Application Delivery Systems: A Survey Of Approaches

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Something is always going wrong with the network or servers. When things go wrong, you can chase each problem down and fix it piecemeal, or take charge and install a permanent mitigation solution. Such solutions, which assume many forms, are called application delivery systems (ADS). Application delivery systems make applications perform better on existing servers and networks. They change, pull, push, convert, protect, and perform amazing feats to make bad applications behave.

To date there has been a gulf between networking teams and the teams responsible for applications running over the network. Because of this organizational disconnect, applications often don't work well over the network.

Fortunately, networking and applications teams, which previously didn't talk, are starting to cooperate. Rather than applications teams "fixing" applications, which is expensive, time consuming and difficult, enterprises are beginning to turn to application delivery systems to compensate for the shortcomings of the applications and servers--as well as the shortcomings of the underlying network.

This is a survey of ADS approaches, the vendors that supply them, and the market for ADS solutions. We surveyed 40 ADS product vendors. Despite our best efforts to include them, traditional network equipment vendors Avaya, Cisco, Juniper, and Nortel--all of whom have applicable products--chose not to participate in the survey. This may signal their willingness to cede this dynamic $2 billion market to smaller, more nimble competitors, some of whom are poised to dominate the market.

Alternative ADS Approaches

The clearest clustering among ADS approaches is into network or application-focused camps. Products in the network-centric camp operate at the packet layer and see all traffic. They can control, shape and/or accelerate traffic flow--up to and including the TCP layer. Some devices reach higher into the protocol stack using deep packet inspection, and make stateful decisions across all network traffic based upon network conditions. An example of such a stateful decision might be to ensure that a new and unknown traffic source is allocated a modest amount of bandwidth and is not allowed to adversely affect mission critical applications.

Products and services in the application-centric camp are designed to improve the delivery of a limited set of applications, but with very high functionality. The application-centric ADS solutions are associated with a server and the limited number of applications running on that server, but they see all the traffic and users accessing the server. Many of these solutions operate at a high level of abstraction, possibly aware of application process logic and unique user needs, and making decisions based upon the state of the process in light of all user states. An example of such a decision might be to ensure that a user who is about to make an expensive purchase receives good service, and a link to an easy credit offer.

The two types of solution are implemented very differently, with most network-centric devices designed to be distributed in many enterprise locations, and most application-centric devices designed to operate alone in front of a server.

The distributed nature of network-centric ADS solutions has led to a range of devices covering needs of small to large locations, and since they are deployed in many remote devices, their strong suit is remote management, policy and diagnostics. The result is that network-centric ADS products tend to scale easily in number, and managing hundreds of far-flung devices is commonplace.

Application-centric solutions sometimes provide redundancy and global load balancing across datacenters, but unlike their network-centric counterparts, their management tools scale only to the tens, not hundreds of devices. On the other

hand, they scale in a different dimension: throughput. Competitive pressure drives application-centric solution vendors to support gigabit data rates, thousands of simultaneous connections, thousands of active SSL sessions, and huge state tables of cookies and URLs. Welcome to the world of big iron!

An enterprise's type and needs further differentiate ADS offerings. Some enterprises need an ADS in a few key locations, while others with a distributed user population may want to extend the ADS solution as far as possible towards users. Given the divisions along network-versus-application and central-versus-distributed lines, we can break the ADS landscape into the four solution classes shown in Figure 1. These solution classes include:

Traffic Manager: A network-centric device that sits at the LAN-WAN boundary and controls the traffic coming to the LAN. Most of these devices perform bandwidth management based upon application groups. Although they are often referred to as "application aware," they are not application-centric as described above. The control generally does not require another device on the other end of the connection. Carriers can supply these devices as part of a managed service.

Acceleration System: These devices generally require boxes on both ends of a connection, however, given that they are in many locations, they can operate as a mesh network of their own (note the interconnected campus networks shown in Figure 1). These devices perform most of the traffic control of a traffic manager, and add application acceleration by making TCP run faster. A few speed up HTTP as well. The resulting acceleration shortens the response times of transactional applications.

Application Front End (AFE): An application-centric device that operates in a datacenter and is bound to a server (this is the equivalent of the mainframe communications front-end). These devices first and foremost offload the server by performing TCP connection management, SSL processing, XML processing, content caching, dynamic compression, etc. These are all functions that a server can perform in software, but that are more effectively performed by a specialized box. Many of these devices also provide additional features that improve the user experience (see *BCR*, March 2005, pp. 54-59).

Application Delivery Network (ADN): Many AFE functions are symmetrical, and need a mate on the other end of the connection to finish the process they started. AFEs rely on the browser as the second half of the solution, which has the advantage of ubiquity, but has limitations in that not all browsers are the same and many desktops may be limping under the strain of poor configurations or competing software, and there is a limit to what can be done within the confines of the browser.

An application delivery network puts a new partner into the path in the form of a server on the Internet. An ADN service intercedes on both ends of the connection and can thus perform a wider set of more effective acceleration functions than an AFE. Typically, ADN servers are inserted into the path through DNS redirection, but in some cases the server side of the connection is terminated and processed by a device in the datacenter that is much like an AFE.

Figure 2 places the leading ADS vendors into the four solution classes described above. Although some vendors may supply solutions in more than one class, we have placed each vendor into the primary solution they supply.

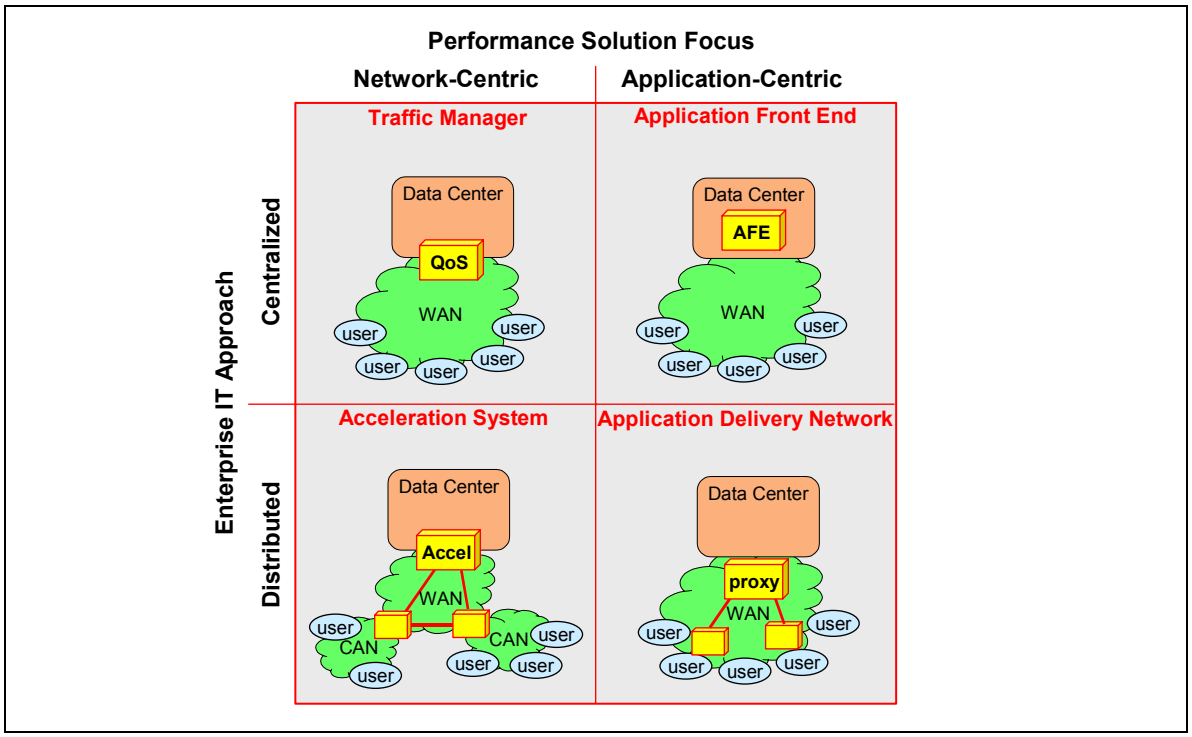

Figure 1 – Alternative Solutions

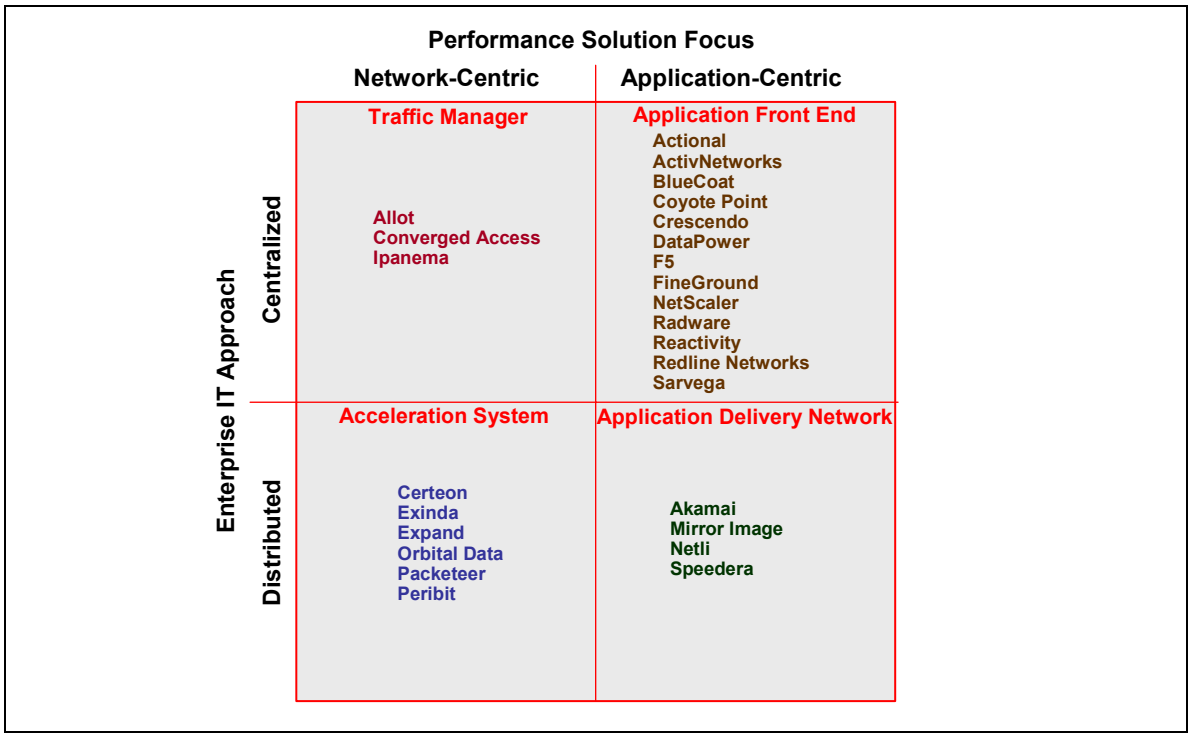

Figure 2 – Vendors Supplying the Alternative Solutions

ADS Functions

All ADS products and services provide performance improvement, but do so in various ways. NetForecast has created a framework for understanding six basic performance functions (see *BCR*, November 2003, pp.8-10). Each of the six performance functions can be improved by adding control or enhancement features as shown in Table 1. NetForecast gave points to each vendor for functions performed in the "control feature" and "enhance feature" columns in Table 1.

Control features add stability and management to infrastructure and service delivery, but do not add capacity to the infrastructure or accelerate the user experience. Increasing capacity and speeding transactions are made possible only by "enhancement" features.

Table 1 – The Performance Benefit Matrix

	Control Features	Enhance Features
Asset Functions		
Provisioning - Ability of the system to establish new service or recover failed service.	Maintain service continuity in times of system stress. Example: keeping service available to important users during high traffic periods.	Improve the ability to maintain or add services. Examples: ability to shift traffic to alternate data center, ability to seamlessly roll out new applications.
Efficiency - Ability of the system to best utilize the assets.	Make better use of assets. Example: traffic volume controls by application class (bandwidth management).	Permit assets to operate at higher utilization. Example: Compression that adds virtual bandwidth.
Protection - Ability of the system to protect itself from malicious use that would degrade the asset.	Maintain service during times of system attack. Examples: limiting denial-of-service attacks, virus filters on inbound traffic.	Improve asset security. Example: adding IP-sec VPN to remote users.
Experience Functions		
Accessibility - Ability of the system to provide the broadest access to authorized users.	Ensure proper users have access to applications. Examples: enforcing access control lists, differentiating service by user class.	Increase the number of users served. Example: enabling dial-up users to use an application that was limited to broadband users.
Quality - Number of users that are satisfied with the interaction process (e.g., response time, MOS).	Maintain nominal response time. Examples: bandwidth management, forward error correction to overcome loss.	Improve response time. Examples: making TCP run faster, adding TTR, adding compression.
Safety - User safety while interacting with the system (privacy, identity protection, anti-virus assurance, etc).	Prevent malware from reaching the user. Example: spam and virus filters on outbound traffic to the users.	Add safety to the user experience. Example: scrubbing cookies at the end of a session.

Let's illustrate the difference between the benefits achieved through control and enhancement. Controlling bad traffic with a traffic manager so that good traffic gets priority use of fixed bandwidth can provide a reliable and predictable user experience under periods of network stress. But it does not add bandwidth, nor does it make transactions run faster.

On the other hand, enhancing technologies such as compression do add effective bandwidth, which can support more users, and/or allow transactions to run faster. If there is content that can be compressed, then all of the good traffic runs better all of the time. However, compression will not keep bad traffic in check.

Control and enhancement serve different ends. Control shines when there is rogue traffic, whereas enhancement shines when there is compressible traffic.

It is important to understand your own set of performance challenges, and to be vigilant about claims vendors make. Many vendors are quick to claim that their primary feature, be it traffic management or compression, works all the time, keeps out bad traffic and makes everything run faster. That is unlikely to be the case, so buyer beware.

NetForecast's survey mapped the features of each participating vendor's product into the 12 performance benefits described in Table 1. In general, most of the vendors supply both control and enhancement. Until recently, vendors could easily be categorized as controllers or enhancers, but with the exception of traffic managers, which remain primarily control devices, that distinction is fading rapidly as control and enhancement are becoming integrated.

That said, we predict that control without enhancement will remain a niche market for enterprises that have big "bad" traffic management problems, like universities with impish and diversion-hungry students, and network service providers who bear the burdens of their many types of users and abusers.

Although some devices on the market are strong on enhancement and light on control, this is a risky proposition because the enhancement engine may very well accelerate dangerous traffic. For example, a mail acceleration system will speed the mail--along with any viruses or worms that are in the mail. Our prediction is that vendors with uncontrolled acceleration will need to add control or look for another line of work.

Assessing ADS Product Capabilities

Figures 3 and 4 illustrate the many ADS product capabilities, where we placed vendors on a matrix: functions performed versus applications supported in. On both axes we captured a count of product capabilities and accounted for the level of sophistication supported in each case.

Figure 3 shows the network-centric vendors. As expected, most of the network-centric products support many, if not all, applications. However, there is enormous variation in functions supported. The traffic managers (shown in red), cluster in a simpler, control-only world, whereas Packeteer, Peribit and Expand stand out from the pack as the function/application leaders among network-centric vendors.

Figure 4 shows the application-centric vendors, which exhibit a greater variety of function and application coverage than their network-centric counterparts. In the application-centric world, it is not at all bad to support just a few applications, because an enterprise often buys the device to control or enhance just *one* application, and do it really well. If a particular product supports that application with the functions you need, you've made a perfectly good choice. However, as with the network-centric vendors, the application-centric vendors that are farther to the right lead the pack in supplying more sophisticated functions.

Notice that two XML-focused players, Sarvega and Reactivity, have highly sophisticated Web services-specific function sets. Netli inches out Akamai for functionality in the ADN services product class, but Akamai supports more applications. Blue Coat and FineGround fare well among targeted AFEs, and among big traditional multi-application AFE vendors, F5, Redline, and NetScaler lead in application/functionality.

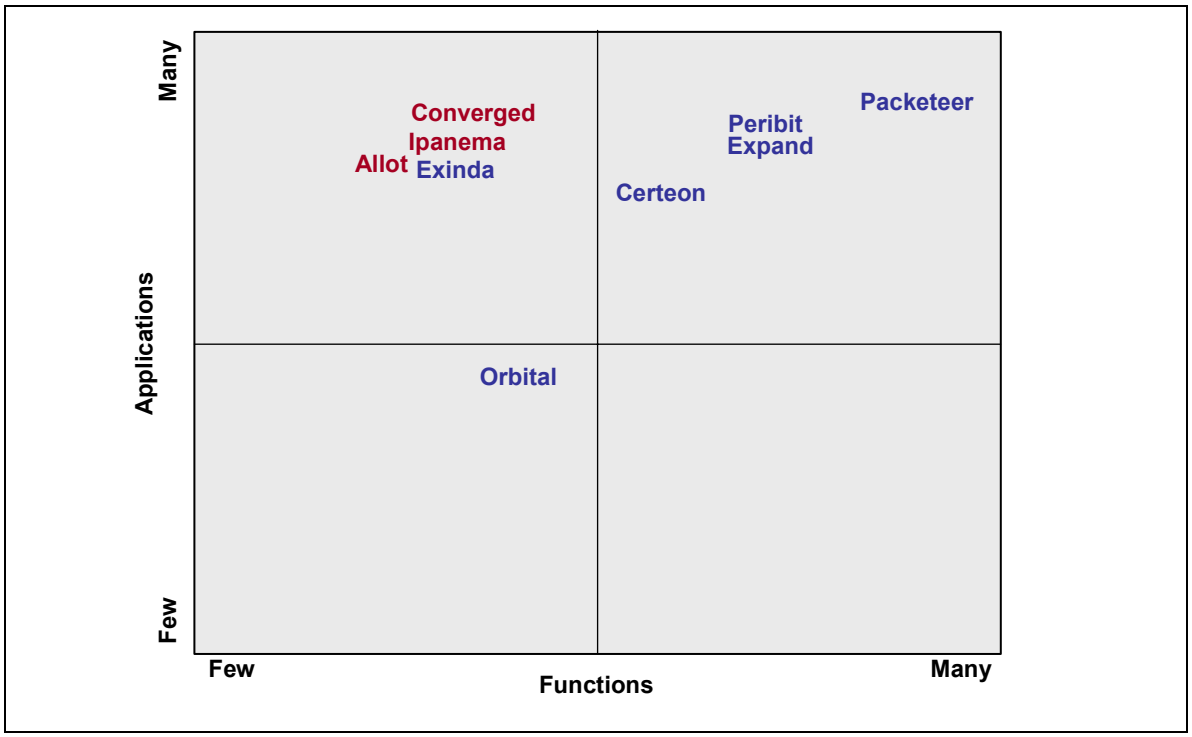

Figure 3 – Network-Centric Features

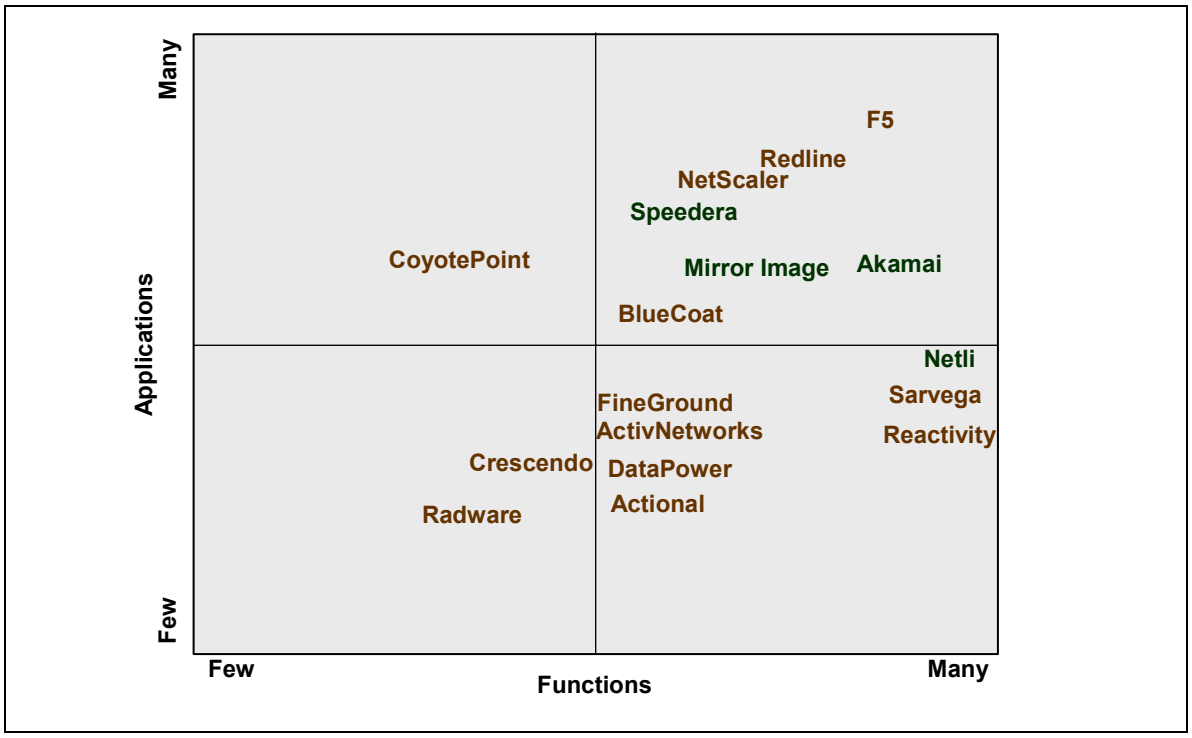

Figure 4 – Application-Centric Features

Market Evolution

The ADS market started in the mid 1990s with single-function products focused on a limited set of control or enhancement features. It then transitioned to multi-function devices and services that are now morphing into even more complex solution offerings, and spawning a race to add functions--to check all the boxes in Table 1--and we are beginning to see competition across product classes, and vendors selling into the other squares in Figure 1.

Features are being added through internal development as well as acquisition, and policy management will fast become a must-have as the feature counts climb. Given a potential of more than a dozen functions that can be performed on more than a dozen applications, it is not clear that the enterprise wants all 144 combinations operating at the same time! Because they are ahead in managing many distributed devices, network-centric players are better positioned to provide policy management software for the control of many applications.

NetForecast believes that the next phase of product evolution will be the ADS platform. This platform will be a maturing of the choice of functions into a comprehensive delivery solution. The ADS platform will provide full disintermediation between the users and the applications, and provide a single touch-point for the user to operate many applications in a variety of environments: desktop, PDA, conference call, podcast, cell phone, interactive TV.

Conversely, the system will provide presence and connectivity status to the applications as needed. The system will control access certificates and manage regulatory compliance by copying sessions to appropriate repositories. This may provide the hook to let Big Brother watch your every move; however, it may also provide the place where the user receives assurances that only the systems they want to know about them can do so, while other systems will be proxied and kept at bay.

Initially, we will know that an ADS is a platform when a vendor can no longer say, "If anything goes wrong, we just fail over to a wire." Going to wire is not an option when you are the critical junction of all sessions. Eventually, we predict that some ADS systems will become so sophisticated that their providers will make guarantees about the reliability and safety of their system. Think of an assurance similar to the credit card companies, "Yes, someone may steal your number, but you are only liable for the first $50 in charges." That assurance comes not from your bank or the merchant, but rather from the intermediate credit card *network*.

Emerging Market Shift

As interesting and exciting as the evolution described above may be, it is not the most significant change in the works. Until now, the four product classes have had natural barriers among them and enough distinction of approach that they have not competed head-on. Some cross-class competition exists between traffic managers and acceleration systems because they are cousins within the network-centric group. Similarly, AFEs and ADNs compete as alternative delivery mechanisms for the Web-based world. However, there has been little competition across the application and network worlds. That is about to change.

Figure 5 shows that the AFE, ADN and traffic manager product classes are neatly tucked into well-defended niches. However, the typical enterprise that has a wide range of location sizes (small office to big campus) and an equally wide range of traffic needs is only half served. Acceleration systems have done well covering the network-centric needs of this group, but current application-centric solutions have not sufficed.

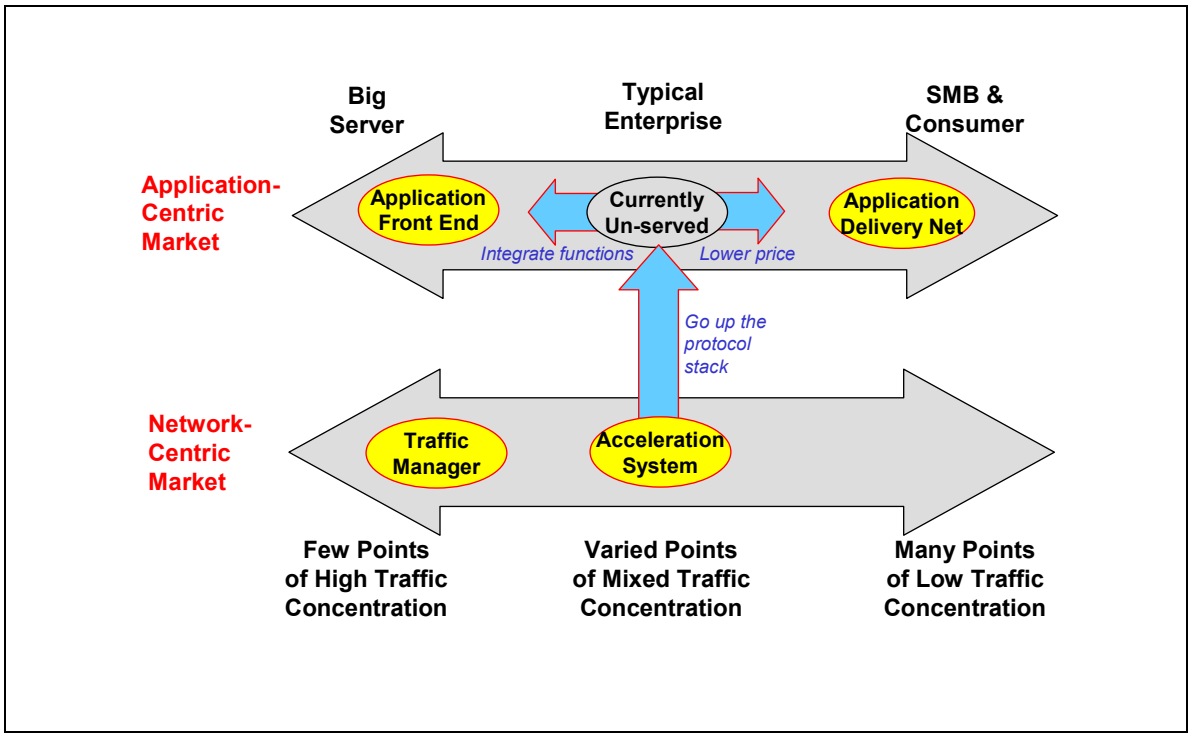

Figure 5 – Emerging Market Shift

There are two ways to fill the void: modify AFEs to scale in number rather than throughput, or move the acceleration systems up the protocol stack with more application-aware sophistication.

It is very unlikely that the former will work. Such a shift of product design and expertise will be hard. Once a company is in love with its ASICs, it never lets them go. Furthermore, the AFE and ADN vendors have little experience in watching and controlling all the traffic that is essential in the general enterprise market.

The latter shift, on the other hand, is easy. Acceleration system vendors built the proper foundation for filtering all traffic and managing thousands of boxes at once. New developments at the leading acceleration system vendors show that they are building expertise in application-aware functions.

The second half of the strategy is also already emerging--lowering the price point of smaller devices targeted for the small office. As companies like Packeteer, Peribit and Expand roll out new low-end devices and add key application management software, they are opening a new untapped market.

Once a few leading companies, along with recent start-ups, penetrate more broadly in the enterprise market and begin adding platform features, they will take market share from the AFE players. In the long-term, the market will likely have a different segmentation model along “customer facing,” and “enterprise contained” lines.

This divergence will be especially prevalent among the “enterprise contained” solutions, where, for cost, management and simplicity's sake, enterprises are loathe to deploy separate solutions for different applications, and vendors are eager to deliver more value.

“Customer-facing” solutions are more likely than “enterprise contained” solutions to take the form of services rather than hardware or software products. Unlike their “enterprise contained” product counterparts, the “customer-facing” solutions will be focused on a limited set of applications--primarily Web based applications. One reason for this is that services can provide scale that an

individual enterprise can't match without massive infrastructure investment and management headaches. The move to services for "customer-facing" solutions is likely to become the norm for businesses of any size.

Conclusion

Eventually, a dialogue about standards and interoperability will emerge. Many customers own two types of solutions: Today it is centralized AFEs and distributed acceleration; tomorrow it will be customer-facing and enterprise-contained. At some point the enterprise wants these to work together. The industry is very far from supporting such a requirement. Today, vendors don't even use the same term for a common function like gzip (a compression utility)!

The next five years will be action-packed. By the end of that time, today's network equipment gorillas may have taken notice and may have consumed some of today's aggressive small fry. Stay tuned.

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Companies mentioned

Actional (www.actional.com)
ActivNetworks (www.activnetworks.com)
Akamai (www.akamai.com)
Allot (www.allot.com)
Avaya (www.Avaya.com)
BlueCoat (www.bluecoat.com)
Certeon (www.certeon.com)
Cisco Systems (www.cisco.com)
Converged Access (www.convergedaccess.com)
Coyote Point (www.coyotepoint.com)
Crescendo (www.crescendonetworks.com)
DataPower (www.datapower.com)
Exinda (www.exinda.com)
Expand (www.expand.com)
F5 (www.f5networks.com)
FineGround (www.fineground.com)
Ipanema (www.ipanematech.com)
Juniper Networks (www.juniper.net)
Mirror Image (www.mirror-image.com)
Netli (www.netli.com)
NetScaler (www.netscaler.com)
Nortel (www.nortel.com)
Orbital Data (www.orbitaldata.com)
Packeteer (www.packeteer.com)
Peribit (www.peribit.com)
Radware (www.radware.com)
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Redline Networks (www.redlinenetworks.com)
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