Application Velocity

A New Holistic Approach to Application Performance Via Borderless Networks

by

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Abstract

Information flow precedes cash flow, and in the Global economy networks and applications deliver intrinsic value to both. The huge investment in corporate application portfolios have never been optimized in a holistic manner, rather each application or suite of applications is optimized via specialized management tools. In today's corporate world IT business leaders are faced with increasing application performance demands for both legacy and new cloud based applications to deliver excellent user experience while contributing to corporate agility. In this paper we offer a new holistic network service approach to application performance optimization called Application Velocity.

Major IT Delivery Transitions IT Business Leaders Are Managing

Application owners and developers have been deploying and writing applications as if networks had no boundaries or were borderless. By application owners we mean IT departments chartered with IT application delivery and management. By application developers we mean in-house corporate software developers, independent software vendors or ISVs and software companies. There has always been a disconnect between applications and network architects where developers write applications to run over a network as long as there is connectivity. In addition, service oriented architecture (SOA) based applications call for greater application componentization, which increases messaging between application components resulting in the network having a direct impact on application performance. In essence application owners, developers and application standard bodies assume that networks are borderless as the industry is organized around the OSI model where knowledge and skills at one layer e.g., the network is not necessarily taken into account at another layer i.e., the application. Therefore, the normal state of affairs is that network designers have been tasked to optimize applications to improve user experience especially when the application was not written to run over a particular kind of network.

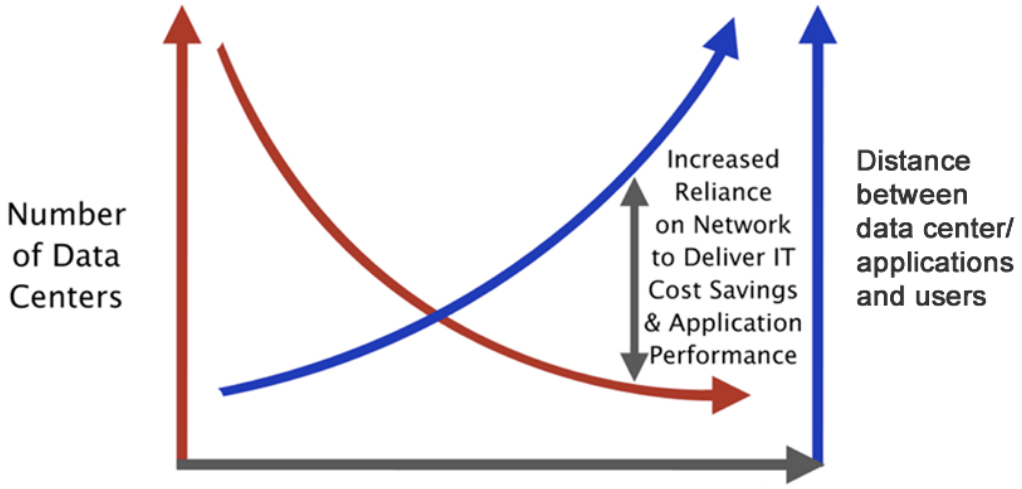
Every cycle of computing has brought with it this discontinuity between applications and networks with the possible exception of mainframe computing and SNA. Minicomputer applications designed for local ASCII terminal connections were extended over the Wide Area Network (WAN) and via virtual terminals. Client-server computing applications designed to run over Local Area Networks (LANs) were extended over the WAN. At first the internet was text based until the mid 1990s when the web was developed bringing graphics, audio and video to a network that needed a massive upgrade to support new media rich applications.

IT today is no different. Application developers are writing mobile applications at a frenzied pace thanks to Apple's iPhone and iPad, Google's Android, RIM's blackberry and now Cisco's CIUS etc. Legacy enterprise applications are being extended to mobile platforms too with the assumption of a suitable network for delivery. At the same time applications are being increasingly centralized into consolidated data centers creating greater distance between users and their applications plus data. Some estimate that over 80% of enterprises have under gone a data center consolidation process, which is significant, but we are just at the being of the centralization trend.

Thanks to the economics and performance offered by server virtualization much more consolidation will occur with associated challenges. For example, IT leaders require application tracking as applications are moved from Virtual Machine (VM) to VM as they tune/optimize their virtual infrastructure or respond to peak loads as well as manage VM failovers. In addition to virtualization, massive data centers we call cloud-computing facilities are being built to host applications at scale plus offer infrastructure, platform and other IT services. According to the Yankee Group, 56% of IT business leaders seek to take advantage of cloud computing technology and build their own private cloud center while 24% seek a fully managed cloud computing facility. In the same study, 32% of IT business leaders will seek a hybrid cloud approach; that is connect their private

cloud to a service provider's public cloud. While these market numbers are impressive they could be much higher as IT leaders express that their top three concerns as they consider cloud services is application performance issues, according to IDC.

In addition to increased mobile and cloud computing trends, video communications both on-demand and real-time has become the largest percentage of internet traffic type. In fact, Cisco Systems recently predicted that by 2014 video traffic will be greater than 94% of all global internet traffic!



This disconnect between applications and network architects will more then likely continue as application owners/developers/standards continue to view networks without borders and boundaries. However for most network architects there is no single network, but a wired network, wireless, campus, wide area, data center, branch office network, telecommuting network, mobile network, etc. In fact most enterprises have a diverse infrastructure in which they are tasked to delivery applications over and for those applications to perform at high standards. The good news is that network designers and architects are starting to build borderless networks that anticipate unforeseen application changes, are equipped with a portfolio of application performance features and simplify deployment and management of IT services. More on this below.

Application Performance Challenges

From the above discussion it's clear that enterprise-computing applications are being demanded and stretched over increasingly borderless networks. Consider that the number of small or remote offices and mobile employees are increasing significantly. It's impossible to argue the mobile computing surge with over 3.3 million iPads shipped in its first three months and new entrants such as Cisco offering its CIUS tablet for business users. In addition, data centers are being consolidated with cloud computing offering further consolidation and centralization of applications. Applications are changing too as developers add rich media features and video becomes a dominate application type. Employees, customers, partners and suppliers will be accessing applications over ever-larger distances, via a plethora of endpoints and different networks,

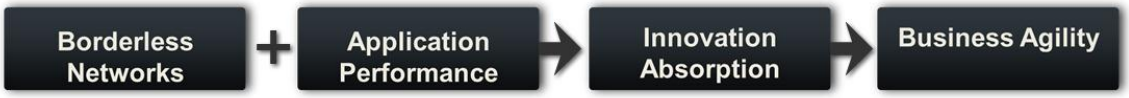
To assure applications perform their task and deliver an excellent user experience, network architects and designers will be increasingly challenged with network capacity being taxed as a wider application portfolio competes for network resources. Today's model of application performance optimization is to implement appliances within remote sites and data centers, which increases certain application performance, but at the high capital and operational expense of increased network complexity. In addition to network capacity and complexity issues, latency or application transaction delay and how to efficiently utilize data center resources are challenges faced by network architects as they seek to maintain high application performance over a borderless network. Relating specific application transaction problems to network behavior to ascertain if a correlation exists is yet another challenge.

Application Performance Creates Corporate Value

At the center of application performance is corporate performance. The ability of IT leaders to respond to executive management directives is directly linked to corporate performance. Executive management may be challenged with a competitive threat or a new market opportunity etc., requiring fast corporate response. IT leaders that can execute directives quickly have built an agile business capable of changing when markets or customers shift under them placing their corporation in a better competitive position to serve its customers and prospects. For example, consider a retail store under competitive pricing pressure where executive management decides to respond with an alternative offer. IT may be able to display the new offer via digital signage quickly allowing the business to respond.

Key to business agility is the IT attribute of rapid innovation absorption, that is, the capability to deploy new applications and technologies at the speed of business opportunity. Most IT infrastructure consist of innovation and features which are already in place, but IT organizations require knowledge, skills and tools to put them to work when needed.

A borderless network that is capable of application performance delivers these attributes of innovation absorption and business agility. In addition, IT resource utilization can be optimized, and most importantly to users is that they gain an excellent IT experience independent of geographic location, endpoint device, or application, which in the end improves productivity. As an example of optimal resource utilization, consider Cisco's ISR G2 branch office router that integrates unified communications, wide area application optimization, network security, LAN/WAN networking plus supports its AXP or Application eXtension Platform which run applications at the branch office router. In one branch office an IT manager can deliver networking, security, voice and video communications and host applications while gaining visibility to applications. This type of resource utilization not only saves on capital cost and energy spend, but offers IT operational efficiency, rapid application deployment and innovation absorption.



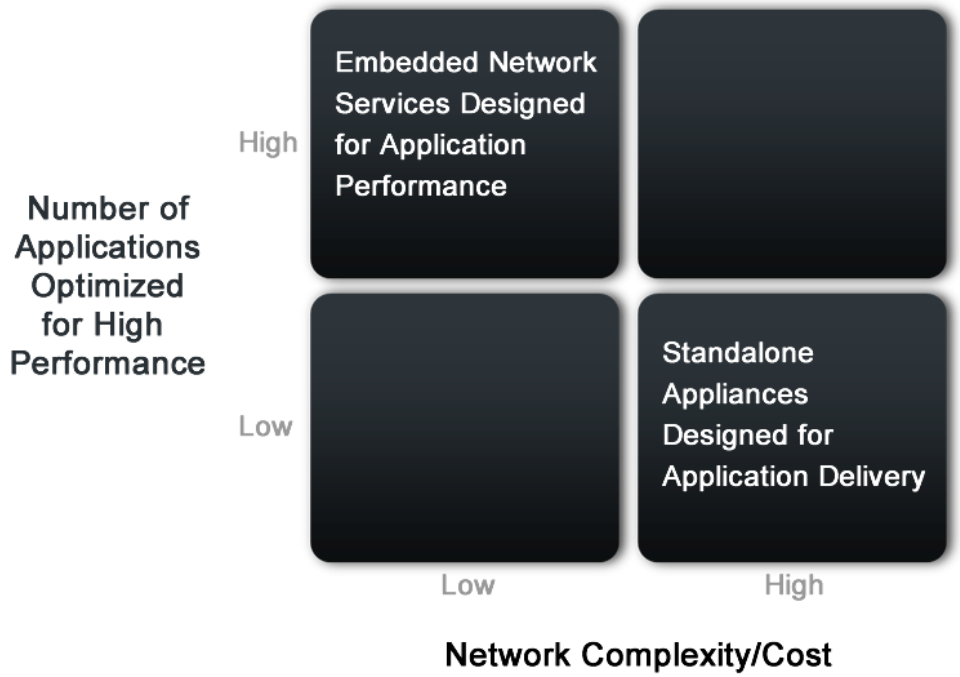
To gain the full value of corporate applications, their performance must deliver excellent user experience. An excellent experience should not only be had while working in the office or at home, but anywhere in between, even while talking on a mobile endpoint. Independent of geographic location, a user accessing their business services and/or personal services should be the same seamless experience. Application performance is key to excellent experience and should be consistently good whether sitting at a desktop watching a video or engaged in a WebEx conference, and then immediately transitioning to an iPhone for example. The user should have an excellent experience at the highest level afforded by their endpoint. To deliver this seamless user experience application performance the technology needs to being incorporated in corporate IT infrastructure, endpoint devices or a combination of both.

An Architecture To Deliver Excellent Application Performance

To enable a borderless application performance experience, IT business leaders need to consider borderless network architecture. While a few network suppliers such as HP, Avaya and Juniper Networks offer aspects of borderless networking, Cisco Systems is the furthest along in their thinking and delivery of borderless network architecture and the integration of application performance.

Cisco's borderless network architecture is built upon five network services: 1) mobility or users in motion, 2) Energy efficiency called EnergyWise, 3) integrated network security via its TrustSec architecture, 4) application performance or Application Velocity and 5) video services via its MediaNet initiative. These borderless network services are built within switching, routing, security, wireless and wide area application services or WAAS infrastructure products. It's the integration of these services into existing network infrastructure and their control via policy and management that enables a borderless experience to occur. In short, a borderless network eliminates the disconnect between applications and network designers by allowing the network to be aware of the applications that traverse it and endpoint capabilities that it connects. In this paper we'll focus on the Application Velocity borderless network service as it pertains to a new holistic approach to enterprise wide application performance.

Application Velocity: A Holistic Approach to Application Performance



As the name connotes, Application Velocity delivers velocity or speed and performance to applications based upon endpoint capability, access bandwidth and geographic access location. Application Velocity is a basket of application performance technologies. Traditionally WAN optimization appliances utilizing exotic cache schemes managed application performance. But Application Velocity is a superset of application performance, which builds upon WAN optimization. In short, Application Velocity is not just one application performance technology but a systems approach to deliver network based application performance.

Application Velocity is a network service made up of three components: visibility, optimization and agility.

Visibility: As the old adage goes, "You Can't Manage What You Can't Measure." The first component of Application Velocity is the ability to gain visibility into the network and the applications that it supports. To deliver this capability, Application Velocity is equipped with a discovery mechanism that finds and identifies applications in use. Applications can be classified and prioritized on an end-to-end basis, which the application carries with it as it traverses the corporate network. Once applications are discovered, their performance can be measured, baselined, and monitored to assure user experience expectations are being realized. To understand trending and analysis of application performance, the visibility component provides trending and analysis to aid application owners/developers and network designers gain insight into performance over a period of time.

Optimization: The second component to Application Velocity includes the traditional role of application and network optimization. This includes compression, caching and protocol optimizations as well as quality of service (QoS) based controls to deliver fast response to endpoints. In short, optimization includes the control knobs to tweak performance. In addition to application acceleration and optimization, this Application Velocity component delivers policy-based control of applications too, offering IT leaders the ability to inject corporate policy, such as user policy to application access. Once the network is improved, IT can compare the

new optimized baseline with the pre-optimization baselines to show the value achieved. But application acceleration and optimization even with policy control does not provide a tool to distribute content effectively.

The final element of optimization is content distribution or the ability to reposition content for distribution factoring in endpoint capabilities. For example, a video session with a mobile endpoint would require a different compression and coding scheme than a Telepresence session; content distribution matches content to endpoints and provides the appropriate content reposition.

Agility: The third and final component of Application Velocity is agility or the ability to offer IT business leaders capabilities to quickly deploy applications and simplify their management. Agility allows IT leaders to offer a higher level of responsiveness to business leaders. In essence, agility closes the gap between business and IT executive management execution expectations. Agility is gained by IT delivery acceleration. For example, by integrating applications into branch office networks a series of benefits occur such as energy and footprint efficiency, fewer IT personal requirements, rapid replication, and initial deployment. In addition, removing barriers to cloud computing where corporations can reap its value of scale and quicker application deployment is an attribute of agility. For example, as mentioned above, application performance is one of the top three concerns IT business leaders have in their deployment of cloud computing services. By implementing Application Velocity and thus gaining application visibility and optimization this concern becomes mitigated; accelerating use of cloud computing when the economics and need arise. In addition, with increased traffic of voice and video over corporate networks, the ability to deliver applications that contain rich media types to any endpoint accelerates corporate business process and its ability to respond to market and regulatory dynamics.

From a continuum point of view, Application Velocity first delivers visibility into applications being used on the network. Much of the visibility technology already exists within a Cisco network infrastructure such as NBAR or Network Based Application Recognition for discovery, NetFlow for usage analysis, Network Analysis Module (NAM) for performance measurement and baselining, and QPM or QoS (Quality of Service) Policy Manager for analysis. With the corporate application portfolio captured discovered, monitored and analyzed, IT leaders can now optimize their performance. Technologies such as WAAS or Wide Area Application Services, WAAS-Mobile for mobile users and the new WAAS-Express deliver application acceleration and optimization over the wide area. Other optimization technology that deliver policy control is PfR or Performance Routing, which selects the best WAN path for each application based upon WAN link criteria such as reachability, delay, loss, jitter, and Mean Opinion Score (MOS). The NAM can then be used to baseline the new network performance and before/after comparison charts are readily available as well as historical trending reports.

As IT operations gain visibility and optimization tools around its application portfolio, IT leaders can focus on making the corporate business process more agile. A product/technology example of network integrated applications is Cisco's ISR G2 with SRE/AXP (Services Ready Engine/Application eXtension Platform), which

supports application hosting, unified communications, wireless and wired connectivity, routing, switching, security, etc. Cisco's Media eXperience Engine or MXE is another product that supports Application Velocity, which has potential uses in applications such as distance learning, video surveillance, remote medicine, and video conferencing. For example, the Cisco MXE offers an example of any-to-any rich media by converting presentations formatted by a boardroom camera to formats required by employees' PCs, mobile devices, or digital displays in common areas or remote sites.

Application Velocity Example

The figure below illustrates the wide range of application performance technologies that are built and integrated within Cisco Borderless Network Architecture. The illustration depicts various network scenarios such as campus/data center, WAN and branch/remote office/Mobile and identifies the various technology that deliver Application Velocity within its three network service components of visibility, optimization and agility. It's clear from the illustration that to control and optimize application performance, various technologies are distributed throughout the network architecture.

Components/ Place in Network	Campus and Data Center	WAN	Branch/Remote Office/ Mobile
Visibility	NBAR, IP SLA, Netflow, ACE, NAM, WAAS Central Manager	NBAR, Performance Routing (PfR), IP SLA, Netflow, Service Control Engine (SCE), NAM	IP SLA, Netflow, WAAS Central Manager. NAM
Optimization	WAAS Performance Routing (PfR)	WCCP, Advanced QoS Performance Routing (PfR)	WAAS Express, WAAS on SRE on ISR G2, WAAS- Mobile, Performance Routing (PfR)
Agility	WAAS Central Manager, Advanced QoS, Netflow, Networks NetQoS, Fluke	WebEx Node on ASR 1000	Windows on WAAS (WoW), Virtual WAAS, UCS Express, AXP, SRE.
Network Infrastructure	Wide Area Application Engine (WAE), Catalyst 6500, Nexus	ASR1000	ISR G2

For example, in the branch or remote office the Borderless Network offers the following integrated technologies to gain application visibility. These technologies are IP SLA (Service Level Agreements), which verify service provider SLAs, NetFlow and WAAS Central Manager. The Flexible NetFlow available in Cisco ISR G2 and Cisco Catalyst 4500 switches provides pervasive visibility from campus to the branch with Layer 2 (MAC address, VLAN information in campus LAN) to layer 7 (such as TCP flags). This visibility helps to

understand application and network usage, build capacity planning, assist performance troubleshooting, identify application behavior anomalies and meet compliance requirements. To optimize applications there are a few WAAS options such as implementing the new WAAS Express or WAAS on SRE in the ISR G2, WAAS-Mobile, which extends application acceleration benefits to mobile workers and the IOS feature PfR. To baseline or troubleshoot performance is the NAM. Finally there are options to deliver agility such as through Windows on WAAS or WoW which host a windows server, virtual WAAS and the powerful Unified Computing System-Express (UCS-Express) on the ISR G2, which provides branch-to-cloud application survivability, reliability, and predictability for storage, compute and networking when a WAN connection is unstable or broken.

Some of the above technologies are horizontal, meaning that they span the entire Borderless Network while others are unique to a particular place in the network. Further a few of the technologies are in appliance form factor; expect Cisco to virtualize the borderless performance service over time and integrate it into IOS.

Industry Recommendations

Application Velocity offers an application performance network service approach to gaining visibility, optimizing and accelerating application deployment. At the heart of Application Velocity is the goal of providing superior user experience as well as efficient IT resource utilization and business agility. To gain these advantages we offer the following recommendations to put Application Velocity to work within a corporate IT infrastructure.

Catalog Application Portfolio: Consider utilizing the visibility features of Application Velocity to first catalog the enterprise application portfolio. The vast majority of IT business leaders have not identified the applications being delivered to employees, contractors, suppliers and partners. This would be the first step in gaining insight into the applications that traverse the borderless network.

Catalog Existing Application Performance Technology In Use: Consider cataloging all the application performance technology features and products available and in use within the enterprise borderless networks. It's highly likely that many of the features and technologies discussed and illustrated above are already available and deployed within the enterprise network.

Conduct Gap Analysis: Consider comparing the catalog of existing application performance technology in use to the matrix above and develop a gap analysis, which can be used to guide product/technology acquisition to deliver a borderless performance experience. The gap created in this process also shows vulnerability to application performance degradation.

Gap Closure: Consider closing the gap with application performance product/technology acquisition. Consider starting by deploying Application Velocity visibility tools to further assist in trending, management and planning.

Optimize Applications: Consider deployment of optimization tools to increase application performance of existing and planned applications.

Implement Branch Office Application Agility: As Application Velocity offers much business agility tools for branch office and data center environments and it is a growing segment of the global economy, consider implementing the various agility tools/technologies/products to speed innovation absorption.

Chief Application Performance Manager: Consider designating a senior IT leader as the application performance manager. As performance management consist of systemic infrastructure implementation the responsibility and authority to implement its tools should rest within a designated IT leader. Other responsibilities would be to oversee the above process above as well as work with business and IT leaders to assure business agility as well as vendors and service providers to manage their implementation.

About Nick Lippis

Nicholas J. Lippis III is a world-renowned authority on advanced IP networks, communications and their benefits to business objectives. He is the publisher of the Lippis Report, a resource for network and IT business decision leaders to which over 35,000 business and IT executive leaders subscribe. Its Lippis Report podcasts have been downloaded over 80,000 times; i-Tunes reports that listeners also download the Wall Street Journal's Money Matters, Business Week's Climbing the Ladder, The Economist and The Harvard Business Review's IdeaCast. Mr. Lippis is currently working with clients to transform their converged networks into a business platform.

He has advised numerous Global 2000 firms on network architecture, design, implementation, vendor selection and budgeting, with clients including Barclays Bank, Microsoft, Kaiser Permanente, Sprint, Worldcom, Cigitel, Cisco Systems, Nortel Networks, Lucent Technologies, 3Com, Avaya, Eastman Kodak Company, Federal Deposit Insurance Corporation (FDIC), Hughes Aerospace, Liberty Mutual, Schering-Plough, Camp Dresser McKee and many others. He works exclusively with CIOs and their direct reports. Mr. Lippis possesses a unique perspective of market forces and trends occurring within the computer networking industry derived from his experience with both supply and demand side clients.