 601, however, and thus could be more expensive. Both the 7100LC and the 21066 will integrate more system functions than the 601, which may make overall system cost more comparable. The 21066 will include a built-in PCI interface, allowing it to use the same graphics and peripherals as x86-based Windows NT systems.

The MIPS vendors are also working on new low-cost chips. MIPS is developing the VRX under contract to NEC. This chip is rumored to be basically an R4000PC with the unused areas (secondary cache control and MP

support) removed from the die to reduce cost. IDT is working with the QED design firm on Orion, which has a similar set of specifications but a completely redesigned core. One or both chips should make it to market by the end of the year.

## Comparisons to Pentium

Despite Intel's claims that Pentium will close the performance gap with RISC, most of the RISC vendors will continue to hold a comfortable lead throughout 1993. Pentium does improve on the 486's poor floating-point performance, but it cannot match what DEC, HP, and IBM are currently shipping, much less what is expected later this year. Even if Pentium reaches its goal of matching the performance of the R4000, it will be a moot point, since the R4400 should ship about the same time as the Intel chip.

Of the RISC vendors, Sun is the most threatened by Pentium. A 66-MHz Pentium may have similar performance to a 40-MHz SuperSPARC, and it appears that Sun and TI have a long and difficult task in improving SuperSPARC's clock speed. Simply matching Intel's performance is not enough for Sun to gain share on the desktop. If hyperSPARC or other high-end SPARC designs meet their promises, Sun's position would be greatly improved.

The low-end chips from IBM/Motorola, HP, and DEC will all have roughly the same integer performance as a 66-MHz Pentium. Although the RISC chips will be fairly expensive, so will Pentium, and all three RISC processors include system functions that apparently are not included in Pentium. All of these chips will be used in sub-\$5000 systems that will compete with Pentium-based PCs (and, of course, with each other). All three of these RISC chips will have a significant advantage over Pentium in floating-point applications.

The low-end MIPS-architecture chips take a slightly different approach. They will offer Pentium-class performance at a very low price, but will not include the system functions of the more expensive RISC chips. MicroSPARC, even if the clock rate is improved, will not reach Pentium's performance but instead will compete with 486-based PCs. Neither microSPARC nor the low-end MIPS chips will be close to the DEC, HP, and IBM/Motorola chips in floating-point performance.

It appears that 1993 will continue the trend of seeing more RISC chips introduced than the previous year. The established workstation vendors will continue to butt heads to see who can deliver the fastest systems, but for the first time, many of these vendors have realized that there is much more volume in the low end of the market. With a selection of new low-cost chips, the RISC vendors are hoping to grab a piece of the high-volume PC market, but they may be disappointed if they also get the low profit margins that go along with it. ♦