# H-P's Precision Architecture - Strengths and Weaknesses

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The writer was a systems Engineer with IBM during the introduction of the S/360. The S/360 was a single architecture, implemented in different CPU's, that replaced the existing widely different models of IBM computers. While it established a new standard for all IBM computers, it was radically different in architecture (instruction set) than any of the existing IBM computers (1400 series, 1620, 7040, 7070, 7090, etc.). The parallel to HP's Spectrum project are striking.

The Wall Street Journal labelled Spectrum "the most adventurous gamble the company has ever undertaken." We have all been hearing about Spectrum for a long time. Remember when it replaced "Vision" as the HP 32 bit entrant?

Now that some models of the Spectrum series have been delivered, we can take a look at what the initial results of this five year development have been. The first of the 900 series (which is what HP is calling the Spectrum offerings in the commercial marketplace) was the 930. The Series 930 used Schottky TTL logic to deliver CPU performance of 4.5 million instructions per seconds. It supported 24 megabytes of main memory and dual I/O busses as a standard feature.

The 930 was a stop gap machine. I would almost say that it was a pilot system, which is being replaced by the 950. It incorporates the logical architecture of Spectrum. Its main benefit was a test bed for HP and the very first beta test sites.

The series 950 is the first of the Spectrum series to take advantage of HP's NMOSIII VLSI processor. It will execute 7 million instructions per second. It will have up to 64 megabytes of main memory. It is the first HP product to marry the architecture with new chip technology. In order to take advantage of the improved performance, users will have to recompile into native mode and convert to Turbo-Image if they have not already done so. This means that their source programs must be either in COBOLII, Pascal or Fortran 77. Those are the only native mode compilers that are available at first release of the 900 series.

HP has taken the concept of reduced Instruction Set Computing, adopted it and added other new developments in hardware and software design. They call the result HP Precision Architecture. The basic features of Precision Architecture are:

1. Reduced Instruction Set
2. Fixed-length and fixed format instructions
3. Load/Store design
4. Hardwired instructions

5. Single Cycle operation
6. Optimizing Compilers

Reduced Instruction Set Computers (RISC) are the current darlings of the computer industry. In a netshell, this engineering philosophy states that a well chosen simple set of instructions that can be hard wired is better than a much richer more complex set, usually implemented in microcode to keep the cost reasonable. First of all the CPU is much easier to engineer and therefore can be designed economically to run at much higher speeds. Secondly, well designed "optimizing" compilers can be more effectively implemented for a RISC machine than the previous CISC (Complex Instructions Set Computers) because the compiler writers have fewer instructions from which to choose. The rationale for RISC is that changes in circuit technology, the speed and cost of accessing memory and better high level language compilers, have made the CISC machine technologically obsolete. Memory access speeds have increased faster than CPU speeds. RISC, with fixed length, fixed format instructions and single cycle operation is inherently very fast for most operations that have to be performed on today's computers. However, what is "Reduced" is not defined. There are about 127 instructions in the 900. I can remember computers that had only 1/5 that many instructions. The HP implementation of RISC is not that "reduced."

Other elements of the 900 Series are also a radical departure from current 3000's. A virtual memory addressing scheme is used whereby disc memory is regarded as an extension of main memory as required. This scheme fits very well into the caching scheme used by the 900 Series and is a very effective method to access both data and instructions. However, it is a radical departure from the current methods, although it eliminates the dual buffering inherent in a cached 3000 system today. Obviously, the entire I/O system must be re-written to support this I/O method.

The software is the critical element in the 900 Series. Not only is a huge amount of software required for the operating system, which goes under the name MPE/XL, but the new optimizing compilers require an even higher level of technological competence than previous compilers. At the same time HP is attempting to integrate their IMAGE database system with their new SQL relational database. On top of that they are committed to run almost all existing code in compatability mode. All this is a huge undertaking. Just doing the new XL version of MPE is a larger undertaking than HP has accomplished up to now. It is the software area that causes many people to have doubts about HP's ability to deliver the 900 Series, with reliable software that gives the promised performance. There is no question that HP will be able at some point to deliver a quality 900 Series product with a reliable, complete set of program products, operating at the promised performance levels. However, today they are a long way from this goal. Getting there is no easy matter.

As an interim step to gaining improved throughput on the 900 Series without having to recompile, HP has something called the Object Code

Translator. This will gain an estimated 10% to 30% speed improvement, and is meant to assist users in cases where they cannot recompile. If it is reliable, it will be of use to users with SPL code.

What does the market think of this radical new product line from HP? There have been several comments that indicate that while the 900 Series is impressive, it has been a long time coming. "HP is currently comparing Spectrum to (DEC's) 8600. By the time the systems come out, they will be competing with an entirely new machine," said Michael Murphy, co-editor of the "California Technology Stock Letter."

HP success with this new series seems to depend on two factors.

1. How long will it take HP to stabilize the new product at a high level of performance and with a complete software offering. If this can be done relatively quickly and as promised, then HP has laid the groundwork for an architecture that will benefit them for years to come. If they are slow to implement their excellent strategy, their credibility will be damaged.

2. What will the competition do in the next year or two to counter and perhaps improve on these new offerings? HP has no lock on any of this new technology. It is known that every other major vendor is looking seriously at RISC and other new technologies to improve price performance. Some have already produced RISC machines.

Where does this leave the HP 3000 user who is looking at Spectrum as an upgrade for his system? The series 70 will be a better choice for many at least in the short term. There are two classes of 3000 users who have an immediate interest in the 900 series.

1. Those users who need CPU power beyond that available on the Model 70 and require that it be on one computer (because of the size of a database, perhaps).

2. Those in large corporations with many 3000's who can afford to bring a 900 series in-house as prototype for future systems.

Those who are not in one or both of the above categories should probably upgrade to or acquire additional model 70's.

Having made the decision to go to a 900 series, the user must develop a detailed migration strategy. He must balance the conversion effort of going to native mode with the benefits. Only native mode processing will give him cost/performance benefits that justify the acquisition of a 900 series. Even programs to be run in compatibility mode need to be tested at least until there is some confidence that compatibility mode is bug free.

By adopting a radically new architecture, HP has taken a giant step toward rationalizing their computer line for future growth. It is an excellent, bold, decisive strategy on HP's part to increase their market share in the long run. The immediate problem for the current HP user who needs more processing power is how to get from here to there. It will be a while before the 900 series stablizes into the kind of super reliable system we have come to expect from HP.

We already see evidence of HP's move to use HPPA to aggressively increase its market share. In the last few years most of HP's computer revenue has come from its installed base. With HPPA, HP now has the hardware (or can soon have) to compete at all levels of computer power. HP has a competitive advantage. For example, it is estimated that HP's HPPA computer can be produced for one-quarter the cost of a DEC CPU of equivalent power.

Hardware is only part of the picture. Software and connectibility ("Networking") are the other parts. Both DEC and IBM have announced major new networking products recently. HP has also, but is having to run to catch up. It is caught in the position of having to do two versions - one for the MPE/V machines and one for HPPA.

It is the software area that causes the HP friendly computer user community the greatest concern. MPE/XL is still not a proven product, although we all hope it soon will be. Realistically, I expect that HP will take some real heat on the software side before things improve to the point where MPE/XL's reliability and performance will match MPE/V. As far as new customers are concerned, HP has taken a step in this direction by targeting an HP/UX "commercial" market. The HP implementation of UNIX has seemed to have been easier to implement than MPE/XL. The 800 series (HPPA-UNIX) computers have been well received in the marketplace. It is estimated that the UNIX market will grow at twice the rate of the general computer market this year. Whether UNIX will become the true standard operating system for the future remains to be seen.

The other problem HP has is the lack of a large repertory of application programs for HP computers. In attempting to increase market share, i.e. attract new customers, software availability is very important. This may slow down HP's ability to attract new customers who are not interested in UNIX.

The next few months will be very interesting for all of us involved with HP.