SUPERCOMPUTING BY HANDHELD SEGMENTS
EXECUTIVE SUMMARY

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I. Synopsis

My patent-pending invention, "Reconfigurable Computing Array Without Chassis" (RCAWC), will deliver the power of a mini-supercomputer in flexible handheld segments. The light weight and power, lack of a clumsy chassis, and ease of reattachment open up uses that haven't even been thought of up to now. RCAWC offers the form and handling of an iPod(TM), the snap-together robustness of Lego(TM), and the power of a large cluster of blade servers or PCs.

The invention pieces together well-known component technologies using extremely quick-responding and robust software interconnects in which I have specialized. Once developed, it can easily and cheaply be customized to diverse specialized customer needs.

II. Advantages

A fair comparison is with rack-mounted blade servers, each drawing something like 200 W and having the computing power of five ordinary PCs. Each equivalent RCAWC segment would draw 5 W. This cuts down on cost, heat, fire-code violations, and strain on the UPS in case of power failure.

The RCAWC segment fits in the hand, making it easy to transport and avoiding heavy lifting, workplace injuries, and frequent damage. It is physically robust, with long life due to lack of tight-fitting touchy components, and it can be made weather-resistant.

The RCAWC "rope" is controlled from within its application program, not needing operating system or network support. It boots quickly and reliably instead of hanging and requiring rescue by technical experts. It is hot-swappable, so computing power can be added or reconfigured, or even removed, without downing a running program.

The RCAWC segment will retain its power/performance lead as CPU technology improves.

III. Markets

The RCAWC segments replace a cluster or supercomputer in fields that require 10 to 1000 times the computing power of a standard PC. This includes scientific, academic, financial, medical, military and sales applications, and many others that don't yet exist because RCAWC is needed to enable them.

On-the-spot analysis becomes possible without a call to a cluster or supercomputer. Possibilities include customer scenario response (sales or financial), live broadcasting (try a suggested storm path), building design variations (finite element), retailing, search engines, traffic flow, and medical data analysis.

Mobile computing needs only a laptop and lightweight segments, and no longer depends on cell or satellite connections that keep cutting out. Arrays with variable sensors, as for anti-pollution checking, can be carried in a suitcase instead of a semi, and mixed and matched as needed. Other possibilities include oil and mineral exploration, large-scale farming and forestry, hospital mobile units, airplanes including small planes, trucking, police cars, and military battlefield equipment.

IV. Development needs and resources

To reach the combination of electrical power and computing power desired, the CPU needs one more Moore's law or electrical cube-law step beyond what now exists, in the IBM Blue Gene(TM) for instance. This provides us cover by keeping the development from being obvious. Using only current technology resembling the Gumstix(TM), computing-underpowered prototype nodes can already be made.

All other hardware features — hot-plugging, power, communication, firmware, and the robust package resembling a light-rope — use existing technology. System and bootup design uses massive multiprocessing technology well known in the 1980s and 1990s. It passed out of fashion around 1995, providing cover for our development direction, but it is all recorded and reproducible.

Software principles and prototypes exist, and are well documented in the patent and in my related "Transparent Analogical" language project. See the companion executive summary and white paper for that project. OS support needed is orders of magnitude lighter that the heavy Linux basis of the Blue Gene and Gumstix, which will lower transistor count and electrical power needs.

V. Practical options

Development can follow several possible tracks, depending on resources and partners. A minimalist approach could use commercially available CPU and communication cores, adding *small, known* firmware to bring about the necessary node. In parallel, the electrical driver and hot-plug packaging is a standard development. Also in parallel, the software middleware component required to make a host program into an RCAWC "focus program" capable of accepting RCAWC assist is small, known, and prototyped in my old work.

A suitable partner could speed this development, adding software and peripherals like sensors that could take the market by storm, and carrying out the one power step for the CPU. Candidates include Apple, famous for the iPod and for educational computing; IBM, low-power node Blue Gene developer; Intel, AMD, TI, or any number of other leading edge CPU developers; and even embedded hardware makers like Microchip Technologies.

The "Transparent Analogical" language development, which could be carried out in parallel with this one for synergy, is a good candidate for open-source and an academic or DARPA contract. It would do a public service by solving the complexity and lack of robustness problems of all modern software, and at the same time would support, and offer an introduction to, our hardware.

VI. Details

For a detailed discussion of the technology and plans, see my patent application. For a discussion of the supporting software issues, see also my "Complete Language Instance — Executive Summary" or its white paper "Transparent Analogy as a Foundation for Language." For technical and personal references and details of ownership and cost, please inquire.