Starlight™

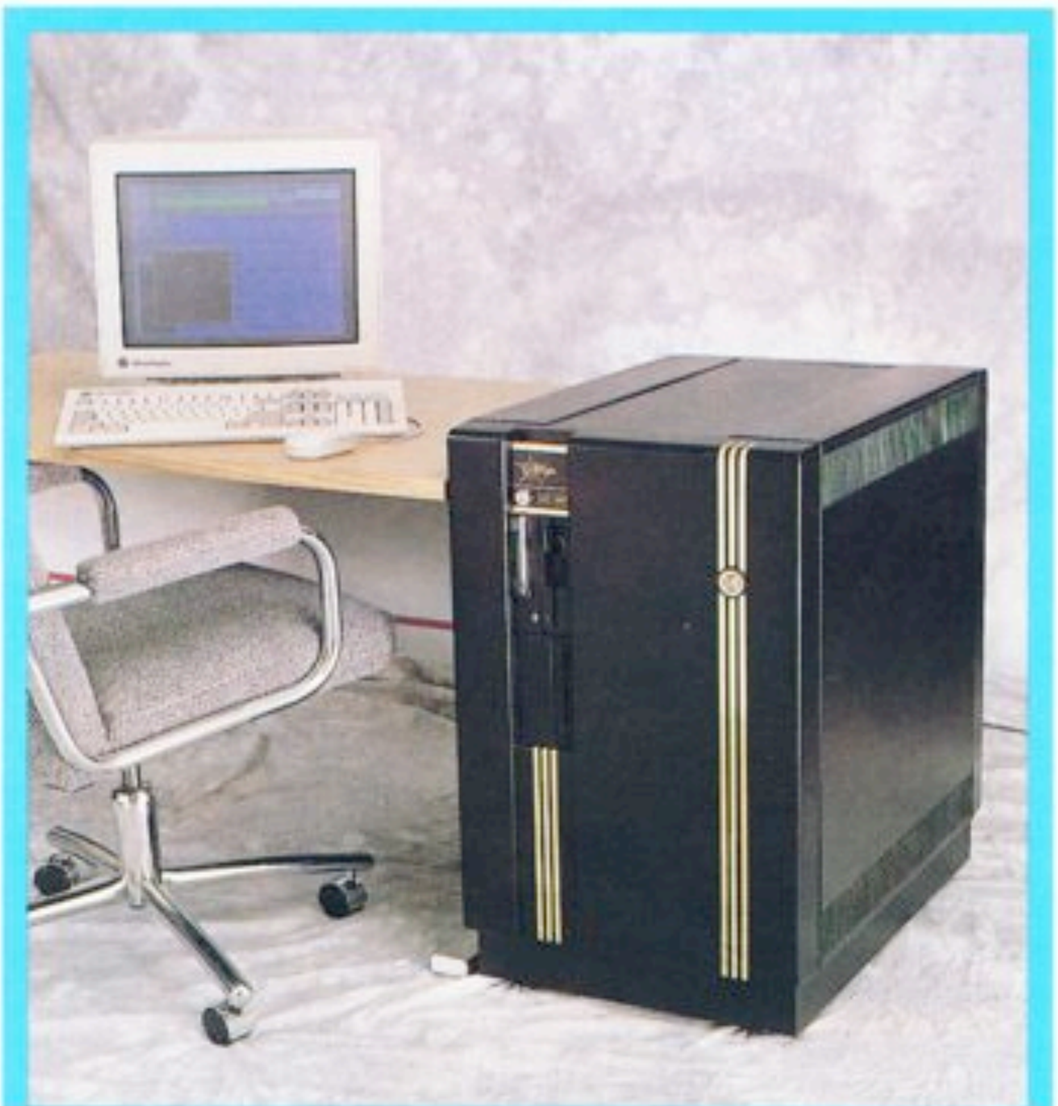
...the Ultimate Simulation Computer

STARLIGHT is an extremely fast Real Time Simulation Computer that dramatically reduces the time required for continuous system simulations and dynamic systems modeling. It is designed to provide superior computing power for projects with time-dependent calculations, simulations, hardware-in-the-loop testing, or any situation where results are needed in real time or faster.

The workstation size and low price allows companies to bring product testing and design in-house, expand previously limited testing, or decentralize simulations to achieve results in less time.

STARLIGHT innovations include these FEATURES:

- Efficient Data Flow Architecture
- Integrated Hardware/Software
- Simulation Code implemented directly (not mapped to FORTRAN)
- Optimized serial/parallel operations for maximum speed
- Total solution (not just an accelerator board)



Complete STARLIGHT System

STARLIGHT BENEFITS over traditional simulation methods include:

- Significantly reduced size
- Drastically lowered price
- 10-100 times performance increase
- Power to handle larger, more complex simulations
- Ability to function in a normal office environment

STARLIGHT's tremendous speed opens the way to additional, more diverse or complex projects. This increased simulation speed is achieved through a digital implementation of analog computing architecture. Now there is time for more thorough testing without project delays, improving design dependability.

This does not mean, however, increased operation complexity or costs. ***STARLIGHT***, only a small workstation-like tower unit, outperforms higher cost conventional simulation systems traditionally needed to achieve this performance level. Since it operates in a normal office environment, this simulation power is available right at the engineer's fingertips. ***STARLIGHT*** is controlled from an X-Terminal user station with a standard X-Window/Motif interface. ***STARLIGHT*** can just as easily connect to your present system as it can stand alone. There is no need to completely revamp your lab. When computing power must be increased, you now have a better choice without the usual additional large investment.

EAI®

USER INTERFACE

STARLIGHT has a standard workstation for user interaction, control and graphic display output. The system can also be used with your existing workstation or terminal with an Ethernet link and X-Terminal capability. Users would then have access to ***STARLIGHT*** from any site on the network. You can run a simulation on ***STARLIGHT***, continue with other work while the simulation is running, examine the results on a local terminal, and pull simulation data into other software packages as needed for analysis or reports.

STARLIGHT operates through a menu system with integrated help screens. Set-up, parameter changing, run sequencing, recall, searches, and other operations are all executed in a few keystrokes or menu selections. Simulation output is presented to the user in either graphical or tabular form. Analog outputs are also available for plotters, scopes, etc, as well as digital output for slave monitors, mass storage systems, or data transfer to other computers.

SYSTEM ARCHITECTURE

One of ***STARLIGHT's*** benefits is its significantly smaller footprint when compared to the much larger size of a traditional system needed to match its extremely high level of computing power. This is achieved through a unique hardware architecture, bringing system computing size to the board level.

The heart of the system is the ARITHMETIC COMPUTATION MODULE (ACM). This primary computational component is a unique floating-point, pipelined parallel processor designed and built by EAI specifically for modeling continuous dynamic systems. A single ACM can run simulations 30 to 100 times faster than a microprocessor-based workstation, and 5 to 10 times faster than a supercomputer costing tens of millions of dollars. The system will accommodate up to three additional ACMs (four total) for very large simulation models or to meet further speed requirements. Speed is the key to putting results in your hands so decisions and modifications are implemented in much less time.

Each ACM provides up to 128K words (512K bytes) of data memory for function generation and data logging. For applications requiring more than this, an optional DATA MEMORY MODULE (DMM) provides up to 64 million 32-bit words (256 million bytes) of additional indexed data memory. This supports very large data tables for functions of up to eight variables, and high-speed logging of many channels of data for additional post-run analysis on ***STARLIGHT*** or your system.

STARLIGHT includes a Host processor housed in an industry standard VME chassis, running under the UNIX operating system. During problem preparation, the Host performs editing, compiling and linking tasks and loads the simulation model. During runtime, the Host supports menu-based user interaction, real-time data-logging, and graphic display.

For connection to external equipment such as flight tables, lab instruments, or other computers, a wide range of I/O options is available:

- The ANALOG INTERFACE MODULE (AIM) provides 16 Analog-to-Digital Converters (ADCs) and 16 Digital-to-Analog Converters (DACs) with control circuitry for continuous analog hardware-in-the-loop communication. The system can accommodate up to 4 AIMs, for a total of 64 channels in each direction.

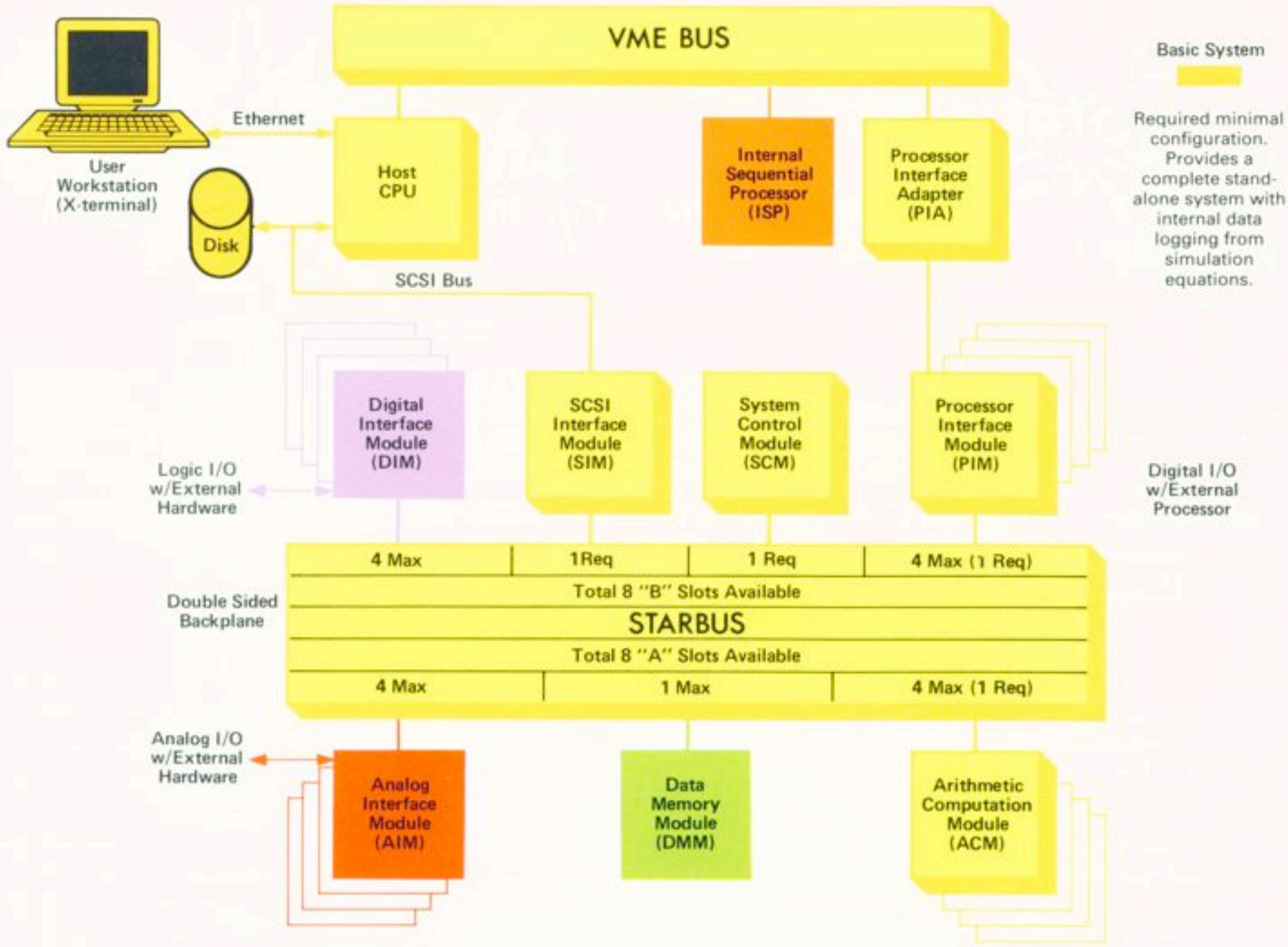
- The DIGITAL INTERFACE MODULE (DIM) provides 32 discrete digital inputs and 32 discrete digital outputs to communicate with digital hardware-in-the-loop. Four DIMs maximum allow for 128 discrete channels in each direction.

- The PROCESSOR INTERFACE ADAPTER (PIA), and the PROCESSOR INTERFACE MODULE (PIM) with its dual-port memory (32 bits wide), provide the link between ***STARLIGHT*** modules on the VME bus and the STARBUS. Three additional PIMs can provide independent run time communication with up to three different external processors, providing a data path into an existing computer system.

- An optional INTERNAL SEQUENTIAL PROCESSOR (ISP) is available for simulations that require sequential code (for example, simulation of a continuous system controlled by an embedded microprocessor). The ISP is housed in the same VME chassis as the Host processor, and runs without operating system overhead for maximum speed. The ISP may be programmed in any standard sequential language, such as FORTRAN, C, or Ada, and communicates with the ACMs via the standard PIA/PIM modules.

The SYSTEM CONTROL MODULE (SCM) provides the centralized program counter, which is distributed to the other processors and I/O modules to synchronize the entire simulation. The program is loaded into the ACMs, DIMs, DMM, AIMs, and PIMs through the Host processor on the VME bus and the SCSI INTERFACE MODULE (SIM) on the STARBUS. The SIM also monitors results between tests and will run diagnostics via the SCSI bus.

A key element in achieving ***STARLIGHT's*** high performance in computation speed and real world interconnection is the STARBUS. Designed by EAI, the STARBUS operates at a true 80 MB/sec sustained transfer rate. Hardware-in-the-loop connections come directly into the STARBUS, which operates at rates 2-4 times faster than conventional real world links. Not only does STARBUS allow ***STARLIGHT's*** various modules to perform their calculations at tremendous speeds, but it also receives data from and transmits results to your hardware-in-the-loop at increased rates. The com-



STARLIGHT System Components. All components shown (except workstation) are housed in a single tower unit.

bined result of ***STARLIGHT's*** computation speed with the high STARBUS throughput rate and automated scheduling means a more efficient operation and faster results in your hands.

PROGRAMMING METHODOLOGY

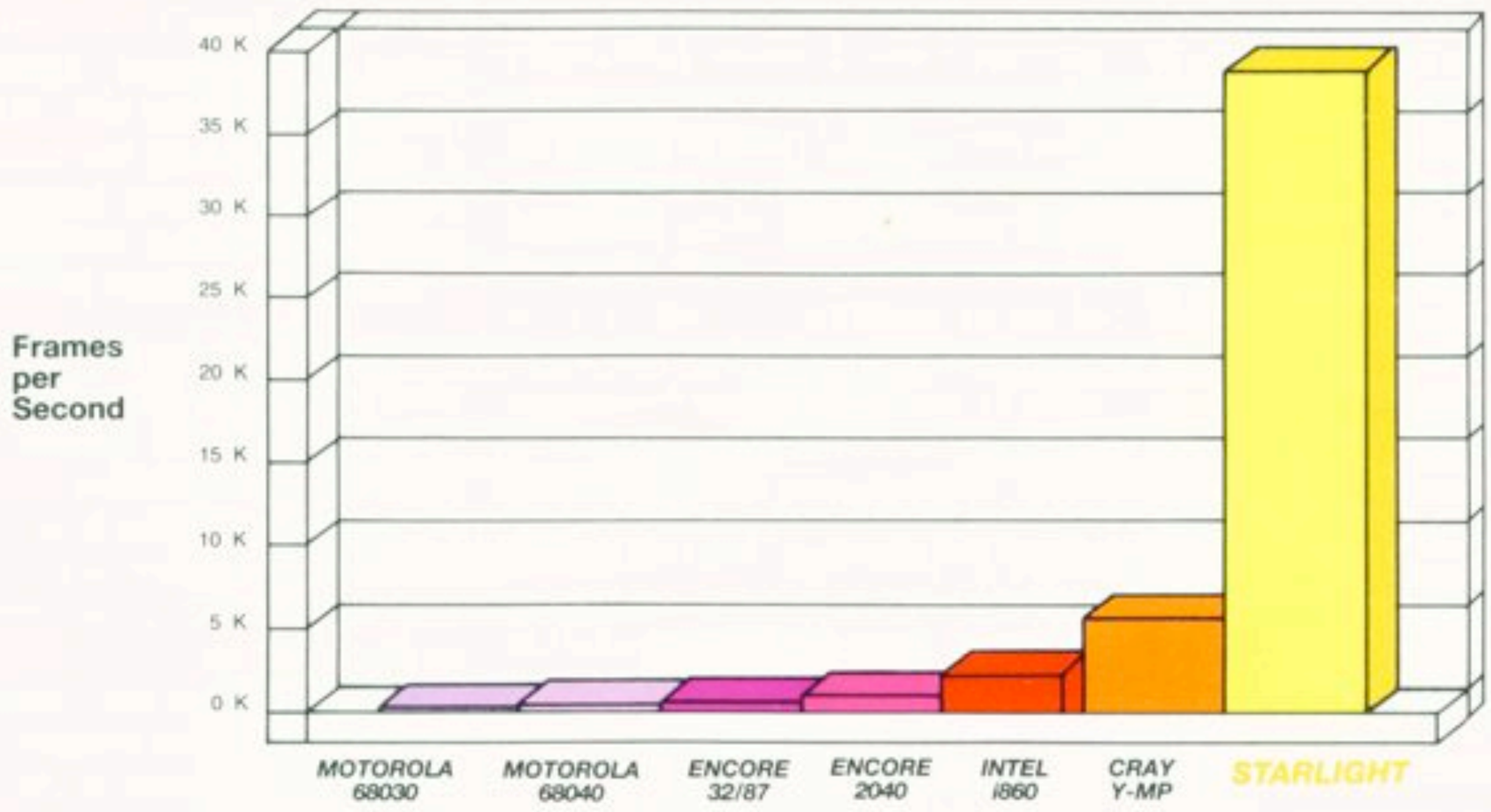
Your simulation model is programmed using the STARLIGHT INTERACTIVE SIMULATION LANGUAGE (SISL) which conforms to the industry-standard CONTINUOUS SYSTEM SIMULATION LANGUAGE (CSSL) specifications, freeing you from the details of numerical integration methods and sorting considerations. A continuous parallel system is modeled in a continuous parallel language, enabling you to model the system simply in terms of differential equations or transfer functions, WITHOUT THE NECESSITY OF TRANSLATING A PARALLEL MODEL INTO SEQUENTIAL CODE. For applications requiring sequential code, the ISP may be programmed in any standard sequential language (e.g. FORTRAN, C, or Ada).

Most currently available CSSL implementations translate the user's CSSL source program into an intermediate FORTRAN or C format, which is then compiled and executed in the usual manner. If speed is not a major concern, this simple approach is adequate. However, if parallel processors are used for speed, the compiler is forced to search this FORTRAN or C program for opportunities to "parallelize" it (despite the fact that the original problem was parallel in the first place). In contrast, the ***STARLIGHT*** compiler maps the SISL source directly into parallel machine code, omitting the intermediate step. Result...a more efficient program.

The availability of both SISL (for continuous parallel simulation) and FORTRAN, C, and Ada (for standard sequential programming) means that you can convert a module at a time from current programs, either to break up the conversion task or perhaps to run a particular component at a faster rate. You may also want to isolate a particular task that requires maximized computation power.

Starlight™

Gives you the competitive edge...



Measured speed for a typical non-linear dynamic simulation with 20 integrations

WHY *STARLIGHT* EXCELS

STARLIGHT's unique hardware architecture combines with the efficiency of the STARLIGHT INTERACTIVE SIMULATION LANGUAGE (SISL) to create a totally linked system. ***STARLIGHT*** handles the implementation of differential and algebraic equations, logic equations and function generation in a manner analogous to how they would be ideally programmed and run on a completely parallel multiprocessor computer. The SISL software breaks-up each mathematical equation and function generation statement into fundamental mathematical operations. It then automatically schedules the calculation and memory I/O code sequences to utilize the available hardware to its maximum physical efficiency. In this way, ***STARLIGHT*** achieves computing speeds that far surpass any sequential approach used by single processor, multiprocessor, or other parallel systems on the market today for this type of application.

WHEN YOUR APPLICATIONS ARE FOR REAL...
...EXPLORE THE POSSIBILITIES WITH STARLIGHT.

Electronic Associates, Inc.
185 Monmouth Parkway, West Long Branch, NJ 07764-9989 (908) 229-1100
Toll Free: 1-800-631-4198 **Fax: 1-(908)-229-1329**

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