Remote Access Servers and Remote Access Concentrators - Problems and Solutions

Technology Overview
The overwhelming majority of Internet and WAN access is through dial-up modem connection. Indeed, DSL and Cable broadband connections will become more common in the coming years; however, the majority of users, whose numbers are growing daily because of the increasing popularity of the Internet, will continue to use analog connections, at rates of up to 56Kbps, for network connectivity. These analog modems will be used for Internet browsing, eCommerce, Voice over IP (VoIP), Fax over IP (FoIP) and accessing corporate LANs. ISPs and businesses must meet this growing need for analog connectivity through increasingly complex equipment.

Remote Access Servers (RAS) allow telecommuters to access the corporate LAN by dialing through the Public Switched Telephone Network. Their larger counterparts, the Remote Access Concentrators (RAC or Monster RAS), are used by ISPs and other Network Service Providers who are bombarded by thousands of simultaneous calls directed mainly towards the Internet.

The increasing popularity of VoIP and FoIP driven by the Enterprise work environment will place even more diverse demands on access equipment because of the need for convergence of these different services.

Core Technology Problems with RAC and RAS

Remote Access Concentrator (RAC)
Size (the amount of simultaneous dial-up users that can be served) and scaleability classify Remote Access Concentrators. Additional criteria within a given category are availability, throughput and the cost performance ratio.

Degraded throughput
Vendors claim that their RACs meet five 9s requirements. However, in practice many RACs drop a certain percentage of calls or degrade throughput when all ports are active.

Problems with density
Added to this, ISPs and other providers have a basic need for density. With Collocation monthly charges reaching several hundred dollars per rack, ISPs and other providers require maximum density. Today’s technology enables RACs to handle several DS3s per rack. However, this greater density is at odds with NEBS standards. The NEBS’ top limit on power dissipation for any rack placed in a central office creates a tight power consumption budget. The response has been that access chip manufacturers are constantly working on new multi-port, low power chipsets.

Built-in obsolescence
The pace of technological change means that equipment "ages" quickly. Complexity is also increasing due to the demand for added functionality (e.g. Voice and Fax over IP) and ease of management. Manufacturers have attempted to future-proof their equipment by speculating on the favorable mix between a DSP core and hardware accelerators in their chipset. These less than state-of-the-art hardware fixes result in inflexible architecture. Chipsets optimized for a given standard have difficulties handling new standards. The result is the constant adding, replacing and upgrading of equipment at great cost to the providers.

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Reducing throughput and availability concerns

Traditional methods of call allocation such as round-robin, least recently used, next and first available do not cope with increases in volume. When all ports are active, the previously mentioned problems in throughput and availability make themselves felt.

RAS - multi-service juggling

As CPE equipment, the smaller RASs do not share the density constraints imposed on RACs. However, as the small and medium size business sectors expand, and their demand for Internet access expands, so do the demands on the RAS equipment. The remote access server must juggle different demands: These WAN gateways have to handle incoming V.90 calls from telecommuters to the LAN; VoIP to the service provider, FoIP and fax relays. Integrated Access Devices (IADs) incorporate these different functions and the market for IADs is booming due to same expansion of the small and medium size business sector and use of the Internet.

Software Access Solutions

Vendors must provide future-proof, reliable, open and dense systems while maintaining the cost performance ratio. These systems should be economical in power consumption and flexible through software upgrades. Fixed design access chipsets, and their lengthy time to market, are clearly not adequate responses. Fixed designs use an architecture based upon different chipsets tailored together, each offering a certain functionality. This has led to a search for powerful open solutions that are easy to tailor, enable flexibility in both design and use, and reduce the high costs of the present technology. Software access solutions based on advanced DSPs are the logical solution to these problems.

Surf-based RAS card: A single design for all data, fax and voice services

Flexibility vs. chipsets

Soft-access-solutions provide answers to the RAC in terms of saving in MIPS, Watts and real estate. With their ability to run various services concurrently, they also provide:

- a single source for all the IADs tasks
- a single DSP based generic platform that simplifies design
- the ability to provide an entire family of products aimed at business of any size, by simply altering the mix of integrated software stacks
- the ability to handle DSL technology integrated into the IAD

Today, all this and more can be handled by state-of-the-art DSP’s. The DSP can run different services concurrently through multi-tasking software. This also gives vendors the ability to tailor IADs and servers through the use of software. Thus, soft-access solutions become the optimal core for these machines. New offerings by IADs, such as DSL
interfaces and VoDSL are easily integrated into a DSP, without the need for an assortment of chipsets.

**Modern Access Solutions - RAS in a square inch**

A family of software access products, such as that offered by Surf Communication Solutions, is built around a general purpose DSP design that incorporates different software loads. This means that solutions can be directed easily at the multi-use RAS market needs.

One of Surf’s innovations is a T1/E1 server on a single, one square inch chip. Surf has also engineered a channel manager named SMP that can simultaneously run the complete range of V series modems, faxes and vocoders on a single chip. By providing code that runs on the latest industry standard DSPs, designers can use the latest IC high-performers as soon as these are available. Solution providers specializing in DSP software are seen by the silicon manufacturers as complementary partners who provide them with advanced samples of their latest technology. This means that advanced software DSP access solutions are readily available as soon as the latest technological advances are available in production quantities on the market.

**Maintaining the technological advantage**

Chipset manufacturers require long development lead times while they embed weaker and less flexible DSPs into their IC design. The resultant inflexible product will be released at least one year after the comparable soft-modem has entered the market. This results in a Chip generation gap between the two approaches. Software solutions relying on the DSP industry leaders - the companies that build the most advanced FABs and DSPs (0.15um instead of 0.35um, for example) - will be, at any given time, technologically more advanced than non-DSP specialty chipsets. In the same way, a DSP based remote access solution will require less power and space than a comparable chipset. This minimizes the power requirements and PCB real estate. That is DSP access solutions are found in Carrier’s infrastructure RACs, in sophisticated Enterprise access solutions and even in systems which have severe space and weight restrictions such as airborne RASs.

**Optimal use of resources**

A software access solution, such as Surf’s Multi-access Pool (SMP)™ resolves call allocation by calculating the available processing power of each DSP against the requirements of the incoming channels. By managing and distributing calls between the DSPs according to the load on each, DSPs are optimized for the maximum volume and type of calls that can be handled. Any combination of voice-band-data, fax, and VoIP channels is possible on a single chip - all at optimal performance rates and without pushing the system over its limits.

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Easy provisioning and in-service scalability

The software access solution meets the needs of providers for provisioning and in-service scalability. The DSP software’s built-in flexibility enables the provider to cater to the constant changes in V series recommendations running concurrently on a single chip. A chip can handle, simultaneously, any mixture of VoIP, fax and V.90 sessions. Incoming calls are automatically balanced between these changing demands. In effect, the soft-access solution future-proofs the RAS because it keeps the RAS concurrent with the latest standards through painless software upgrades. By using a single chip, the DSP based solution saves on costly space and does so at very low levels of heat dissipation. This is accomplished despite handling the entire traffic of an entire channelized T1/E1 with a single chip.

Latest protocols

The following standard protocols are commonly found in access equipment and are implemented in software solutions such as Surf’s SMP:

- V.90 digital and analog modem pool, in addition to previously used V series standards
- Fax as V.17, V.29, V.27ter, V.34 HD and T.38
- Vocoders such as G.711, G.723.1A, G.726, G.722.1, G.728 and G.729A & B
- xDSL, G.DMT, G.Lite
- ISDN support

Protocols are integrated easily through the dynamic management of DSP resources and channel allocation to a multi-DSP board. Smart API’s and Host port interface (HPI) support, ease the integration effort for implementing advanced remote access servers and concentrators.

In Search of Excellence

Today’s rapidly changing telecommunications industry places extreme demands on the technology suppliers. The only way to meet these demands is by providing focused, specialized technology. On the one hand, the experts in DSP silicon chips are constantly achieving remarkable technological breakthroughs with products that provide greater and greater MIPS horsepower at lower power and smaller size. On the other hand, DSP software experts such as Surf Communication Solutions are completely focused on providing the best DSP software on these advanced DSP platforms for the most advanced remote access protocols. When the technological experts from the silicon and software world team together, each with its own focused products, the result is a compelling remote access solution that successfully meets the demanding challenges of the telecommunication industry.