Introduction

The emergence of Unified Communications (UC) represents the next step in the evolution of converged communications. Whereas the initial benefits of converging communications on the IP networks included toll charge reductions, the elimination of redundant communications infrastructure, and location independence, UC introduces the next level of improvement by reducing human latency which streamlines enterprise wide business processes. By turning communications into a software application, UC provides a central platform that allows users to optimize how they communicate with each other (e.g. IM, voice, video, distributed application sharing) appropriate to the task at hand, in real time or store and forward modes. And most importantly, UC allows this communication to be integrated with Enterprise Application Software that supports an enterprise’s business processes, which will speed transactions and enable quick and informed decision making.

As UC is still in the early adoption phase, there are a number of innovative applications that are being introduced to the market from companies like IBM Lotus, Microsoft and Cisco. In addition, VoIP platforms from Cisco, Avaya, and others are starting to include presence and click-to-call capabilities that move these technologies towards the UC realm. And finally, video conferencing vendors like Polycom and Tandberg are introducing desktop products that aim to grab a share of the UC market.

All of these applications are silos of technology, each of which requires pockets of dedicated bandwidth to ensure reliable operation. Some of these technologies attempt to manage their dedicated bandwidth within their own framework. Others—such as the UC technologies from IBM and Microsoft—include no bandwidth management capabilities whatsoever, which require customers to over provision the associated bandwidth to achieve acceptable quality levels. This results in big variations in quality of experience to the end user, and huge differences in control and management flexibility between different communication silos. Moreover, as these applications are adopted within the enterprise, the amount of bandwidth needed by each is growing exponentially. And as each vendor requires sufficient bandwidth for their application to operate at peak volume, much of this bandwidth goes unutilized much of the time.

In the absence of the ability for IT to pool the bandwidth requirements across all communications and media distribution solutions, and to manage this bandwidth pool using a single set of tools, the cost of redundant bandwidth and the resources required to implement these various silos of UC technology will slow adoption and limit innovation.

Where do you manage heterogeneous bandwidth requirements?

For organizations to confidently deploy UC as an enterprise technology for audio and video communications, they must be assured that all users can access the system and that the
communications traffic will not overwhelm portions of their networks. Indeed the key to the market opportunity in UC is the management of associated infrastructure stress. Without this key component to the solution many UC promises frequently fall short in guaranteeing an acceptable experience to the end user, since they cannot manage quality end-to-end.

Conventional wisdom states that managing the stress placed by voice and video on IP networks requires significant investments in network technologies, specifically in the areas of QoS, policy-based routing and reservation protocols. Network companies like Cisco are investing heavily in making their networks more application-aware with the goal of providing better service quality on these networks.

In practice, however, these technologies have proven to be hard to manage, are limited in scalability, are fundamentally under-estimated in their complexity and very expensive to implement. This is especially true in large, distributed organizations with many networks, WAN segments or remote offices. Modifying the network topology and associated infrastructure to accommodate expanding bandwidth requirements is also difficult to architect in the face of an increasing number of mobile workers.

In light of these complexities, Avistar takes a fundamentally different approach: we believe that the best way to deliver a high-quality experience to the end user is by putting all the intelligence in the application software so it can adapt to whatever underlying network conditions occur at any given time. Avistar’s strategy, therefore, is as follows: Avistar puts the network management intelligence in all components of the application software, including the endpoints, the servers, and the infrastructure components. This results in network-aware software applications, which are dramatically better positioned to ensure a high quality end-user experience than software-applications that rely on application-aware networks.

Network Bandwidth Management: Optimizing the UC Index

IT and network managers will resist any scaled deployments of UC which incorporate voice and video without having the ability to proactively manage the bandwidth used by both types of calls. Without voice and video calling, UC fails in its mission to become a true unified solution and is instead perceived by the market as another enterprise Instant Messaging and data collaboration solution. This reduces its market appeal by <Z=X-Y > which is the difference between the size of the UC market (X) versus the size of the enterprise IM market (Y).

Solving the UC Value Equation:

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\text{UC Index} = \frac{\text{Distributed, Integrated Business Competitive Value}}{\text{Network Costs}}
\]
The opportunity created by introducing dynamic, software-based, integrated network management in the application software changes the value proposition of the UC index. By reducing the need to increase network costs, enterprises will be positioned to realize the value of better labor mobility, knowledge leverage, client intimacy and green efficiency at a fraction of the cost and implementation time, thereby adding the “missing piece” to solving the UC equation 12 months ahead of the market.

**Crossing communications silos: Avistar’s Shepherd**

In real world deployments, UC will co-exist with other real-time communication tools, such as H.323 video conferencing, hybrid IP-PBX deployments, streaming media, video broadcast solutions and web conferencing. All of these real-time communications tools are currently islands of technology that suffer from a lack of converged management infrastructure:

- Call Admission Control solutions from IP-PBX vendors are tied to legacy technologies such as H.323 Gatekeepers and proprietary signaling and call control functionality that require desktop devices such as IP phones. These solutions are driven by manually generated dial plan management and manually defined zone and call routing management.

- Network infrastructure solutions based on QoS are designed to ensure continuous operation of the network, but not the solutions that run on their infrastructure. As such, they do not address the needs of the business processes UC enables and the productivity gains that these solutions provide.

- Technologies that enforce bandwidth constraints within their own framework, as shown in the figure below, manage their own bandwidth pools without regard for other real-time communications on the network, which results in inefficient bandwidth use, poor quality, or both. And each of these solutions requires configuration and administration through their own interfaces, which is time consuming, error-prone and resource intensive for IT administrators.
In short, Administrators don’t have the tools today to control how much simultaneous real-time traffic is allowed on the network or monitor all simultaneous real-time traffic across their networks. The lack of a centralized tool for managing the traffic across the enterprise also eliminates their ability to capture and report on all simultaneous real-time traffic on their networks and therefore manage bandwidth requirements across their global enterprise.

Avistar’s Shepherd addresses this void in the bandwidth management market through a meta-communications manager that provides an *integration layer* on top of multiple real-time communications technologies to:

- Provide a single entry point into configuration of call admission control and bandwidth management of multiple real-time communication technologies;
- Add call admission control and bandwidth management to real-time communication for other technologies that don’t currently provide it (e.g., Microsoft OCS, IBM Lotus Sametime);
- Synchronize bandwidth pools dynamically between multiple RTC technologies to enforce a single set of bandwidth constraints;
- Provide visibility across all RTC traffic on the network at all times;
- Provide a single access point and interface to capture, record and report all RTC traffic.
As a result, Avistar’s Shepherd provides the ability to deploy solutions today consistent with how they will migrate over the next several years (as seen above). By providing a meta-view of the bandwidth across all silos of bandwidth usage, Shepherd will create the forum needed to innovate and continuously adjust application deployment without need for re-architecting the network at great expense.

Avistar’s Shepherd – Increasing Available Network Capacity
UC “Pipeshare” Application Trend

Shepherd also provides IT and network administrators a central view of bandwidth usage across the global WAN for all communications and media distribution traffic. This capability enables organizations to identify pockets of unused bandwidth; identify bottlenecks and adjust network routing to meet a diverse set of application requirements.

Since Shepherd operates at the application layer, it can also be made sensitive to the different needs of different types and classes of users and applications. VIP users can be enabled with alternate routing abilities within the network to ensure that their calls always go through despite bandwidth limitations.
and network bottlenecks. Applications can also be assigned class of use such that mission critical applications (like trading dealer boards) are guaranteed access to bandwidth on demand and in real time.

By providing a panoramic view of bandwidth across the organization and across different silos of dedicated bandwidth pools, Shepherd increases the number of applications that can be deployed on existing bandwidth. With Shepherd, each silo’s average, peak and spare bandwidth requirements are viewed as and managed as a single pipe. The need for redundant bandwidth is greatly reduced and therefore more applications can be deployed over existing network resources. Shepherd pays for itself by simplifying the process of adding bandwidth intensive applications and reducing the need to expand the bandwidth pools to accommodate the new generation of rich media applications.

**The Technology behind Avistar's Shepherd**

The following diagram illustrates the high level architecture of Avistar’s Shepherd:

Shepherd is based on industry standard XML messaging for publishing and subscribing to Real Time Communication (RTC) activity on the network. It incorporates a reservation-based bandwidth management methodology that is network topology aware and incorporates call admission control.
software for enforcing policies and determining call rates, in real time, at call setup. Shepherd adapts to changing network conditions and utilizes location aware optimization algorithms which synchronize bandwidth management across multiple technologies and from multiple sources.

Avistar’s Shepherd fills the meta-layer bandwidth management void in the market with an application suite that will set the standard for intelligent real-time communications management.

**Shepherd Value Proposition and ROI**

The value proposition in integrating this solution is significant:

- Network management is integrated into the application software rather than within the network itself. This offers huge opportunities in improving application performance and functionality without increasing network infrastructure or redesigning network topologies.

- The deployment and TCO of UC becomes considerably lower and hence reduces costs of sale. As network management issues are addressed by the application rather than associated network technology changes.

- Additional applications can be deployed which are enabled with communications software without requiring IT to resolve all of the network management issues before deployment. Avistar’s bandwidth management technology enables UC deployments to solve business issues quicker while addressing network bandwidth issues at the same time.

With Shepherd, network administrators associate maximum per-call bandwidth constraints with each network element. This includes defining the maximum per-call bandwidth within each location and for each application as well as for each of the links between locations and among applications.

This unique capability provides administrators the ability to assign an expense to each link without compromising the audio or video quality on bandwidth-rich links or for VIP users. Shepherd’s call setup process reduces requested bandwidth if necessary to fit within the limits of each network element. Bandwidth is automatically negotiated end-to-end to fit within the network’s lowest common denominator.

The return on investment for implementing Shepherd can be calculated based on the per employee cost of corporate bandwidth. Avistar polled five (5) of its large enterprise customers and discovered that the average charge-back for per employee share of bandwidth is $25 per month. By implementing Shepherd, Avistar estimates that companies can expect to reduce their bandwidth spend from 10% to 40%. Actual savings will depend on percentage of rich media usage on the network (e.g. VoIP, video conferencing, streaming media, multimedia messaging, et al). Table 1 below shows the annual savings companies can expect on WAN bandwidth spend depending on their size and the depth of rich media in

**Avistar’s Shepherd**
use across their network. For large companies, savings per 100,000 employees for 2008 would reach $3M with cost reductions at 10% per user, growing to $12M in 2011 with cost savings of up to 40% per user. Using a linear growth rate of savings at 10% per year to achieve 40% in 2011, the total savings for the period of 2008 through 2011 would be $42M per 100,000 employees.

<table>
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<th>40%</th>
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<td>10,000</td>
<td>$25,000</td>
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Table 1 – Monthly savings in U.S. Dollars

As an additional consideration, using the linear growth rate projected above, large companies would also exceed the bandwidth provided by 100mb desktops in 2010, requiring them to upgrade to gigabit desktops and multi-gigabit LAN backbones.

Shepherd’s Impact throughout the Enterprise

As enterprises look to adopt UC to increase the value proposition of communicating across mediums on their network, the need for bandwidth management extends beyond the scope of desktop deployed real time communications.

High end video conferencing rooms have long enjoyed exclusive access to large dedicated pools of WAN bandwidth. Since these technologies have existed primarily outside the framework of other real time communications, the need to manage their bandwidth has been non-existent. But as UC extends video calling and video conferencing to the desktop, these room systems will need to give up their exclusive bandwidth silos and participate in the larger communications network schema.

Rich media creation, archiving, publication and on-demand distribution have also been strategically limited to access by small, elite workgroups within the enterprise, based on the highest need for access to this bandwidth intensive information. But with Shepherd, these technologies can also be incorporated into the central bandwidth management framework and therefore access to this valuable information can be opened up to larger groups of users without impacting the network. Shepherd’s
abilities to enable access to bandwidth pools based on application class of service and class of user provide a robust set of tools for distributing rich media data throughout the enterprise.

In its early adoption phase, UC has been looked at as an intranet solution for enterprises. But as more and more enterprises engage in adopting UC, cross enterprise communications through community based extranets will start to take shape. Avistar foresees the need for local UC implementations that are managed by Shepherd’s capabilities to be able to exchange routing and provide access to bandwidth pools through these external extranet links. Therefore, Shepherd is designed to operate in both master-slave and peer-to-peer implementations. Extranets that deploy Shepherd within their network will be able to provide cross enterprise bandwidth management through intelligent and cost-based routing algorithms that communicate and cooperate with the intranet Shepherd servers.

Shepherd’s functionality will therefore not only facilitate the addition of UC technologies within existing bandwidth, it will also provide the forum for expanding the use of many different kinds of bandwidth rich applications across the enterprise. This will result in both providing an increase in their value proposition and a reduction in the TCO of these applications and their deployed bandwidth.

Summary and Conclusions

Avistar began deploying the core architecture behind Shepherd in 2000 to enable widespread adoption of the company’s video conferencing systems at leading global financial services enterprises. Today, these capabilities enable thousands of users within these enterprises to complete millions of minutes of high bandwidth video calls every month across their LAN and WAN infrastructure – with a call completion rate of over 90% and without requiring the deployment of additional network infrastructure.

Avistar is now taking this field proven technology and making it available as a cornerstone technology to simplify the adoption of UC platforms across the enterprise to enable a new class of communications technologies that enhance business processes.

Avistar’s Shepherd creates the opportunity for enterprises to build a custom suite of innovative rich media communications applications that extend the value proposition of their selected UC platform. It minimizes their need to alter their existing network topology or add substantially to their network infrastructure or bandwidth investments to implement these solutions – as well as simplify their ability to swap out applications as new innovations come to market.

To learn more about Avistar’s Shepherd and discover how it can help your enterprise reduce network stress and pave the way for adopting Unified Communications, contact your Avistar Account Manager or drop us an email at avistarshepherd@avistar.com.